THE LAWS OF PHYSICS
DE
THE ECONOMY

(THE MADRID THEORY)

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Preface

(First Edition)

It is curious, but the most cited economics book of all times begins its preface with the same words we would have chosen to explain the reasons that lead us to the publication of this work:

> *"I address this book especially to my fellow economists, though I hope it will be comprehensible to those who are not. Its primary object is to deal with the difficult questions of theory, and only secondarily with its practical applications; for if orthodox economics is in disgrace, the reason is to be sought not in the superstructure, which has been worked out with great care as regards its logical consistency, but in the lack of clarity and generally of its premises."*
>
> *JOHN MAYNARD KEYNES, 1935*

If we had proceeded in this way (and removing the reference to "my fellow economists", which in our case would have been clearly pretentious because only one of the authors has studied economics), we would have been very justly accused of plagiarism; and for this reason we have not done so.

We say it is curious, because the quote is almost a century old and nothing seems to have changed in the economy in such a long period of time, when the advances in other scientific disciplines would leave the most daring visionaries of those times with their mouths open. We have been to the Moon and back, and in a few years we will do the same with Mars. Genetics has advanced so much that the problems we face are more ethical than scientific: cloning, organ trading, immortality just around the corner and at exorbitant prices. We know what happened to the universe 15 billion years ago and also what killed, in more recent times, our distant relatives the dinosaurs. Getting machines to think is a goal that many visionaries already see as very feasible to try to tackle. The new materials that chemists and physicists put within our reach allow us to dream of towers as tall as Babel, and in which we can touch the sky with our fingertips. We live in a world that is so extraordinarily generous and promising to human beings that we are astonished that only 10 years ago, in 2008, everything was on the verge of collapse due to an economic crisis that very few economists were able to predict and that nobody seems to know even today, 10 years later, why it happened.

We are amazed that, being immersed in such an abundance of scientific knowledge, no one knows how to tell us what it is that pushes us so blindly to destroy the world in which we live and which has been sustaining us with such generosity for more than 1 million years.

There are a few economists, "colleagues" of other economists, who have denounced without rest and without achieving absolutely nothing, the degraded situation in which economics finds itself from the scientific point of view, and which Keynes also denounced in the prologue of "The General Theory". To name now the small number of these people does not make any sense here, and we will not do so, but we will point out that there have always been within the universities of the world "a handful of irreducible Gauls" (like Asterix), who have tirelessly denounced the repression of economic thought that the Empire of Liberal Theory has imposed by force in all the universities of the world and, most importantly, who have managed to keep alive the flame of science that illuminates economics.

In this prologue, we denounce Liberal Theory as responsible for the great scientific deficiencies that economics has been suffering for hundreds of years.

We denounce in this prologue, the large amounts of money with which Multinational Companies and Investment Funds flood our Public Universities around the world, to buy wills, to remove and put chairs, to decide what is researched or not researched, to propagate as science what is only ideology with the sole purpose of maintaining an economic system that favors a few, while pushing the rest of us to deplete the planet's resources.

We denounce in this prologue, the Private Universities. Like Princeton University, which uses its immense annual income of more than 25 billion dollars to propagate Liberal Theory.

We denounce in this prologue, the Swedish bank that awards the Nobel Prizes without anyone knowing who are the people in charge of the election, nor is it at all clear what dark and unspeakable ideological reasons they are serving when they grant the coveted award.

We denounce in this prologue, the media that propagate and give interested coverage to opinions lacking any scientific backing from liberal economists.

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October 05, 2019

Preface

(Second Edition)

Beginnings are always difficult, or so they say, but the reception of the first edition of the Madrid Theory has been really disastrous. The authors selected more than 100 economists, almost all of them Spanish and university professors, and sent them the first pdf edition of the theory asking them to evaluate its contents, but no one responded to our request. In the message they were told that the work deduced the basic equations of a monetary economy and analyzed the most direct and obvious consequences for the real economy, but, for some reason unknown to us, the mention of the basic equations not only did not arouse any curiosity on the part of the economists, but rather produced a strong rejection and a strong lack of understanding of the work.

We still do not really know what happened exactly. Perhaps the problem lies in the mathematical language we use, very far from the one economists are used to, even though the level of mathematics used in the theory is really simple and within the reach of any pre-university student.

Perhaps the problem lies elsewhere, and is more psychological than anything else. Apparently, economists are brought up to believe that economics is not an experimental science like medicine, chemistry or physics. Economists are usually very wary of any such assertion about the discipline. Even more so when you affirm, as is done in theory, that the use of money imposes very demanding constraints and limitations on what can and cannot be done in economics. Although nobody is unaware, and neither are economists, that economic crises exist and that, therefore, not everything is possible within a monetary economy, it seems that openly exposing a mathematical expression that explains it, raises an enormous suspicion among economists without the authors being able to understand why. Let us look at the following formula:

$$\frac{1}{k_F}\frac{d}{dt}PIA = [Ah^C - Ah^S] \qquad \textit{Growth Equation}$$

The expression, which we call in theory the Growth Equation, indicates that it is the quantity of bank money injected into the economy through credit that guides nominal production within the monetary economy. From the expression, whose veracity is very easy to verify empirically, we deduce the condition for the appearance of a credit crisis, which is apparently impossible to believe for an economist educated in the Theory of Utility, accustomed to dealing with equations lacking any empirical support.

One of the most prestigious economists to whom we sent the first edition of the Madrid Theory in October 2019, was an English Marxist economist, whose name we will not mention, who offered to give an assessment of the theory even though we warned him that it had not been translated into English. We sent him the document in Spanish and translated with Google into English to avoid the translation, and it was quite frustrating to see that, like the rest of the economists, he did not send us any evaluation of the work, nor did he respond to us again. We did not quite understand what had happened. Why this unnecessary lack of politeness? Even today, more than a year later, we do not know why he did not reply, but we never heard from the English economist again and never tried to communicate with him again.

The sadness that seized us was very great. We were unable to understand anything that was going on around us, and we could not understand why no one responded, if only to tell us that our work seemed meaningless to them.

We were so disappointed that we went to visit in person one of more than 100 economists to whom we had sent the paper requesting an appraisal. Specifically, we went to visit a prestigious professor of economics at the University of Seville in search of answers, and we had no qualms about approaching him in his office in the hope that we would finally find out why the Madrid Theory was so silent. He attended us very politely and listened to us very patiently, but we did not get anything clear because, as was logical, he told us that he had only had time to look at the work, which was very logical.

Silence became more silence, and the only thing we could learn from our visit to Seville was that we were not going to find out from a personal conversation why no one seemed to have any interest in expressing an opinion on what was said in the theory. Of course, our professor was very skeptical of everything we told him about the theory, but other than that, we could not get anything out of it.

Our search ended there, in that office, and we gave up trying to find an economist willing to give us an answer. From then on, we focused on expanding the theory in the hope that, by rewriting the Madrid Theory and explaining its consequences more directly and in more depth, it would be better received by the scientific community.

The second edition of the Madrid Theory began to be rewritten at the beginning of the pandemic, already in 2020. Between confinement and confinement, the extension of the theory was ready by Christmas of that year, coinciding with the arrival of the expected vaccine that would leave behind the hundreds of people killed every day by the terrible pandemic in Spain alone. It was a great effort for us, but we thought it was very important to finish it. The virus had put the entire world economy in check and all the nations of the world were using the Central Bank's ability to create money to rescue the real economy, without having any idea of the consequences of such a course of action, and without having any idea of the existence of other alternatives.

It is in this pandemic situation, when the economy collapses, that we clearly see the need for good economic theory to guide us in raising real production and alleviating the economic effects that confinement has had on people. Let us note that, in less than a year, scientists working in the field of infectious diseases have prepared more than half a dozen vaccines to stop the virus and make it a bad memory. Yet the economists working for us in our public universities have been unable to come up with a coordinated and coherent response to the unique economic problem that every country in the world is facing.

Let us observe that, while the rest of the scientific disciplines advance and find solutions to the problems they face, economics and economists seem bent on leading humanity to disaster. The problem with economists is not only that they do not find solutions to the problems, but that they behave as if they were not responsible for the economic disasters caused by their theoretical recommendations. It is curious, but if you ask an economist about what happened in 2008, they will answer that it was a natural disaster, a black swan, but they will give you the impression that they feel the slightest shame or the slightest embarrassment for what is happening in the world. It is as if the economy has nothing to do with them, being unable to understand that they are the ones responsible for bringing the economy to the edge of the precipice, and letting it fall there. For an economist, the 2008 crisis was something alien to the economy and alien to the way we approach productive processes. It is, so to speak, an unpredictable pandemic alien to economists and alien to economics, and to which there is no answer from science.

In this sense, having the Madrid Theory is very important from the social point of view, because it allows us to understand the origin of the economic crises and what causes them, and allows us to face the economic effects of the pandemic in the best possible way. The scientific knowledge provided by the Madrid Theory will not prevent disasters, but it will certainly contribute a lot to avoid their most painful consequences.

We must also warn, with insistence, that the problem that the study of economics suffers from is the lack of any scientific methodology within the discipline. It is much more important for economics to reinstate scientific methodology within the discipline than to have a scientific economic theory, however important the theory presented here may be. If economics wants to leave behind the control imposed on it by private universities in the USA, it is necessary first of all to reinstate peer review within the discipline and to create a set of public economics journals where the selection of articles to be published is carried out in a clear and transparent manner.

But it is not the only thing that must be done.

It is also necessary to make the selection process for the Nobel Prize in Economics more transparent, because the prize is currently being used for ideological and propagandistic purposes. To explain this and other measures that must be taken to return economics to its status as a scientific discipline, we have added to the first edition of the book a brief chapter zero in which we talk about science and the scientific method, and in which we denounce the degraded situation into which economics has fallen and how to remedy it.

There are many economists, more and more, who are aware of the degrading situation in which the economic discipline finds itself, but the lack of a reasonable explanation of what is happening and the root causes of the discipline's failure prevents them from finding a solution and remedying it. Also, the lack of an alternative theory with which to confront the liberal doctrine taught in public universities around the world prevents them from organizing successfully and stopping what has been happening for many decades. They are unable to face the real enemy together, since they are not aware that the people who run the private universities in the USA are preventing any scientific progress in the economy, with the sole intention of preventing the governments of the countries of the rest of the world from freeing themselves from the economic domination exercised by US companies over production in the rest of the world.

We hope that this treatise will open the eyes of all these economists and allow them to understand where the problem has always been and how to remedy it, because only by restoring the scientific methodology within economics, can economics have any future, and with it the society in which we live. We have the absurd idea that "Science" is, by itself, invincible and very capable of defending itself against any violence, but nothing is further from reality than this idyllic idea that we usually have about the incorruptibility of the scientific method. Science", like almost anything else that is valuable, is fragile and must be protected against those who want to manipulate it, break it and turn it into an instrument of oppression, precisely because it is so valuable.

We address this treatise to all students studying economics in the many public universities around the world, but not only to them. Although it is undoubtedly true that, after reading it, students will have a totally different view of economics from that which their professors try to instill in them during their studies, we would be very disingenuous and somewhat untruthful if we were to say that this is the only motivation that has moved us to write and publish it. This treatise is addressed to the rest of the scientific community to remind them that science, like democracy, needs much more protection than we think.

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March 4, 2021

PART 0

THE ECONOMY

CHAPTER 0

THE SCIENCE OF ECONOMICS

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March 4, 2021

1. WHAT IS SCIENCE?

What is science? When is something considered scientific and when is it not? How do we know if any statement is being supported by science and when it is not?

To answer these questions in a categorical way is always very difficult, and almost certainly impossible. Philosophy, which studies these and other similar problems, tells us that what we call "science" is only the more or less majority consensus of the scientific community on all those statements that are considered scientific. That is to say, science itself tells us that scientific knowledge is not the absolute knowledge of reality and is not, nor can it be, alien to the scientific community where it is created and where it exists. Therefore, the philosophy that studies the bases on which scientific knowledge is based, uses the word "paradigm" to refer to the set of statements that are considered the scientific truth by the scientific community at a given moment in the historical evolution of a discipline.

Of course, we are not saying that scientific knowledge is subjective, but we are affirming that there is always a part that is subjective and undemonstrable within any non-trivial scientific statement that is made about the reality that surrounds us. There is, therefore, no "truth" that can be stated as objective within a scientific discipline, but there is a methodological consensus on "the truth" contained in a set of propositions that we state as scientific.

When we understand that science is the methodological consensus created by the people who form the scientific community, then it is possible to understand why the foundation of science and the strength of the Scientific Method rest on the prescription, or compliance with the set of unwritten rules, that must be followed to create scientific consensus on the veracity of a statement. This set of rules is known as "peer review," and there can be no scientific truth if this methodological prescription is violated or not followed.

The next thing to understand about science is that "peer review" requires that any claim or statement made within a scientific discipline must be permanently exposed to criticism from the moment it is made. It is in the permanent criticism of the veracity or non-veracity of any statement, and in which the entire scientific community participates, that creates the dominant paradigm within a discipline, and that advances science.

It is now possible to understand why economics is far from being a scientific discipline, since it is very easy to demonstrate that peer review is not taking place within the discipline. It is very important to understand, and we will show it now, that economics fails miserably because no claim that is shown to be scientific within the discipline is subject to any criticism. Or to put it another way, the economic paradigm that is presented to the community as the result of scientific methodology is not subject to any criticism, i.e., it is a doctrine and not a scientific paradigm.

For example, the variables or parameters that appear in a scientific statement must always be well defined and must refer to something that can be measured, or at least that can be isolated in the context in which it is formulated. It is logical. If the elements with which a statement is constructed are not well defined or cannot be isolated, it will be difficult for another person to verify or refute any statement made with them and it will be difficult to reach any consensus on that statement. However, it is easy to see that the variables used in economics are mostly poorly defined and therefore cannot be measured or isolated.

Let's take a concrete example within the economy to understand the importance of well-defined variables: "**The** non-accelerating inflation rate of unemployment**,** also known as NAIRU (non-accelerating inflation rate of unemployment)".

Although, of course, the inflation rate and the unemployment rate are well defined and can be measured, the NAIRU, however, is a term that is not well defined. Not only because the term implies that there is a causal relationship between unemployment and inflation, in the sense that unemployment is the cause of inflation, which may not exist, but also because it is impossible to calculate the NAIRU without first creating a context in which the NAIRU exists.

The existence of concepts such as NAIRU demonstrates very clearly that peer review does not exist in economics. If there were peer review in the science of economics, an article on NAIRU would never have been published in an economics journal, because the reviewers of the journal would have considered the term as a non-scientific term. At most, some article would have been published showing the shortcomings of NAIRU and asking for help in defining it, but it is certain that it would never have become the center of attention in economics for decades, as has in fact happened.

For decades, thousands of articles on the NAIRU have been published in the most prestigious economic journals in the world, without any censor raising any objection. How could this have happened? Well, because the economic journals are controlled by their owners and publish what they want on the topics they want without following any scientific criteria, with the aggravating factor that prevents the publication of any criticism of the Liberal doctrine. For example, it is hard to find articles that are critical of NAIRU. Evidently, in such an environment, science can hardly flourish, and the result of this methodology can only be the creation of a religious doctrine. In fact, this is how the church, the synagogue or the madrassa works.

The essence of the Scientific Method is the permanent critique of any statement that claims to be scientific, and this does not exist within the current economic discipline. Or in other words, what is called in science peer review does not exist within the discipline of economics.

2. PEER REVIEW

Nowadays, the name "peer review" is used to refer to the sophisticated and arbitrary selection process followed by any article before its publication in one of the many scientific journals that exist. It refers, therefore, to the censorship process to which articles are subjected before publication, but here we are using the term to refer to the set of rules that must be followed to ensure that any statement made within a scientific discipline can be criticized, on a permanent basis, by any other scientist or any other person who sees fit, i.e., to refer to the opposite.

Science differs from any of the many other systems that have been used to accumulate and make knowledge accessible, in that any statement made within it is always subject to criticism and revision, whether or not the statement is considered true. It is at this point that the difficulty of a discipline being able to call itself scientific lies, because it is not at all easy to create the necessary environment for the permanent critique of any idea or knowledge to take place.

Let us think of any religion, for example, Catholicism. The structure that the Catholic Church has created to spread Catholicism is a pyramidal structure, at the top of which is the pope, to whom infallibility is attributed when he gives his opinion on Catholic doctrine. Or in other words, within the Catholic Church, no statement made by the pope about Catholic dogma can be questioned and criticized by the Catholic community. We see that Catholicism is not a scientific discipline, nor can it become one, because it does not accept any criticism of what the pope affirms when he speaks of Catholic dogma. The sad thing is to see that the economic discipline works just like the Catholic Church and has recreated the same pyramidal structure and has placed at its top economists working for private universities in the USA, whose opinions cannot be criticized in any economics journal.

How has the science of economics degenerated so much? How has it become a theology at the service of the minority favored by the economic system? Understanding this is not difficult when one studies the role played by scientific journals within scientific methodology.

Peer review is originally conceived to ensure that the entire scientific paradigm is always open to any criticism or any new data that may call it into question in order to force the scientific community to review it in the event of doubts or evidence to the contrary. In this sense, scientific journals are created so that any criticism of the ideas that are considered true according to the scientific paradigm can be made public. The problem arises when the process of permanent criticism that takes place in economics journals (and which is the basis of the scientific method) is manipulated to do the opposite, to prevent the claims that are presented to the community of economists surrounded by the halo of "scientific claim" economists working for private universities in the U.S. from being criticized. In fact, this is what has happened in the discipline of economics.

The perversion implied by this change in the function entrusted to economic journals is so incredible, so inconceivable, that no economist seems to have realized that this is what has been happening for more than fifty years with the articles published in economic journals around the world. The necessary review process to which any article is subjected before publication is used within the economic discipline for the opposite, to censor articles on the basis of ideological, not scientific, criteria.

It is not at all difficult to understand how it is possible that in a world and in an era in which science is presented as a paradigm of reason, independence and knowledge, scientific journals can be used as a court of censorship to prevent any idea that dares to criticize the Liberal Doctrine taught in the private universities of the United States from prospering. It is only necessary to analyze the process followed to select the articles that are published in economic journals, to understand how it is possible to present as a genius what is only one of the greatest stupidities that can be said, to the point of awarding the Nobel Prize in Economics to the economist who has said such a tremendous stupidity without anyone being surprised:

1) The article is first evaluated by the editor of the journal, or by the person that the management of each journal may have designated for this purpose. The intention is to determine in a quick reading whether the article is suitable for publication in the journal. When the article is rejected in this first evaluation, it is usually returned to the author accompanied by a laconic comment, saying that either the subject matter does not fit the journal's guidelines, or that articles very similar to this one have already been published, or that the article is not sufficiently relevant, or it is rejected without explanation.
2) When the editor finds the article interesting then it is sent to a group of 2 to 5 reviewers who are supposed to be independent and knowledgeable about the particular subject of the article, and whose names usually remain anonymous. They are the ones who, after 15 days to 3 months, issue an opinion on the article, which results in deciding whether the article will be published or not.
3) From this point on, what happens with the evaluation of the article by the journal becomes confusing at best. Sometimes the article is returned to the author for modification and re-evaluation in some specific aspects, and other times it is definitively rejected, but the author is never told who were the people who evaluated his work or what was the result of such evaluation. In other words, neither the author nor the scientific community knows why the article has been rejected, nor does it know who rejected it.

The obscure evaluation process to which an article is subjected before publication has its origins in the recent past, when the scientific community was very small and all scientists knew each other. At that time it was considered a good idea that the person who acted as censor, as well as his or her opinion on the ideas that were exposed to evaluation, should remain anonymous to avoid suspicions among people who knew each other. But no one is unaware that the obscure evaluation process just described makes the hair stand on end for anyone who knows a little history, because it is very similar to the procedure followed by any Court of Censorship to prevent the publication of ideas that are considered dangerous to those who govern. For example, it is the same process that was followed by the Tribunal of the Holy Inquisition, and it used to end with the condemnation of the accused to burn at the stake.

In fact, at the dawn of the scientific method, scientific journals were not used as they are today. At that time, peer review was carried out through written correspondence between specialists and the organization of face-to-face congresses, while scientific journals remained in the background and were used only to communicate findings to the rest of the less specialized scientific community. It is easy to understand why, in that distant era, the process of article selection did not pose any danger to the scientific method or to science, since peer review was not taking place with the publication of articles in journals. Nor did the implicit idealism among scientists, who have always seen themselves as incorruptible benefactors of humanity, help much to see the potential danger of the nauseating system of article selection imposed on researchers by those who run scientific journals, and time passed without anyone questioning the process or seeing its potential dangers.

But time never passes in vain.

In less than 200 years, science went from the "god is machine" that opened the industrial revolution to the "every man for himself" that brings with it the most atrocious economic liberalism. Scientific knowledge, formerly shared collective knowledge, gave way to a race to obtain patents that turned science and the scientific method into the greatest source of inequality between countries. Immense universities rose up all over the world, just as immense cathedrals, synagogues, madrassas and Buddhist temples had risen only a few centuries earlier. The new god claimed his tribute and the power and riches generated by scientific discoveries were immense. But the terrible thing, what sends shivers down our spine when we recreate those moments, was the aura of unreality that science and the "scientific" was taking on. Being "a scientist" was like being a priest. It was to be a person who was in touch with wisdom and knowledge, and little short of infallible in his claims. It was in that climate of unreality between the divine and the human, between sleep and wakefulness, between wisdom and ideology, that science was used to sustain the racist theories with which the most atrocious colonialism of the time was justified and with which the genocide of the Jews was ushered in. Science had become too powerful to be left to anyone. To present a claim as supported by the scientific method was to present the claim as absolute truth, and that was something that could not be left to just anyone.

It was inevitable that those who decided what was published in science journals would use that power to establish a Court of Censorship to prevent the propagation of ideas that they considered contrary to their interests. Not only that, that same power of censorship would allow them to present absurd claims as claims supported by science, just by publishing them in a scientific journal.

How it has come to this and why it has been allowed to happen is anyone's guess.

We can understand that there are left-wing and right-wing newspapers, and we can understand that journalists are required to profess the ideology of the editorial line of the newspaper in which they work. However, we would have a hard time understanding that something like this would happen in scientific journals. Scientists like to think that scientific articles are published according to their scientific importance and not because of the ideology they profess, completely forgetting that "scientific truth" is only the consensus reached using scientific methodology. Scientists behave like children when they prefer to ignore what this means: that it is very easy to pass off as science what is only ideology. It is enough to control the selection process to which the articles published in scientific journals are subjected.

3. PRIVATE UNIVERSITIES IN THE UNITED STATES

Everything started to go wrong in the world after the end of World War II. At that time it became very clear that there were two superpowers, the USA and the USSR, engaged in an all-out ideological struggle over which was the best political and economic system to organize the world: communism or liberalism. Of course, it escaped no one's notice that the ideological struggle between the two hegemonic blocs barely concealed the material struggle for the possession of the resources that both superpowers needed to continue to exist, but that does not matter now.

In the midst of such a violent situation, where two opposing conceptions fight to maintain economic hegemony, it is inevitable that the temptation arises to bribe science to make it support the ideas defended by one of the two sides. Scientific theories, but above all economic theories, then unwittingly become a battlefield where scientific knowledge matters very little and where any consideration is subordinated to achieving ideological victory over the opponent. However, while in the USSR it was not necessary to bribe scientists because any idea was subject to prior censorship, the same did not happen in the USA and in the so-called "free world", where economists propagated Marxist ideas without any restraint, driven by an environment of poverty, misery and inequality that acted as a breeding ground and a sounding board.

In the "free world", unlike in the USSR, there was a very strong incentive to control the ideas and theories that were propagated as scientific within the discipline of economics. It was necessary to present the Liberal Doctrine as a scientific theory in the face of scientific socialism, and to do this it was necessary to force the science of economics to take sides with the liberal cause. What was done to achieve this, as it could not be otherwise, was to use the process of selection of articles published in economic journals as a censorship court. In full view of the whole world, but without anyone being aware of what was happening, not even the scientists themselves, economics was subjected to strict censorship by private universities in the USA on what was published in economics journals and in the textbooks that depended on these universities. Any article contrary to liberal ideology was prevented from being published in economics journals, and economists who did not defend liberal doctrine with sufficient zeal were prevented from progressing. Scientists in other disciplines, too idealistic to think that such a thing was possible, never came to understand that the greatest attack ever perpetrated against science was not only being carried out under their noses, but was being consummated with their collaboration and consent.

The witch hunt suffered by the Mecca of Cinema, Hollywood, during the decade of the 50's of the 20th century is known to all, but not so well known is the silent expulsion of teachers with leftist ideas that, in that decade, began in all private universities in the United States. The period of persecution, which Hollywood was able to visualize with all the pomp that any media lynching always deserves, also occurred in other activities within the United States, but in a much more silent and forceful way, in the university teaching of economics, where it was natural that there were economists who defended alternative approaches to the study of economics, such as, for example, Marxist ideas. A rapid process of selection and replacement of university professors based on their political beliefs, their race, their nationalism and, above all, on their faith in liberalism began, especially for those professors dedicated to the teaching of the science of economics.

The ideological cleansing was constant and was greatly aided by the fact that the vast majority of US universities are private universities, whose owners were under no obligation to justify why they hired some professors and not others. Gradually, and after the passage of only a decade, all faculty working in private universities in the U.S. professed unreservedly liberal ideology.

From then on, everything published in the most important economic journals in the world began to be censored, which at that time, just after the end of the war, were the journals that depended on the private universities of the United States, the only country that had come out of the war unscathed. The obscurantist system of review of articles before publication was perfect for this purpose, and from the seventies onwards it allowed the economists who ran the private universities of the United States to present the Liberal Doctrine to the world as the result of scientific consensus among economists, nothing could be further from the truth.

The power that the cloisters of the private universities of the United States acquired from that moment on was immense, and the small minority of people who formed them were able to propagate the liberal doctrine without problems, by passing off as brilliant ideas what were only ideological swill of the worst kind aimed at justifying liberal policies.

Theories were constructed to justify the free circulation of capital, forcing local currencies to a constant process of devaluation in relation to the dollar. Theories were constructed to justify the elimination of tariffs that protected local industries in all countries of the world. Theories were constructed to justify the dismantling of trade union organizations throughout the world, to justify the auctioning of public goods to the highest bidder, and, finally, the theory of externalities was constructed to prevent the protection of the environment by local governments, both in the U.S. and in the rest of the world.

All the economic theories fabricated by economists working for US private universities, and all the recommendations derived from them, are aimed at protecting US economic interests for reasons of economic "utility" and "efficiency", and only collaterally, the interests of the richest people on the planet.

Economists working for private universities in the USA have a very bad memory and now, after the 2008 crisis, they are denying the recommendations that they have been making for the last 50 years, and that the International Monetary Fund forced developing countries to follow. It is quite understandable that today they want to forget the role played by economic theories during the second half of the 20th century, since all of them came out of private universities in the USA, and were the cause of the poverty in which half of the inhabitants of the planet live, the deterioration of the environment and the threat to the entire planet posed by climate change.

What is science for? So that human beings can protect themselves against the ideological fundamentalism with which human beings are degraded. But what happens when a minority uses science to scientifically justify the degradation to which they subject other human beings?

That is what Nazism did with the supposed scientific support that Darwin's theory of evolution gave to the existence of a superior race, and that is also what liberals have been doing for the last 50 years with the economic theory created by economists working for private universities in the USA. These economic theories are taught in public universities around the world, are supported by articles published in the most prestigious economic journals, and the economists who created them are awarded the Nobel Prize in Economics. However, these theories are only fundamentalism of the worst kind created to support the degrading liberal idea that some human beings are more productive and more efficient than others and, therefore, the former are deserving of their wealth and the latter are deserving of their poverty.

If before racism used physiological differences to justify that some human beings are better than others, now, liberal economic theory justifies with the difference in income the superiority of some people over others and, therefore, justifies as self-deserved the misery and poverty suffered by a good part of the human beings that inhabit the planet.

4. PUBLIC UNIVERSITIES

To talk about economics is to talk about corrupt economics and to talk about economists is to talk about corrupt economists, regardless of whether it may seem unfair, or even insulting, to many of the economists working in public universities around the world. We are sorry they are upset.

We have already denounced the conscientious work done by private universities in the United States to select, according to their ideology, the professors and researchers who teach economics in their classrooms, but it has not been at all clear why we have to put together with them, in the same bag, the economists who work in public universities around the world.

Let us note that a private university cannot be reproached for hiring the economists it deems appropriate and, therefore, although we may call the economic theories produced by these economists degrading, we can hardly call them corrupt, since they only do the work for which they have been hired. For example, economists like Paul Samuelson, or Gregory Mankiw, work for a private university and we cannot reproach them for deceiving, lying and misrepresenting in their respective teaching books, because that is what they have been hired to do.

However, alongside these economists whose main work is deception and who are usually awarded the Nobel Prize, it is very clear and diaphanous for all those who want to see it, that there are other economists, much grayer and much less visible, without whose complicity, silence and work, the deception of the others would not be possible and could not be carried out. We are referring to economists working in public universities around the world. They are, in our opinion, the true corrupt economists of the discipline, because it is the citizens who hire them, and yet they deceive, lie and misrepresent in their classes to their students, as if it were the private universities that have hired them.

To understand the reason for this strange behavior of teachers working in public universities around the world, we must remember how teachers working in a public university are selected.

Unlike what happens in a private university, where no one questions the right to hire research and teaching staff as it suits the owners, the opposite is true in a public university. As a consequence of the transparency demanded by the administration of public goods, in a public university there is a complex selection process that seeks to be impartial when determining the suitability of the teaching and research staff it hires. And this is where the problems begin, because the research evaluation of a candidate who opts for a position in a public university comes from an external evaluation of two very specific aspects of his or her work. The first is the quantity and scientific quality of the articles, books and other publications that the researcher has published throughout his or her professional life, and the second is the importance of the work carried out up to that time within the discipline.

As we have already analyzed this point, it is clear that publishing an article in a scientific journal does not depend on the research capacity of the person who submits the article, nor on the scientific quality of the article, but on the evaluation of the article by the editors of the journal, which is almost always a private institution, dependent in turn on a private university in the USA. It is clear that it is the economics journals that are allowing the researcher to acquire a curriculum with which to access the public university position, to the detriment of other candidates.

The same is true of the time spent teaching. A researcher who opts for a position in a public university can present as part of his or her curriculum the teaching work done in a private university in the USA. It is clear, for anyone who wants to see it, that in such a case, here too, it is the private university that is allowing the researcher to acquire the necessary curriculum to access the university position to the detriment of other candidates.

The enormous influence that private universities in the USA have on who will end up occupying the professorships of public universities of economics around the world is well understood. In both cases, it is a private university in the U.S. that is allowing him/her to acquire the curriculum with which to successfully apply for the position offered by a public university, and economists know this. It is clear that, in such a situation, the economist will have to submit to the will of those who are really allowing them to access the position, which are none other than the private universities in the USA, since they are the ones who allow them to publish in their journals and who allow them to work as adjuncts in their classrooms.

This silent and corrupt curricular selection process has been going on for more than 50 years, especially in the field of economics, and today all teaching and research staff at any public university process liberal ideology.

It is very easy to see that a large number of the economists who hold professorships in Spain's public universities have the same curricular profile. First, almost all of them have a doctorate or postdoctoral degree from a private university in the USA. Second, almost all of them have been hired between 6 months and 2 years in a private university in the USA. Third, all of them have published with some regularity in an economics journal of a private university in the United States, usually the university where they did their postdoctoral studies or where they worked as assistant professors for some time. This is no coincidence. We are in the presence of a conspiracy orchestrated from a foreign country, the USA, to fill the teaching positions in public universities of economics all over the world with economists who are akin to the liberal doctrine.

We forget the obvious, because we want to forget the obvious, but who has to determine the scientific "quality" of an article is the entire scientific community, and not a private institution, which can evaluate the article based on ideology, race, nationality or any other consideration other than the purely scientific. We do not forget that scientific methodology requires that any article be published for the community to evaluate its scientific quality, and not to be presented to the community as an article whose scientific quality has already been previously evaluated by those who run the journal. We also forget that those who have to assess the scientific suitability of a person applying for a position in a public university is the scientific community itself and not a foreign private university, as has been happening.

5. THE NOBEL PRIZE IN ECONOMICS

But, neither all the manipulation nor all the censorship imposed from the cloisters of private universities in the USA would be enough to prevent, by itself, scientific truth from breaking through. Even in a discipline as degraded as economics, something else is needed to close the circle and stifle any hint of critical thinking within economics, and that was achieved from the beginning by using the awarding of the Nobel Prize in Economics to give the appearance of scientific theory to the whole fabric of the Liberal Doctrine.

Like scientific journals, the Nobel Prize is relatively old and the Nobel Foundation began awarding it in 1901. As is the case with the selection process of articles in journals, the process of choosing the laureates carried out by the Nobel Foundation is also very opaque, so much so that it is not known what it consists of or who are the people who award it. The reason is to be found, once again, in the small number of people who formed the scientific community at the end of the 19th century, and in the suspicions that could be aroused by the nationality and ideology of those who awarded the prize, if their name was known. For this reason, and already since the birth of the institution, the selection process is completely secret and it is not known what criteria are used to choose the candidates and who are the people in charge of the selection. Once again, the naivety and blind faith in ethics that scientists attribute to themselves allows the establishment of an election system that is easily manipulated by a small minority of people, whose identity, moreover, remains hidden because the selection process itself guarantees their anonymity. Seeing is believing.

In the specific case of the Nobel Prize in Economics, the situation is even worse, because it was in 1969, at the beginning of the liberal offensive, when the Swedish Central Bank established the prize, which was initially called the Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel (in Swedish, Sveriges riksbanks pris i ekonomisk vetenskap till Alfred Nobels minne), and which later became managed by the Nobel Foundation. It was no coincidence that only one year later, in 1970, the Nobel Prize in Economics was awarded to Paul Samuelson for his work on the Theory of the Production Function, marking what was to be the general tone of the purpose for which the prize was to be awarded: the support of the scientific community for the economic theories that would emerge from the private universities of the USA to propagate the liberal doctrine.

To think otherwise about the Nobel Prize in Economics would be stupid.

It is not difficult to understand that it is thanks to the awarding of the Nobel Prize in Economics to people who have developed completely absurd theories that these theories have been presented as if they were scientific recommendations. Thus, the policies imposed by the International Monetary Fund on developing countries with the aim of destroying local industry and forcing them to specialize in the production of raw materials were presented to the public as scientific recommendations endorsed by none other than the recipients of the Nobel Prize in Economics.

What has become of the discoveries made by Paul Samuelson only 50 years ago? Samuelson was awarded the Nobel Prize *"for scientific work by which he has developed static and dynamic economic theory and has actively contributed to raising the level of analysis in economic science",* i.e., for nothing that can be concretized or has had any continuity after 50 years.

So why was Samuelson awarded the Nobel Prize in 1970?

A true fact that can put us on the track of the reason why someone is awarded the Nobel Prize in Economics can be found when we count the number of laureates with US nationality. Is it not surprising that about 70% of the Nobel Prize in Economics laureates belong to the faculty of a private university in the USA? In other words, 7 out of every 10 Nobel laureates in economics are

US nationals and work for a private university in the USA. That alone tells us everything we need to know about who is behind the selection of the winners and what kind of criteria may be used to award them. But, as if that were not enough, we only have to take a look at the scientific findings that have served as an excuse for the awarding of the prize to realize that the awarding of the prize has been used to give apparent scientific backing to the Liberal Doctrine that justifies the elimination of tariff barriers, the elimination of capital controls, the auctioning of public companies, the outsourcing of the destruction of the environment, etc. All of these policies leave local production defenseless against US companies.

The situation that the science of economics has reached is frightening, and we can easily see that economists working for private universities in the USA are the ones who are deciding what is presented to the world as "scientific discovery" in the field of economics. First, because they are the ones who decide which papers are published and which papers are not published in the most prestigious scientific journals. Second, because they are the ones who decide who prospers in economics. And third, because they are the ones who decide who receives the Nobel Prize. Let's take an example.

William Nordhaus is an American economist, close collaborator of Paul Samuelson, teaching researcher and involved for many years in the direction of the private Yale University in New Haven, Connecticut (United States), who was awarded the Nobel Prize in 2018 for his research and findings on climate change. What do these findings on climate change consist of? Certainly nothing, but the people who run the cloisters of private universities in the USA wanted to award one last tribute to the only remaining economist of Samuelson's generation. The Nobel Prize in Economics was awarded to William Nordhaus because they simply could or wanted to award it to him. There is no other reason: "I can because I can".

It would be a serious mistake for the reader to conclude that we are accusing private universities of being conservative and of propagating conservative ideas. To think so would be a grave error. Here we are not censuring people for defending conservative ideas. Here we are denouncing the private universities of the United States of having created worldwide, and deliberately, a structure to infiltrate at all levels of public responsibility economists akin to the Liberal Doctrine, but very especially, in the teaching positions of the public universities of economics, with the sole purpose of propagating the Liberal Doctrine as if it were a scientific theory. An odious and corrupt structure, whose logistic base is the private universities of the USA, from which thousands of economists indoctrinated in liberal fundamentalism come out to spread throughout the public universities of the whole world and teach and propagate the Liberal Doctrine.

The Dantesque and terrifying picture is completed with the active complicity of large companies and investment funds, which organize symposiums and competitions where they cover with honors and greatness economists who profess the Liberal Doctrine to show them as successful scientists to the rest of the community, which has no awareness of what is happening and how public universities around the world are being used to propagate an economic doctrine that differs very little from the ideology propagated by the Nazis.

6. THE THIRD WORLD WAR

Albert Einstein was asked one day what kind of weapons would be used in World War III and he replied that he did not know what kind of weapons would be used in the next war, but he did know that World War IV would be fought with stones. To understand Einstein's answer, one must understand who Einstein was and what was the context in which he was being asked the question.

Albert Einstein was the most prestigious theoretical physicist of the 20th century and a convinced pacifist, despite having signed a few years earlier a joint letter addressed to President Franklin Roosevelt for the USA to build the atomic bomb. The context of the question was the nuclear race that the US and the USSR had started. What Albert Einstein was claiming in his answer was that the weapons had reached such a level of destruction that the whole of human civilization would be destroyed in the event of a Third World War.

But Albert Einstein was wrong.

Only a few years after his death, World War III was to begin; a war in which the economies of the entire free world were to be annihilated, and in which more than half of the world's population was to be condemned to misery and hunger. All this, without anyone realizing what was happening and without anyone being able to do anything to prevent it. And no, the Fourth World War was not going to be fought with stones, as Einstein thought.

What is a war for?

A war has always been waged for the same purpose, to seize the natural resources possessed by the enemy and put them to work for the victor. This is not debatable. This has always been so, and always will be so. There has never been any other reason to wage war, and that is why Einstein was wrong in his answer: because no one will ever wage war with nuclear weapons, from which they will never derive any economic benefit and in which they risk annihilation. A nuclear war is not a good business for anyone.

But are nuclear weapons the only weapons that exist and the only weapons with which World War III can be waged?

No. Nuclear weapons are not the only weapons that exist. There are other weapons far more destructive than nuclear weapons, which allow you to seize your enemy's natural resources and put them to work for you. And all this, without any risk to those who use those weapons. I am referring to science, the most powerful weapon that has ever existed and far more destructive than any other weapon. Specifically, I am referring to the science of economics, a discipline that can easily be used as a weapon of mass destruction, with more capacity for annihilation than any nuclear weapon, yet possessing none of its drawbacks.

Let's give an example to make it clear.

Let's imagine a country, for example, Spain, and let's observe the low price that farmers obtain from the sale of olive oil. What should the government do to solve or alleviate the problem of a part of its citizens? Put tariffs? subsidize the crops to keep the jobs? eliminate the crops and give alternative work to farmers? The government has many options and choosing one of the alternatives does not have to be easy, but anyone understands that a good decision will make Spain and Spaniards progress, while a bad decision will make Spain and Spaniards poorer.

Thanks to the example, it is well understood that it is very important to have a scientific economic theory that governments can use to make the right political decisions without making mistakes. It is well understood from the example that the progress of the billions of people living on the planet, and indirectly the life of the planet itself, will depend on this economic theory, since the misery and poverty of the population bring about the destruction of the ecosystems with which people live. It is therefore easy to understand the great importance of having an economic theory that is scientific and that you can trust.

If we are able to understand the importance of having an economic theory, then we are also able to understand the importance of our enemies not having it. In such a situation, we will make progress guided by economic theory, while our enemies will make the wrong decisions that will lead them to impoverishment.

For example, the US central bank reacted very quickly in 2008, when it created more than 4 trillion dollars to buy assets of all kinds, preventing the collapse of the Capital Market. However, the European central bank made a big mistake when it delayed the same decision for about 5 years, with very damaging consequences for the whole European Capital Market, but especially for the

Southern European economies. Why did the US policy makers make the right decision quickly and why did the European policy makers delay the same decision for 5 years? Well, because US politicians have an economic theory to guide them, while European politicians only have the nonsense they are told by the network of liberal economists who have infiltrated the Mont Pelerin Society in all positions of responsibility in the public administration, but especially in the public universities. If you prefer to put it more mildly, Europeans are guided by an incorrect economic theory that has been fabricated in order for them to make wrong decisions.

7. OPERATION KNIGHT

The preparations for the war began in 1947, in the small village of Mont Pelerin in Switzerland, when Frederic Hayek called together 36 intellectuals, most of them economists, to discuss how to deal with the threat posed by socialist ideas to the world after the Allied victory in World War II. We have to understand that for the mentality of Hayek and the rest of the people gathered at Mont Pelerin, all the high positions of responsibility in the free world were occupied by people of socialist ideology, in particular, the professors who taught economics in the public universities of the world were all of them, in the eyes of the small group gathered at Mont Pelerin, either Keynesians or communists. Something that Hayek knew very well from his time in London, where he had suffered in the flesh the mockery of the group of economists that surrounded Keynes.

Hayek was no fool, and none of the people who accompanied him at Mont Pelerin were fools either. He understood perfectly well the role played by intellectuals in the propagation of more or less utopian and unattainable ideas, which sweep people along in the hope of achieving a better life. Indeed, Hayek believed that much of the success of socialist doctrine lay in the vague promise it makes that an egalitarian paradise is attainable. But, above all, Hayek believed that socialist success lay in the fact that the belief in an egalitarian paradise was shared by the intellectual elite of the day. Hayek was very clear that two things had to be done to wipe the socialists off the face of the earth: first, to create a more or less utopian doctrine to follow, and second, to get the intellectual elite to follow it without question.

Basically, what Hayek put forward to erase socialism and socialists from the face of the earth, was contained in his book "Road to Serfdom", and it was none other than to use the search for freedom as a utopian goal to be pursued in substitution of the egalitarian paradise pursued by socialists, and to use the distribution of wealth according to personal merit in substitution of social justice. Both are ideas that fit very well with the feelings of the average American and were predictably going to be very well received in the United States, but getting the intellectual elite to embrace the libertarian utopia, make it their own and propagate it as an end to be pursued, seemed to the rest of those gathered at Mont Pelerin a much more difficult undertaking to carry out.

Fortunately for the group, at that Mont Pelerin meeting was Karl Popper, an Austrian philosopher with a deep understanding of the scientific method.

It was Popper who made the group understand the immense manipulative power of the common belief that science and scientific method are infallible. In fact, as Popper made them see, a large part of Karl Marx's success was to present Capital as a scientific treatise on economics, in which he proves the mechanism that capital uses to exploit the worker: surplus value. It was Karl Popper who convinced the group that liberalism also needed to present itself to the world as a theory backed by science if it was to succeed among the intellectual elite. Only after science demonstrated that distributive justice could be achieved through the free market would it be possible for the intellectual elite to embrace liberalism and pursue the pursuit of freedom as a utopia achievable through the implementation of the free market.

After a long meeting, The Mont Pelerin Society was founded with the objective of carrying out a set of actions, known as "Operation Knight" after the name of the American economist Frank Knight who proposed them, which can be summarized in the following three phases:

1) To fill with economists akin to the liberal ideology, the teaching positions in the universities of economics of the free world. First in the private universities of the USA and then in the public universities of the USA and the rest of the world. The private character of most of the universities in the United States was going to make the operation much easier.

2) Using economic journals to propagate the Liberal Doctrine as if it were a scientific theory. First, by preventing the propagation of any alternative economic theory. Second, by preventing the publication of articles that questioned the Liberal Doctrine. The fact that the economics journals are all private and depend on private universities in the United States was going to make the job of censoring the economics articles published in the journals much easier.

3) Establish the Nobel Prize in Economics and control the process of choosing the winners, so that only economists who defend the Liberal Doctrine are awarded the prize. The purpose was none other than to give the Liberal Doctrine an apparent scientific character,

> since everyone knows that the Nobel Prize is only awarded to great scientists such as Albert Einstein. The fact that the Nobel Prize in Economics was initially awarded by a private Swedish bank, and the fact that the Nobel Foundation is a private foundation (as are all private foundations in the USA) made it very easy to create a completely opaque election process, so that it was the Mont Pelerin Society that would choose the winners.

Operation Knight" began in the mid 50's of the twentieth century, starting the witch-hunt in the USA. Within a few years, it had succeeded in expelling from all positions of responsibility in the influential areas of American society anyone considered to have a socialist mentality, but especially from teaching positions in private universities of economics, where they were replaced by people with solid beliefs in the Liberal Doctrine. Operation Knight" culminated well into the 1970s, when Friedrich Hayek was awarded the Nobel Prize in Economics, to demonstrate to all members of the group that the three phases of "Operation Knight" had been completed successfully and without any opposition from the rest of the economists.

By the mid-1970s the US economic elite was ready to embark on the real conquest of the free world. Thanks to the network of liberal economists that "Operation Knight" was infiltrating the world's public universities of economics, the science of economics was already in an advanced state of decay, unable to give a coherent response to the economic crisis that, once again, was looming on the horizon. The confusion created from the universities by liberal economists, with their constant and unjustified criticism of any policy limiting the "laissez-faire" of companies, allowed governments to be blamed for the excesses and arbitrariness carried out by the economic elites. All the world's governments had been left without a coherent economic theory to fall back on in order to make the right policy decisions, and were blindly facing the challenges that technological evolution and big business posed to the organization of society. Governments had no answers to offer citizens to explain what was happening, except for the explanations offered from the liberal ranks, which were gradually occupying all positions of responsibility. There was no longer any scientific consensus in the field of economics, and the recommendations offered were reduced to repeating the liberal mantra.

What happened from the 70s onwards in the decade of the last century on the political level is very eloquent. While in Chile, Argentina, Brazil and almost all the countries of Latin America, the Liberal Doctrine was imposed by force through a military coup d'état backed by the CIA, in the USA and England the liberals came to power through the ballot box, when Ronald Reagan and Margaret Thatcher were elected president in the 80's. In the rest of the world, the economists in charge of advising the governments were replaced by economists elected by the economists of the United States. In the rest of the world, the economists in charge of advising governments were replaced by economists chosen by private universities in the USA, all of them faithful to the

Liberal Doctrine, with the result that liberal policies were gradually being applied independently of the ideology of the governments. Both socialist and conservative governments applied the same policies: The Liberal Doctrine.

On the economic level, the consequences of the lack of a scientific theory were Dantesque.

In the early 1980s, as a consequence of the rise in the dollar interest rate a few years earlier, the debt crisis devastated all Latin American economies. In 1989, Japan and Norway also collapsed when the real estate bubble burst due to another rise in the dollar interest rate. Also in 1989, the "Iron Curtain" fell and with it, the USSR, the great reference used by the economic elites to justify the coups d'état in Latin America.

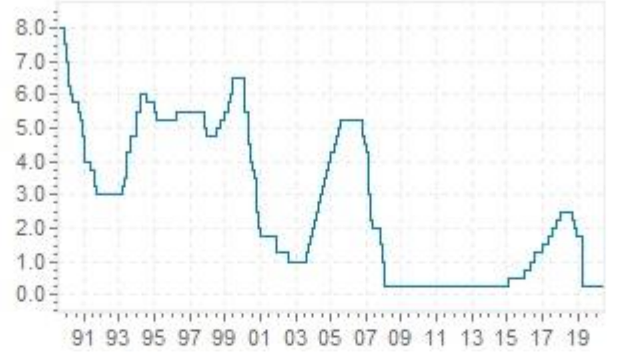
At the beginning of the 1990s, in 1993, the Federal Reserve raised the dollar interest rate again from 3% to 6% in just one year, triggering the Asian exchange rate crisis. The economies of Indonesia, South Korea and Thailand collapsed without remedy, and the economies of the rest of Asia and Oceania were seriously affected. In 1998, at the end of the decade, when everything seemed to be over, the Federal Reserve again raised the dollar interest rate, this time hitting the Russian economy head-on, a country that had been left out of the Asian crisis because it was not as industrialized as South Korea, but whose heavy dependence on foreign sales of raw materials finally condemned it to an exchange rate crisis. It was this crisis in the Russian economy that brought Vladimir Putin to power.

When the new century finally arrived, no economy in the world had been spared the devastation of an exchange rate crisis. Except in China, Europe and the USA, the world was in a state of total desolation. Misery was everywhere, and it was only thanks to the economic success of the Chinese that the UN figures on the increase in poverty and inequality in the world could be disguised. However, the network of economists working for private universities in the USA, in their books, call the period of time between the crisis of change in Latin American countries and the crisis of change of 2008, with the name of "the great moderation", surely because the USA was not using nuclear bombs to conquer the world.

How is it possible that the most disastrous period ever suffered by mankind appears in economic books under the name of "the great moderation"? How is it possible that, in economic books around the world, the thirty years between 1978 and 2008 are considered the period of time of greatest economic growth of mankind?

8. THIS TIME IT'S DIFFERENT: THE FALL OF EUROPE

Only Europe and China were left standing, and they would be next. Let's look at the attached graph, which shows the evolution of the dollar interest rate. Although the data is only shown from 1990 onwards, the three major interest rate hikes since then are clearly visible. The first rise starts in 1993 and is caused by the Asian crisis (the 1998 spike caused by the Russian exchange rate crisis is also clearly visible in the graph). The second spike starts in 2004 and causes the great recession of 2008. The third spike starts in 2015 and is stopped by the Federal Reserve before the US economy enters recession (the arrival of the virus hides this fact).



If we had started the graph in the 1980s, we would also have seen that the big rise in the dollar interest rate that began in 1980 was what caused the exchange rate crisis that devastated the entire Latin American continent (on this occasion, the interest rate rose to 22%, some 7 points above peak inflation). We would also have seen that the subsequent spike in the dollar interest rate in 1987 was the one that killed the economy of Japan and the Nordic countries.

What does the graph tell us?

The graph tells us two things. First, that in the economic crisis that was to cause the interest rate hike that began at the end of 2003, only Europe's economy should have collapsed, but the US economy also collapsed, something that the Federal Reserve did not expect to happen. It was because the Fed had to halt the interest rate hike and orchestrate a bailout of the US economy unprecedented in the history of the Fed that the European economy and the world economy were saved. The second thing the chart tells us is that the attempt to raise the dollar interest rate started in 2015 was thwarted because the US economy threatened to go back into recession at the end of 2019, a fact that the Fed did not expect to happen either, but a fact that saved the world from an unprecedented exchange rate crisis.

Let's look at the graph once again.

In the graph, it is very clear that the value of the interest rate, every time the Federal Reserve starts to raise it, is lower and lower. Specifically, the value is close to 1% in 2003 when the Fed starts to raise the interest rate, and has a value of almost zero in 2015. Why, along with Europe, did the US economy also collapse in 2008? Why did the US economy threaten to go into recession if the Fed kept raising the interest rate at the end of 2019? Why did the Fed not expect that either of these two events could happen?

Evidently, because the Federal Reserve does not know that the consequences of raising the interest rate are not the same if you start from an interest rate close to zero as if you start from an interest rate of 3%. But why is it different to start from one interest rate or the other? The reason lies in this equation:

$$K = \frac{\langle \alpha \rangle \cdot k_F}{i} M$$

But to understand what it says, it is necessary to read the Madrid Theory first.

An economic theory is a weapon of mass destruction when you have the theory and your enemy has only a bunch of lies that you yourself have propagated to prevent him from defending himself. In 2008 the entire world economy, except the US, must have gone into a frightening turnaround crisis. In 2019, the entire world economy, except the US, must have gone into a frightening crisis of change. In both cases, what prevented that from happening was that the Federal Reserve was unable to keep raising the dollar interest rate in the face of the threat of recession in the U.S. economy. That is what has changed.

The world has already been saved twice from the destruction caused by a crisis of change. Perhaps it is time to remember that the letter carrier always rings twice, but never rings a third time.

THE RESERVE CURRENCY. When the Federal Reserve changes the interest rate of the dollar, it is not only changing the interest rate of its currency, it is also changing the interest rate of the currency it is using to buy in the international market.

When the Federal Reserve persistently raises the interest rate of the dollar, what happens is that international trade is reduced, the faster and more persistent the increase in the interest rate of the dollar is. Trade between the U.S. and the rest of the countries is also going to be reduced, but much more the trade of the rest of the countries with each other is reduced. These countries want *to continue to trade, and there is no reason why they should not continue to do so, except for the shortage of dollars caused by the Federal Reserve when it raises the dollar interest rate.*

The consequences of the forced reduction of international trade between countries that wish to continue trading, but are unable to do so because of the scarcity of dollars, is much worse than it seems at first sight, because it is the dollars obtained from foreign sales that are allowing a country to acquire products that are not manufactured within its borders. As soon as a country's balance of payments becomes unbalanced because of declining foreign sales and foreign purchases are maintained by borrowing, two monetary phenomena conspire to produce an exchange rate crisis in a short period of time.

The first thing that happens is that the price of the country's capital goods falls (in other words, the price of the country's companies, especially those that sell abroad), which forces investors to flee to liquidity. The second thing that happens is that the country's own currency is exchanged for the reserve currency, which automatically produces an exchange rate crisis. The country's central bank can do nothing to prevent the devaluation, except to maintain the currency exchange rate as long as it has dollars left. Sooner rather than later, it will have to let the exchange rate fall and the entire capital market will collapse, dragging the real economy down with it.

The crisis is resolved when the price of the companies stops falling, which usually does not happen before they have lost more than 50% of their value. The companies are then bought by foreign investors (i.e. US investment funds) and the country's economic recovery begins. After a few years the value of the companies will have doubled, tripled or quadrupled and the investors with access to dollars who bought them (the US investment funds) will sell them at a huge profit.

Of course, the companies that competed with US companies will not recover from the exchange rate crisis and will disappear. As if by magic, the economy of the country that has suffered the exchange rate crisis will have specialized in the production of raw materials and products that US companies do not want to produce.

It is truly stupid to use the currency of a country as a currency to conduct international trade and mankind is paying a high price for its stupidity. But in their defense we will say that it is the economists working for private universities in the USA who are deceiving us.

9. WHAT TO DO?

What can be done to destroy the entire propagandist structure created by private universities in the United States for the propagation of completely false economic theories? What can be done to prevent what is only doctrinal fundamentalism from being passed off as scientific findings? What can be done to make economists work for their country and stop serving a foreign power? What can be done to make economics once again a scientific discipline at the service of all humanity, and not only of the United States?

Obviously, the first thing to do is to expel all the economists that the Mont Pelerin Society has been infiltrating into the public universities of economics and into positions of responsibility in the institutions in charge of preparing technical reports for the government, such as the central banks or the statistical centers. Of course, the first thing to do is to replace these corrupt economists with economists who do not serve the interests of a foreign power, but that will not be enough.

For economics to become a scientific discipline again, it is necessary to restore peer review, because that is where the scientific method and science are based. To this end, it is necessary to create a public network of economics journals to allow the permanent critique of any claim that is propagated as scientific within the discipline of economics, whether it is considered true or not. Science is based, first of all, on the existence of a methodological consensus within the community on what is scientific truth, so if the institutions that are responsible for guaranteeing scientific methodology, what we have called peer review, are not restored, no consensus can be reached on what is scientific truth.

We have to understand that the origin of the power that private universities in the USA have over the science of economics comes from manipulating the process of selection of articles before their publication, until it becomes a Court of Censorship with which they prevent the publication of any article contrary to the Liberal Doctrine. Therefore, it is necessary to deprive the private universities of the USA of the control they have over what is propagated within the discipline as scientific truth:

1) The Nobel Prize has to be awarded by the scientific community as a whole. It cannot be left to a group of people, who nobody knows who they are and nobody knows what interests they protect, to award the Nobel Prize in Economics. This is truly barbaric. The method used to award the Nobel Prize must be transparent and similar to the one used in the cinema to award the Oscars or the Goya Awards. Economists from all over the world should be the ones to select, by open voting and two rounds, the person deserving of the Nobel Prize. In economics, each economist has to count one vote, just as in the world of show business.

2) A public network of economics journals must be built to prevent private universities in the US from continuing to use article review as a censorship court. This would deprive them of most of their power. Of course, it is necessary to guarantee the transparency of the process of admission of articles, which is only possible if each journal in the public network is obliged to make public the name of the person who has assessed an article together with that assessment, so that they are known to the person submitting the paper and to the rest of the scientific community. Furthermore, no article published in a private economics journal should be used to apply for a job in a public university. Science is the result of a methodological consensus that is public and should be publicly managed.

(It is often thought that a journal is scientific because scientific articles are published in it, when the reality is the opposite: articles are scientific because they are published in a scientific journal. The reason for this confusion is that it is often thought that scientific truth is an objective reality, when the truth is that it is the result of a methodological consensus within a community. The function of a scientific journal is not to evaluate the scientific quality of an article, but to allow its publication so that the scientific community can evaluate it. A journal is said to be scientific when it is part of the methodology that allows the permanent criticism of any idea that is considered scientific. Secret Courts and anonymous judges are what has always been used to impose by force a particular vision of the world that favors a few, and they have no place in science.)

3) The research prestige of a scientist, whether in the field of economics or in any other field of science, cannot depend on whether or not a scientific journal publishes his or her work, or whether or not he or she is cited more or less frequently in such journals. This is tantamount to giving those who run such journals the power to select the teachers and researchers who will work in public universities around the world, which is absurd and should not be allowed.

   To avoid this, a self-evaluation procedure should be established, so that the scientific community itself, working in the same field of knowledge, is the one that evaluates itself. We fully understand that this is a delicate aspect that must be studied carefully, but we firmly believe that the current system of scientific evaluation based on the number of publications or the number of citations makes no sense and allows a small group of people to corrupt themselves. We therefore believe that it should be changed to a more open and democratic system.

It is very important to understand that science cannot thrive in the darkness of a Court of Censorship working in the shadows. It is very important to remember that 7 out of 10 economists who have received the Nobel Prize are U.S. nationals. It is important to prevent economists working in public institutions from owing their positions to private universities in the USA.

10. THE MADRID THEORY

Once you understand that the Liberal Doctrine is not an economic theory backed by science, then you also understand why liberals differ very little from the Nazis. Just as the Nazis used science to convince the intellectuals of the time of Aryan supremacy was, so too have liberals convinced today's intellectuals that it is a scientific fact that people with higher incomes are more capable and productive than people with lower incomes. All this, in order to justify that it should be the most capable and productive who make the public decisions that affect us all through the freedom provided by the market, to the detriment of democracy, which, in the opinion of liberals, too often becomes the dictatorship of the less capable.

For this reason, liberals dislike government and argue that the smaller the government, the better it is for everyone, without daring to state explicitly that the reason for their distrust of government stems from their contempt for the democratic form of government, which they consider the dictatorship of the less able.

Who was Frederic Hayek? He was certainly not an economist and the Liberal Doctrine he presents in "The Road to Serfdom" is not an economic theory.

Hayek was born in Austria, one of the last strongholds where the belief in the moral superiority of the aristocracy is still alive. He was, like Hitler, a supremacist who abhorred democracy as a form of government because he considered it "the dictatorship of the weakest", or if you prefer, "the dictatorship of the least capable". Therefore, his defense of individual freedom to buy and sell in the market, which he presents as the means to achieve the utopian goal of freedom, can only be understood as the excuse that will allow those who have more money to make political decisions regardless of the opinion of those who have less money. Instead of political decisions being made by the rule of one person one vote, Hayek advocated that the rule to be used should be one dollar *one vote, on the understanding that whoever had the most dollars would also be the most capable person.*

For Hayek, anything was better than allowing the dictatorship of the less able, which is how he understood democracy. If Hayek had stayed in Austria in 1931, instead of going to London, he would most probably have supported Hitler's National Socialism, from which he was only 10 years away.

The Madrid Theory is a scientific theory that, unlike the current economic theories propagated by economists working for private universities in the USA, can be verified. All the variables that appear in the theory are associated with physical quantities that can be measured and, therefore, there is no problem in confirming the validity of each of the assertions made in the Madrid Theory, something that cannot be said of most current theories.

The Madrid Theory has been constructed with the intention of providing governments with an economic theory with which to confront the threat posed by the US to the free world. For example, so that governments can defend themselves against the stupidity of using the dollar as a reserve currency. But not only for that, but also to prevent the US from continuing to deceive our rulers into believing that the theories they teach in public universities have any scientific backing. Keep in mind that the economists who come out of our public universities every year are the ones who are going to make the economic decisions in our companies and in our public institutions. For example, if the head of the Bank of Spain is a believer in the liberal doctrine, he or she will make decisions that will be to the benefit of U.S. companies and to the detriment of Spanish companies.

CLIMATE CHANGE. It is a wrong decision of the European government to use the auctioning of $_{CO2}$ emission allowances as a mechanism to drive the European economy towards decarbonization of production.

The economic theory that supports the wisdom of imposing a tax on an activity to be reduced or eliminated, to the detriment of the direct prohibition of that activity, was created in the 1990s by economists working for private universities in the United States. The purpose of such a theory, which is not at all scientific, is to force governments to refrain from prohibiting or regulating activities that are considered harmful to the community, and, failing that, to force governments to use a tax on such activities, so that it is the high price that must be paid to carry out such activities that prevents them from being carried out.

It is the same as advising the government to tax rapists in proportion to the harm they cause, instead of prohibiting rape, as has been done since ancient times. However, despite the absurdity of such an idea, it still enjoys wide scientific recognition within the economics community, thanks above all to the propaganda work carried out by the network of liberal economists spread throughout the world by private universities in the United States.

Today, following this absurd economic theory, the European Union has created the EU Emissions Trading Scheme (EU ETS), whose consequences will be disastrous for the entire European economy, since, long before the amount of $CO2$ *discharges into the atmosphere is significantly reduced, stagflation will appear in the economy, destroying much of the industrial fabric and forcing the European economy to return to the consumption of fossil fuels.*

Not having an economic theory that is scientific is very bad, but much worse is to have an economic theory that your enemy, the US, has made you believe is a scientific theory.

The Madrid Theory has not emerged from any public university of economics, because that would have been quite impossible in the present state of degradation of the science of economics. Nothing good can come out of any of the public universities in Europe and the rest of the world because what is important in science is not whether a particular theory is true or not true. What is important in science is the methodological consensus that leads to "scientific truth". Without that methodology, there can be no science, nor can there be "scientific truth".

PART I

THE BASIC EQUATIONS

CHAPTER 1

THE BASIC EQUATIONS

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INTRODUCTION

If we do not want a discipline to advance from the scientific point of view, so that it becomes completely stuck in barbarism and ideological fundamentalism, the first thing we have to do is to define the variables on which the discipline is based as imprecisely as possible. When a magnitude or variable is poorly defined, nothing can be affirmed or denied about it and any discussion about its evolution will be impossible; no one will know what we are talking about. Thus, we will be able to prevent any discussion of the assertions made within the discipline, no matter how absurd they may be, and any nonsense we may think of can be passed off as a stroke of genius. Therefore, we are not very surprised to find that the variables used in textbooks to describe economic reality are all so poorly defined that nothing can be affirmed or denied about them, much less can they be measured in practice and predictions made with them.

On the contrary, for a theory to be "scientific" it must have at least one essential characteristic: *"that the variables used by the theory to describe reality must be well defined, so that any* *statement or prediction made in the theory about those variables can be discussed by the community"*. When a theory has at least this characteristic, and the variables used by the theory are well defined, any prediction or claim made about them can be discussed and tested. In such a case, the theory is said to be "falsifiable," i.e., it is possible to test whether any prediction or statement made by the theory is false or not false.

In this sense, the economic theory currently taught by economists working for private universities in the USA is not a scientific theory, and most of the variables used to explain social organization from an economic point of view are not well defined, are imprecise and, in practice, are impossible to measure. Although we understand that the criterion of "falsifiability" is only one of many criteria that can be used to define science, the intention of using it now is to denounce the lack of any scientific methodology within economics. For example, and they are by no means the only meaningless variables, "utility" or "opportunity cost" are variables that are very frequently mentioned in papers published in the world's most prestigious economics journals, even though no one knows how to define them and, therefore, no one can ever measure them.

Another example, but much more serious, is the definition of "supply" and "demand". Both are by far the two most important basic variables in economics, yet their definition is so imprecise that it is impossible to measure them. Economists call "supply" the quantity of goods produced by entrepreneurs, but it is never clear whether they are referring to the goods that are sold, the goods that are manufactured, or even the quantity of goods that can be produced but for some reason are not manufactured. But the most serious thing about the idea of "supply" is that it is a heterogeneous aggregate of goods and it will be difficult to compare different aggregates of goods. Which supply is greater or smaller, a supply of two cars and a tractor or of two tractors and a car?

The same is true of "demand" which, depending on the case, may refer to the quantity of goods that are consumed, the quantity of goods that are desired to be consumed or even the quantity of goods that can be consumed, without it ever being clear which of the three situations is being referred to. Nor can the different demands be compared with each other, since they are heterogeneous aggregates of goods.

So why do private universities in the US base the economic theories they have fabricated on two variables that cannot be used for measurement or comparison because they are ill-defined? Evidently, because the job of private universities in the US is to prevent economics from becoming a scientific discipline.

Here, in order to develop the Madrid Economic Theory, let us begin by doing what the science of economics should have done more than a century ago, which is none other than to define in a univocal and coherent way the basic variables on which any economic theory must be based in order to be considered a scientific theory, so that any statement made about them can always be at least discussed. Only in this way can we speak of peer review and scientific method. We will begin by defining the variables "income" and "expenditure", with the same meaning that it has for a person who is not an economist and which, curiously, can be measured without any problem using money.

It is easy to see that the quantity of goods or services that are sold, as well as the quantity of goods or services that are bought, are variables that can be measured very easily. However, both are magnitudes that cannot be compared with each other, since they are a heterogeneous grouping of different goods, and therefore, although they are considered as basic variables of economics, they cannot be used directly within an economic theory.

Instead of the quantity of goods bought and sold, we are going to use the monetary flow of buying and selling, that is, expenditure and income, as the constructing variables of the economic theory we are going to develop. The monetary flows created by the purchase and sale of goods, which are calculated by multiplying the price of each good by the quantity of it that is bought or sold in a period of time, are variables that can be measured and compared without any difficulty, since their value is given in current money.

Here we are going to use "income flow" and "expenditure flow" as the basic variables of the economy in the Madrid Theory, although later we will introduce more variables to complete the theory. Of course, we will not mention the word "supply" or the word "demand" again in the rest of the paper, because in the Madrid Theory we will not need to define them.

2. THE *G-EXPENDITURE* MATRIX AND THE *PIA*

Let us imagine that some aliens visit an island inhabited by three people, Juan, Celia and Lucia, where there is a monetary economy. It is not strange for the aliens to see that the three inhabitants of the island cooperate in the production of consumer goods, and it is not strange for them to see that they share among themselves what they produce. But they are struck by the "money" that seems to guide the relations of production and distribution within the island. So much so, that they decide to investigate the function that the mysterious "money" that the inhabitants always use as "currency" when they give each other goods, may have within the society.

To do this, during a specific period of time, they record the amount of "money" exchanged among the inhabitants of the island, with the idea of verifying the suspicion that the "money" is always the same and is conserved when exchanged for the goods produced on the island. With the data they collect, they construct a square matrix where they record the flow of money given (and received) by each of the inhabitants of the island during a given period of time (a month, for example):

Expenditure (Euros/Month)	John	Celia	Lucia
John	0		
Celia		0	
Lucia			0

What appears in each row of the square matrix, which we will call Expenditure Matrix ***G*,** is what each inhabitant of the island spends, over the course of a month, in buying goods from the other inhabitants of the island. For example, Juan has spent during the month 400 euros in purchases from Celia and 600 euros in purchases from Lucia. The same can be said for Celia and Lucia, who spend 600E and 300E respectively on purchases from Juan. Of course, the matrix does not specify the type of goods that have been given in exchange for the money because the aliens are only interested in keeping track of the money to show that the money is kept during the purchases, and the table shows all of them.

THE SPENDING MATRIX: The "Spending Matrix" shows the money that each participant in a monetary economy spends on the purchase of services from any other participant, over a period of time, usually one year:

$$\textit{Spending Matrix} \rightarrow \qquad \boldsymbol{G} = \begin{pmatrix} c_{11} & \cdots & c_{1n} \\ \vdots & \ddots & \vdots \\ c_{n1} & \cdots & c_{nn} \end{pmatrix}$$

The coefficients of the expenditure matrix c_{ij} are the basic variables of the theory we are going to develop, and their dimensions are money/time, that is, they are a monetary flow. We can see that when we take any row and add up all the values that appear in it, we obtain the total flow of expenditure of each of the participants, i.e., the flow of money. x_i of each of the participants, i.e., the total money spent on purchases by participant "i" on the island during the period of time considered:

$$(Flujo\ de\ gasto)_i \rightarrow \quad x_i \stackrel{\text{def}}{=} \sum_j c_{ij}$$

$$(Flujo\ de\ ingreso)_i \rightarrow \quad y_i \stackrel{\text{def}}{=} \sum_j c_{ji}$$

But we can also see that when we add up the values that appear in any of the columns, what we obtain is the total flow of income of each of the inhabitants of the island, that is, the total money that each inhabitant earns from sales in a month. y_i of each of the inhabitants of the island, that is, the total money that each of the inhabitants earns from sales in a month:

$$\rightarrow \begin{cases} \boldsymbol{X} \stackrel{\text{def}}{=} \boldsymbol{G} \times \boldsymbol{I} \leftrightarrow \begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix} \stackrel{\text{def}}{=} \begin{pmatrix} c_{11} & \cdots & c_{1n} \\ \vdots & \ddots & \vdots \\ c_{n1} & \cdots & c_{nn} \end{pmatrix} \times \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix} \leftrightarrow x_i \stackrel{\text{def}}{=} \sum_j c_{ij} \\ \boldsymbol{Y} \stackrel{\text{def}}{=} \boldsymbol{G}^{\boldsymbol{t}} \times \boldsymbol{I} \leftrightarrow \begin{bmatrix} y_1 \\ \vdots \\ y_n \end{bmatrix} \stackrel{\text{def}}{=} \begin{pmatrix} c_{11} & \cdots & c_{1n} \\ \vdots & \ddots & \vdots \\ c_{n1} & \cdots & c_{nn} \end{pmatrix} \times \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix} \leftrightarrow y_i \stackrel{\text{def}}{=} \sum_j c_{ji} \end{cases}$$

The "expenditure matrix" is all we need to know for now to describe the island's economic activity. It is thanks to it, that we define the expenditure vector x_i and the income vector y_i as the sum of the rows and columns, respectively.

The definition of the income vector y_i and the expenditure vector x_i by means of the coefficients of the expenditure matrix $\boldsymbol{G}$ are two of the basic equations of the theory, and with the matrix we introduce two of the basic economic variables with which we are going to describe the monetary economy.

Now it is very easy to prove the suspicion of aliens, and to prove that money is conserved in the purchase and sale. To do this, it is only necessary to demonstrate that the sum of all expenditures is equal to the sum of all revenues, which is always the case. Equality between aggregate expenditures and aggregate income of the economy is a property that will always be fulfilled in any economy and we will call it Say's Law, because it was the economist Say who first formulated it in 1870, although in an ambiguous context where it is not clear that it has the same meaning that we are giving it here:

<u>SALLY'S LAW</u>: "The sum or aggregation of all expenditures within a monetary economy is equal to the sum or aggregation of all income.

$$\sum_j x_j = \sum_j y_j \qquad (ley\ de\ Say)$$

Say's law is a macroeconomic property and its validity, as it is formulated here, is beyond doubt since it is a consequence of the fact that the expenditure matrix $\boldsymbol{G}$ and its transpose $\boldsymbol{G^t}$ contain the same coefficients. Say's law is another of the equations that appears in the set of basic equations of monetary economics and tells us that in a closed monetary economy aggregate income is always equal to aggregate expenditure.

Indoor product . $\boldsymbol{PIA}$. Another variable of interest that is going to be used frequently is the *PIA* or Broad Domestic Product. It is defined as the nominal value of the sum or aggregation of all monetary flows of exchange carried out within the economy, during the period considered:

$$PIA \stackrel{\text{def}}{=} \sum_i x_i = \sum_{ij} c_{ij} = I \times G \times I \ = X$$

$$PIA \stackrel{\text{def}}{=} \sum_i y_i = \sum_{ij} c_{ji} = I \times G^t \times I \ = Y$$

The *PIA* is, therefore, a monetary flow and its nominal value can be obtained by two different ways, one by the sum of the agents' sales revenues, and the other by the sum of all their purchase expenditures. Both sums give identical results because they contain the same terms, the coefficients of the expenditure matrix. c_{ji} of the expenditure matrix. It is this equality that we have called Say's Law.

3. THE MATHEMATICS OF ECONOMICS.

The previous section suggests very clearly that vectors, matrices and scalars seem to be the natural language with which to describe monetary phenomena because they are very well adapted to the description of an economy divided into different sectors, what is usually called microeconomics. Therefore, in the Madrid theory we are going to use the matrix language as the basic mathematical language in which to express any relationship within the monetary economy.

Specifically, any microeconomic relationship or linkage fulfilled by a generic sector "i" will be represented using a vector relationship, thus indicating that it is a linkage that must be fulfilled by each of the sectors of the economy independently. For example, the definition of the flow of income y_i or expenditure flow x_i is a vector expression and the generic subscript "i" refers to the flow of income or expenditure of each of the sectors into which the economy has been divided:

$$\begin{cases} x_i \stackrel{\text{def}}{=} \sum_j c_{ij} \\ y_i \stackrel{\text{def}}{=} \sum_j c_{ji} \end{cases}$$

Another vectorial expression that may make the idea clearer is the expression that is usually used to define savings, which will be studied later on:

$$y_i = x_i + ah_i \qquad \begin{cases} si \quad ah_i > 0 \quad \rightarrow \quad ahorro \\ si \quad ah_i < 0 \quad \rightarrow \quad crédito \end{cases}$$

The expression tells us that each participant in the economy divides its income between spending and saving. It is an equation that must be fulfilled by each and every one of the sectors and the index runs through all of them. That is why we say that the expression is a microeconomic linkage, because it describes a property or linkage that must be fulfilled independently by each participant in the economy.

The interesting thing about the vector formulation is that we can define an operation, "the vector aggregation", that sums all the components of the vectors that appear in the expression, so that, if the microeconomic expression is fulfilled, the aggregate expression will also be fulfilled. For example, when we add up all the components x_i of the expenditure vector, we obtain a number, the aggregate expenditure flow of the whole economy, which is no longer a vector, but a number, the aggregate expenditure flow of the whole economy. Xwhich is no longer a vector, but a scalar to which we have given the name of *PIA or Producto Interior Amplio for* its acronym in Spanish:

$$X = \begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix} \equiv x_i \quad \xrightarrow{agregacion} \quad X = x_1 + x_2 + \cdots + x_n = \sum_i x_i = PIA$$

When instead of referring to a single vector as in the previous case, reference is made to a vector equality, the aggregation process is carried out by adding the components of each of the vectors appearing in the expression, and will result in a scalar identity that will be valid as long as we assume that the vector identity from which it comes is valid. For example, the usual expression used to define savings has an associated aggregate equation, which will be valid to the extent that the savings equation from which it is derived by aggregation is valid:

$$y_i = x_i + ah_i \quad \xrightarrow{\boldsymbol{agregacion}} \quad Y = X + Ah \quad \begin{cases} Y = \sum y_i \\ X = \sum x_i \\ Ah = \sum ah_i \end{cases}$$

<u>AGGREGATION</u>: Given a microeconomic property expressed by means of a vector identity, when we add each of the components of each of the vectors that appear in the expression, we obtain a scalar identity which, in the particular case of economics, is always associated with the idea of aggregation as the sum of the parts of a whole.

We define the aggregate equation of a vector expression (or scalar equation) as the equation obtained when we add all the components of the vector expression:

$$a_i = b_i + c_i \quad \xrightarrow{ecuacion\ agregada} \quad \sum_j a_j = \sum_j b_j + \sum_j c_j \quad \leftrightarrow \quad A = B + C$$

In general, we will use capital letters to refer to a macroeconomic variable and lowercase letters with subscript to refer to a microeconomic variable.

The importance of the aggregation process comes from the different economic meaning of the aggregate equation. A vector equality is fulfilled component by component and refers to a microeconomic property that must be fulfilled by each of the agents or sectors into which the economy has been divided. In contrast, scalar equality is fulfilled by the aggregate sum of all the components, so that scalar equality refers to a property that is fulfilled by the whole economy as a whole.

MICROECONOMIC EQUATION. A vector expression is a microeconomic constraint that has to be fulfilled component by component, i.e., fulfilled by each of the agents used to describe the economy, since each component of a vector is associated with the behavior of each of the agents:

$$a_i = b_i + c_i$$

MACROECONOMIC EQUATION. On the contrary, when we take a vector expression and perform the sum or aggregation of all the components we obtain a scalar expression that refers to a macroeconomic constraint that is met by the whole economy as a whole:

$$a_i = b_i + c_i \xrightarrow{ecuacion\ agregada} \sum_j a_j = \sum_j b_j + \sum_j c_j \leftrightarrow A = B + C$$

Some aggregate expressions will be very important within the theory we are developing because they are macroeconomic laws that the whole economy will have to comply with.

4. THE MONETARY EQUATION

That money exists and is real has been known for a long time. That there is a fixed quantity of money M circulating in the economy, which is linked to total production, is also a very old and well-established idea in economic science. But to show what is the relationship between the quantity of money, what we will call the "mass of money", and the total amount of output, is a very old idea. Mwhat we will call "money supply", and the other variables of the economy, such as income and expenditure flows, is neither so simple nor so evident, and that is the reason why we are going to introduce the relationship here in the form of a postulate.

The type of completely real variable, such as the quantity of money, which is used in economics, but which is at the same time a phantom variable M which is used in economics, but which is at the same time a phantom variable because it has no clear link to the other variables of economics, appears a lot in the natural sciences and its practical importance in the discipline depends on whether an equation can be found to link it to the rest of the variables used in the theory.

In a theory, the equations of experimental origin that serve as a link between variables that need not be related are called **Constituent Equations of the Theory** and, although the subsequent development of the theory can deduce them from deeper principles without the need to impose them from outside as empirical laws, they are equations of tremendous importance because their experimental origin allows the expressions in which they appear to be empirically validated. That is to say, they are the expressions or relations that turn a simple theory into a scientific theory, because they allow the formulation of laws that can be experimentally verified and, therefore, that allow the theory to be validated.

In short, a theory becomes science when this type of relationship appears, which allows the expressions that are deduced from them, and in which the variables on which the theory is based appear, to be contrasted by experiments and empirical data. Without these equations there is no experience, nor is there science.

In the science of economics there is one of these equations, the so-called "**constitutive**" ones, which has been going around for a few centuries now and has been the subject of heated discussion within the discipline. If we want to do justice to history, we have to affirm that the expression periodically reappears from its ashes like a phoenix to become the fashionable expression of the moment, only to fall into oblivion and disappear shortly thereafter. We are referring to the equation they call **The Currency Equation** and which is expressed in the matrix language we are using, as follows:

$$k_F \cdot M = \sum_j p_j \cdot q_j = PIA \qquad (Ec. Monetaria)$$

Where k_F is Fisher's constant, and the summation is made over all the monetary flows of exchange carried out during a period of time. In other words, the expression relates what we have called the *PIA* to the quantity of money present in the economy through a constant, the Fisher constant. Although there are several interpretations of the expression, each one subject to the different conception that each school of thought has about money, here we will consider valid the interpretation made of the expression at the beginning of the 20th century by the American economist Irving Fisher, which is the reason why the constant bears his name: "*Fisher's constant*".

The monetary equation is an equation with a long history in economic science and, undoubtedly, it is by far the most famous equation in the discipline. One of the first times it appears is in the hand of David Hume, although he was by no means the first to refer to it. Hume used it successfully in the mid-19th century to attack the protectionism of his time, claiming that any monetary surplus in a country as a result of increased exports would eventually raise prices and limit exports. The dubious conclusions reached by Hume brought the equation into disgrace and it disappeared from economics shortly thereafter. More than a century later, it was revived by Irving Fischer, who in the 1910s used it in a very similar way to Hume, before falling into oblivion once again as a result of the Great Depression and Keynes' fierce criticism of it.

The last time it became fashionable was in the 1970s after the rise of "monetarism" sponsored by economists working for private universities in the USA, in particular the University of Chicago. It was an economist from this university, Milton Friedman, the father of liberalism, who, with the publication in 1957 of a famous short article, brought the equation back into fashion. In the article, he demonstrated, with empirical data taken from historical series, that the "velocity of money" (the k_F of the expression) was in practice a constant, that it does not depend on any other variable and that it changes little over time, i.e., the same idea that both Hume and Fisher advocated. The problem with Friedman's interpretation of the equation is that he completely forgets what the monetary equation really says and uses it to justify the liberal doctrine, propagating the idea that inflation is a consequence of the creation of money by the government, without it being at all clear how the statement should be interpreted because he does not develop a theory of monetary creation. His is the famous phrase: "*inflation is always and everywhere a monetary phenomenon"*, which is little or nothing different from that other famous phrase that says: *"rain is always and everywhere a meteorological phenomenon",* except that neither of the two statements tells us anything we do not know. It seems to us a bit excessive to give someone the Nobel Prize for such a trivial statement.

<u>THE MONETARY ECUATION</u>: The monetary equation is what in the natural sciences is known as the constitutive equation. An equation whose origin is almost always empirical and whose relevance resides in the fact that it links variables that apparently have no reason to have any relation, in this case, the quantity of money and the flow of exchanges.

Clearly it is not an accounting equation, nor can it be easily deduced from first principles, but it is an expression that links variables that have a very clear statistical meaning, such as the quantity of money, or the sum of the economy's purchase flows, or PIA, so its ultimate theoretical *justification will have to be sought in statistics, and its validity will be tested by empirical data. MIt is therefore its ultimate theoretical justification will have to be sought in statistics, and the proof of its validity will be the empirical data taken from reality that show it:*

$$k_F \cdot M = PIA \qquad\qquad (Ec.\ Monetaria)$$

The expression links a monetary stock $M$the quantity of money in the whole economy, with the aggregate flow of the economy, the PIA, through the Fischer constant, although there is no economic reason why the two variables should be related. k_F or Fischer constant, although there is no economic reason why the two variables should be related. This was the meaning Fischer gave to the constant in the early 20th century and the reason why we think the constant should bear his name. The dimensions of the constant k_F is that of $(time)^{-1}$.

Although its importance for the theory we are developing lies in the fact that it will allow us to relate the creation of money with the growth of the economy, the monetary equation is, above all, the expression that gives value to money. It is not an expression that serves to fix the specific price of goods, but it is an expression that tells us the purchasing power of money, since it establishes a biunivocal relation between the quantity of money and the quantity of goods that can be bought:

Amount of money ↔ Amount of goods
M ↔ PIA- year

The monetary equation is one of the basic equations of monetary economics. It refers to a macroeconomic property and is the only one of them that has an experimental or empirical origin. It introduces into economics the important concept of the money supply M associated with the PIA, the aggregate flow of exchanges, in Fisher's original interpretation. The monetary equation is the pillar on which all monetary economics rests. If it falls, the whole theory that we are going to develop here falls.

THE FISCHER CONSTANT. Although the money supply M is unique and in the monetary equation it appears related to the PIA, we can expect, although it is not entirely correct, that if there is a constant relation between the money mass M and the PIA, then there must also be a constant relation between the money mass M and the GDP. This forces us to define two monetary equations with two different Fischer constants, depending on which flow we relate to the money supply:

$$\begin{cases} k_F^* \cdot M = PIB \\ k_F \cdot M = PIA \end{cases}$$

In order not to overload the notation with two different Fisher constants, we will name both constants with the same name, the Fisher constant k_FThe Fisher constant is the Fisher constant, and the Fisher constant is the Fisher constant, but we have to understand from the context to which of the two flows we are referring to at any given moment, whether it is the IPA, as is usual in economics, or the GDP.

5. THE FISHER EQUATION: THE MONEY SUPPLY

The monetary equation introduces into the economy the quantity of money as a new variable, different from the flows of expenditure and income, which must be precisely defined before it can be used in the description of the economy. In a monetary economy which we assume to be stationary, with no growth or decline in economic activity, we can intuit that there will be a given quantity of money M associated with this stationary situation, so that an increase or decrease in M will take the economy out of the stationary state in which it finds itself, increasing or decreasing the nominal flow of exchanges. The importance of this fixed quantity of money, associated with the aggregate flow of exchanges, lies in the fact that it allows us to characterize the monetary economy, depending on whether or not the monetary equation is fulfilled.

MONETARY ECONOMY: An economy is said to be a monetary economy when there is a good called money with which any other good, service or merchandise offered for sale can be bought and whose quantity M fulfills the monetary equation:

$$k_F \cdot M = PIA \qquad (Ec.\ Monetaria)$$

Where M is the money supply.

The money supply is measured as a nominal amount or stock in current currency, being perhaps the most important concept in macroeconomics because it allows us to "touch" money, which until now we have only seen it pass from one side to the other as a monetary flow of income or expenditure. For now, it will suffice for us to understand that a money supply is necessary for an economic system based on the exchange of goods and services for money to function.

Let's imagine that the stores are full of products but no one has enough money to buy anything. Nothing can then be bought and nothing can then be sold, buying and selling will be impossible. If the baker needs to buy flour and has no money, he will have to wait to sell the loaves he has in order to get the money to buy the flour to continue producing loaves. It can be intuited that when the amount of money in the economy is scarce, buying and selling will be scarce and will be conditioned to other purchases and sales, which will lead to a slowdown in the flow of exchanges and a decrease in the *IPA*. The opposite will happen if the amount of money used by economic agents is very large. The exchanges will increase and will be very fluid, perhaps excessively so, that the stores may become empty of products and the suppliers of services may not be able to satisfy the high demand for goods due to the increase in the quantity of existing money. In such a situation, intuition leads us to suspect that there may be a generalized rise in prices, perhaps together with an increase in production.

It might be thought, from what we have said up to now, that the money supply is a macroeconomic concept related to the monetary flows of the whole economy, which can hardly be generalized by defining a microeconomic money supply for any sector or agent into which the economy is divided, which is only half true. Moreover, it is intuited that its origin will have to be based on statistics and big numbers, so that we could get the wrong idea that it is a concept that can only be associated with the economy as a whole.

On the contrary, from now on, we <u>will consider that any economic agent, or sector into which we divide the economy, is formed by the grouping of a sufficient number of individual agents that behave in the same way, so that we can use statistics and associate to all of them, as a whole, a microeconomic monetary mass with which they carry out the economic activity.</u>

<u>MICROECONOMIC MONEY SUPPLY</u>. The microeconomic money supply is defined as a vector whose components represent the nominal stock used by each of the agents into which the economy has been divided to carry out exchanges. m_i *represent the nominal stock used by each of the agents into which the economy has been divided to carry out exchanges, understood as a grouping of a large number of persons or companies of the same type:*

$$\boldsymbol{M}=\begin{bmatrix}m_1\\ \vdots\\ m_n\end{bmatrix}\xrightarrow{agregación} M=\sum_i m_i \qquad M\rightarrow \left| \begin{matrix} la\ masa\ monetaria\\ de\ toda\ la\ economia\end{matrix}\right.$$

It is not difficult to understand that the aggregate sum of the vector m_i is the aggregate money supply M of the economy that appears in the monetary equation.

Our purpose in introducing the vector $\boldsymbol{M}$ is to find the microeconomic expression from which the monetary equation comes and which we will call the Fisher Equation. We know that the monetary equation is a scalar expression and describes a macroeconomic binding that must be fulfilled by the whole economy as a whole, so there must be a microeconomic property, described by a vector equation, from the aggregation of which the monetary equation proceeds.

We also know that the monetary equation establishes a relation between a stock, the aggregate monetary mass $M$and the aggregate flow of expenditure or income of the economy, the *PIA*, so the vectorial expression we are looking for must relate microeconomically the same magnitudes, i.e. it must relate the vector monetary mass of each agent with the monetary flow created by each agent in his economic activity. m_i of each agent with the monetary flow created by each agent in his economic activity. The only doubt will be to know with which of the two possible flows, the flow of expenditure or the flow of income, should be related. x_i or the flow of income $y_i$flow, the money supply will have to be related:

$$¿? \rightarrow \quad k_F\begin{bmatrix}m_1\\ \vdots\\ m_n\end{bmatrix}=\begin{bmatrix}x_1\\ \vdots\\ x_n\end{bmatrix} \;\equiv\; k_F\cdot m_i = x_i \xrightarrow{agregación} k_F\cdot M = PIA$$

$$¿? \rightarrow \quad k_F\begin{bmatrix}m_1\\ \vdots\\ m_n\end{bmatrix}=\begin{bmatrix}y_1\\ \vdots\\ y_n\end{bmatrix} \;\equiv\; k_F\cdot m_i = y_i \xrightarrow{agregación} k_F\cdot M = PIA$$

Both flows, expenditure and income, have the same aggregate value, the *PIA,* so that both flows will reproduce the monetary equation by aggregation. But both vectors have different components, so choosing one or the other will give rise to two completely different theories. That is, only one of the two possible expressions is correct and only one of the two possible flows is the one that generates the monetary equation by aggregation.

A priori, we have no reason to choose the expenditure flow and discard the income flow, and vice versa, but of course only one of them can be valid. Which of them is the correct flow? Which of the two vectors, the expenditure flow or the income flow, is the one that should appear in the microeconomic monetary equation, or Fischer Equation?

The doubt as to which of the two vectors, the expenditure or the income vector, is the one that appears in Fisher's expression is resolved when we understand that the income flow is the money received in exchange for the sale of a good, so it represents the agent who does not need to have money to carry out the exchange. y_i is the money received in exchange for the sale of a good, so it represents the agent who does not need to have money to carry out the exchange: *"the income flow represents the seller"*. On the other hand, the expenditure flow x_i represents the expenditure made by the buyer and requires the prior possession of money so that the exchange of purchase and sale can take place: "*the expenditure flow represents the buyer*". Therefore, it is very clear that it has to be the expenditure flow that is backed by the money supply, since the money supply represents the money that it is necessary to have previously in order to carry out the buying and selling exchanges.

When we exchange a good for money there is an agent, the seller, who does not need to have money to carry out the exchange, and there is another agent, the buyer, who needs to have the money to carry out the exchange. It is therefore to the flow of purchase, the buyer, that the money supply must be associated because it is he who is using the stock of money to carry out the purchase:

$$k_F \cdot m_i = x_i \qquad\qquad (ec.\, de\ Fischer)$$

The microeconomic equation that relates the money supply to the flow of expenditure is called the Fisher Equation and is another of the basic equations of a monetary economy. From it, the monetary equation is obtained by aggregation:

$$k_F \cdot m_i = x_i \quad \xrightarrow{agregación} \quad k_F \cdot M \ = PIA$$

With this last expression we put together a set of three basic microeconomic equations and their corresponding aggregate equations.

6. BASIC EQUATIONS OF MONETARY ECONOMICS

We have already mentioned that we were going to use "income" and "expenditure" as the basic variables with which to describe the monetary economy. We have called **income vector** the annual amount of money received by any agent for the sale of goods and services, and we have called **expenditure vector the** annual amount of money spent by any agent in the purchase of goods or services, and we have used the expenditure matrix to define both vectors. But, apart from these two definitions, we have introduced the rest of the equations by implicitly using two postulates in our reasoning.

Specifically, it is well understood that in order to define income and expenditure we have implicitly assumed that in an exchange or sale-purchase, the amount of money that the seller earns is always equal to the amount of money that the buyer spends. The validity of the above statement may seem very obvious, but it is important to understand that it has been necessary to use it to obtain Say's Law.

CONSERVATION POSTULATE: The quantity of money used by each agent in a monetary economy is a magnitude that is conserved in buying and selling exchanges. m_i *used by each agent in a monetary economy is a magnitude that is conserved in buying and selling exchanges.*

Or in other words, the activity of buying or spending does not change the quantity of money within the economy, i.e., the aggregate sum of all money used in the economy is constant and conserved during exchanges. The postulate of conservation of the quantity of money is a self-evident postulate and all economists agree with it, although it has never been formulated explicitly. We have used it implicitly when constructing the expenditure matrix **G** and using it to obtain the vectors of income and expenditure, but we cannot forget that it is its existence that will allow us to affirm in the end that when money in the economy grows or decreases it is because someone is making money out of nothing or destroying it.

The other postulate we are using, this time stated explicitly as a basic equation, is the monetarist postulate we have used to define the money supply of an economy.

MONETARIST POSTULATE: In a monetary economy there exists a constant relationship k_F *between the quantity of money* M *that is used in exchanges and the flow of exchanges, or* PIA*that take place within the economy:*

$$k_F \cdot M = PIA$$

In other words, we have characterized the monetary economy as that economy in which the monetary equation is fulfilled with the interpretation made by the American economist, Irving Fischer, at the beginning of the 20th century. It is also this postulate that has allowed us to deduce that Fischer's microeconomic equation, from which it proceeds by aggregation, must also be fulfilled.

The two postulates, conservation and monetarist, are very simple, very easy to understand and even easier to interpret. The variables that appear in them are measured in money and, therefore, the conclusions reached with them are empirically verifiable. Based on these two postulates, we have already found six of the eight basic equations that a monetary economy based on the free exchange of goods for money fulfills:

$$\boldsymbol{Ec.\ B\acute{a}sicas\ de\ la\ Econom\acute{\imath}a\ Monetaria}$$

$$Ec.\ microecon\acute{o}micas \begin{cases} y_i = x_i + ah_i + \dfrac{1}{k_F}\dfrac{dx_i}{dt} & (Ec.\ de\ conservaci\acute{o}n) \\ \begin{cases} y_i = \sum_j c_{ji} & (Def.\ del\ ingreso) \\ x_i = \sum_j c_{ij} & (Def.\ del\ gasto) \end{cases} \\ k_F \cdot m_i = x_i & (Ec.\ de\ Fisher) \end{cases}$$

$$Ec.\ macroecon\acute{o}micas \begin{cases} k_F \cdot M = PIA & (Ec.\ monetaria) \\ \left.\begin{matrix} Y = \sum_i y_i \\ X = \sum_j x_i \end{matrix}\right\} \rightarrow PIA = \sum_i x_i = \sum_i y_i & (Ley\ de\ Sally) \\ Ah + \dfrac{1}{k_F}\dfrac{dPIA}{dt} = 0 & \begin{pmatrix} Ec.\ agregada\ de \\ conservaci\acute{o}n \end{pmatrix} \end{cases}$$

The set of basic equations is divided into two subgroups, the equations that describe the economy from the microeconomic point of view and the equations that describe the economy from the macroeconomic point of view.

Microeconomic equations express the linkages that each of the sectors into which the economy has been divided for study. Vectors are used as a means of representation because they allow each component "i" of the vector to refer to each of the "N" sectors or economic agents into which the economy has been divided.

On the contrary, macroeconomic equations are scalar relations that are obtained by the sum or aggregation of the components of each of the vector equations, so they are not independent equations of the vector equations from which they come. Macroeconomic equations do not add new links to the existing ones, but refer to a link that must be fulfilled by the whole economy as a whole, so that each of them has a macroeconomic meaning very different from the microeconomic meaning of the vectorial expression from which it comes.

It remains, therefore, to derive the other two equations that appear in the set, the first equation and the last one:

THE CONSERVATION EQUATION. In a monetary economy the following relationship between the flows of expenditure, income and savings is fulfilled:

$$y_i = x_i + ah_i + \frac{1}{k_F}\frac{dx_i}{dt} \qquad \textit{Conservation Eq.}$$

THE GROWTH EQUATION. In a monetary economy, the nominal decrease in the IPA is proportional to the net flow of saving Ah (the flow of money destruction), the constant of proportionality being Fischer's constant k_F:

$$\frac{dPIA}{dt} = -k_F \cdot Ah$$

Although we have not yet defined the savings vector ah_iit can be easily checked that the Growth Equation formally proceeds from the aggregation of the Vector Conservation Equation, simply by defining Ah as the aggregate flow of the savings vector.

CHAPTER 2

THE CONSERVATION EQUATION

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1. CONSERVATION EQUATION OF THE MONETARY FLOW.

What characterizes a monetary economy, and what differentiates it from any other type of organization that can be used to jointly produce and distribute the goods needed to live, is that each of the generic agents participating in the economy has to comply with an accounting equation, the Conservation Equation, which forces money to be conserved.

Let us recall that in the first chapter we have made use of only two postulates to derive the set of basic equations that a monetary economy fulfills. In fact, we have used the monetarist postulate to derive two of them, while the other three equations are a consequence of the conservation postulate and the definition of the flow of expenditure and income by means of the expenditure matrix:

$$\begin{cases} y_i = \sum_j c_{ji} & (Def.\ del\ ingreso) \\ x_i = \sum_j c_{ij} & (Def.\ del\ gasto) \end{cases}$$

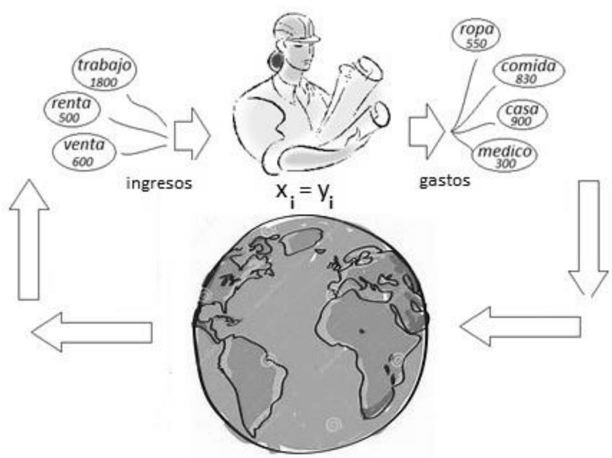
$$k_F \cdot m_i = x_i \qquad (Ec. de\ Fischer)$$

$$k_F \cdot M = PIA \qquad (Ec.\ Monetaria)$$

$$\left.\begin{aligned} Y &= \sum_i y_i \\ X &= \sum_j x_i \end{aligned}\right\} \rightarrow PIA = \sum_i x_i = \sum_i y_i \qquad (Ley\ de\ Sally)$$

But none of these equations refers to the accounting equation that must be fulfilled by each of the persons, companies or institutions that participate in a monetary economy. The equation we are missing is a vector equation, since it must be fulfilled by each of the agents independently of the rest of the agents, but it must also be a conservation equation that forces money to be conserved, since this is the essential characteristic of a monetary economy.

Let us begin by explaining why the missing equation must be an equation that conserves the monetary flow, which we will call the **Conservation Equation.** In the attached figure, we show the relation that any generic agent has with the rest of the economy, which we have symbolically represented by a globe. It can be seen that the generic agent has only two ways of connection with the rest of the economy, one is the money he earns from his sales and the other is the money he spends on his purchases.



Let us observe that when we demand of each of the agents participating in the economy that the nominal flow of their expenditures be equal to the nominal flow of their income, we will be forcing money to be conserved within the economy, since the rest of the world is made up of many other agents on whom we are also imposing the same condition:

MONETARY FLOW CONSERVATION LAW (economy without savings or monetary creation): *The Flow of Expenditure for purchases of each of the agents participating in the economy is equal to their Flow of Income for sales:*

$$x_i = y_i \qquad \left| \begin{array}{l} Ec. de\ Conservacion \\ del\ Flujo\ Monetario \end{array} \right.$$

To impose on each agent to match his income with his expenditure, is one of the many possible statements we can make of the Conservation Equation to force money to be conserved in the economy, but it is not the only one. In fact, the statement thus formulated is very restrictive and we will see that it describes a very particular case of monetary economy in which neither monetary transfers between different agents nor the creation or destruction of money are allowed, but it serves as an example to show the meaning of the conservation equation and the reason why its formulation is so important within the economy, since its function is none other than to force the activity of each agent to conserve the quantity of money in the economy.

The Conservation Equation of the Monetary Flow expresses the bond that each agent within the economy must fulfill to guarantee that the monetary flow is conserved, that is to say, the conservation equation will serve to describe the destination or origin of the money being created or destroyed within the economy.

In the particular example above, the equality in the flow of expenditure and the flow of income that we impose on each agent implies that no agent saves and, therefore, in the economy there is no saving. It also implies that there is no creation or destruction of money either, so that, in the general case, the conservation equation will have to be very different from the previous equation, since in the real economy there is saving and there is also the creation and destruction of money, and the previous expression does not contemplate this.

Another observation about the conservation equation that is important to make now is that, since it is a vector expression, we can obtain from it by aggregation a scalar identity that reflects the macroeconomic conservation condition that the economy as a whole fulfills. With the particular formulation we have given to the conservation equation, the aggregate equation coincides with Say's Law:

$$x_i = y_i \xrightarrow{ecu.\ agregada} \quad PIA = \sum_i x_i = \sum_i y_i$$

The appearance of Say's Law does not occur by chance, and is the reason why we have named the equality between the aggregate flow of expenditure and income as Say's Law, since this was the original meaning given to it by Say:

> "*Every producer asks for money in exchange for his products, only for the purpose of employing that money again immediately to purchase another product, for we do not consume the money, and money is not usually sought to hide it; therefore, when a producer wishes to exchange his product for money he may be considered as already asking for the commodity which he proposes to purchase with that money.*"
>
> *Say*

It can be seen very clearly in the paragraph that Say is saying that in an economy the microeconomic conservation equation we have just formulated is "normally" fulfilled, which obliges any seller to spend on purchases everything he earns from sales. On the assumption that this condition is fulfilled, Say succeeds in demonstrating that in a monetary economy there cannot be overproduction at the aggregate level, since aggregate income must be equal to aggregate expenditure, which is what Say really wanted to demonstrate.

Say's intention was to refute the argument that most economists of his time used to explain the economic crisis: *"an economy in which more is produced than is desired or can be consumed"*. It is exactly the same argument used by Keynes 100 years later to explain the economic crisis, and still used now, 200 years later, to explain recessions: "under-consumption". Thus, Keynes mentions Say's Law and states that in an economy it does not have to be fulfilled. We see that the idea of what causes economic crises has actually changed very little in the last two hundred years.

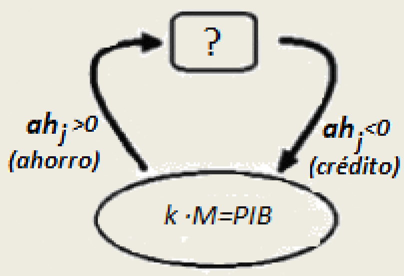
We have called "Say's Law", not the microeconomic conservation equation that forces each agent to spend what he earns, which would have been more correct, but the conclusion that is reached when this obligation is imposed, which is what Say wanted to demonstrate in order to refute the argument of overproduction, or underconsumption, as the origin of the economic crisis (it is necessary to remember that what we have called "Say's Law" is always true, whatever the particular statement of the conservation equation may be).

The rest of this chapter will be devoted to finding the most general possible conservation equation that satisfies any generic agent in a monetary economy.

2. SAVINGS IN THE MONETARY ECONOMY.

In a real economy, economic agents do not spend all their sales income and usually save part of their income. Not only that, agents can also borrow money, which allows them to maintain a flow of expenditure higher than the value of their income flow. To construct a realistic economic theory we must bear in mind that both possibilities, saving and borrowing, can be assumed by agents when they carry out economic activity and must be reflected in the concrete formulation of the Conservation Equation. It is evident that the equality between expenditure and income, as we have formulated it in the previous section in the Conservation Equation, does not allow for saving and will have to be changed to reflect the possibility of saving and spending on credit.

<u>*SAVING*</u>*. A very important aspect to take into account when saving or spending on credit is that we are not going to consider it as an exchange of buying and selling. The reason for proceeding in this way is that when saving or spending on credit we understand that we are not acquiring any service in exchange for money, which is what is understood by a purchase and sale, so it should not appear in the expenditure matrix.* $\boldsymbol{G}$.



The attached figure shows what we mean by savings. The act of saving or spending borrowed money is a monetary transfer between economic agents without compensation in the present, which is based on a promise of future repayment of the borrowed money backed by a legal system.

There is, therefore, no buying and selling or exchange, nor is there any reason why it should appear in the expenditure matrix, which is what we use to describe monetary exchanges.

The figure shows that savings money is taken out of the real economy and ends up outside the economy. The opposite happens with the money that is unsaved, which in the figure comes from outside and ends up being spent within the real economy.

This makes it necessary to separate the monetary flows generated by savings and credit from the flows generated by buying and selling exchanges in the real economy, so a specific vector will be defined to represent savings and credit, the savings vector ***Ah.***

The traditional definition of savings and credit, as the two inseparable sides of a single coin, can be found without difficulty in the statements made by economists, and not precisely by the less famous ones. John Keynes' definition, which appears in the General Theory, is more than 80 years old and is still considered valid today. It is the standard definition used in economics:

> *"As far as I know, everyone agrees that savings is the excess of income over consumption expenditures."*
>
> *John Keynes, 1936*

However, when we look at the statement with which Keynes defines savings from the perspective of the theory we are developing, we see that the expression is, at the same time as the definition of the savings vector of the economy, a possible formulation of the Conservation of Money Flow Equation for an economy in which savings and credit are allowed. ah_i of the economy, a possible formulation of the **Conservation of Money Flow Equation** for an economy in which savings and credit are allowed. Therefore, we define savings:

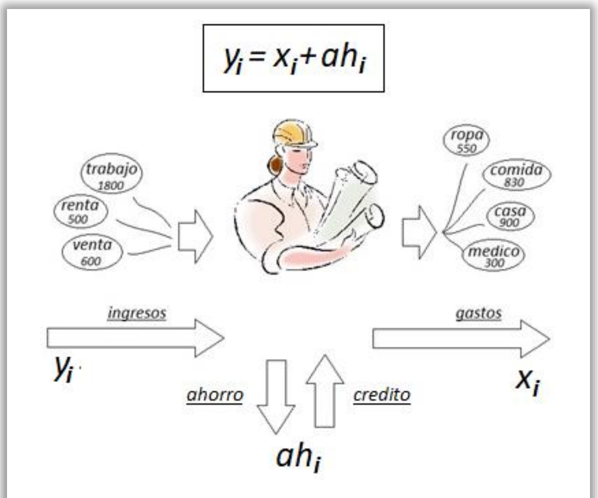
<u>SAVINGS</u>: The Flow of Savings is defined as the excess of the flow of income over the flow of expenditure of each of the agents that carry out economic activity ah_i is defined as the surplus of the flow of income over the flow of expenditure of each of the agents that carry out the economic activity:

$$y_i = x_i + ah_i \qquad \begin{cases} si \quad ah_i > 0 \ \rightarrow \ ahorro \\ si \quad ah_i < 0 \ \rightarrow \ préstamo \end{cases}$$

$$\boldsymbol{Ah} = \begin{bmatrix} ah_1 \\ \vdots \\ ah_n \end{bmatrix} \xrightarrow{agregacion} Ah = \sum_j ah_j$$

From this point of view, saving is a monetary extraction and lending is a monetary injection.

The reason for the positive sign in the expression is so that its coefficients are positive when they represent money that leaves the economic system and is not spent (what is understood by savings), and negative when they represent money entering the economic system (what is understood by a loan). The definition of savings, understood as the statement of the conservation equation, contains and generalizes the expression given in the previous section, as a particular case where the savings vector is identically null. This idea is shown in the figure below.



Ecuación del ahorro

Now, the definition allows us to understand savings and credit within the economy as a monetary flow outside the real productive activity that allows us to violate, and not comply with, the microeconomic conservation equation that we imposed on the agents in an economy without savings:

$$ah_j \neq 0 \xrightarrow{y_i = x_i + ah_i} y_i \neq x_i$$

Thanks to saving, agents do not have to spend everything they earn, and thanks to borrowing they can spend more than they earn, invalidating the previous formulation of the Law of Conservation which stated that each agent's income flow had to be equal to his expenditure flow.

<u>The Conservation Equation</u>. To show that, indeed, the expression with which the savings vector is defined ah_i is the **Conservation Equation of the Money Flow of** an economy in which saving and lending are allowed, we only have to show that when the expression is satisfied money really is conserved. To prove this, let us obtain the aggregate equation of the new conservation equation:

$$y_i = x_i + ah_i \xrightarrow{agregación} \sum_j y_j = \sum_j x_j + \sum_j ah_j \xrightarrow{Ley\ de\ Say}$$

$$\rightarrow \quad Ah = \sum_j ah_j = 0 \qquad (Ec.\ Agregada\ de\ Conservacion)$$

The expression tells us that in an economy in which the equation with which we have defined saving is satisfied, aggregate saving is always zero. Perhaps we can see more clearly what it means for aggregate saving to be zero if we separate the agents who are spending on credit from those agents who are saving:

$$\sum_j ah_j = 0 \rightarrow \left\{ \begin{array}{c} ah_i > 0 \leftrightarrow ahorro = \sum_{ah_i > 0} ah_i \\ ah_i < 0 \leftrightarrow préstamo = \sum_{ah_i < 0} ah_i \end{array} \right\} \rightarrow Ah = ahorro + préstamo = 0$$

That aggregate saving is zero necessarily implies equality between the aggregate flow of saving and the aggregate flow of lending, i.e., it necessarily implies that all the money that is saved is spent as lending and, therefore, that in the economy there is no creation or destruction of money. In other words, <u>the expression with which saving is defined in monetary economies is, effectively, the statement of a Law of Conservation of Money Flow that does not allow the creation or destruction of money</u>.

This can also be seen when the positive components of the savings vector are identified with "savings", and the negative components with "investment", which is what loans are usually identified with in the economy:

$$\sum_i ah_i = 0 \quad \rightarrow \quad \left\{ \begin{array}{l} ah_i > 0 \;\rightarrow\; \quad ahorro \;\rightarrow\; A = \sum_{ah_i > 0} ah_i \\ ah_i < 0 \;\rightarrow\; inversión \rightarrow\; I = \sum_{ah_i < 0} ah_i \end{array} \right\} \rightarrow \quad A + I = 0$$

Using the same words that John Keynes used in the General Theory, almost 100 years ago:

"To my way of thinking, the prevalence of the idea that savings and investment, considered in their strict sense, may differ from each other, can only be explained by the optical illusion due to the fact that the relationship between an individual depositor and his bank is regarded as a unilateral operation, instead of bilateral, as it is in reality. It is assumed that a depositor and his bank have a way of contriving to effect an operation whereby savings may disappear from the banking system in such a way that they are lost to investment; or conversely that the banking system may contrive to bring about an investment to which no savings correspond."

John Keynes, 1936.

Although it is a very strange quote coming from Keynes, knowing what he thought about Say's law, the obligation that every euro saved must be lent and spent, or vice versa, the obligation that any amount of money lent must be previously saved, is a consequence of how saving has been defined, but it is very difficult to understand why it has to be necessarily fulfilled. It is not easy to justify why any money that is saved has to be lent and spent, or vice versa, it is very difficult to understand why all the money given in loan obliges someone to simultaneously make the corresponding saving.

The problem is not only to find the mysterious mechanism by which the two flows, the flow of savings and the flow of loans, are connected. It is also the problem of determining which is the causal line that creates equality between saving and borrowing: *Who saves forces someone to spend on credit or is it who spends on credit that forces someone to save?*

All economists of all times have tiptoed silently past the problem, and have postulated the equality between savings and credit by appealing to the equilibrium achieved by manipulating the interest rate of money, without even understanding where the problem lay, except Keynes. Only Keynes seems to have understood very clearly that the usual definition of saving obliges equality between saving and investment, although this does not seem to have made him doubt the definition of saving. However, we have just shown that whenever the equation defining saving is satisfied, both flows must always be equal:

$$\sum_j ah_j = 0$$

The ultra grave obligation that links saving and investment is a problem that has always been latent within economics and turns out to be a direct consequence of the equation that has been used to define saving, so it is easy to conclude that the definition cannot be, far from it, the general conservation equation we are looking for, because, as we have shown, it describes an economy in which money is neither created nor destroyed, which does not correspond to a real economy in which money can be created and destroyed.

Adding the definition of savings to the set of equations we already have allows us to describe a monetary economy with savings and credit, but without money creation:

$$\underline{Economia\ Monetaria\ \ sin\ creacion\ de\ dinero}$$

$$Ec.\ microeconómicas \begin{cases} y_i = x_i + ah_i & (Ec. de\ conservación) \\ \begin{cases} y_i = \sum_j c_{ji} & (Def.\ vector\ de\ ingreso) \\ x_i = \sum_j c_{ij} & (Def. vector\ de\ gasto) \end{cases} \\ k_F \cdot m_i = x_i & (Ec.\ de\ Fisher) \end{cases}$$

$$Ec.\ \ macroeconómicas \begin{cases} k_F \cdot M = PIA & (Ec.\ monetaria) \\ PIA = \sum_i x_i = \sum_i y_i & (Ley\ de\ Sally) \\ Ah = 0 & \begin{pmatrix} Ec. agregada\ de \\ conservación \end{pmatrix} \end{cases}$$

These equations are the first representation we make of a monetary economy. The second and third expressions are used to define expenditure and income, so they are always satisfied. The fourth expression is the vector version of the monetary equation and has an experimental origin. The first expression is the only expression that carries an implicit economic hypothesis or postulate, the Conservation Postulate, and therefore does not have to be true, although y is the expression used to define savings and has been considered true since the dawn of time.

The problem of savings. It can be said that we have reached the limits of knowledge. The above set of expressions are those currently used to describe a monetary economy, despite the fact that we know that in the real economy it is possible to create and destroy money and, therefore, we also know that the equation with which savings is defined must necessarily be false.

THE PROBLEM WITH SAVINGS: Let's analyze the following two statements:

If the millions of euros carried by an armored car are burned in a traffic accident, according to the equations proposed, the rest of the agents are forced to take the same amount of money that has been burned in the accident from somewhere to lend and spend it.

When a counterfeiter manages to spend his counterfeit bills, according to the equations presented, the rest of the economic agents are obliged to save in the same amount in which the counterfeiter spends the counterfeit money.

It is very evident that the above two statements must be false in general, and yet the Conservation Equation with which we have defined savings forces both statements to be true because it does not allow that money can be created and destroyed.

Therefore, savings cannot be "the surplus of income over consumption expenditure"*, as Keynes thought, but then, what is the expression of savings that allow the creation and destruction of money within an economy?*

The problem is obvious. The link we have imposed on the economy with the equation defining savings is unrealistic:

$$y_i = x_i + ah_i \qquad (Ec.\ de\ Conservación)$$

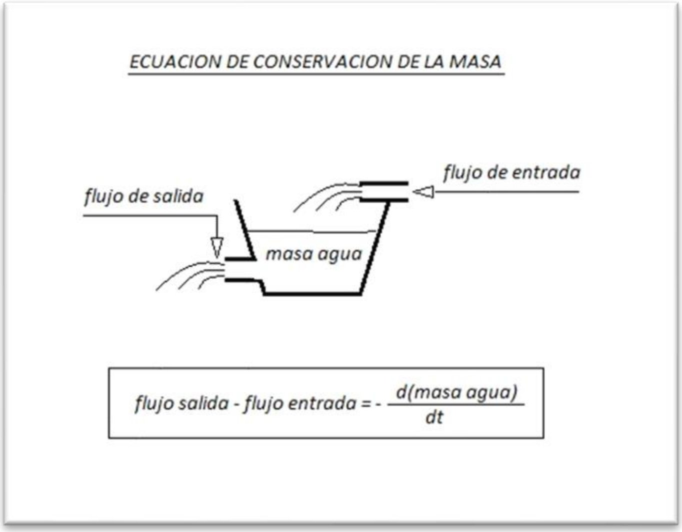
The equation cannot reflect what happens when a counterfeiter (or any bank) creates money out of thin air and spends it in the economy. Nor can it reflect what happens when a saver buries money in his backyard. Both possibilities can occur in a real economy and the conservation equation, as we have defined it, does not allow it.

To solve the problem and understand what is the ***Conservation Equation*** that allows there to be net saving or net credit spending, i.e., that there can be both the creation and destruction of money, we must ask the right questions. Where does the money that someone takes out of the economy when saving come from? Where does the money that the counterfeiter manages to sneak into the market go?

3. THE MICROECONOMIC CONSERVATION EQUATION.

To understand why the microeconomic money supply is so important, let us draw a comparison between the money flowing through the economy, which we represent with the money supply m_i that we introduced when we formulated the Fisher Equation, let us make a simile between the money flowing through the economy, which we represent with the money mass, and the mass of liquid flowing through a pipe system.

Let us think concretely of a container in which water accumulates, with a pipe through which it is filled and a pipe or drain through which it is emptied. The attached diagram describes the physical situation, together with the conservation equation that the quantity of water contained in the container fulfills:



$$\frac{d(masa\ saliente)}{dt} - \frac{d(masa\ entrante)}{dt} = -\frac{d(masa\ del\ recipiente)}{dt}$$

The equation, which only expresses the conservation of the mass of the water in the container, says textually that, "*the difference between the outflow of water and the inflow of water can only come from a change in the mass of water contained in the container, increasing or decreasing depending on whether the difference of flows is positive or negative*". Therefore, we can express the amount of water contained in our vessel as:

$$flujo\ saliente - flujo\ entrante = -\frac{d(masa\ del\ recipiente)}{dt}$$

Knowing the value of the inflow and outflow we can know without any difficulty how the amount of water in the vessel changes.

Now, let us make a conceptual leap and accept that the quantity of money within the economy is conserved in the same way that the quantity of water is conserved within a container. That is, let us consider the economic system as a whole as a system formed by many pipes through which money circulates and many containers in which it accumulates, and let us identify any generic agent as one of those containers containing money inside. Then, it will also be possible to identify the conservation equation fulfilled by the mass of water in a container with the conservation equation fulfilled by the mass of money used by any agent for his activity within the economy.

With this identification, the monetary mass m_i that each agent uses to maintain and carry out economic activity is equivalent to the water contained in each container. Therefore, when the amount of money owned by a generic agent changes, either because he spends more money than he takes in, or because he takes in more money than he spends, there will be an outflow of money or an inflow of money linked to changes in the money supply and which in no way differs from the rest of the money being used in the economy.

The changes in the value of the quantity of money m_i of each of the agents, will create a flow, either incoming (money creation) or outgoing (money destruction), which are completely real and can be used to buy, when spending increases with respect to income, or to save, when spending decreases with respect to income:

$$\boxed{\frac{dm_i}{dt} = (flujo\ monetario\ entrante - flujo\ monetrio\ saliente)_i}$$

The monetary inflow, or outflow, resulting from the changes in the monetary mass used by each agent is real and must be added to the conservation equation of the monetary flow we already have to complete it, but the variation of the monetary mass must never be confused with savings or with credit, which are still described by the savings vector ah_i because it has nothing to do with it. Therefore, to obtain the equation that will allow us to describe the evolution of a monetary economy in which money can be created and destroyed, we must add to the conservation equation that we used to define saving, a new term that accounts for the contribution in the money flow caused by the changes in the money supply of each of the agents:

MONETARY FLOW CONSERVATION LAW: In a monetary economy, the flow of income from sales of any economic agent must be equal to the sum of the flow of expenditure of any economic agent. y_i of any economic agent must be equal to the sum of the flow of expenditures for purchases, plus the flow of savings x_i purchases, plus the flow of savings Ahplus the variation of its money supply:

$$y_i = x_i + ah_i + \frac{dm_i}{dt} \qquad (Ec.\ de\ Conservacion)$$

The expression is the Conservation Equation of a monetary economy in which money can be destroyed or created.

This is the general conservation expression we are looking for. The positive sign in the expression indicates that an increase in the money supply can only be the consequence of a positive difference between income, expenditure and savings flows:

$$\frac{dm_i}{dt} = (flujo\ monetario\ entrante)_i = y_i - x_i - ah_i$$

The expression is, clearly, the **Currency Flow Conservation Equation** (or **Accounting Equation)** that must necessarily be fulfilled by any agent or sector within a generic monetary economy that contemplates the possibility of changes in the quantity of money it handles, and is, as we know, a microeconomic binding.

TIME DEPENDENCE. The notable novelty of the "Conservation Equation" we have just presented is that it introduces time as an economic variable into the economy in a natural and unforced manner.

Moreover, it is the variation of the quantity of money over time that appears in the Conservation Equation, so that the quantity of money becomes an independent variable as are the flow of expenditure and income necessary to carry out the exchanges:

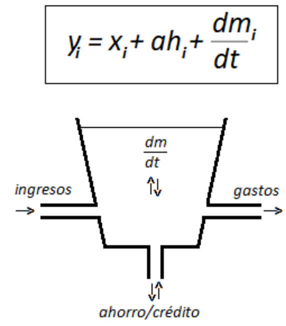
$$y_i = x_i + ah_i + \frac{dm_i}{dt} \qquad (Ec.\ de\ Conservacion)$$

The expression is a dynamic equation that turns economics into a predictive science, since it describes the evolution of economic variables over time.

Perhaps the simplest way to visualize what the equation states is to reuse the simile of water flowing in and out of a container.

In the attached figure an agent is again represented as if it were a recipient into and out of which a flow of water enters and leaves. The quantity of water in the container serves as the monetary mass of the economic agent and the water flowing in and out of another container we identify with its expenditure and income. The flow of savings and loans we identify with the extraction or injection of water to or from nowhere, implying that it is an exchange of money in which there is no purchase or sale. In other words, saving or lending makes it possible to change the amount of money used by an agent within the economy without being limited to his income or his expenditure.

While spending and income flows come and go from one recipient to another without changing the quantity of money in the economy, savings and credit flows have a known destination and origin within the economy, and are external to it.



The latter, the extraction and injection of money into the economy, can be seen very well when we calculate the aggregate equation associated to the new conservation equation, since it is this that will allow us to show without difficulty that the new term will allow money, although conserved, to be created and destroyed without any problem. In other words, the vector equation that includes the term of variation of the monetary mass is really the conservation equation of money we are looking for.

We know that to obtain its aggregate equation we only have to add each of the components of the conservation equation, and since Say's Law is always obtained, we have that:

$$0 = Ah + \frac{dM}{dt} \qquad (Ec. de\ Agregada\ de\ Conservación)$$

The aggregate expression links the nominal value of the flow of money that saving or lending is taking out of or entering the money supply, $Ah$with the changes in the money supply M, as is quite logical. Moreover, we can see that when aggregate saving is zero, the equation tells us that aggregate saving is zero. $Ah = 0$the equation tells us that the money supply M remains unchanged, i.e., when aggregate saving is zero there is no creation or destruction of money and all the money saved by one agent has to be spent by some other agent as credit, or vice versa. On the contrary, when aggregate saving is not zero, the expression indicates that money is being created or destroyed and the money supply changes. M changes. The importance of the equation, apart from the value it has in itself, is that it points to the money supply needed to carry out economic activity as the destination or origin of the money that is created or destroyed from outside the economy:

CREATION AND DESTRUCTION OF MONEY. The money supply M necessary for the functioning of the economic system is the origin of the money that leaves the economic system (destruction), *and is the destination of the money that enters the economic system (creation), through the flow of Ah savings:*

$$0 = Ah + \frac{dM}{dt}$$

The equation can be compared to the equation of conservation of energy in physics, since it tells us about the conservation of monetary mass in the economy:

> *"When the economy is isolated, i.e., neither money is flowing in nor out, the money supply remains unchanged."*

The conservation equation, together with its aggregate equation, turns economics into a predictive science that in no way differs from the other natural sciences, since it expresses the time dependence of the basic variables with which economics is described. Moreover, it makes it possible to solve most of the problems that have impeded the scientific progress of the discipline in the last two centuries, among them, those related to the creation and destruction of money.

With the new conservation expression, the set of equations describing any generic monetary economy remains:

$$\underline{Ec. Básicas\ de\ la\ Economia\ Monetaria}$$

$$Ec.\ microeconómicas \begin{cases} y_i = x_i + ah_i + \dfrac{dm_i}{dt} & (Ec. de\ conservación) \\ \begin{cases} y_i = \sum_j c_{ji} & (Def. del\ ingreso) \\ x_i = \sum_j c_{ij} & (Def. del\ gasto) \end{cases} \\ k_F \cdot m_i = x_i & (Ec.\ de\ Fisher) \end{cases}$$

$$Ec.\ \ macroeconómicas\begin{cases}k_F\cdot M=PIA & (Ec.\ monetaria)\\ PIA=\sum_i x_i=\sum_i y_i & (Ley\ de\ Sally)\\ Ah+\dfrac{dM}{dt}=0 & \begin{pmatrix}Ec.agregada\ de\\ conservación\end{pmatrix}\end{cases}$$

Now, it would seem that we have achieved the purpose of finding the set of basic equations that describe any generic monetary economy. The truth is that this is so, but it would be a pity to end our search here and not finish it with a beautiful finale.

If we derive with respect to time the Fischer equation and use the expression to substitute the vector m_i for the expenditure vector x_i in the microeconomic conservation equation, we obtain:

$$y_i=x_i+ah_i+\frac{dm_i}{dt}\quad\xrightarrow{k_F\frac{dm_i}{dt}=\frac{dx_i}{dt}}\quad y_i=x_i+ah_i+\frac{1}{k_F}\frac{dx_i}{dt}$$

The new equation is no different from the old one, although the money supply has been eliminated from it and now only the income vector, the expenditure vector and the savings vector appear in the expression. Nor will the aggregate equation have a different meaning from the one it already had, although now in the new formulation the money supply does not appear as an explicit variable, but the aggregate expenditure, or PIA:

$$y_i=x_i+ah_i+\frac{1}{k_F}\frac{dx_i}{dt}\quad\xrightarrow{agregacion}\quad Ah+\frac{1}{k_F}\frac{dPIA}{dt}=0$$

Now the aggregate expression relates the flow of money creation to changes in aggregate economy-wide spending, or Ah to the changes in aggregate expenditure of the whole economy, or PIA. Therefore, the definitive set of basic equations that any economic system based on the free exchange of goods for money must satisfy is:

<u>***Ec. Básicas de la Economía Monetaria***</u>

$$Ec.\ microeconómicas \begin{cases} y_i = x_i + ah_i + \dfrac{1}{k_F}\dfrac{dx_i}{dt} & (Ec. de\ conservación) \\ y_i = \sum_j c_{ji} & \\ x_i = \sum_j c_{ij} & \\ k_F \cdot m_i = x_i & (Ec.\ de\ Fisher) \end{cases}$$

$$Ec.\ \ macroeconómicas \begin{cases} k_F \cdot M = PIA & (Ec.\ monetaria) \\ PIA = \sum_i x_i = \sum_i y_i & (Ley\ de\ Sally) \\ Ah + \dfrac{1}{k_F}\dfrac{dPIA}{dt} = 0 & \begin{pmatrix} Ec. agregada\ de \\ conservación \end{pmatrix} \end{cases}$$

Of the whole set of equations describing the monetary economy, only the microeconomic equations form an independent set. The scalar equations are obtained by aggregating the vector equations and are therefore redundant equations. The reason why we state them explicitly is because each of them has a macroeconomic meaning that is very different from the microeconomic meaning of the vector expressions from which they are derived. In fact, we can say that the set of vector equations describes the economy from the microeconomic point of view while the set of aggregate equations describes the economy from the macroeconomic point of view.

The last expression, which we have called the scalar conservation equation, has as we shall see an enormous importance in economics, so much so that we have given it a specific name:

THE GROWTH EQUATION. In a monetary economy, the nominal growth of the IPA is proportional to the flow of money creation Ah*the constant of proportionality being Fischer's constant* k_F*:*

$$\frac{dPIA}{dt} = -k_F \cdot Ah$$

The equation tells us that IPA growth has nothing to do with the amount of money saved for investment, since it is only the spending of new money that is created out of nothing that allows for growth, whether or not it is spent on investment.

$$\sum_i ah_i = Ah \neq 0 \quad \rightarrow \left\{ \begin{matrix} ah_i > 0 \rightarrow \ ahorro \ \rightarrow \quad A = \sum_{ah_i > 0} ah_i \\ ah_i < 0 \rightarrow \ inversión \rightarrow I = \sum_{ah_i < 0} ah_i \end{matrix} \right\} \rightarrow A + I \neq 0 \rightarrow \frac{dPIA}{dt} \neq 0$$

This is perhaps the most important macroeconomic law of economics and is equivalent to the conservation of energy equation in the physical sciences.

CHAPTER 3

THE MEANING OF THE BASIC EQUATIONS

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1. THE MONETARY EQUATION.

We do not want to be tiresome repeating once again the same thing, but the importance of the monetarist postulate demands it, since it is this postulate, together with the conservation postulate, which makes it possible to obtain the set of basic equations that a monetary economy fulfills.

Although it is not easy to agree on what science is, we can affirm that we all agree more or less that it is based on the belief that there is a set of laws or relationships which link and make dependent on each other the immense quantity of phenomena we observe around us. Bearing this in mind, and supposing that this vague way of defining science as the search for the laws that order reality is true, we have no choice but to affirm that the monetary equation is a physical law that relates or links economic phenomena that appear to us as independent when they are not.

What reason can there be for needing a specific amount of money to maintain a specific flow of monetary exchanges? In principle, none, but it is the fact that there is such a relation between two variables which appear to us as independent, which allows us to investigate and relate other economic phenomena which also appear to us as independent, but to which the monetary relation is hopelessly linked once we consider it to be true. Specifically:

$$k_F \cdot M = \sum p_i \cdot q_i \quad \rightarrow \quad \frac{dPIA}{dt} = -k_F \cdot Ah$$

The growth of expenditure, what we have called the PIA of the economy, does not necessarily have to be related to the flow of savings, understood as monetary injection coming from the creation of money from nothing. However, it is this interdependence between apparently unrelated variables, which the mathematical structure of a theory forces us to formulate a posteriori, that constitutes the magic that surrounds science and the reason why we believe that there really exist in nature a reduced set of mathematical relations with which we can explain what is happening around us. In this sense, the scientist is a believer who in no way differs from other believers, and like them, he bases his faith on the silent dialogue he establishes with nature.

At no point in this long treatise are we going to try to justify, by resorting to first principles, that the monetary equation is true. Not because we do not have a deeper theory from which to make the relation emerge, but because it is enough to introduce it as a postulate and let the conclusions to which it leads us show us its validity.

To understand that it is the monetary equation that characterizes a monetary economy is therefore obvious. To understand that the monetary equation is the ultimate binding cause of credit crises is also very obvious. But to understand that it is the monetary equation to which we will finally have to resort to find a cure, is the magic that drives science and forces us to believe in it.

2. THE CONSERVATION EQUATION OF MONETARY FLOW.

Let us analyze the three formulations of the Conservation Equation, which have appeared until we find the most general equation that allows us to describe a monetary economy in which money is created and destroyed:

$$y_i = x_i + ah_i \qquad (1)$$

$$y_i = x_i + ah_i + \frac{dm_i}{dt} \qquad (2)$$

$$y_i = x_i + ah_i + \frac{1}{k_F}\frac{dx_i}{dt} \qquad (3)$$

The first equation is nothing more than the accounting equation that we have taken for granted all our lives. It is the expression used in economics to define savings as an activity outside and external to the process of production and distribution. To use Keynes' words:

> *"As far as I know, everyone agrees that savings is the excess of income over consumption expenditures."*

It is a static equation in the sense that no time derivative of the variables appears, although there is nothing in the expression that prevents the vector of income, expenditure and savings from changing over time. However, we know that the expression cannot be valid in a generic way for any economy because its aggregate equation, the one obtained by adding all its components, tells us that the aggregate saving of the whole economy is zero:

$$\sum_i y_i = \sum_i x_i + \sum_i ah_i \xrightarrow{PIA=\sum_i y_i=\sum_i x_i} \sum_i ah_i = 0 \;\rightarrow\; Ah = 0$$

In an economy where the usual expression used to define saving is fulfilled, there can be neither creation nor destruction of money, and it cannot be used to create a real model of the economy because the expression cannot be valid in a real monetary economy.

The second equation is telling us exactly the same as the first and is therefore also an accounting equation:

$$y_i = x_i + ah_i + \frac{dm_i}{dt} \qquad (2)$$

The difference between one and the other lies in the appearance of a new term, the term of variation of the money supply, which converts the expression into a dynamic equation in which the quantity of money in the economy does not have to remain unchanged. Now the aggregate savings Ah of the whole economy need not be zero and money can be created and destroyed in the economy:

$$\sum_i y_i = \sum_i x_i + \sum_i ah_i + \frac{dm_i}{dt} \xrightarrow{PIA=\sum_i y_i=\sum_i x_i} \sum_i ah_i + \sum_i \frac{dm_i}{dt} = 0 \ \rightarrow \ Ah + \frac{dM}{dt} = 0$$

We see that the quantity of money present in the economy depends on the flow of aggregate savings. M depends on the flow of aggregate savings, and when this is not zero, the variation of the quantity of money will not be zero either. The really surprising thing about the expression is that it indicates the origin and destination of the money that is created or destroyed in the economy:

> "*It is from the monetary mass m_i used by each of the agents to carry out buying and selling exchanges, where the money that is destroyed and created in the economy comes from and where it ends up*":

$$y_i - x_i - ah_i = \frac{dm_i}{dt} \rightarrow \begin{cases} y_i - x_i - ah_i > 0 & \rightarrow \dfrac{dm_i}{dt} > 0 \\ y_i - x_i - ah_i < 0 & \rightarrow \dfrac{dm_i}{dt} < 0 \end{cases}$$

The problem with the equation is that it does not tell us how to calculate the money supply or what relationship it has with the other variables of the economy. Specifically, it does not tell us what relationship each agent's money supply has with his income, with his spending or with his savings.

<u>The third expression </u>is another story:

$$y_i = x_i + ah_i + \frac{1}{k_F}\frac{dx_i}{dt} \qquad (3)$$

It is not only that this is a dynamic equation in which the time derivative of expenditure appears x_i as a variable, it is also the fact that now, since money supply does not appear as an explicit variable, the expression recovers its original status as an accounting equation with which savings are defined ah_i and once again expresses the microeconomic link between the three basic variables of the economy: income, expenditure and savings. Let us also note that, when the economy does not change over time, the expression becomes the one used by Keynes to define savings, in the first equation. Therefore, the third expression is a more general equation than the one traditionally used in economics to define saving, and contains it as a particular case.

The expression also tells us about the profound asymmetry that exists between the role of the buyer and the role of the seller within monetary economies, since the flow of expenditure x_i appears in the Conservation Equation together with its time derivative, something that does not occur with the flow of income.... y_i. This asymmetry is not trivial and is of enormous importance, since it indicates very clearly the causal line of economic growth:

$$\frac{1}{k_F}\frac{dx_i}{dt} + x_i = (y_i - ah_{\boldsymbol{i}}) \quad \rightarrow \qquad x_i \xrightarrow{\frac{dx_i}{dt} \to 0} (y_i - ah_{\boldsymbol{i}})$$

The Conservation Equation is a differential expression with respect to expenditure, where the difference between income and savings is what is acting as an independent term and, therefore, is the term to which expenditure tends: *"expenditure follows the difference between income and savings"*. If we forget the ambiguous term coined by Keynes in the General Theory to name the engine of growth: "Effective Demand", and replace it by the much more precise: "Disposable Income", as the difference between income and savings:

$$(Ingreso\ Disponible)_i = y_i - ah_i$$

So, what the Conservation of Money Flow Equation tells us is that the expenditure of any sector of the economy will grow or decrease according to whether disposable income is higher or lower than the expenditure of the sector. In other words, the nominal consumption of any sector follows disposable income and "will grow when disposable income grows and will decrease when disposable income decreases". Or in other words, any sector of the economy will go into recession when the sector's disposable income decreases.

Last but not least, the expression tells us that the creation of money is the sole cause of the growth of the economy:

<u>THE GROWTH PRINCIPLE</u>. In a monetary economy, the nominal growth of any sector is <u>proportional</u> to the difference between disposable income and sector expenditure, the constant of proportionality being equal to Fisher's constant:

$$(Ingreso\ Disponible)_i = y_i - ah_i$$

$$k_F \cdot (y_i - x_i - ah_{\boldsymbol{i}}) = \frac{dx_i}{dt} \rightarrow \begin{cases} \xrightarrow{y_i - x_i - ah_i > 0} dx_i \uparrow \quad (crecemiento) \\ \xrightarrow{y_i - x_i - ah_i < 0} dx_i \downarrow \quad (decrecimiento) \end{cases}$$

This is why the Conservation Equation should be called "Keynes' Equation" because the equation expresses what he wanted to communicate when he wrote the General Theory:

$$y_i = x_i + ah_i + \frac{1}{k_F}\frac{dx_i}{dt} \qquad\qquad ¿Ecuación\ de\ Keynes?$$

We leave it to the scientific community to decide that, because Keynes is not exactly an economist who needs to be rescued from oblivion.

3. ANALYSIS OF AN ECONOMY DIVIDED INTO N SECTORS

Let us begin by studying the conservation equation of a monetary economy divided into N sectors in the general case in which money can be created or destroyed:

$$y_i = x_i + ah_i + \frac{1}{k_F}\frac{dx_i}{dt}$$

We will assume at all times that income, expenditure and savings are functions independent of each other, and that they are linked only by the conservation equation. This working hypothesis is highly debatable, especially as far as savings are concerned, but we have no choice but to assume it to be true if we wish to reach very general conclusions without first having to consider any specific economic example.

The conservation equation shows, with the above assumption, a system of first order differential equations for the expense vector **X** that has an associated homogeneous equation, a characteristic equation, and a non-homogeneous functional term:

$$\boldsymbol{Y} = \boldsymbol{X} + \boldsymbol{Ah} + \frac{1}{\mathrm{k_F}}\frac{d\boldsymbol{X}}{dt} \quad \rightarrow \quad \begin{cases} \dfrac{d\boldsymbol{X}}{dt} + \mathrm{k_F}\,\boldsymbol{X} = 0 & (ec.\ homogenea) \\ k_F(\boldsymbol{Y} - \boldsymbol{Ah}) & (t\acute{e}rmino\ no\ homogeneo) \\ (k_F + \lambda)^n = 0 & (ec.\ carasteristica) \end{cases}$$

The general solution of the system of differential equations is, for each component:

$$x_i(t) = \ C_i e^{-k_F t} + k_F e^{-k_F t} \int [y_i(t) - ah_i(t)]\, e^{k_F t} dt \qquad (soluci\acute{o}n\ sector\ "i")$$

The following observations can be made about this equation:

1) The general solution has a transient functional term $C_i e^{-k_F t}$ which for large times cancels out, since k_F is positive by definition:

$$C_i e^{-k_F\, t} \xrightarrow{t \to \infty} 0$$

This shows that events that occurred in "the past" do not influence the present beyond a characteristic time that is of the order of the "Fischer constant." k_F.

The economic significance of the "Fischer constant" k_F is, therefore, the average time it takes for the flow of expenditure to respond to sudden changes in disposable income (the equivalent of the sector's money creation), which can be used to calculate experimentally the value of Fischer's constant.

2) From the previous statement it follows that, for very long times the transient can be neglected and the general solution remains:

$$x_i(t)_{t \to \infty} = \ k_F e^{-k_F t} \int [y_i(t) - ah_i(t)]\, e^{k_F t} dt$$

Note that the term $[y_i(t) - ah_i(t)]$ is precisely the value of $x_i(t)$ when there is no change in expenditure, what we have called the disposable income of the sector, so the expression shows the causal line of monetary economies:

"expenditure depends on, and follows, the sector's disposable income".

In other words, it is necessary to increase disposable income above spending in order to achieve spending growth in the sector:

$$y_i - x_i - ah_i > 0 \quad \leftrightarrow \quad \frac{dx_i}{dt} > 0$$

Money that may come from a transfer from another sector through the flow of credit.

3) The conservation of money flow equation can be expressed for each of the sectors as follows:

$$(y_i - ah_i - x_i) = \frac{1}{k_F}\frac{dx_i}{dt}$$

The term $(y_i - ah_i - x_i)$represents the net money flow out of or into the sector, and when referring to a country's economy is referred to as external balance of payments. In the conservation equation, this term acts as the flow of money creation within the sector, so, as we already know, the economy of the sector can only grow when the term is positive. Although we will explain the theory of economic growth later on, it can be seen that the origin of the nominal increase in expenditure (consumption) within any sector (or within a country), can only grow when the term is positive. $\frac{dx_i}{dt}$ (or within a country), has two possible origins:

$$(y_i - ah_i - x_i) > 0 \;\rightarrow \begin{cases} \xrightarrow{ah_i=0} \; y_i - x_i > 0 & \rightarrow \textit{incremento del ingreso} \\ \xrightarrow{y_i-x_i=0} \; ah_i < 0 & \rightarrow \begin{cases} \textit{credito externo} \\ + \\ \textit{creacion de dinero} \end{cases} \end{cases}$$

The first term indicates the amount of money that enters the sector due to the difference between sales revenue and purchases expenditure. The second term indicates savings, i.e., income due to internal money creation in the sector plus monetary transfers in the form of credit from other sectors (which acts as money creation). When the sum of both terms is positive it contributes to the nominal growth of the economy.

4) DEFINITION. *We say that an economy is Say's economy when the expenses for purchases of any sector are equal to its income from sales:*

$$y_i(t) = x_i(t) \qquad\qquad (Economía\ de\ Say)$$

In a Say economy, each sector fulfills the same expression that aggregate saving fulfills in a closed economy:

$$y_i(t) = x_i(t) \quad \xLeftrightarrow{\textbf{Economía de Say}} \quad \frac{1}{k_F}\frac{dx_i(t)}{dt} = -ah_i(t)$$

To put it another way, in a Say economy each sector behaves as an isolated economy (but to which money can come from other sectors).

With this small introduction to the underlying mathematical structure of the Conservation Equation we end this third chapter, but not before making a brief incursion into the terrible consequences that "Disposable Income" has in the real economy in which we live.

4. EMPTY SPAIN

Although we will develop a theory of trade in more depth later, we want to show now how the Conservation Equation of Monetary Flow allows us to explain very easily one of the most obvious and least pointed phenomena of trade globalization:

> *"The massive migration from the countryside to the city shown by all societies based on a monetary economy, in every age and in every place."*

All countries, whether rich or poor, tend to concentrate a large part of their population in large urban centers. Moreover, it can be empirically proven that the less economically developed a country is, the higher the percentage of the population concentrated in large cities tends to be. We are not going to name specific countries that follow this dynamic of human concentration in large cities, but it can be easily verified that it is not uncommon to find urban centers where a third or more of the country's entire population is concentrated.

Paris is a huge city with some 12 million inhabitants in a country with a population of close to 70 million people. Tokyo is the most populous city in the world, sitting on an island, Japan, which contains some 120 million inhabitants. However, it is not uncommon to find many capitals, in countries with less than half the per capita income of France or Japan, with a population that reaches and exceeds 18 or 20 million people in countries with no more than 60 million inhabitants. For example, the city of Buenos Aires has around 16 million people in a country 4 times the size of France and with a population of about 45 million inhabitants.

Why does this phenomenon occur?

Although it is, of course, a phenomenon that has always occurred, it is not difficult to demonstrate that it has become much worse during the last 50 years of globalization of trade and free movement of capital, without it being at all clear whether or not the two phenomena are connected.

"Empty Spain", is the term used in Spain to refer to this phenomenon that is occurring everywhere, that seems unstoppable and for which there is no convincing explanation from economists working for private universities in the USA, because they simply prefer to ignore it. Anything that does not appear in the prestigious economics journals published by the prestigious private universities in the USA does not exist, even if it is a phenomenon that is very easy to explain from a monetary point of view.

Let us observe what the conservation equation says when we divide the economy into two unique sectors, which in our case we can identify with an urban core against the periphery. When we assume that there is no creation or destruction of money, we have:

$$\left.\begin{aligned} y_1 &= x_1 + ah_1 + \frac{1}{k_F}\frac{dx_1}{dt} \\ y_2 &= x_2 + ah_2 + \frac{1}{k_F}\frac{dx_2}{dt} \end{aligned}\right\} \xrightarrow{ah_1+ah_2=0} \frac{dx_1}{dt} + \frac{dx_2}{dt} = 0 \rightarrow$$

$$\rightarrow \begin{cases} (x_1\ \uparrow) & \leftrightarrow \quad (x_2\ \downarrow) \\ (x_1\ \downarrow) & \leftrightarrow \quad (x_2\ \uparrow) \end{cases}$$

The equations tell us that, when there is no monetary creation, the nominal growth of one sector is at the expense of the nominal growth of the other sector, which is a very remarkable result. Especially when it is understood that it is the disposable income of each sector that is guiding the process of growth or decline of the sector. This was the conclusion we reached when we analyzed the conservation equation and showed that the causal line linking expenditure to income confirms that the decrease in disposable income below expenditure leads to a decrease in expenditure, which has dire consequences for the sector that suffers from it, since, as we will see later, the decrease in consumption expenditure will diminish its productive fabric in favor of the growth of the productive fabric of the other sector. Concretely, for any given sector this is true:

$$(y_i - x_i - ah_i) = \frac{1}{k_F}\frac{dx_i}{dt} \xrightarrow{(y_i - ah_i) < x_i} \frac{1}{k_F}\frac{dx_i}{dt} < 0 \quad \rightarrow \quad x_i \downarrow$$

Where $(y_i - ah_i)$ is the sector's disposable income and x_i its expenditure.

The conclusion of the expression is valid for any generic sector and shows that, within the same country, regions that "export" more than they "import" will see their productive fabric increase, while regions that "import" more than they import will see their productive fabric decrease (provided that we identify the increase in expenditure with the increase in production, as is correct). It is the same thing that happens between exporting countries and importing countries: the former will see their production increase at the expense of the production of the latter, which export less than they import.

Let us note that it is possible to maintain stationary expenditure in each of the sectors despite the fact that income is greater or less than that. To see this, it may be better to compare the monetary flows coming from buying and selling with those coming from transfer through the savings vector, so that the two balance each other out:

$$(y_i - x_i - ah_i) = \frac{1}{k_F}\frac{dx_i}{dt} = 0 \rightarrow \begin{cases} (y_1 - x_1) > 0 \leftrightarrow ah_1 > 0 \\ (y_2 - x_2) < 0 \leftrightarrow ah_2 < 0 \end{cases} \xrightarrow{\frac{dx_i}{dt}=0} \quad ah_1 + ah_2 = 0$$

A sector that sells more than it buys must save and lend the monetary surplus to the sector that buys more than it sells, in order to keep the economy balanced, while the sector that buys more than it sells must spend by borrowing (negative savings) in order to keep its economy balanced. Evidently, what one saves must be what the other spends on credit, so the economy that buys more than it sells will be able to maintain equilibrium as long as it "has credit", otherwise, it will have to decrease spending and thus production (its *PIA*) will decrease until it manages to balance spending with income. In other words, economies, or sectors, that import more than they export will sooner or later see their production decrease and become poorer and unproductive when money stops flowing in through loans.

The great migratory flows from the periphery to the large urban centers, which have always occurred, but which are getting worse since the liberalization of trade and the free movement of capital, are a direct consequence of the Conservation of Money Flow Equation, and have little or nothing to do with how much or how little people work. Regions become poorer to the extent that they find it necessary to buy more than they sell, which is quite logical. Empty Spain, the enormous capitals that are being created all over the world at the expense of the population of the periphery are part of the same process that we are witnessing impassively without doing anything to remedy it.

How can you fight an equation? You cannot fight against an equation. When we fight against mathematics we must be like the reed that bends with the wind, but without ever breaking. Let us try to understand the mechanism we are fighting against:

1) A core with a larger population produces a greater variety of goods and more efficiently than those produced in the periphery, which tends to have a widely dispersed population.

2) The vast majority of the time, goods manufactured in the urban core have a higher added value than those produced in the periphery, for many and varied reasons.

3) A greater variety of goods implies that, under normal conditions, people living in the periphery buy more goods from the core than goods bought by those from the core in the periphery. This unequal flow of goods unbalances the flow of monetary exchange between the two regions, which causes the disposable income of the region that buys more in the other region to fall below the expenditure. In other words, income in the periphery is lower than its spending, and vice versa, the core has income higher than its spending.

There is nothing strange or mysterious in the analysis, what we have is a periphery that empties of money:

$$(y_i - x_i - ah_i) = \frac{1}{k_F}\frac{dx_i}{dt} \xrightarrow{(y_i - ah_i) < x_i} \frac{1}{k_F}\frac{dx_i}{dt} < 0 \quad \rightarrow \quad x_i \downarrow$$

People in the periphery depend on many products that they are not manufacturing and need to buy from the urban core, causing an imbalance in the monetary flow between the periphery and the center. The periphery literally empties of money and with it, empties of businesses and people. If we want to say the same thing, but in a more technical way, we would say that the disposable income of the periphery decreases and with it, the entire productive fabric of the periphery.

Taxation, understood as a flow of transfers, can slow down the process and even stop it, but any attempt to stop the process with fiscal transfers from the center to the periphery will always have to be maintained because it does not attack the source of the problem. The solution lies elsewhere and we will show it when we study international trade.

The consequences of the use of money in people's lives, which we have shown in the brief analysis of "Empty Spain", are very general and can be applied to any other coherent division of a monetary economy into two sectors. Of course, for the analysis to be valid it is necessary that the agents forming each of the sectors into which the economy has been divided be sufficiently homogeneous so that their behavior can be assimilated to that of a single agent, but beyond this statistical restriction, which is not at all complicated to comply with, there is no other limitation which prevents us from generalizing the result.

The preceding analysis on the causes of Empty Spain is also valid to predict what will happen in a country as large as the European Economic Community made up of some 500 million people, or what is happening to a country as large as the USA, regardless of the fact that it uses the same currency.

When we divide Europe into two sectors, the industrialized countries of the center and north, and the agricultural and tourist countries of the south, we have a situation with two very heterogeneous sectors that reflect very well the imbalances in sales and purchases that we have discussed. It is foreseeable that the "disposable income" of the northern countries will remain higher than their expenditures thanks to their greater specialization in products with a high added value that the southern countries do not produce, but which they consume avidly. The opposite is true for the incomes of the peripheral countries, which are highly specialized in tourism and products derived from agriculture and fishing, and which tend to pay lower wages compared to the wages paid in the industrialized North.

In this economic context, and taking into account that the difference in language will prevent massive displacements of the population in search of work, it will be inevitable that the imbalance in the flow of income from one sector to the other will lead to a net extraction of money, which will force production in the countries of the South to fall. The decrease in production will be observed in an increase in unemployment, which will remain at very high levels and which economists working for private universities in the USA invariably associate with structural unemployment for which they recommend lower wages. In spite of the fact that what is happening is that there is an imbalance in the balance of trade that feeds back, and whose origin is to be found in the lower income obtained by producing goods of lower added value, that is to say, in low wages.

To see that these imbalances are not easy to solve, let's take the East and West German economies as an example. Both areas still have a significant wage inequality even after almost 30 years since the fall of the Wall, and this, despite the numerous aids and investments that industrialized West Germany has made in East Germany. If the Germans themselves have not been able to balance the production of the two Germanys after 30 years of uninterrupted efforts, even less can the Greeks, Spaniards or Portuguese be expected to do so. It is enough for them to follow the wheel and not fall even further behind.

ECONOMY OF TWO COUNTRIES. The set of independent variables describing a monetary economy consists of the coefficients of the expenditure matrix, the saving flows, the saving flows, and the saving of the economy of two countries. c_{ij}savings flows and time. ah_i and time. The flow of expenditure x_i and the flow of income y_i are obtained from the sum of the coefficients of the expenditure matrix by aggregation and are therefore redundant variables.

Concretely, an economy divided into N sectors, has N2+N independent flows linked by N equations: the N2 flows that form the expenditure matrix and the N flows that form the savings vector. Therefore, if we want to go a little deeper into the consequences of the conservation equation, we must express the conservation equation in terms of these general flows of the expenditure matrix.

For example, let us do it for the particular case of an economy divided in two sectors, or in two countries, the conservation equation expressed in terms of the coefficients of the expenditure matrix remains:

$$\begin{matrix} y_1 = x_1 + ah_1 + \frac{1}{k_F}\frac{dx_1}{dt} \\ y_2 = x_2 + ah_2 + \frac{1}{k_F}\frac{dx_2}{dt} \end{matrix} \quad \rightarrow \quad \begin{matrix} c_{11} + c_{21} = c_{11} + c_{12} + ah_1 + \frac{1}{k_F}\frac{d(c_{11} + c_{12})}{dt} \\ c_{12} + c_{22} = c_{21} + c_{22} + ah_2 + \frac{1}{k_F}\frac{d(c_{21} + c_{22})}{dt} \end{matrix}$$

Where the income and expenditure vector are obtained by aggregation of the rows and columns of the expenditure matrix $\boldsymbol{G}$:

$$\begin{cases} x_1 = c_{11} + c_{12} \\ x_2 = c_{21} + c_{22} \end{cases} \qquad \begin{cases} y_1 = c_{11} + c_{21} \\ y_2 = c_{12} + c_{22} \end{cases}$$

When each sector represents the economy of a country, the coefficients of the expenditure matrix have a very concrete and simple meaning:

$$c_{11} \rightarrow \textit{gasto del país 1 en el propio país}$$
$$c_{12} \rightarrow \textit{gasto del país 1 en el país 2}$$
$$c_{21} \rightarrow \textit{gasto del pais 2 en el país } 1$$
$$c_{11} \rightarrow \textit{gasto del país 2 en el propio país}$$

The two differential equations dependent on the coefficients of the expenditure matrix c_{ij} are very complicated to solve in the general case, but it is possible to simplify them a lot by making a fairly simple assumption that is likely to be true in most cases:

"the expenditure that a country makes within another country is proportional to the total expenditure of the country".

With this simple assumption, the four coefficients of the matrix become dependent on only two parameters. Calling "a" and "b" the percentage of own spending that one country spends in the other country, we have:

$c_{11} = (1 - a) \cdot x_1$ → *country 1's expenditure in country 1's own country*

$c_{12} = a \cdot x_1$ → *expenditure of country 1 in country 2*

$c_{21} = b \cdot x_2$ → *expenditure of country 2 in country 1*

$c_{22} = (1 - b) \cdot x_2$ → *country 2 expenditure in own country*

With a little algebraic manipulation, the two differential equations become the following system of coupled differential equations, now dependent on the coefficients "a" and "b" and saving:

$$\left.\begin{aligned} \frac{1}{k_F}\frac{dx_1}{dt} &= -a\cdot x_1 + b\cdot x_2 - ah_1 \\ \frac{1}{k_F}\frac{dx_2}{dt} &= a\cdot x_1 - b\cdot x_2 - ah_2 \end{aligned}\right\} \qquad \textit{Economy of two countries}$$

Again, a set of general conclusions can be drawn as long as we accept that both expenditure streams and x_1 y x_2 are independent of each other:

a) Let us assume, for simplicity, that the respective savings flows are zero, i.e., we will assume that there are no monetary transfers between the Capital Market of both countries (we will see a little later what the capital market is). With this assumption, the system of equations reads:

- Each of the expenditure flows has two contributions. A first transient contribution that tends to zero for very large times, and a second stationary contribution, to which each of the expenditure flows tends to zero for large times.

- For large times, when the transient decays, the two expenditure flows tend to a constant relationship, dependent only on the expenditure coefficients "a" and "b". Specifically, it can be shown that the relationship is:

$$a \cdot x_1 = b \cdot x_2 \quad \leftrightarrow \quad \frac{x_1}{x_2} = \frac{b}{a}$$

Therefore, for very long times, the trade balance has to balance and the expenditure between both countries becomes equal, being the ratio between the total expenditure of both countries (the GDP), inversely proportional to the ratio between their respective expenditure ratios.

This result is quite remarkable, and may seem shocking until we describe it in balance of payments terms. When we identify the flow of expenditure x_1 y x_2 with the GDP of each of the countries, what the expression states is that the more unbalanced the balance of payments of one country is with respect to the other country, and the more one country spends in the other, the lower its GDP (production) will end up being with respect to the GDP (production) of the other country. In other words, the ratio between the GDP of the two countries will end up being inversely proportional to the quotient between their respective expenditure coefficients.

b) When we assume that savings flows are not zero (but we assume that there is no money creation), or, equivalently, when we assume that both savings flows are equal and of opposite sign, the result is slightly altered, but does not change the substance of the matter. For very large times, the ratio to which the expenditure of each of the countries tends, is altered:

$$ah_1 = -ah_2 \;\rightarrow \qquad a \cdot x_1 = b \cdot x_2 - ah_1$$

Now, thanks to a flow of negative savings (coming from and equal to the positive savings of the other country) it is possible to maintain an expenditure (which we identify here as the country's

GDP, which is not entirely correct) above that which corresponds to its trade income, i.e., the country can maintain a deficit expenditure thanks to the loan from the other country:

$$a < b \xrightarrow{a \cdot x_1 = b \cdot x_2} x_1 > x_2 \qquad \text{(trade balance=0)}$$

$$a < b \xrightarrow{a \cdot x_1 = b \cdot x_2 - a h_1} x_1 \overset{?}{\leftrightarrow} x_2 \qquad \text{(balance of trade}\neq\text{0)}$$

Now, the trade balance is not cancelled for very long periods because the trade deficit is maintained with the loan from the surplus country, and the country's GDP can be maintained above that which corresponds to its trade. We see that, thanks to the flow of loans, it is possible to maintain an external deficit without having to reduce domestic spending (GDP), but, of course, it will be necessary to ensure that the flow of external credit that compensates for the trade deficit is maintained indefinitely over time.

c) The situation changes again <u>when the possibility of creating money is taken into account and the savings flows are decoupled and can both be negative</u>. In such a case, the system of equations becomes difficult to solve in a generic way, so we will have to wait a bit, until we define the Capital Market and have a theory of economic growth, to try to address the concrete solution in some specific situations, but we cannot expect the result obtained in the previous sections to change significantly.

Since we do not yet have any theory on growth or monetary creation, it is impossible to interpret in more depth the consequences of savings on the final GDP of countries, but it does not seem an exaggeration to state that money flows cannot change the economic reality underlying commodity exchanges, so that the conclusion we reached when we assumed that there was no savings will probably be universally valid:

"The more unbalanced the trade balance of one country is with respect to the other country, and the more one country spends in the other country, the lower its GDP (production) will end up being with respect to the GDP (production) of the other country."

This is the same conclusion we reach when we try to explain the economic growth that benefits large cities at the expense of the periphery.

5. THE KEYNESIAN EXPENDITURE MULTIPLIER.

One of the strangest concepts in economics is the "expenditure multiplier", specifically, the "public expenditure multiplier" or "Keynesian multiplier". As is the case with most of the variables used in economics, the "multiplier" is something very vague that is never defined, but any economist will tell you that he knows exactly what it is, even though it is impossible to measure in practice, precisely because it is not defined.

For example, "Samuelson" defines it as the ratio of the increase in GDP to the increase in government spending that causes it (a definition that, of course, can be generalized to any increase in spending by any agent within the economy, e.g. "the investment multiplier"). The problem with the definition is that it is not clear what is meant by an increase in public spending; whether it is an increase in taxes to evenly increase public services, or whether it refers to a one-off, deficit spending by the government to activate the economy. A similar definition can also be found in another textbook published by a private university, in this case written by Mankiw, where the concept is not explicitly defined, but where it is also associated with the increase in *GDP as* a result of an increase in public spending, without specifying what is meant by an increase in public spending. In any case, the lack of definition that characterizes any variable used to describe the economy seems to be motivated in this particular case by the fact that the expenditure multiplier is associated more with an evolutionary process of the economy than with a simple quotient of two variables, so that the concept needs some implicit model to support it.

If we stick strictly to the definition of the multiplier as the relationship between GDP growth and growth in public spending, we must first of all think of two basic aspects that surround the ratio. The first is that public spending is a flow and, therefore, changes in the flow of public spending are the variation of a flow, and cannot be described as a flow. Second, for public spending to increase, there must be either an increase in revenue or deficit spending, so the best way to analyze the spending multiplier from the point of view of the basic equations we have developed is to divide the economy into two sectors, the private sector and the public sector:

$$\left.\begin{array}{l}\frac{1}{k_F}\frac{dx_1}{dt}=-a\cdot x_1+b\cdot x_2-ah_1\\ \frac{1}{k_F}\frac{dx_2}{dt}=a\cdot x_1-b\cdot x_2-ah_2\end{array}\right\}\qquad \textit{Economy divided into two sectors}$$

Where now the meaning of the parameters is:

$$a \cdot x_1 \quad \rightarrow \quad \textit{what is collected in the private sector}$$
$$b \cdot x_2 \quad \rightarrow \quad \textit{public spending that ends up in the private sector}$$
$$ah_1 = 0 \quad \rightarrow \quad \textit{private sector net savings}$$
$$ah_2 \quad \rightarrow \quad \textit{the flow of public sector credit}$$

For simplicity we have assumed that the net saving of the private sector is zero and that the constant public deficit comes, in aggregate terms, from monetary creation. Although it is possible to solve the system of equations without difficulty, to find the expression of the spending multiplier we are looking for, we only need to divide the change in the economy's GDP by the change in government spending due to credit spending:

$$\frac{dPIB}{dx_2} = \frac{d(x_1+x_2)}{dx_2} = \frac{-ah_2}{(a \cdot x_1 - b \cdot x_2 - ah_2)} = \textit{expenditure multiplier}$$

The result is very curious and somewhat different from what one might expect. Given that ah_2 is always negative because it is a loan, and given that the term $(a \cdot x_1 - b \cdot x_2)$the difference between what taxes are collected and what the public sector spends within the private sector, can be negative or positive depending on whether the public sector is in surplus with the private sector or not (the term is almost always negative), we have that the multiplier will be greater than "1" or less than "1" depending on whether the public sector surplus is positive or negative:

$$(a \cdot x_1 - b \cdot x_2) > 0 \quad \rightarrow \quad \frac{dPIB}{dx_2} < 1$$
$$(a \cdot x_1 - b \cdot x_2) < 0 \quad \rightarrow \quad \frac{dPIB}{dx_2} > 1$$

The expression is of a very general nature, and tells us something we already know, that the concept of multiplier does not make much sense when associated to the public deficit in this way, because it is very dependent on the specific public deficit at the time of the monetary injection and not only on the monetary injection, which is what would give meaning to the relationship.

A much more coherent way of defining Keynes' multiplier, in the context created by the Madrid Theory, is expressed in the aggregate conservation equation, that is, in the Growth Equation:

$$\frac{dPIA}{dt} = -k_F \cdot Ah$$

When we refer Fisher's constant to *GDP,* we have:

$$\frac{dPIB}{dt} = -k_F \cdot Ah \quad \rightarrow \quad \frac{1}{Ah}\frac{dPIB}{dt} = -k_F$$

The expression tells us that, whatever the origin of the monetary injection, GDP will grow proportionally to the monetary injection. $AhGDP$ will grow proportionally to the monetary injection, being the Fisher constant of proportionality, this being the main conclusion derived from the basic equations deduced in the first chapter. Here, we will consider all the time that the value of Fisher's constant is "2", but there are many reasons to think that its value is closer to "1.5", although this is indifferent for what concerns us here.

PART II

THE CONSUMER MARKET

CHAPTER 4

SIMPLE PRODUCTION ECONOMY AT CONSTANT YIELDS

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1. INTRODUCTION

In the first topic we find the equations that describe a monetary economy based on only two assumptions. First, that in the monetary equation the Fisher constant is indeed a constant and, second, that the quantity of money used to carry out exchanges is conserved. In spite of all this, and although the basic equations are very powerful and allow us to reach very general, deep and surprising conclusions about the monetary economy, the truth is that, as they stand, the equations speak only of monetary flows and tell us nothing about the productive reality that creates them.

The purpose of this second topic will be to propose a Basic Economic Model, in which the monetary flows that appear in the set of basic equations are connected with the two variables with which we usually describe the economic reality that surrounds us, the price variable and the quantity of goods variable.

Evidently, the difficulty of creating a "model" of the economy in which monetary flows depend on prices and the quantity of goods will be closely related to the possibility of finding a balance between the realism of the model and the predictive capacity of the model. A model so excessively simple that only trivial predictions can be made will be of no use, just as a model of the economy so realistic, but so complex, that no predictions can be obtained with it. The model has to be realistic, but above all it has to be approachable from a mathematical point of view, so that it shows us predictions that we can check, only then will the model make sense.

Here we are going to be inspired by the self-sustaining mechanism that life uses to reproduce itself and we are going to build a model of the economy that is complex enough to contain all the variables that appear and are used in the description of the economy, and simple enough to draw realistic conclusions without excessive mathematical difficulty. Let us begin by understanding what life does to reproduce itself and why it is so efficient at keeping itself alive.

Let us think for a moment of a herd of gazelles. We will observe that all the individuals that form the herd are very similar to each other, so much so, that it becomes difficult to distinguish them from each other, especially when we pay attention only to the adult members, which are the majority. All adult gazelles appear to be the same; they are the same size, feed on the same food and behave in the same way, making them virtually indistinguishable from one another. But the most important thing of all, and what interests us most, is to note that when the food available to the herd increases or decreases, the gazelles do not increase or decrease in size, becoming larger or smaller, but the herd becomes more or less numerous, increasing or decreasing the number of gazelles.

Now let's look at what happens in a fishing port. We see in it many boats, almost all of them of the same size and almost all of them engaged in the same kind of fishing. In that sense it is very similar to what we observe in a herd of gazelles; they are all very similar and are used to catch the same type of fish. But, the curious thing is to note that also, as with the gazelles, when fishing becomes more abundant we will see the number of boats in port increase, but we will not see the boats get bigger. It is the opposite that will happen when fishing becomes scarce. Then, the boats will not become smaller, but will simply reduce in number to match the amount of catch they have access to. Fishing vessels, as with most businesses we see around us, seem to behave like a herd of gazelles, increasing or decreasing in number as business opportunities increase or decrease, but maintaining the right number of businesses to match the size of the market.

We can go further and ask ourselves why this is so, why our companies seem to behave so much like life has been behaving for billions of years and why they show around us, as life does, a plethora of diversity that is very reminiscent of the diversity displayed by animal species. The answer is very obvious:

> *"Because companies, like life, find it more efficient to reproduce themselves at constant yields.*

To see this, let's think for a moment about gazelles. If gazelles were to increase in size every time the amount of food available increased, they would face tremendous biological challenges that are difficult to solve. The heart, lungs, bones, and the rest of the body would have to increase in size, not proportionally, but depending on their functionality. If the organism is already very efficient at a particular size, finding a way for all these organs to remain equally efficient when they change size does not seem easy to achieve. The same is true for a fishing boat. Having to change the size of a fishing boat every time the amount of available fish changes seems very inefficient.

It can be well understood that when there is more food the gazelle does not try to get bigger, but the herd takes advantage of it to feed a greater number of young and become more numerous, which is a more efficient way of growing than increasing the size of the individuals. The same thing will happen when for some reason the food decreases. If the gazelle were to decrease in size every time food becomes scarce, the biological challenge it would face to change its metabolism and adapt to the changing environment would be a very inefficient process in biological terms.

This can be seen much better if we think of two species competing for food in the same ecosystem, one of them changing the size of each individual in response to changes in food, and the other changing the number of individuals, but without changing size. It is easy to conclude that the most efficient strategy would undoubtedly be the second option, and not because we say so, but because it is the option that life has chosen and has used on Earth for the last 2,000 million years, without changing strategy in all that time.

Therefore, when we hear economists working for private universities in the United States argue against the possibility of the economy operating at constant returns, we can only guffaw. When they claim that *"it would be too much of a coincidence for any randomly chosen firm to operate at constant returns when it could operate in so many other possible ways,"* they are not only talking nonsense, they are deliberately misleading people, since the economy can operate at constant returns, even if individual firms do not (although they do too). We have seen that an economy produces at constant returns when, faced with an increase in output, the economy responds by increasing the number of firms and not by increasing the size of each individual firm. In such a case, it matters very little whether or not the firm operates at constant returns, because it is the specific set of firms, and not the individual firm, that produces at constant returns.

When we look around us we see without difficulty that in order to increase production, the economy increases the number of companies engaged in production but does not increase their size, so the assumption that it is possible to represent the economy with a simple production model at constant yields is not only a completely valid hypothesis within the reality that surrounds us, but above all it is a very sensible hypothesis given the mathematical simplicity of the model.

Obviously, an individual company does not necessarily operate at constant returns, and in fact this is almost never the case. It is the same as with an individual gazelle, which it is absurd to claim that it operates at constant returns, just as a herd of gazelles does. In the same way, it would also be completely absurd to think that a fishing boat operates at constant yields and is going to increase the size of its engine every time an additional sailor is hired. This is the absurd logic to which the textbooks written by economists working for private universities in the United States would have us believe that, for the economy to function at constant yields, it is necessary for individual companies to also function at increasing yields. We will not fall into this trap.

The reason why economists working for private universities in the USA despise the model of simple production at constant yields was already given by Piero Sraffa 50 years ago, when he comments in the foreword of *"Production of Goods by means of other Goods":*

> *This point of view, which is that of the old classical economists from Adam Smith to Ricardo, has been submerged and forgotten since the advent of the "marginalist" method. The reason is obvious. The marginalist approach demands that attention be focused on variation, because without variation, either in the scale of industry or in "the proportions of factors of production," there can be no marginal product and no marginal cost. In a system where production continued without variation in these respects, day after day, the marginal product of a factor (or, alternatively, the*

> *marginal cost of a product) would not only be* ***difficult*** *to find, but there would be nowhere to find it.*
>
> *Piero Sraffa*
> *(Production of goods by means of goods)*

In the model of production at constant returns there is no marginal return that can be associated with a set of factors of production. Labor appears in the model and is renumbered with wages, but, incredible as it may seem, there is nothing in the model that can be identified with physical capital that needs to be renumbered. In fact, capital cannot be consistently defined within the model. And therein lies the problem, because economists working for private universities in the US want the distribution of production to be made a function of the productivity of each of the factors involved in production, which is not possible in the model of simple production at constant returns.

When economics is driven by ideological reasons, as has happened in the discipline since the seventies of the twentieth century, it is inevitable that science, and the peer review on which it is based, is pushed into the background and certain absurd ideas, such as the Production Function Theory, are explained in textbooks as a scientific truth with empirical justification, when the truth is that it completely lacks such support.

More than 1.5 billion years of multicellular life on the planet support the fact that it is more efficient to produce at constant yields than in any other way. The logical thing then is to expect that the economy, like life, will also try to produce at constant yields, which is in fact what we observe all around us:

> *"thousands of identical McDonald's locations, in identical cities, producing identical hamburgers accompanied by identically cut pickles."*

One would have to be very blind not to see it and we will not insist any further on the obvious. We only wish to state that economists working for private universities in the United States have more than earned their salaries.

2. ECONOMY OF SIMPLE PRODUCTION AT CONSTANT YIELDS.

Although in the first chapter we have found the basic equations describing a monetary economy and have used them to draw a set of very general conclusions, the fact is that the monetary flows that appear in them have no reference to the productive reality that creates them. The purpose of this chapter will be to find the expenditure matrix associated with a simple production economy at constant returns as a function of real variables, so that we can express the conservation equations as a function of price and quantity of firms engaged in production.

In order to associate the monetary flows of exchange that appear in the Expenditure matrix with the physical variables that give rise to them $\boldsymbol{G}$ with the physical variables that give rise to them, it is necessary, first of all, to make some constructive assumptions about the production and distribution of goods and services within the economy. This is what is known in economics as a "model". Specifically, the model that we are going to use throughout this work is very simple, compact, and complete, and is called the **Simple Constant Yield Production Model**. It will be thanks to this model that we will obtain in the next topic the Buyer and Seller Asymmetry Principle governing production and distribution in the Consumer Market. But, we must make it very clear from the beginning that, despite the apparent simplicity of the set of expressions we are going to arrive at, these will be valid in a very general way.

Simple Constant Yield Production Model

The model assumes that there are N+2 agents involved in the production process:

- The N basic companies that produce N differentiated goods or services.
- The group of workers.
- The business community as a whole.

Each of the N+2 agents will fulfill an accounting equation. The N firms will depend on two new real variables, "the number of basic firms" and "prices". λ and "prices". $p$and it will be in function of them that we will express the expenditure matrix and the conservation equations describing the economy. The accounting equations of workers and entrepreneurs will in turn depend on new variables, wages and profits.

a) The N basic companies.

The first and most important assumption we are going to make in order to realistically describe the economy is to define the "basic enterprise". We will assume that each of the sectors "i" into which the economy has been divided is made up of specific basic firms engaged in the manufacture of a single good. λ_i specific basic firms engaged in the manufacture of a single good.

THE BASIC ENTERPRISE. The production of each generic good "i" is carried out within each sector of the economy by a number of identical and independent firms, called "basic firms" of the sector. λ_i *of identical and independent companies, called "basic companies" of the sector.*

We are said to be in a "simple production" economy when each basic firm produces a single good. The technical coefficient Q_{ii}^{o} *describes the flow of goods of type "i" produced by each of the basic firms, while the set of technical coefficients describes the flows of goods necessary for production, which each of them buys from the other basic firms.* Q_{ij} *describes the flows of goods necessary for production, which each of them buys from the other basic firms. It is said that we are in a constant returns production model when the coefficients are all constant.*

The accounting equation that each basic company fulfills is:

$$Q_{ii}^{o}p_i = \sum_{j=1}^{n} Q_{ij}p_j + B_i^{trab} + B_i^{cap}$$

Where the coefficients B_i^{trab} *y* B_i^{cap} *are the expenses incurred in salaries and rents.*

The reason why the "basic firm" is introduced into the model is to attribute any increase or decrease in output to the increase or decrease in the number of firms that exist in the sector. In this way, the economy can produce at constant returns, even if the basic firms themselves do not produce at constant returns. In this sense, we will assume that each basic firm produces a constant flow of goods, consuming for this purpose a constant quantity of goods that are given by the technical coefficients, so that the accounting equation fulfilled by each of the basic firms is of the type:

$$(ingreso)_i = (gasto)_i \rightarrow \begin{cases} (ingreso)_i = Q_{ii}^o p_i \\ (gasto)_i = \sum_{j=1}^{n} Q_{ij} p_j + B_i^{trab} + B_i^{cap} \end{cases}$$

Where, Q_{ii}^o is the quantity of goods produced by each of the basic companies, Q_{ij} is the quantity of products "j" that each basic company buys from each of the other basic companies, and B_i^{trab} y B_i^{cap} are respectively the part of the profits that each firm devotes to pay the wages and rents received by the entrepreneurs. The p_i are the prices at which each of the goods is sold.

Evidently, in the Simple Constant Yield Production Model, each sector of the economy is made up of a specific number of basic firms which is given by the variable $\lambda_i$and which we call, "number of basic companies of sector i". Therefore, the accounting equation that each of the sectors fulfills according to the new variables is:

$$\lambda_i Q_{ii}^o p_i = \lambda_i \cdot (\sum_{j=1}^{n} Q_{ij} p_j + B_i^{trab} + B_i^{cap})$$

We see in the equation that companies not only spend on buying goods from other companies, but they also spend on paying wages and paying corporate profits. This is the term $B_i^{trab} + B_i^{cap}$ at the end of the expression. That is to say that a simple production economy with constant yields formed by N productive sectors, has at least two more sectors, the workers and the entrepreneurs, which must also be described by an accounting equation independently. This is logical. As we have mentioned, the basic enterprises are not the only agents in a simple production economy.

b) <u>The workers as a whole</u>.

In an economy there are not only companies, there are also workers who carry out production in exchange for a part of the monetary surplus of the company. That is why their income appears in the accounting equation of each company as an expense, but we know nothing about what they do with it and what they spend it on, which is what we need to know in order to incorporate it into the expense matrix with its own accounting equation:

<u>DEFINITION</u>. The aggregate flow of expenditure made by the workers as a whole is equal to the sum of the quantity of each of the goods they buy, multiplied by their price. q_i^{trab} of each of the goods they buy, times their price p_i:

$$\mathrm{x}^{\mathrm{trab}} = \sum_{\mathrm{i=1}}^{\mathrm{n}} \mathrm{q}_{\mathrm{i}}^{\mathrm{trab}} \mathrm{p}_{\mathrm{i}}$$

<u>DEFINITION</u>. The aggregate flow of income that all workers obtain for their work is equal to the sum of the profits that each basic enterprise in the sector pays to pay workers times the number of basic enterprises in the sector. B_i^{trab} that each basic enterprise of the sector devotes to pay workers per the number of basic enterprises in each sector λ_i of each sector:

$$y^{trab} = \sum_{i=1}^{n} \lambda_i B_i^{trab}$$

<u>ACCOUNTING EQUATION OF THE WORKERS</u>. The accounting equation for all workers is:

$$y^{trab} = \sum_{i=1}^{n} q_i^{trab} p_i$$

In the simple constant yield production model, workers are just another sector with its own accounting equation. The model tells us, not only where their income comes from, the term $\sum_{i=1}^{n} \lambda_i B_i^{trab}$ but it also tells us what they spend it on, which is what the row of the expenditure matrix represents. $\boldsymbol{G}$ dedicated to them.

c) <u>The group of entrepreneurs</u>.

Finally, it does not remain to include in the model the entrepreneurs, who, like the workers, are aggregated into a single independent agent who buys and sells in the same way as any other agent. The entrepreneur receives his income because he is the owner of the company and, like the workers, he will also be a buyer of the goods he needs to live, so he will also have to fulfill an accounting equation:

DEFINITION. The aggregate flow of expenditure made by entrepreneurs is equal to the sum of the amount they buy of each of the goods q_i^{cap} they buy of each of the goods for its price p_i:

$$x^{cap} = \sum_{i=1}^{n} q_i^{cap} p_i$$

DEFINITION. The flow of income obtained by the set of entrepreneurs is equal to the sum of the number of basic companies in each sector and the share of the surplus in the total income of each sector. *λ_i of each sector by the part of the surplus B_i^{trab} that each basic enterprise* devotes to *pay the entrepreneurs:*

$$y^{cap} = \sum_{i=1}^{n} \lambda_i B_i^{cap}$$

ACCOUNTING EQUATION OF THE ENTREPRENEURS. The accounting equation that the set of entrepreneurs fulfills is:

$$y^{cap} = \sum_{i=1}^{n} q_i^{cap} p_i$$

Now we also know where their income comes from and what specific goods the entrepreneurs buy with it. In other words, we know the accounting equation of the entrepreneurs and we can incorporate it as another row in the expenditure matrix $\boldsymbol{G}$.

3. THE EXPENDITURE MATRIX

Knowing the accounting equations of each sector, and identifying each of the terms that appear in them with each of the coefficients of the expenditure matrix, we can finally describe a simple production economy at constant returns as a function of prices, the number of firms and the technical coefficients of each basic firm. Specifically, the income matrix and the expenditure matrix take the following values:

$$\boldsymbol{G}=\begin{bmatrix} \lambda_1 Q_{11} p_1 & \cdots & \lambda_1 Q_{1n} p_n & \lambda_1 B_1^{trab} & \lambda_1 B_1^{cap} \\ \vdots & \ddots & \vdots & \vdots & \vdots \\ \lambda_n Q_{n1} p_1 & \cdots & \lambda_n Q_{nn} p_n & \lambda_n B_n^{trab} & \lambda_n B_n^{cap} \\ q_1^{trab} p_1 & \cdots & q_n^{trab} p_n & 0 & 0 \\ q_1^{cap} p_1 & \cdots & q_n^{cap} p_n & 0 & 0 \end{bmatrix}$$

It can be seen that the matrix is divided into four distinct zones that have a specific economic significance:

$$\boldsymbol{G}=\begin{bmatrix} \begin{vmatrix} \lambda_1 Q_{11} p_1 & \cdots & \lambda_1 Q_{1n} p_n \\ \vdots & \cdots & \vdots \\ \lambda_n Q_{n1} p_1 & \cdots & \lambda_n Q_{nn} p_n \end{vmatrix} & \begin{vmatrix} \lambda_1 B_1^{trab} & \lambda_1 B_1^{cap} \\ \vdots & \vdots \\ \lambda_n B_n^{trab} & \lambda_n B_n^{cap} \end{vmatrix} \\ \begin{vmatrix} q_1^{trab} p_1 & \cdots & q_n^{trab} p_n \\ q_1^{cap} p_1 & \cdots & q_n^{cap} p_n \end{vmatrix} & \begin{vmatrix} 0 & 0 \\ 0 & 0 \end{vmatrix} \end{bmatrix}$$

The first quadrant of N rows and N columns, top left, contains all the expenditure flows generated by purchases among the basic firms present in the economy. The second two-column quadrant, above and to the right, contains the expenditure flows that firms use to pay wages and rent (which are at the same time the income of workers and employers). Finally, the third two-row quadrant, below and to the left, contains the expenditures made by workers and entrepreneurs in purchasing the goods produced by the basic firms. Matrix ***G*** is general, and describes a Simple Monetary Economy with Constant Returns.

In addition, and independently of the expenditure matrix, the model also gives us the income vector of a simple production economy as a function of the technical coefficients of the basic companies, prices and the number of companies:

$$y_i = \lambda_i q_{ii}^o p_i$$

Note that the model does not state two different ways of obtaining the income vector, one this last expression and the other by adding all the coefficients of each of the rows of the expenditure matrix ***G***, which is much more important than it seems, as we shall see.

It is interesting, in order to simplify the notation, to define the auxiliary matrices $\boldsymbol{Q}$ y $\boldsymbol{Q^o}$ called matrices of the technical coefficients of the basic companies. A little further on they will allow us to express certain results in a very compact and elegant way:

$$\boldsymbol{Q} = \begin{bmatrix} Q_{11} & \cdots & Q_{1n} \\ \vdots & \ddots & \vdots \\ Q_{n1} & \cdots & Q_{nn} \end{bmatrix} \qquad \boldsymbol{Q^o} = \begin{bmatrix} Q_{11}^o & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & Q_{nn}^o \end{bmatrix}$$

The rows of the matrix $\boldsymbol{Q}$ represent the quantity of products purchased by each of the basic companies. While the matrix $\boldsymbol{Q^o}$ represents the quantity produced by each of the basic companies, and therefore all the coefficients that are not on the main diagonal are zero.

Finally, and thanks to the fact that the expense matrix $\boldsymbol{G}$we can express the basic equations of the economy in terms of the new real variables. Recall that the basic equations expressed as a function of the flow of income and expenditure are:

$\underline{\boldsymbol{Ec.\ Básicas\ de\ la\ Economía\ Monetaria}}$

$$Ec.\ microeconómicas \begin{cases} y_i = x_i + ah_i + \dfrac{1}{k_F}\dfrac{dx_i}{dt} & (Ec. de\ conservación) \\ y_i = \displaystyle\sum_j c_{ji} & \\ x_i = \displaystyle\sum_j c_{ij} & \\ k_F \cdot m_i = x_i & (Ec.\ de\ Fisher) \end{cases}$$

$$Ec.\ \ macroeconómicas \begin{cases} k_F \cdot M = PIA & (Ec.\ monetaria) \\ PIA = \displaystyle\sum_i x_i = \sum_i y_i & (Ley\ de\ Sally) \\ Ah + \dfrac{1}{k_F}\dfrac{dPIA}{dt} = 0 & \left(\begin{matrix} Ec. agregada\ de \\ conservación \end{matrix}\right) \end{cases}$$

Specifically, the set of vector equations as a function of the new variables is:

Simple Production at Constant Yields

Sistema de ecuaciones contables

$$\overbrace{\begin{aligned} \lambda_i q_{ii}^{o} p_i &= x_i + ah_i + \frac{1}{k_F}\frac{dx_i}{dt} \\ y^{trab} &= x^{trab} + ah^{trab} + \frac{1}{k_F}\frac{dx^{trab}}{dt} \\ y^{cap} &= x^{cap} + ah^{cap} + \frac{1}{k_F}\frac{dx^{cap}}{dt} \end{aligned}}^{\textit{Ecuación de conservación}}$$

$$\overbrace{\boldsymbol{X} = \begin{bmatrix} x_1 \\ \vdots \\ x_n \\ x^{trab} \\ x^{cap} \end{bmatrix} = \boldsymbol{G} \times \boldsymbol{I} = \begin{cases} x_i = \sum_{j=1}^{n} \lambda_i Q_{ij} p_j + \lambda_i B_i^{trab} + \lambda_i B_i^{cap} \\ x^{trab} = \sum_{i=1}^{n} q_i^{trab} p_i \\ x^{cap} = \sum_{i=1}^{n} q_i^{cap} p_i \end{cases}}^{\textit{vector de gastos}}$$

$$\overbrace{\boldsymbol{Y} = \begin{bmatrix} y_1 \\ \vdots \\ y_n \\ y^{trab} \\ y^{cap} \end{bmatrix} = \boldsymbol{G^t} \times \boldsymbol{I} = \begin{cases} y_i = \sum_{j=1}^{n} \lambda_j Q_{ji} p_i + q_i^{trab} p_i + q_i^{cap} p_i \\ y^{trab} = \sum_{i=1}^{n} \lambda_i B_i^{trab} \\ y^{cap} = \sum_{i=1}^{n} \lambda_i B_i^{cap} \end{cases}}^{vector\ de\ ingresos}$$

$$\overbrace{y_i = \lambda_i q_{ii}^{o} p_i}^{vector\ de\ ingresos}$$

$$\overbrace{x_i = k_F \cdot m_i}^{Ecuación\ de\ Fisher}$$

Let us note that we have given physical support to the set of monetary flows of indefinite origin that appears in the set of basic equations we obtained in the first chapter. Now, the expressions where it appears are expressed by means of the set of variables that are usually used to describe the real economy: the number of firms, the prices of goods and services, the number of firms, the prices of goods and services, and the prices of goods and services. $\lambda_i$prices p_i and the set of technical coefficients q_{ij} with which we describe the basic firms and which we assume to be constants of the economy. The novelty comes from the two different ways in which the income vector is expressed.

<u>The Principle of Conservation of Production</u>**.**

There is one detail that needs to be mentioned because it almost always goes unnoticed. In all the analysis we have made, it is implicitly assumed that all the goods produced by any basic enterprise are bought and consumed. To see that this assumption is actually being used as true, it is only necessary to remember that the income of a basic enterprise can also be expressed as a function of the quantity of goods it produces and sells:

$$y_i = \lambda_i q_{ii}^o p_i$$

Where q_{ii}^o is the quantity of commodity "i" produced by each of the basic enterprises. It is not difficult to see that when the above expression is accepted as valid, then we are also accepting that all the goods that are produced are consumed:

$$y_i = \sum_{j=1}^{n} \lambda_j Q_{ji} p_i + q_i^{trab} p_i + q_i^{cap} p_i \xrightarrow{y_i=\lambda_i q_{ii}^o p_i} \lambda_i Q_{ii}^o = \sum_{j=1}^{n} \lambda_j Q_{ji} + q_i^{trab} + q_i^{cap}$$

Any commodity that has been produced, the left-hand term of the expression, is either consumed by enterprises, or consumed by workers, or consumed by entrepreneurs. $\lambda_i Q_{ii}^o$ of the left of the expression, is either consumed by the enterprises, or consumed by the workers, or consumed by the entrepreneurs.

It is important to understand that this conservation law is not contained in the conservation equation of the monetary flow, so it must be imposed from outside when the production model is created and when the previous expression is assumed to be valid.

4. INVESTMENT IN THE CONSTANT YIELD PRODUCTION MODEL.

Another interesting parameter whose value is not possible to know in the simple production model at constant returns without making new assumptions, is the investment expenditure being carried out within the economy. Knowledge of the components of the expenditure matrix c_{ij} as a function of the variables price, number of firms and technical coefficients allows us to know explicitly the flow of exchanges within the economy, the *PIA*, and also allows us to know what is the flow of final goods *GDP* that is produced, which are the variables that are usually of interest in the economy, but in the model does not appear when investment is worth, that is, what is the nominal flow that is devoted to create new capital.

Normally, it is said that the *GDP* of the economy is given by the consumption made by entrepreneurs and workers when they spend their income, without including the consumption made to replenish the already existing capital, and without including the consumption in the creation of new capital. Normally the name investment is given to the money spent to satisfy these last two concepts, the maintenance of the already existing capital and the expenditure on the creation of new capital. However, it is not at all simple to introduce these two expenses in the model at constant returns.

The usual thing is to accept that companies are devoting a part of the income to replace the deterioration of the means of production, although we do not know how much explicitly. In this way, the profits that are distributed between workers and businessmen are the real surplus of the economy, and can be dedicated, indistinctly, to satisfy personal needs in consumption, or to new investment. For this reason, *GDP* is normally considered to contain personal consumption and investment, but does not contain the replacement cost of the already existing means of production, which, logically, is not considered to be part of the surplus.

To see what we mean more clearly, let's look at the breakdown of the *IPA* according to what the different agents spend their money on:

$$PIA = \boldsymbol{I} \times \boldsymbol{G} \times \boldsymbol{I} = \sum_{i=1}^{n} x_i + x^{trab} + x^{cap} \rightarrow \begin{cases} x_i & \rightarrow gasto\ entre\ empresas \\ x^{trab} & \rightarrow gasto\ de\ los\ trabajadores \\ x^{cap} & \rightarrow gasto\ de\ los\ empresarios \end{cases}$$

Expressing each of the terms in terms of the coefficients of the Expenditure Matrix, we obtain without many problems:

$$PIA = \left[\sum_{j,i=1}^{n} \lambda_j Q_{ji} p_i\right] + \left[\sum_{i=1}^{n} \lambda_i B_i^{trab} + \sum_{i=1}^{n} \lambda_i B_i^{cap}\right] + \left[\sum_{i=1}^{n} q_i^{trab} p_i + \sum_{i=1}^{n} q_i^{cap} p_i\right]$$

Therefore, three monetary flows of differentiated economic significance contribute to the total value of the *IPA:*

$$PIA = \Phi^{empresas} + \Phi^{beneficios} + \Phi^{consumo}$$

The first monetary flow is identified with the aggregate value of expenditures among the companies present in the economy. We call it business flow:

$$\Phi^{empresas} = \sum_{j,i=1}^{n} \lambda_j Q_{ji} p_i \ = \boldsymbol{\lambda} \times \ \boldsymbol{Q} \times \boldsymbol{P}$$

The second monetary flow is identified with the sum of the expenditures that companies make when paying workers and entrepreneurs. It is the income that workers receive for their work and entrepreneurs receive for owning the companies, and its value does not have to coincide with the expenditure made by workers and entrepreneurs since, in general, both can be saving or spending on credit. We call it profit flow because it is the monetary surplus that companies obtain from their activity, even though it appears as an expense in their accounting equations:

$$\Phi^{beneficios} = \sum_{i=1}^{n} \lambda_i B_i^{trab} + \sum_{i=1}^{n} \lambda_i B_i^{cap} \equiv PIB$$

The third monetary flow is identified with what we normally call "consumption" expenditure, which we identify here with *GDP* or with the aggregate expenditure flow of the whole economy, i.e., monetary expenditure on final goods consumed by workers and entrepreneurs:

$$\Phi^{consumo} = x^{trab} + x^{cap} = \sum_{i=1}^{n} q_i^{trab} p_i + \sum_{i=1}^{n} q_i^{cap} p_i$$

The difficulty of the simple constant output model is in clearly identifying real *GDP* and separating investment from consumption. Normally, investment is referred to as the part of consumption that entrepreneurs and workers devote to expanding businesses:

$$PIB = \Phi^{inversión} + \Phi^{consumo}$$

But this way of looking at things ignores the fact that it is not individuals but the companies themselves that normally spend on investment, using a part of the surplus that is not distributed as capital income. Although most of the time companies borrow the money they need to invest, the truth is that they almost always set aside a part of the surplus to be used for investment expenses. That is to say, part of what companies would have to devote to pay wages or rent, they devote, on the contrary, to investment expenses: the investment of part of the surplus is insufficient to carry out the investment and, therefore, it is not enough to cover the investment.

$$\Phi^{empresas} \ = \Phi^{producción} + \Phi^{reposición} \ + \Phi^{inversión}$$

From this point of view, all replacement spending, but also part of investment, is being made by companies and does not appear in *GDP as* we have defined it. However, when *GDP* is measured in practice, it usually includes both investment and replacement spending, in addition to all consumption spending, so it is not at all easy to differentiate between them all.

It is possible to move forward with the "model" assuming that companies distribute all the possible surplus in profits and only carry out replacement costs, which implies assuming that the investment is made by workers and entrepreneurs through previous savings, which is what we will do here.

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CHAPTER 5

THE PRINCIPLE OF BUYER-SELLER ASYMMETRY

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1. INTRODUCTION

In this subject we are going to enter fully into the thorny study of price formation within monetary economies, but limit our attention only to the reproducible goods that are bought and sold within what we are going to call the Consumer Market.

Any economist, or any self-respecting economic theory, is obliged to give a minimally convincing explanation of why things are worth what they are worth and are sold at the price at which they are sold, this being undoubtedly the subject that has aroused most interest among economists since very early times and to which most time has been devoted by the discipline. If there is one thing that characterizes economists working for private universities in the United States, it is that they do not have a theory of price formation that can be called such. The reason is to be found in the Theory of the Production Function, which forces prices to be linked to the marginal productivity of the factors, but only for the price of labor and for the price of capital, and leaves no explanation for the price of commodities. For them, he resorts to the intersection of two curves, the supply curve and the demand curve, without anyone knowing for certain how each of them is determined, and without anyone ever having calculated them for a particular commodity.

The observation that is often used to start the discussion about the price at which things are sold is the great difference between the price at which water is sold and the price at which diamonds are sold. Water is considered something very valuable, so much so, that we cannot live without it, and yet its selling price is very low. Whereas diamonds, which is something that no one really needs for anything, have a very high selling price. Why is this the case? Why does something with no real value have such a high price and something so essential for living have such a low price?

Let us note, first of all, that the example is misleading, very tricky and chosen with the intention of confusing, since neither water nor diamonds are reproducible goods of which any desired quantity can be produced. Both diamonds and water are non-reproducible goods, the quantity of which may be very scarce, as in the case of diamonds, or very abundant, as is usually the case with water. Therefore, we have no reason to think that their price is fixed in the same way as reproducible goods are fixed, which is the price that one wants to explain when constructing a theory of value.

We are very clear about "price" because we live in a monetary economy where most desirable things can be bought and have a price, which is the amount of money it costs us to buy them. However, we are not very clear about where the idea of "value" comes from, absolute, intrinsic and different from the price we attribute to a commodity.

Let's look a little more slowly at what history tells us about value and price.

Let us note that Aristotle, more than 2,000 years ago, made a distinction between the "value" and the "price" of things, pointing out that, all too often, prices do not correspond to the value that things should have. We see that, since the most remote antiquity, any attempt to explain the price of reproducible goods starts from the point of view that there are two distinct qualities within each thing, value and price, and that it is the disparity between the two that needs an explanatory theory. Although no one, not even the great Aristotle, ever clarifies to us what is the "value" that we attribute to things, and to which we suppose a quality distinct from price.

There is written record of how in the time of Diocletian, 301, an imperial edict fixed the selling prices of more than 1500 products under penalty of death for those who did not abide by it, and we know that at that time the application of the death penalty was taken very seriously. If prices are decided by healthy and free competition between buyers and sellers in the market, as economists working for private universities around the world tell us, it is very difficult to explain the complaints that consumers have expressed at all times about the abusive selling prices of many commodities.

Nor is it easy to justify the fact that, in the face of public discontent, the authorities of all ages have always ended up agreeing with consumers and agreed to regulate prices. For example, today, the price of rents in the center of the most important cities of the world is regulated in a way that in no way differs from the edict issued by Diocletian. If there were not some truth in the popular idea that the "value" of goods is very different from the "price" they fetch in the markets, it is very difficult to understand the persistence of the idea over time.

Also throughout the Middle Ages there was a general consensus among scholastic thinkers on the issue of prices, reaching the conclusion that one thing was the price at which goods were bought and sold and quite another thing was the intrinsic value of goods. It was they who introduced into the study of economics the idea of "fair price", which has endured to the present day and is the basis of many social movements that do not believe in the goodness of the free market proclaimed by economists working for private universities in the United States.

Attempts to explain the difference between the market "price" of a good and its "value", or inherent natural price, is what led the thinkers of the industrial revolution, such as Adams Smith or David Ricardo, to seek the origin of "value" in the human labor necessary for its production, justifying the punctual differences between the market price and the cost of its production (the intrinsic value of things), in the punctual scarcity of the quantity of goods. But this identification between labor and value, although logical, does not correspond to what is observed in the markets, where the price at which things are sold does not seem to have a clear relationship with the amount of social labor needed to produce them.

The economist Karl Marx takes to the end this logic that implies the identification between the value of a commodity and the social labor contained in the commodity and turns Smith's and Ricardo's reasoning upside down as one turns a sock inside out. For Marx the selling price of a reproducible commodity always tends to its value, understood as "the social labor" contained in it, and he enunciates it as a law, the Law of Value:

> "commodities are exchanged according to the social labor contained in them".

For Karl Marx, "price" and "value" are the same in monetary economies (<u>except for labor</u>, because according to Karl Marx it is the only thing that is not being paid for its value).

Here, in the Madrid Theory, we are not going to enter into this silly discussion between the value and the price of things. We will accept, on the contrary, that there is only the "price" at which goods are bought and sold in a monetary economy, so that our problem will be reduced to explaining clearly and unequivocally the mechanism by which the market price of things is determined.

THE THEORY OF PRICES. The only valuation of a commodity that makes sense within a monetary economy is the price at which it is bought in the market, so the problem of creating a Theory of Prices is equivalent to creating a theory that determines how or by whom the specific price of each commodity is fixed.

In this sense, we will say we have a Theory of Price Formation when we find a set of variables on which prices depend and their specific functional dependence. That is, if we are able to determine the functional dependence of the price of any commodity on a specific set of variables of the economy, then we can say that we have a theory of prices that will be falsifiable to the extent that these variables are well defined, can be measured and the dependence can be verified.

Recall that the set of variables on which the economics of the model depends is:

$p_i \rightarrow$ *prices*
$\lambda_i \rightarrow$ *the number of core businesses*
$q_i^{trab} \rightarrow$ *workers' consumption*
$q_i^{cap} \rightarrow$ *business consumption*
$B_i^{trab} \rightarrow$ *benefits from work (wages)*
$B_i^{cap} \rightarrow$ *capital gains (income)*
$Q_{ii} \rightarrow$ *amount sold*
$Q_{ii}^{o} \rightarrow$ *quantity produced*

What we are going to demonstrate now, and we are going to state as the Buyer-Seller Asymmetry Principle, is the concrete dependence of the price and the quantity of firms on the rest of the variables that appear in the model of simple production at constant yields that we are using to describe the economy. With that we will have a Theory of Prices that we can call as such, since we will be able to predict the price of things knowing the rest of the variables on which it depends.

2. BUYER-SELLER ASYMMETRY

In this work we will follow to the end the idea developed by Piero Sraffa in the work published in 1959, "Production of goods by means of other goods", but avoiding making many of the unnecessary hypotheses Sraffa makes to develop his theory. This will allow us to determine what prices and production depend on in a monetary economy without making any additional hypothesis to those we have already made on the Model of Simple Production at Constant Yields, with the only exception, and in a provisional manner, that any agent spends all his income. This will allow us to greatly simplify the analysis without losing generality, since, as we shall see later, the conclusions to be reached remain unchanged in more general cases.

Let's start by recalling the functional form of the income and expense matrices. $\boldsymbol{Y}$ and expenditure $\boldsymbol{G}$ for a simple production economy with constant yields as a function of the number of firms, prices and technical coefficients:

$$\boldsymbol{Y} = \begin{bmatrix} \lambda_1 Q_{11}^o p_1 \\ \vdots \\ y_i = \lambda_n Q_{nn}^o p_n \\ y^{trab} \\ y^{cap} \end{bmatrix}$$

$$\boldsymbol{G} = \begin{bmatrix} \begin{vmatrix} \lambda_1 Q_{11} p_1 & \cdots & \lambda_1 Q_{1n} p_n \\ \vdots & \cdots & \vdots \\ \lambda_n Q_{n1} p_1 & \cdots & \lambda_n Q_{nn} p_n \end{vmatrix} & \begin{vmatrix} \lambda_1 B_1^{trab} & \lambda_1 B_1^{cap} \\ \vdots & \vdots \\ \lambda_n B_n^{trab} & \lambda_n B_n^{cap} \end{vmatrix} \\ \begin{vmatrix} q_1^{trab} p_1 & \cdots & q_n^{trab} p_n \\ q_1^{cap} p_1 & \cdots & q_n^{cap} p_n \end{vmatrix} & \begin{vmatrix} 0 & 0 \\ 0 & 0 \end{vmatrix} \end{bmatrix}$$

On the one hand, the income vector $\boldsymbol{Y}$ and the expenditure vector $\boldsymbol{X}$ can be expressed as a function of the variables price and number of firms using their dependence on the matrix $\boldsymbol{G}$:

$$\underbrace{\boldsymbol{X} = \boldsymbol{G} \times \boldsymbol{I} \quad \equiv \quad x_i = \sum_j c_{ij}}_{gastos} \qquad \Bigg\| \qquad \underbrace{\boldsymbol{Y} = \boldsymbol{G^t} \times \boldsymbol{I} \quad \equiv \quad y_i = \sum_j c_{ji}}_{ingresos}$$

$$\downarrow \qquad\qquad\qquad\qquad \downarrow$$

$$\overbrace{x_i = \sum_{j=1}^{n} \lambda_i Q_{ij} p_j + \lambda_i B_i^{trab} + \lambda_i B_i^{cap}} \qquad \Bigg\| \qquad \overbrace{y_i = \sum_{j=1}^{n} \lambda_j Q_{ji} p_i + q_i^{trab} p_i + q_i^{cap} p_i}$$

$$x^{trab} = \sum_{i=1}^{n} q_i^{trab} p_i \qquad \Bigg\| \qquad y^{trab} = \sum_{i=1}^{n} \lambda_i B_i^{trab}$$

$$x^{cap} = \sum_{i=1}^{n} q_i^{cap} p_i \qquad \Bigg\| \qquad y^{cap} = \sum_{i=1}^{n} \lambda_i B_i^{cap}$$

But, on the other hand, the conservation equation gives us a second expression of income ***Y***, also as a function of the new variables:

$$\lambda_i Q_{ii}^{o} p_i = x_i + ah_i + \frac{1}{k_F}\frac{dx_i}{dt}$$

$$y^{trab} = x^{trab} + ah^{trab} + \frac{1}{k_F}\frac{dx^{trab}}{dt}$$

$$y^{cap} = x^{cap} + ah^{cap} + \frac{1}{k_F}\frac{dx^{cap}}{dt}$$

So we have two different functional expressions for the income vector as a function of the new variables: "*the definition of income as a function of the **G** matrix and the conservation expression*".

STARTING HYPOTHESIS. In all that follows, we will assume an economy in which it is true that any agent spends all the money he earns:

$$y_i = x_i$$

With this condition, we obtain two ways of expressing the income vector which, mathematically speaking, represent two different sets of equations that express the same thing:

$$y_i = x_i \rightarrow \;\; \lambda_i Q_{ii}^{o} p_i = \sum_{j=1}^{n} \lambda_i Q_{ij} p_j + \lambda_i B_i^{trab} + \lambda_i B_i^{cap} \qquad (ec. \quad conservación)$$

$$y_i = y_i \rightarrow \;\; \lambda_i Q_{ii}^{o} p_i = \sum_{j=1}^{n} \lambda_j Q_{ji} p_i + q_i^{trab} p_i + q_i^{cap} p_i \qquad (def. \quad del\, ingreso)$$

The first one comes from the conservation equation when we impose that the income vector of each agent is equal to the expenditure it makes. The second comes from the very definition of income by means of the expenditure matrix $\boldsymbol{G}$. Both are two different systems of equations that link prices, the number of firms and the technical coefficients of the economy:

$$\overbrace{\begin{gathered} \lambda_i Q_{ii}^{o} p_i \;= \sum_{j=1}^{n} \lambda_i Q_{ij} p_j + \lambda_i B_i^{cap} + \lambda_i B_i^{trab} \\ y^{cap} = \sum_{i=1}^{n} q_i^{cap} p_i \\ y^{trab} = \sum_{i=1}^{n} q_i^{trab} p_i \end{gathered}}^{\substack{ecuación \;\; de\, conservación \\ \downarrow}} \quad \Bigg\Vert \quad \overbrace{\begin{gathered} \lambda_i Q_{ii}^{o} p_i \;= \sum_{j=1}^{n} \lambda_j Q_{ji} p_i + q_i^{cap} p_i + q_i^{trab} p_i \\ y^{cap} = \sum_{i=1}^{n} \lambda_i B_i^{cap} \\ y^{trab} = \sum_{i=1}^{n} \lambda_i B_i^{trab} \end{gathered}}^{\substack{definición \;\; de \;\; ingreso \\ \downarrow}}$$

The result is really quite remarkable, because each of the sets of N+2 equations is expressing two different things. If we now eliminate the variable λ_i from the first N equations that form the left-hand set of equations, we are left with a set of N equations where only prices appear. If we do the same with the first N equations on the right hand side and eliminate the variable $p_i$variable is eliminated, we are left with a set of N equations dependent only on the number of companies. λ_i. More explicitly. What we obtain are two systems of N equations each dependent on only one of the two sets of variables:

$$\underbrace{Sistema\ dependiente\ de\ los\ precios}_{\downarrow} \qquad \underbrace{Sistema\ dependiente\ de\ las\ cantidades}_{\downarrow}$$

$$\overbrace{Q_{ii}^{o}\, p_i = \sum_{j=1}^{n} Q_{ij} p_j + B_i^{cap} + B_i^{trab}} \qquad\qquad \overbrace{\lambda_i Q_{ii}^{o} \;= \sum_{j=1}^{n} \lambda_j Q_{ji} + q_i^{cap} + q_i^{trab}}$$

The first of these depends only on the set of prices, and we will call it the money circuit. p_i and we will call it the money circuit. The second of these depends only on the set of the number of firms, and we will call it the commodity circuit. λ_i and we will call it the commodity circuit.

> *<u>THE TWO CIRCUITS</u>: "When in a generic economy of simple production at constant yields described in terms of the real variables p_j y $\lambda_j$is satisfied that the income of each of the agents is equal to their expenditure, then the set of 2(N+2) accounting equations dependent on the 2N real variables p_j y λ_j with which the economy is described, unfold into two systems of N equations dependent, each of them, either on the set of prices or on the set of the quantity of firms. "*

That is, from the original set of $2(N+2)$ accounting equations dependent on the set of prices and on the set of the number of basic companies, two systems of N equations have been extracted, one dependent only on the set of prices "p_i"and the other dependent only on the set of the number of companies "λ_i".

This result, which is not a mathematical mirage, shows that in a monetary economy there is a profound difference between the role played by sellers and the role played by buyers, since, even when the conservation equation is symmetric for income and expenditure, the role played by sellers and the role played by buyers within the economy are described by a different set of equations, independent of each other. $(y_i = x_i)$**The** role played by sellers and the role played by buyers within the economy are described by a different set of equations, independent of each other. By decoupling buying decisions and selling decisions into two independent systems of equations, the consequences of buying and selling are also decoupled:

"The consequences of buying and selling are different in monetary economies."

We call "Money Circuit" the system of equations dependent on prices, and we call "Commodity Circuit" the system of equations dependent on the variable quantity of firms.

3. THE MONEY CIRCUIT AND THE COMMODITY CIRCUIT.

Let us analyze in a little more detail the two uncoupled systems of equations, each dependent on the variables price and number of firms when we impose on the economy that all income is spent, and try to understand what they mean in relation to the theory of price formation.

The Money Circuit

Let us study in detail the first set of N price-dependent equations, which we have called the "Money Circuit". If, for the sake of clarity, we group into a single profit vector, ***B***, the part of the income that firms devote to pay their workers' wages and corporate rents, i.e., we make in the expression:

$$\boldsymbol{B} = \boldsymbol{B}^{trab} + \boldsymbol{B}^{cap}$$

Now, aided by the square matrices of the technical coefficients, the system of N equations can be cleared so that the price vector ***P*** is expressed as a function of the profit vector **B** in a very simple and elegant matrix form:

$$Q_{ii}^{o} p_i - \sum_{j=1}^{n} Q_{ij} p_j = B_i^{cap} + B_i^{trab} \xrightarrow{B_i = B_i^{cap} + B_i^{trab}} \boxed{\boldsymbol{P} = (\boldsymbol{Q^o} - \boldsymbol{Q})^{-1} \cdot \boldsymbol{B}}$$

The result shows very clearly the biunivocal relationship that exists between the profits obtained by the basic companies and the prices at which the goods are sold, so that it is possible to affirm that there is a causal dependence between the two: "*prices are fixed when the companies fix their profits*". This leads us to conclude:

1) It is the sellers (those who wish to sell goods or services in exchange for money), who determine the price at which they are to be sold when they decide the profits they make from the sale of goods.

*Therefore, it is the owners of the firms, the entrepreneurs, when they decide what profits the firms make, the vector **B,** who fix at what price the goods produced are sold, the vector **P.***

2) In the expression, prices depend on the sum of wages and rents, so that the specific distribution of profits between workers and entrepreneurs does not influence the prices at which goods are sold, as Piero Sraffa will already show in 1959 in his work "Production of Goods by Other Goods". $B_i$does not influence the prices at which goods are sold, as Piero Sraffa will already demonstrate in 1959 in his work *"Production of Goods by other Goods".*

   There is, therefore, no macroeconomic or microeconomic reason that justifies a priori which specific part of the profits should go to pay wages and which part should go to pay the profits of employers. Beyond affirming that it is usually the entrepreneurs who decide the distribution of profits, since they are the ones who usually fix the profits of the companies, there is no justification for deciding a priori for one distribution or the other, and if it exists it must be found elsewhere, perhaps in the Theory of Capital that we will study later, but it is not and cannot be within the Consumer Market.

3) The profits obtained by each company are decided in each company, but the selling prices of products, which are the consequence of the decision, are determined globally throughout the economy. Any change in the profits of a particular company will affect not only the price of what the company itself produces, but also the prices of all goods produced in the economy.

   Although decisions on profits are made on an ad hoc basis and for specific sectoral reasons, the fact is that they have a global impact on prices. Society is producing and distributing the surplus jointly, and the struggle over who gets what is intersectoral.

4) Wages received by workers can be considered as one more expense of the companies, or they can be considered as the workers' share in the distribution of the companies' profits between workers and employers. The mathematical structure does not change as a result, but the causal line of who sets the price of wages does change.
   In the first case, when wages are just another expense imposed on employers, then employers are price takers with respect to wages since it is the workers who

decide the price at which they sell their labor (as we shall see, in such a situation employers have the privilege of saying how many people they hire).
However, in the second case, when the distribution of profits between wages and rents is decided jointly, then we can say that the number of people hired is also a joint decision.

It is difficult to decide which of the two situations is currently taking place in the economic reality around us, since the relationship between workers and employers is very different depending on which sector of the economy and which country in particular. Depending on which country is studied, wages are considered in one way or another, and collective bargaining is carried out more intensively in some countries than in others. It is not difficult to confirm that workers' rights are very different in Germany or Denmark than in Spain or Portugal, even though both countries have the same monetary economy.

5) Prices are independent of the absolute or relative quantity produced of any given service, since the system of equations that determines them does not depend on the number of firms λ in each sector. This is no surprise, but the direct consequence of the hypothesis of production at constant yields that we have imposed on the accounting equations with which the firms are described.

6) It is also shocking that companies do not seem to have any limitation when it comes to increasing profits, even if this increases the prices of the goods they sell, so that according to the expressions we have just presented, we would expect at least a tendency to inflation that is difficult to control. In other words, the Money Circuit seems to predict the uncontrolled inflation of all prices, which clashes with the more than evident price stability of all current economies. It will be necessary to justify what other mechanism is stopping inflation, and we will explain the apparent paradox a little later.

<u>THE LABOR MARKET</u>. As the theory is being presented, the monetary surplus produced by each company is shared between workers and employers, reflecting the feeling of belonging to the same common social project. In this sense, we are going to consider that wages are fixed during collective bargaining between workers and employers and, therefore, that labor is not fixed in the

consumer market as just another commodity, which is how it is considered by economists working for private universities in the USA.

But it is good not to forget that the mathematical structure on which the Madrid Theory is based does not prevent labor from being bought and sold as just another commodity and that workers, whose only possession is their labor, become mere sellers with "the freedom to choose" at what price they sell their labor.

Here, we will always consider that there is no "labor market" where workers are offered to the highest bidder, but we must not forget that the increase of "false self-employed" is moving us further and further away from a participatory economy and closer to a slave economy.

One only has to think of the structural change brought about by new technologies, such as Internet shopping or teleworking, to imagine that in the near future the worker will be elevated to the category of "job-creating" entrepreneur: the false self-employed.

Labor thus becomes a commodity which, as in Engels' time, is bought and sold at a price related to its cost of manufacture, just as any other commodity. Although it is very evident that in any era and within any economy, there have always existed a lot of professionals who work autonomously as true manufacturers of specialized services, these have always behaved more like entrepreneurs than workers, so their existence cannot be used as an excuse to justify companies outsourcing labor and "buying" it outside the productive system of the companies as one more commodity they need to carry out production.

The Commodity Circuit

Let us now analyze the second system of *N* equations dependent on the number of basic firms λ that exist in the economy. If, for the sake of clarity, we group the quantity of goods bought by both workers and entrepreneurs, $E_i = q_i^{cap} + q_i^{trab}$in a single vector ***E***, called the surplus vector, the system of N equations can be cleared for the number of firms λ, remaining a function only of the vector ***E,*** called the surplus vector. ***λ***, remaining a function only of the surplus vector ***E*** in a very elegant matrix form:

$$\lambda_i Q_{ii}^o - \sum_{j=1}^{n} \lambda_j Q_{ji} = q_i^{cap} + q_i^{trab} \xrightarrow{E_i = q_i^{cap} + q_i^{trab}} \boxed{\boldsymbol{\lambda} = (\boldsymbol{Q^o} - \boldsymbol{Q^t})^{-1} \cdot \boldsymbol{E}}$$

The result clearly shows the correlation between the spending preferences shown by consumers through the surplus vector and the number of firms in the economy. Thus, it can be stated that there is a causal dependence between the two variables: *"the number of firms in the economy depends on the spending decisions made by consumers".* We can then conclude:

1) The quantity of goods of a particular type purchased by workers and employers, q_i^{cap} y q_i^{trab}The number of basic enterprises engaged in production, which represent their consumption preferences, is determined by the number of basic enterprises engaged in production. λ_i that are engaged in production.

> *Therefore, it is consumers, both workers and entrepreneurs, when they set their consumption preferences by spending their income, who decide what is produced and how much is produced of each of the goods or services, and, therefore, of the number of basic enterprises that exist in the economy.*

The statement may seem trivial, or even superficial, but it is the manifestation of a very deep and beautiful underlying principle, because the number of companies in any sector, and therefore in all sectors of the economy, does not depend on the willingness of entrepreneurs to invest, nor does it depend on the prices at which they sell the goods they produce, but depends only on the decision of workers and entrepreneurs to consume.

The remarkable result is a consequence of the fact that service prices do not appear explicitly in the system of equations linking consumption decisions to the number of basic firms, so prices cannot directly influence the number of basic firms engaged in the production of a good or service.

Of course, prices will indirectly influence the number of firms engaged in producing each good by causing consumers to change their consumption preferences in response to a change in prices. But, and this is what the expression really tells us, it is the changes in consumption preferences, regardless of the motives or reasons why consumers decide to change them, that change the number of firms engaged in producing a given good.

2) Any change in the amount of consumption of a good not only changes the number of firms engaged in producing that good, but also changes the number of other firms in the economy. λ_i that are engaged in producing that good, but also changes the number of other companies present in the economy. In other words, any change in the quantity of a good consumed is a sectoral decision taken individually, but it affects the number of all the basic companies present in the economy globally.

3) Possible changes in consumer preferences for one product or another do not influence product prices, as is generally thought.

4) A change in the distribution of profits (the monetary surplus) between workers and entrepreneurs does not change the nominal value of expenditure, but it may change consumption preferences and, therefore, may change the amount of each service produced.

We tend to believe, to take an example from the world of cars, that advertising on the different vehicles sold is the manifestation of the struggle between vehicle manufacturers to expand or maintain market share within the sector, which, although not necessarily untrue, is not entirely correct. As the Merchandise Circuit shows, the advertising that encourages us to buy cars, or any other product, can also be seen as the manifestation of a struggle between companies in different branches competing for a share of the disposable income that buyers devote to consumption.

For example, it is quite possible that a person who decides to go on vacation, is renouncing to renew his old vehicle by having to choose between spending the money he has on a vacation or on a vehicle. In this sense, it can be said that advertisements inviting us to buy a vehicle are intended, first of all, to convince people to spend their money on renewing their old vehicle and not on other alternatives such as traveling. Although no one doubts, nor do we here, that when the advertiser achieves his purpose, it will most probably be his vehicle that the consumer will finally buy, and not another one.

If car manufacturers realized that they are in competition with other sectors of the economy, and not so much with other vehicle manufacturers, they would almost certainly make joint advertisements trying to convince people to spend their money on renewing their old car for a more modern one instead of spending it on something else.

> *<u>THE COMMODITY CIRCUIT</u>. Perhaps the most notable consequence of the existence of the "commodity circuit" is to show that the specific quantity of any given good produced is not decided independently of other consumption decisions.*
>
> *In a monetary economy there are no markets independent of other markets because all sellers are competing for the disposable income of consumers. It is the struggle between sectors, and not the struggle within the sector itself, that ultimately decides the number of firms in each sector.*
>
> *Let's not forget that sectors do not have to be only companies. Sectors can also be entire countries that specialize in the production of a certain type of goods: agricultural, raw materials, manufactured products, etc. Therefore, their final production or GDP will depend on the consumption decisions made in other countries.*

4. THE PRINCIPLE OF ASYMMETRY AND ITS CONSEQUENCES

The purpose of this chapter was to give a convincing explanation of how prices are formed in a monetary economy. The appearance of two systems of equations decoupled with respect to the variables price and number of firms, shows us the different consequences of the decision of what to buy from the decision of what profit to obtain from that which is sold. We are now going to state in the form of "principles" what in reality are the conclusions derived from the appearance of the money circuit and the commodity circuit, with the sole intention of summarizing in a set of statements the consequences of the differentiated existence of buyers and sellers. This will help us to understand many of the problems that seem insoluble in economics and yet are trivial when viewed from the point of view of the two decoupled circuits:

The set of statements, we are going to state them as principles, although all of them are a direct consequence of the use of money has in our way of organizing ourselves, and they will give us a general overview of the deep intricacies in which the Consumer Market moves:

1) The Principle of Asymmetry.
2) The Principle of Closure.
3) The Inflationary Principle.
4) The Principle of Apportionment.
5) The Principle of Unequal Exchange.

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1) **The Principle of Asymmetry.**

> *PRINCIPLE OF BUYER AND SELLER ASYMMETRY. In a monetary economy, the quantity of each good or service produced is decided by the buyers when they allocate disposable income according to their consumption preferences, while the price at which each good or service produced is sold is decided by the sellers when they fix the profits they earn from the sale of what they produce.*

Or, in other words, the decision of what to buy and the decision of what profits are obtained by selling, which is made by different people in each purchase and sale, have different or asymmetric consequences in the monetary economies. The buyer decides what quantity of each good is produced in the economy when he decides what to buy, while the seller decides the price of each of the goods produced when he decides what profits he earns from their sale.

The possible doubt that arises as to whether it is prices that determine profits or whether it is profits that determine prices, is easily resolved when we understand that the only thing that concerns the entrepreneur is that the profits he obtains from the sale are "sufficient" to keep the business open, regardless of the price at which he sells his goods. There is no "objective" price that any good has to have, but there is an "objective" profit that any business activity has to have in order to develop. In this sense, the "Principle of Asymmetry" is only stating the obvious and what everyone has known since the dawn of time: the prices of goods or services have to make a profit.

The same applies to the purchase of goods and services. It is quite evident that the seller of a commodity does not decide how much of it he is going to sell and, therefore, does not decide how much of it he must produce. This is so obvious that no one with two fingers on his head would dare to assert otherwise: *it is the buyer, when he divides his income among the different commodities he buys, who decides how much of each commodity is produced*.

<u>THE MARKET OF PERFECT COMPETITION</u>. Although the validity of the Principle of Asymmetry has always been evident to economists of all times, this has not prevented economists working for private universities in the USA from asserting just the opposite, propagating the idea that both sellers and buyers are price-accepting. To do so, they have created a whole theory based on a conceptual model, the Perfect Competition Market, which allows them to reach the final conclusion they wish to reach:

"both buyers and sellers are price takers".

That is, they have created a theory of price formation that claims that no one sets prices within a monetary economy, which is a conclusion that is really very difficult to believe.

That such a theory is considered true and taught in the world's universities as such can only be explained by the absolute dominance of economists working for private universities in the USA over what is or is not published in economics journals and textbooks.

It is very clear that economics is not a scientific discipline at present because there is no "peer review".

Evidently, a theory that claims that nobody puts the price on goods and services is necessarily false, since not only does it not explain anything, but it is claiming that nothing explains everything.

The Principle of Asymmetry is the cornerstone on which all monetary economics is based.

The effects and its influence are felt in all areas, modeling and conditioning in such a deep and determining way the social structure in which we live that it is, in fact, where we must look for the origin of capital and of the growing inequality which involves the whole capitalist system. It is arguably by far the most important statement that can be made within a monetary economy.

2) **The Principle of Closure**

Although in a monetary economy the set of variables "price" and "quantity of enterprises" are set independently of each other, both sets of variables are linked together by the value of the PIA, which according to the Monetary Equation is constant and independent of the specific value taken by each of the variables:

$$PIA = k_F \cdot M \quad \leftrightarrow \quad PIA = \sum_i p_i \cdot q_i$$

What the Closure Principle says is that, despite what the Asymmetry Principle states, there is a link between the price of the goods produced and the quantity of firms that produce them, so that prices and the quantity of goods produced are not independent. The two statements, the Principle of Asymmetry and the Principle of Closure, are not contradictory and the two principles complement each other without excluding each other. While the origin of the Asymmetry Principle is in the conservation equation of monetary flow, which is a microeconomic constraint, the origin of the Closure Principle is in the monetary equation, which is a macroeconomic constraint:

$$PIA = \sum_{j,i=1}^{n} \lambda_j (2Q_{ji}^o - Q_{ji}) p_i \ = k_F \cdot M \neq f(\lambda_i, p_i)$$

We have already commented that one of the apparent contradictions facing the Principle of Asymmetry is to explain why entrepreneurs do not raise their profits indefinitely. If it were true that price depends only on the profits that sellers decide to make, it is not clear why they do not raise their profits indefinitely. Nor is it at all clear why consumers do not buy goods without limit. If it were true that the quantity of goods manufactured depends only on what buyers decide to buy, we do not see why they do not buy without limit. The reason why profits do not rise without limit, or the reason why consumers do not consume without limit, is not mysterious at all and is easily explained when we understand that the monetary flow of exchanges is limited by the monetary mass in the economy, as the monetary equation states.

The *PIA* has a specific value that depends neither on prices nor on the number of companies in the economy, since its value is exclusively linked to the amount of money in the money supply and its growth or decrease depends only, according to the aggregate conservation equation, on the amount of money created or destroyed annually in the economy, i.e., on the flow of savings. Ah:

$$Ah + \frac{1}{k_F}\frac{dPIA}{dt} = 0$$

If there is neither creation nor destruction of money within the economy, the *PIA* will remain unchanged and prices will not be able to rise without the number of firms falling, or vice versa, the number of firms will not be able to rise without prices falling. We see that entrepreneurs have a good reason not to raise their profits indefinitely, because in that case, they will have to decrease the number of enterprises in the economy and their very existence will be threatened:

$$PIA = \sum_{j,i=1}^{n} \lambda_j (2Q_{ji}^{o} - Q_{ji}) p_i \ = const.$$

The consequences of the Principle of Closure of the Economy are much more profound than this brief exposition appears. Its existence reminds us of the reason why prices do not end in a debocated inflationary spiral, despite the assertion of the Principle of Asymmetry. The beauty of the appearance of the two circuits, and the different consequences of buying and selling, is an essential feature of monetary economies, which has no parallel with economies based on barter or any other organizing principle. Money conditions our lives in a way that would be unimaginable if we did not use mathematics to see and verify it, and the Principle of Asymmetry together with the rest of the principles we are going to formulate is only one of the many ways in which we can expose them.

3) **The Inflationary Principle.**

THE INFLATIONARY PRINCIPLE. In a monetary economy it can be stated in a very general way that the price at which any good is bought and sold can only go up and can never go down.

DEMONSTRATION. Demonstrating the Inflationary Principle is not complicated, so it is very suspicious that no one has tried to formulate it before. To do so, it is only necessary to resort to the Asymmetry Principle and use it to analyze the most immediate consequence it has on the accounting equation that any basic company in the economy must comply with:

$$q_{ii}^{o}p_i = \sum_{j=1}^{n} q_{ij}p_j + B_i^{cap} + B_i^{trab}$$

We know, from the Principle of Asymmetry, that the entrepreneur is not the one who sets the price of what he buys, so he cannot reduce his production costs, the right-hand term of the equation. $\sum_{j=1}^{n} q_{ij}p_j$ the right-hand side of the equation. Nor can the entrepreneur lower the part of the monetary surplus with which wages are paid, the right-hand term of the equation. B_i^{trab}The employer also cannot lower the part of the monetary surplus with which wages are paid, the wage term, since he can at most negotiate them with the workers, but never fix them. All this leaves only one way for the entrepreneur to lower prices, which is none other than to lower his own profits, which he can only do as long as he does not endanger the very survival of the company, since company profits have to be positive most of the time, if he does not want to put money into it.

The reasoning leads to the same place to which the Principle of Asymmetry leads: *"to lower prices the entrepreneur must lower corporate profits"*. This, of course, can only be done as long as the company's accounting existence is not endangered and it enters into losses that force it to close down. This gives entrepreneurs a very narrow margin of maneuver to try to lower prices in case they need to do so, which proves the statistical validity of the inflationary principle.

In short, entrepreneurs cannot, even if they wanted to, lower the prices of the goods they produce, so prices in general will tend to rise and never fall.

<u>THE DEFLATIONARY CRISIS</u>. The importance of the Inflationary Principle lies not so much in the fact that it explains very well why in a monetary economy prices never fall, which in economics is known as the "rigidity" of prices, but in warning us what will happen in an economy that tries to lower prices.

No monetary economy can enter a deflationary process because, in fact, the economy itself destroys the business fabric before it enters a deflationary process that lowers prices. This can be seen very well when we extract money from the money supply and force the economy to lower the aggregate flow of exchanges (the PIA). According to the monetary equation:

$$PIA = \sum_i p_i \cdot q_i$$

The PIA can be lowered either by lowering output or by lowering prices, but prices cannot be lowered according to the Inflationary Principle, so output will fall and the economy will enter a deflationary crisis. In fact, when we analyze the Financial Theory of Growth we will explain the deflationary crisis by appealing to the Inflationary Principle and monetary extraction.

The apparent deflation of prices in the initial stages of any "deflationary crisis" is a consequence of the fact that the deflationary crisis is almost always preceded by a more or less obvious inflationary price bubble. Before the crisis, companies, in general, are buying and selling with slightly inflated prices, so that when monetary extraction makes its appearance, companies still have a certain margin to decrease their profits and with it decrease the price of the goods they sell. But the price deflation that occurs in the initial phase of a deflationary crisis is only a desperate attempt to maintain production, which will soon cause losses that will force production to decrease and firms to close down. The fall in prices will not prevent the decrease in disposable income for which the companies are fighting (and therefore, the decrease in the income of the companies) and the deflationary process, far from stopping, will be fed back:

$$\rightarrow (baja\ ingreso\ disponible)_i \rightarrow (baja\ gasto)_i \rightarrow\ (baja\ la\ producción\ de\ bienes)_i \rightarrow$$
$$\leftarrow\ \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow\ \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow \leftarrow$$

Whatever the cause of the fall in disposable income, and once the initial price deflation has passed, the output of the whole economy falls rapidly, but now at constant prices.

The deflationary phase is deceptive because it hides the fact that companies, in their attempt to survive, are producing at a loss. But if during the short period of time that the deflationary process lasts, the fall in disposable income that is at the origin of the deflationary crisis is not remedied, nothing can prevent the destruction of the business fabric of the economy at a price level that, this time, is inflexible to any attempt to lower it.

Price deflations are tremendously destructive for the economy precisely because they cannot occur. They must be avoided at all costs because they entail the physical destruction of the entire productive system of society.

THE THREE PRINCIPLES. What the Closure Principle tells us is that the buyer's spending is limited and is spread over all production, while the seller of one product fights with the other sellers of the other products to get a share of that spending. It is the struggle between entrepreneurs in *different industries for the limited disposable income that keeps prices under control and prevents them from increasing their profits, causing inflation to skyrocket, and it is the limited disposable income of buyers that prevents spending from skyrocketing.*

The Asymmetry Principle is consistent with the Closure Principle, although it states that decisions about what to produce and at what price to produce are made independently of each other by buyers and sellers.

The Inflationary Principle completes the picture by stating that prices can only go up and can never go down. It is a direct consequence of the Asymmetry Principle, since prices are set by setting profits and these, although they can be raised at will, cannot be lowered at will without endangering the viability of companies.

There really is something of divinity within mathematics when they are able to show us in such a clear way the immense beauty of natural phenomena when we express them with mathematics.

4) **The Principle of Distribution**.

THE PRINCIPLE OF DISTRIBUTION: In a monetary economy, the nominal value of the monetary surplus produced by an enterprise is independent of how it is distributed between workers' wages and employers' profits.

The distribution of the surplus among those who participate in the productive process is a decision of an exclusively social character that does not depend on the microeconomic variables with which the Consumption Market is described. If the distribution between wages and incomes has a certain proportion, the origin of such a relation will have to be sought in the Capital Market, but it is certainly not found, nor can it be found, in the Consumption Market.

The Principle of Distribution was enunciated by Sraffa in "Production of Goods by Means of Other Goods" in 1959, where he showed that the distribution of the monetary surplus of enterprises between wages and profits of entrepreneurs does not affect prices and production.

The only doubt that may appear is related to the function that labor occupies within the mathematical structure of the theory, since the salary paid to a person can be considered as the expense that the company makes in the purchase of a merchandise called "labor" that is needed to carry out production. When the worker is considered as an entrepreneur who produces and sells his labor, then, although in appearance there are only companies and only entrepreneurs, the truth is that there are two distinct social classes, those who produce the commodity called "labor" and those who produce the rest of the goods or services, even though from the point of view of the mathematical structure labor is no different from any other commodity that is produced.

In such an economy, in which work is a simple commodity, society ceases to exist as a group of people who organize themselves with the intention of producing and sharing among all what is produced. Companies cease to be the place where all, employers and workers, collaborate to obtain what is necessary to live and it becomes a slave society. In a situation like the one described, what we have are two different types of "companies" that the mathematical structure does not distinguish between them, but that we, from the outside, are able to differentiate: the producers of work and the producers of the rest of the products or services. This is the situation so masterfully described by Karl Marx in "Capital" and which, sooner or later, will provoke a revolution as a consequence of the struggle of the working class to take over the means of production.

However, if we distribute the monetary surplus produced by enterprises following a social agreement between enterprise owners and workers, it is possible to overcome the separation of society into two social classes, even though this is the underlying mathematical structure that induces the use of money: a slave-owning social structure in which labor is paid as just another consumer good.

Fortunately, or unfortunately, the equations here are equally applicable to a society in which part of its members are slaves, as for example the society that built the Roman Empire, or to a society in which all people share equally in the ownership of enterprises. This is the reason why we see coexisting under the same capitalist system, nations that seem to have overcome the social struggle between workers and employer, together with other nations that seem to be authentic slave regimes that differ very little from the ancient Republic of Rome.

The responsibility for what is done with a knife can never be attributed to the knife, because the one who wields it is the only one responsible for the benefits or damages which its use may cause.

Monetary economies have undoubted advantages over other forms of organizing production and the distribution of the social surplus, but money can hardly be responsible for the use society makes of money.

It is true that the use of money imposes some constraints and has profound consequences on our way of organizing ourselves, for example, the Principle of Asymmetry or the Principle of Distribution are some of them, but the responsibility for turning the monetary economy into a slave society is solely human.

The last consequence of the presence of the two circuits we will call the Principle of Unequal Exchange, and because of its importance we will analyze it separately from the rest of the principles.

5. THE PRINCIPLE OF UNEQUAL EXCHANGE.

When one studies the difference in wages paid for different jobs in today's economies, two facts become clear:

a) The first one takes place within the same country and shows that the difference in salaries is always between different sectors, particularly between the primary sector and the rest of the sectors, with higher salaries in the latter.
b) The second curious fact occurs when wages in different countries are compared, and shows the different wages paid for the same work in non-industrialized countries and in industrialized countries, with higher wages in the latter.

Both facts have been well known for a long time in economics and we will see below how the Principle of Asymmetry allows us to explain without difficulty the origin of the capacity of industrialized countries to impose the purchase price of what non-industrialized countries produce, which is the same capacity of the secondary sector to fix the prices at which it buys the production of the primary sector within the same country. Let us note that the Principle of Asymmetry seems to indicate the opposite, since it states that it is the seller who sets the prices, which in this case is the primary producer. To this end, let us take a closer look at the example that is often used in this case: cocoa and chocolate production.

Cocoa is a primary product that is usually produced in less industrialized countries and chocolate is a secondary product that is usually produced in industrialized countries. It is not easy to understand why the wages of the people who work in the fields and produce cocoa are much lower than the wages of the people who work in the factories that produce chocolate, but that is what happens. The example serves very well to illustrate the problem because it draws without possibility of deception the real existence of "unequal exchange".

Cocoa is the raw material from which chocolate is made and its production has long been concentrated in countries with a low level of industrialization, such as the Ivory Coast, today's largest cocoa producer. In contrast to the countries where cocoa is grown, the countries that produce and market chocolate happen to be highly industrialized countries, such as Switzerland, the world's leading chocolate manufacturer and one of the countries with the highest per capita income in the world.

Therefore, it is very striking that the wages paid to day laborers who work in cocoa cultivation and harvesting and the wages paid to workers who process and package chocolate can be up to 10 times higher one than the other. This difference is impossible to justify rationally by alleging different productivity in the work performed by one and the other, since they are jobs with a similar level of specialization. Moreover, the greater or lesser use of machinery is a consequence of a greater or lesser industrialization of the activity and does not affect the work capacity of people. A chocolate factory can be much more industrialized than a cocoa plantation, but a person works the same in both activities and the final product, chocolate, needs both activities. We see that some other explanation is needed than simply stating that one job is more productive than another or denouncing the exploitation that the facts clearly show.

Let us now look, from the point of view of the Principle of Asymmetry, at the commercial relationship that exists between the chocolate manufacturers in Switzerland and the cocoa growers in Ivory Coast. Let us note that the former, the Swiss, are the buyers of cocoa and it is they who decide the quantity of cocoa they buy, while the latter, the Costa Ricans, are the sellers of cocoa and it is they who decide the price of the cocoa they produce. It would seem, therefore, that it is the Swiss who have the most to lose in the exchange between the two, since they are price takers and the Costa Ricans are not. Nothing could be further from the truth.

The Swiss only have to buy the right amount of cocoa to leave a surplus unsold on the chocolate market. In such a case, some cocoa producers will be left without selling what they have already produced, which necessarily drives prices down. The Swiss risk very little when they leave cocoa unbought because they are basically middlemen and, although no one denies that they have to bear fixed costs when processing cocoa into chocolate, the fact is that they lose little or nothing by not marketing as much chocolate as they could. Moreover, chocolate manufacturers can compensate for the decline in chocolate production by raising prices precisely because there is less chocolate for sale.

It is a completely different situation from that faced by cocoa producers, who have no choice but to sell what they have already produced, and which, thanks to the restricted purchase of cocoa from the Swiss, is almost always in surplus. The Swiss (the industrialized countries) can keep cocoa prices low by making cocoa production always in surplus, because it is they, according to the Principle of Asymmetry, who decide how much cocoa they buy and what will eventually be turned into chocolate. Although the result is just the opposite of what the Asymmetry Principle seems to lead to, it is the Swiss producers' use of their ability to decide the amount of cocoa they buy that allows them to force down the price of the cocoa they buy.

The result is applicable to the relationship that exists between the different links in any production chain, so that it is the workers engaged in producing the least processed goods who will have lower wages than the workers who produce the most processed goods. In economics, a very generic distinction is made between the primary sector and the secondary sector to distinguish unprocessed products from more processed products, and it is very eloquent to see that the difference in wages between these sectors is very real, although the difference is much better appreciated when comparing the wages of different countries.

Let us note that they are not in contradiction with the Principle of Asymmetry because the Swiss are not deciding at any time the price at which cocoa is sold. In fact, the price of cocoa is set downwards by the producers themselves: *the price of cocoa ends up being the minimum price that allows farmers to pay a survival wage, because it is from that moment on that cocoa production decreases without decreasing in price and the downward pressure mechanism stops working.* Evidently, the ultimate reason for the "unequal exchange" of labor created between the Swiss and Costa Ricans is none other than the lack of control by Costa Ricans over the amount of chocolate produced, which the Principle of Asymmetry states is set by the buyers, i.e. the Swiss chocolate manufacturers. This situation is aggravated by the absence of an alternative to cocoa cultivation. As a result of the lack of industrialization, cocoa-producing countries are unable to lower their cocoa production and to devote workers in the sector to other more productive sectors (in nominal terms), thus preventing prices from falling.

This is what happens with lumber produced in Canada or the Norwegian countries. If the wages paid in the timber sector go down, workers will migrate to other sectors allowing the production of timber to go down, but not allowing its price to go down. Blackmail on production, which forces wages in raw material production to fall below survival wages, does not work in industrialized countries because workers migrate to sectors with minimum wages well above survival wages, capable of absorbing the occasional surplus of work. Canada may someday be forced to reduce lumber production to zero because of low prices from foreign competition, but it will not lower wages in the sector in the process.

However, this is not the case in developing countries, which are often characterized by high unemployment, and where there are no alternative jobs to the commodity sector. In these countries, the only defense against the threat of declining sales is a drop in wages, which only stops when it reaches survival level.

UNEQUAL EXCHANGE. One of the disastrous consequences of the absolute domination of economists working for private universities in the United States over economic thought was the lack of dissemination of many of the advances made by Latin American economists in economics since the 1950s.

One of these advances, which was formalized in the so-called Latin American Structuralist Current, was the explanation given by the Argentine Raúl Prebisch and the German Hans Singer, to the growing deterioration of the terms of trade suffered by the third world countries with respect to the industrialized countries of the time. Singer first, and Prebisch later, had observed that the raw materials produced by the less developed countries were being exchanged for fewer and fewer processed products from the industrialized countries, attributing the process to the position of power enjoyed by the developed countries over the developing countries, which allowed them to reduce the relative prices of the raw materials they bought with respect to the processed products they sold, but without formulating a theory to explain the phenomenon.

Some time later, in the 1960s, the Greek economist Emmanuel Arghiri used the term "unequal exchange" to refer to the unequal exchange between countries, but unlike Prebisch and Singer, this time the exchange referred to trade between central and peripheral countries in a manner *very similar to the explanation we have given here to justify the origin of "Empty Spain" in the second chapter. Nor did Arghiri go so far as to formulate a theory of the facts, beyond denouncing the obvious exploitation implied by the unequal exchange between the countries of the center and the periphery, but he came very close.*

Here we are going to keep the term "unequal exchange" but referring not to the different exchange of production between countries and regions, as is usually the case, but rather to the different exchange of labor between countries, which is more accurate when we want to explain the causes of the phenomenon and formulate a theory about it. What interests us is not how many kilos of coffee a developing country exchanges for a car from an industrialized country, but rather how many hours of work are being exchanged between the two countries when they exchange coffee for cars (at equal monetary flow).

The problem of "unequal exchange" is a direct consequence of the existence of the division of the value chain that gives rise to the division of labor in monetary economies, beyond the inequalities of political origin that may exist within society. It manifests itself within the same country, regardless of whether or not it is an industrialized country, affecting wages in the primary sectors, especially in agriculture, but it is in trade between countries that unequal exchange becomes pure and simple exploitation.

If within the same country it is already difficult to control the process, being the main cause of wage deflation that pushes the population of the periphery towards the center, the problem between countries becomes chronic and impossible to solve because of the different legislation and different industrial development of each country. The trade specialization of an entire country in primary production condemns the country to below-average productivity, as opposed to a country specialized in processed products, which tend to have high productivity or purchasing power.

It is possible to define the exchange between two trading countries as the quotient between the average labor time used by each country to produce the same monetary flow of exchange, and it is also possible to define the same parameter relating any two sectors of the economy of the same country, but we will not do so here.

The important thing to understand is that industrialized countries should force less industrialized countries to increase the wages paid for the goods they buy until they are equal to those of the buying country. This would have two advantages, the first is that they would not have to protect their own products by putting tariffs on products that are manufactured more cheaply thanks to low wages, and the second is that it will prevent production from being offshored in search of low wages.

6. THE DIFFERENT EVOLUTIONARY PROCESSES OF AN ECONOMY.

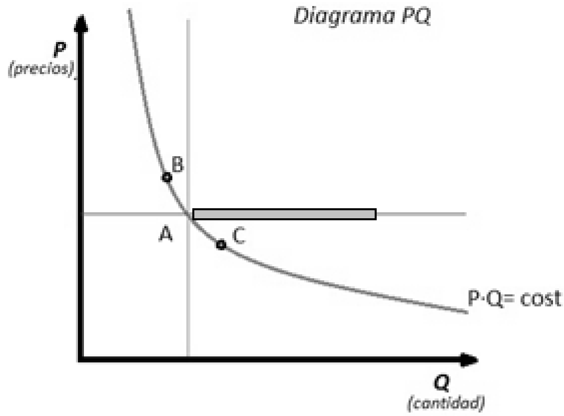
The reason why we have called "principles" what are the direct consequences of the equation of conservation of monetary flow in the model of simple production at constant yields, is none other than to facilitate the analysis of the problems that arise in the economy by helping us with a set of very solid and easily understood premises expressed in terms of the variables price and number of firms. It is the same thing that is usually done in the natural sciences when the Principle of Conservation of Matter, Conservation of Energy or other similar principles are formulated with the aim of analyzing very complex problems and arriving at accurate conclusions almost without a blink of an eye.

In this sense, it is possible to visualize graphically the different evolutionary processes that any economy can follow following as a guide the principles we have enunciated. To do so, let us express in a Cartesian diagram the nominal *GDP* of the economy, representing on the abscissa axis the average prices of the goods produced, and on the ordinate axis the average quantity of goods produced. $\overline{p}$ of the goods produced, and on the ordinate axis, the average quantity of goods exchanged during a period of time. $\overline{q}$ of goods that are exchanged during a period of time. The figure below shows the diagram explicitly.

When we point out in a "P-Q diagram" as described above, a generic point "A" as the initial state in which the economy is, from this point on, there are four evolutionary processes that are particularly well visualized thanks to the four quadrants into which the surface is divided when we draw the lines ($\overline{p} = const.$) y ($\overline{q} = const.$) passing through this generic initial state:

1) Stagflation", which is the term used to describe an economy that suffers inflation at the same time that its production decreases. It occupies the upper left quadrant.
2) Growth", which is the name we give to the evolution of an economy when at the same time that prices increase, production also increases. It occupies the upper right quadrant.
3) Deflation," which is what an economy is called when production declines, accompanied by a more or less persistent decline in the average price of products, is the result of a decline in the price of goods. $\bar{p}$ of products. It occupies the lower left quadrant.
4) Engels' pause, which is the name given to the evolution of an economy when real production grows, but accompanied by a very slight inflation of prices. It is the line that separates the two quadrants on the right into which the map has been divided, and which we have highlighted with a thick black line in the diagram. Its evolution is usually idealized with the line $\overline{p} = constante$although in practice there is always a slight inflation of prices.
5) The only region that remains unnamed is the lower right quadrant, and this is because according to the Principle of Asymmetry, an evolution in which prices fall and output rises is a process that cannot occur in reality. In fact, while deflation has occurred on many occasions for short periods of time, there is no record that real growth in the economy, at the same time as falling prices, has ever occurred.

In the attached figure we have also drawn the isoinput curve ($\overline{p} \cdot \overline{q} = const$) which passes through point "A" and represents the evolution of the economy when the nominal *IPA* does not change.



Let us explain in a little more detail what happens in the different evolutionary processes:

a) **Stanflation**

In an economy where the prices of goods are rising faster than the money supply is growing, it is inevitable that real output will fall because of rising prices and the economy will enter a process known as stagflation. Although the root cause that initiates the rise in prices may be manifold, however, the cause of the fall in output is always the same: *the money supply does not grow as fast as prices do*. Stagflation is a direct consequence of the Closure Principle:

$$PIA = \bar{p} \cdot \bar{q} = k_F \cdot M \;\rightarrow\; \frac{dM}{M} = \frac{d\bar{q}}{\bar{q}} + \frac{d\bar{p}}{\bar{p}} \;\rightarrow\; \frac{d\bar{q}}{\bar{q}} = \frac{dM}{M} - \frac{d\bar{p}}{\bar{p}} \;\xrightarrow{\frac{dM}{M} < \frac{d\bar{p}}{\bar{p}}}\; \frac{d\bar{q}}{\bar{q}} < 0$$

We see that, if prices grow faster than the money supply, the economy enters stagflation, i.e., real economic output falls amidst an apparent monetary abundance that pushes up prices. The relationship can be expressed more elegantly using the growth rates of the different variables:

$$\left.\begin{aligned} \tau_M &= \frac{1}{M}\frac{dM}{dt} \\ \tau_{\bar{p}} &= \frac{1}{\bar{p}}\frac{d\bar{p}}{dt} \\ \tau_{\bar{q}} &= \frac{1}{\bar{q}}\frac{d\bar{q}}{dt} \end{aligned}\right\} \rightarrow \quad \tau_{\bar{q}} = \tau_M - \tau_{\bar{p}} \quad \xrightarrow{\tau_M < \tau_{\bar{p}}} \quad \tau_{\bar{q}} < 0$$

The causes that can initiate a stagflation process are varied, but once it has started, it is the entrepreneurs and workers who maintain and increase it when they try to maintain the purchasing power of their incomes by raising prices. If deflations are bad, stagflations are just as bad, because the monetary mechanism that produces them is the same: *"the existing money supply is not capable of satisfying the monetary flow of exchanges demanded by the real production of the economy".*

<u>*STAGFLATION*</u>*. Understanding the internal mechanisms that set in motion a generalized rise in prices without a sufficient increase in the money supply to support it, is not complicated if we start from the following two statements whose validity we will demonstrate later on:*

The increase in money supply depends on the increase in credit granted by banks.

When there is high inflation, banks are reluctant to grant credit because, even at a negative real interest rate, the nominal interest rate is very high and it becomes very difficult to repay any credit.

The above two statements indicate that, despite the fact that economists usually attribute inflation to an increase in the money supply, the truth is that the presence of high inflation severely limits the granting of credit by banks and, therefore, limits the increase in the economy's money supply. In an environment of high inflation what usually happens is that, despite appearances, the necessary money is not being created for the nominal GDP of the economy to increase, which requires the rise in prices, which causes companies to start being destroyed (Principle of Closure):

$$poco\ credito \rightarrow M\ crece\ poco\ \rightarrow PIA\ nominal\ crece\ poco \rightarrow$$

$$\rightarrow PIA = \sum_{j,i=1}^{n} \lambda_j (2Q_{ji}^{o} - Q_{ji}) p_i \quad crece\ poco \rightarrow$$

$$\rightarrow \boxed{precios\ suben\ mucho\ \rightarrow\ numero\ de\ empresas\ baja}$$

When prices rise a lot and the money supply increases little, production decreases. We must understand that the terms "little" and "much" are relative.

Let us note that what the Asymmetry Principle states is that entrepreneurs will raise prices as a rise in their expenses threatens their profits and, therefore, their own survival. This is what happened when the price of oil rose in the 1970s and, in response, entrepreneurs also raised the prices of their products. The increased spending on fuel prices had to be offset by lower profits in non-producing countries, as more of the surplus had to be transferred as spending to the oil-producing countries. However, both entrepreneurs and workers in non-producing countries tried to maintain the purchasing power of their incomes, which was passed on to product prices and resulted in deep stagflation, especially in developing countries that were heavily indebted in dollars at the time and could not resort to borrowing to alleviate the oil bill (which would have bought time to restructure the redistributive process).

The rise in oil prices was so rapid, and the induced inflation so high, that the slowdown in bank credit prevented the increase in the money supply necessary to maintain the rise in prices and, therefore, the nominal increase in the *IPA* that would have made it possible to maintain the business fabric*. In any case*, the increase in credit could not have been maintained for long and, sooner or later, the dreaded stagflation will appear when the granting of credit comes to a halt.

To aggravate the international situation, the Federal Reserve raised the interest rate on loans in dollars, without any concern for the fact that the dollar was the reserve currency of the rest of the world, catching all the developing economies loaded with dollar debt and in a tailspin. It was impossible for the economies of the rest of the world to deal with the two fronts that had been created: "*The need for dollars to cushion the impact of the rise in oil prices and the payment of debt servitude in dollars*". Although the US managed to escape very well from the inevitable deflationary crisis caused by the rise in the dollar interest rate, it was nevertheless a real disaster for the rest of the economies which, by entering into stagflation with no possibility of return, condemned half of the world's population to underdevelopment. It is well understood that there is no good way out when entering an inflationary spiral, and that is the reason why <u>inflation must be prevented from getting out of control, at any price.</u>

b) **<u>Engels' Pause</u>**

The "Engels Pause" is a special case of evolution that describes an economy in which real production grows slowly because of the weak growth of the money supply and, therefore, of prices. Engels' pause is idealized with a straight line "$p = const$The Engels' pause is idealized with a straight line, "despite the fact that prices grow, because, although they grow, they grow very slowly.

It was the evolution that followed the economy during most of the nineteenth century and from where it takes its name, since it was the time that Friedrich Engels, German communist and socialist theorist, friend and collaborator of Karl Marx and founder of the Marxist current of economics, lived during the death of the latter. It is the economic evolution described in Capital and the reason why Engels and Marx wrote the Communist Manifesto.

Let us begin by understanding why it is not at all common (theoretically impossible) for production growth to be accompanied by a more or less generalized fall in prices. It is very easy for a seller to increase the prices of what he sells, since this means increasing his own profits, but it is very difficult for him to lower the prices of what he sells, since it is not he who decides the price of the goods he buys. This is what the Inflationary Principle states.

For this reason, the only way that a process of generalized lowering of prices can take place is when there is a good or service that all sectors need to buy to produce, that has an important weight in the expenditure of any company and that, of course, for some reason lowers its price. If such a good exists and its price falls, the economy will be able to lower prices across the board, but if these three conditions are not met, the economy will not be able to enter into a process of economic growth without inflation or with a slight fall in prices or deflation. For example, such a product would be oil, so that a generalized and persistent drop in the price of oil could lower prices (this has never happened), but so could wages, since this is a service that has a very important weight in prices and is used by all companies.

If wages fall, the price of all other goods can fall without a decline in profits and real output could grow without an increase in nominal *GDP* (or the flow of nominal trade or *PIA*). But why would wages fall? What would force workers to lower their wages? :

> *In a situation of high unemployment, it is not implausible for wages to stagnate or fall, while the economy as a whole achieves strong output growth, sustained by an environment of technological innovation and productivity growth.*

This is the situation that prevailed, at least, during the second and third quarters of the 19th century, when the industrial revolution produced increases in productivity unseen since the dawn of humanity. It was this miserable and sad epoch that wrote the Communist Manifesto and gave birth to Capital, and that is why it is known as *Engels' Pause* (that is how the economist Robert Allen named it, according to Pikety). But what was the cause of the chronic unemployment that occurred at the time, when technology and industrial development favored a continuous increase in the productivity of labor and, therefore, a strong need for work?

Let us analyze the situation from the perspective of the Asymmetry Principle and the Closure Principle:

1) The money supply cannot be increased because gold stocks cannot be increased, and without a banking system that assumes the creation of credit money backed by a central bank, bank bills cannot be used as money. Neither situation existed in the mid-nineteenth century, when the growth of the gold stock was conditional on its physical extraction and there was no central bank to guarantee bank deposits.
2) As a result of the use of the gold standard, monetary growth is limited by the growth of the quantity of gold, which prevents the nominal *IPA* from increasing at the rate that the strong real growth of the economy is printing.
3) The number of workers is increasing in the outskirts of large industrial cities because of the strong migration from the countryside to the city (empty Spain has been emptying for several centuries).
4) Strong technological innovation significantly increases physical productivity per worker. New inventions create new products and open up new markets, but, above all, they leave a considerable number of people unemployed when the old techniques most in need of work are abandoned (for example, looms powered by steam engines significantly reduce the number of people dedicated to the production of fabrics) and are replaced by others made with more machinery and less work.

Everything was in place at that time to create, out of sheer ignorance of capitalist dynamics, one of the greatest aberrations ever carried out by mankind:

> *"An economy of widespread hunger and misery thanks to stagnant wages, at a time when technology is incredibly increasing productivity and thus enabling widespread and sustained growth in wages, wealth and overall well-being."*

To understand what caused unemployment during the whole industrial revolution we have to understand the serious limitation to nominal growth that the Closure Principle imposes on a monetary economy. When we formulate the Closure Principle with the various growth rates involved, we have:

$$\tau_{\bar{q}} = \tau_M - \tau_{\bar{p}}$$

We see that if the real growth rate of the economy is large, the growth rate of the money supply is $\tau_{\bar{q}}$ is large, the growth rate of the money supply must be large enough to allow at least a slight inflation, since prices cannot fall. τ_M must be large enough to allow at least a slight inflation, since prices cannot fall. But if the rate of growth of the money supply is not endogenous, but depends on the physical extraction of gold, then the growth of production itself will be limited to a generalized fall in prices, even though prices cannot fall in a monetary economy.

In a monetary economy prices cannot fall unless a commodity or service that is used by all firms and is an important expense for all of them falls in price. And there is only one service that has these characteristics: *"labor"*. During the fifty years between 1830 and 1880, the epoch in which Engels lived, unemployment was chronic and an army of reserve workers survived in the midst of some of the most exuberant periods ever experienced by mankind. Economic growth at the time was limited throughout the period because of the monetary restriction imposed by the use of the gold standard. It was not until the 1880s, when the massive issuance of bank bills without gold backing allowed the economy to grow without restraint, that unemployment decreased significantly. Those were the years at the end of the 19th century, after Engels' Pause, the epoch that gave rise to the syndicalist revolution and the birth of social democracy.

One of the great merits of the economist Thomas Piketty's "Capital in the 21st Century" is to denounce in fluent prose the disastrous economic situation that existed throughout the industrial revolution. It is from his book that we have drawn many of the ideas we are expressing here:

> *The most important case, which I discussed briefly in the introduction, is undoubtedly the rise in the share of capital in income during the early stages of the Industrial Revolution, 1800-1860. In Britain, as far as we have the most complete data, the available historical studies, in particular those of Robert Allen (who gave the name "Engels' pause" for the long stagnation of wages), suggest that capital's share increased by something like 10 percent of national income, from 35 to 40 percent in the late 18th and early 19th centuries to around 45-50 percent in the middle of the 19th century, when Marx wrote the Communist*

Manifesto and went to work on capital. The sources also suggest that this increase was offset by a more or less comparable decline in the share of capital the period 1870-1900, followed by a slight increase between 1900 and 1910, so that in the end the share of capital was probably not very different at the turn of the twentieth century from what it was during the French Revolution and the Napoleonic era (see Figure 6.1). We can therefore speak of a "medium-term" movement rather than of a lasting long-term trend. However, this transfer of 10 percent of national income to capital during the first half of the nineteenth century was by no means insignificant: to put it in concrete terms, the lion's share of economic growth in this period went to profits, while wages-objectively-stagnated miserably. According to Allen, the main explanation for this was the exodus of labor from the countryside and into the cities, along with technological changes that increased the productivity of capital (reflected by a structural change in the production function), the vagaries of technology, in short order.

Thomas Piketty (Capital in the 21st Century)

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The most striking fact of the period was the misery of the industrial proletariat. Despite the growth of the economy, or perhaps partly because of it, and because, in addition, of the great rural exodus, due to both population growth and increased agricultural productivity, workers were crowded into urban slums. The working day was very long, and wages were very low. A new urban squalor emerged, more visible, more shocking, and in some respects even more extreme than the rural squalor of the Ancien Régime. Germinal, Oliver Twist, and Les Misérables did not spring from the imagination of their authors, any more than did the laws limiting child labor in factories to children over eight (in France in 1841) or ten in mines (in Britain in 1842). Tableau de l'état physique du Dr. Villermé et des morales ouvriers Employés dans les manufactures, published in France in 1840 (leading to the timid passage of a new child labor law in 1841), describes the same sordid reality of the condition of the Working Class in England, which Friedrich Engels published in 1845.

Thomas Piketty (Capital in the 21st Century)

7. DYNAMICS OF SELLER-BUYER ASYMMETRY

The formulation of the Asymmetry Principle has been obtained assuming that each agent spends as much as he earns, which is a rather demanding restriction within an economy. Although taxation does not prevent either the nominal growth of the economy or monetary transfers through savings, it does force both flows to cancel out and be identical for any of the sectors into which the economy has been divided:

$$y_i = x_i \quad \xleftrightarrow{y_i = x_i + ah_i + \frac{1}{k_F}\frac{dx_i}{dt}} \quad ah_i = -\frac{1}{k_F}\frac{dx_i}{dt} \qquad \text{(Say's Economics)}$$

The question arises as to what extent the conclusions we have reached, which we have summarized in the form of "principles", can be generalized to any monetary economy, whether or not it fulfills the demanding conditions we have imposed in order to demonstrate them.

In this sense, it must be clear that the causal line that relates some variables with others cannot depend on the restrictions we impose in the analysis. If in a particular case we show that prices depend on the decision that sellers make about the benefits they obtain from the sale, then this will always be so for any economy, regardless of whether or not the restrictions we imposed on the economy to reach the conclusion are being fulfilled.

It cannot happen, because it has no logic, that the fact that companies do not produce at constant yields or that some other circumstance related to the flow of savings changes, corporate profits cease to be the cause of prices or the number of companies ceases to be a consequence of people's consumption preferences.

That would not make any sense.

In spite of this, we will try to analyze to what extent the restrictions we have imposed on the economy can be relaxed to obtain the Asymmetry Principle, so that the latter remains valid and the variables continue to appear in the money circuit and the circuit of goods uncoupled. The conservation equation of money flow, without simplifications, is:

$$y_i = x_i + ah_i + \frac{1}{\mathrm{k_F}}\frac{dx_i}{dt}$$

The expression tells us that, in general, sales revenues in any industry are different from their expenditures on purchases, and the set of (N+2) equations dependent on prices and the number of firms is different from the one we obtained when we imposed equality between revenues and expenditures. Specifically, the set of equations is:

$$\underline{Ecuacion\ Vectorial\ de\ Conservación\ del\ Flujo\ Monetario}$$

$$\left(y_i - ah_i - \frac{1}{\mathrm{k_f}}\frac{dx_i}{dt} = x_i\right)$$

$$\underbrace{\boldsymbol{X} = \boldsymbol{G} \times \boldsymbol{I}}_{gastos}$$

$$\downarrow$$

$$\overbrace{x_i = \sum_{j=1}^{n} \lambda_i Q_{ij} p_j + \lambda_i B_i^{cap} + \lambda_i B_i^{trab}}$$

$$x^{cap} = \sum_{i=1}^{n} q_i^{cap} p_i$$

$$x^{trab} = \sum_{i=1}^{n} q_i^{trab} p_i$$

$$\underbrace{\boldsymbol{Y} = \boldsymbol{G}^{\boldsymbol{t}} \times \boldsymbol{I}}_{ingresos}$$

$$\downarrow$$

$$\overbrace{\lambda_i Q_{ii}^{o} p_i = \sum_{j=1}^{n} \lambda_j Q_{ji} p_j + q_i^{cap} p_i + q_i^{trab} p_i}$$

$$y^{cap} = \sum_{i=1}^{n} \lambda_i B_i^{cap}$$

$$y^{trab} = \sum_{i=1}^{n} \lambda_i B_i^{trab}$$

Let us note that the set of equations defining income through the expenditure matrix does not change and it is possible to decouple the commodity circuit in the general case, but the income expression shown by the conservation equation now does not allow decoupling the money circuit in the general case:

$$x_i \neq y_i \quad \rightarrow \quad x_i \neq \lambda_i Q_{ii}^{o} p_i$$

Without the restriction, the equations explicitly show the difference in treatment of the expenditure flow and the revenue flow in the general case, while the set of N equations on the right (the commodity circuit) remains exactly the same:

$$\lambda_i Q_{ii}^o - \sum_{j=1}^{n} \lambda_j Q_{ji} = q_i^{cap} + q_i^{trab} \xrightarrow{E_i = q_i^{cap} + q_i^{trab}} \boxed{\boldsymbol{\lambda} = (\boldsymbol{Q^o} - \boldsymbol{Q^t})^{-1} \cdot \boldsymbol{E}}$$

But now, in the general case, the money circuit changes so much that it is no longer possible to eliminate the variable number of firms from the equations. What interests us now is to try to decouple the dependence on the variable number of firms, and to recover the causal line that allowed us to formulate the Principle of Asymmetry (although it is not really necessary to do this to generalize its validity). To achieve this, we have to make the savings term and the time derivative of the expenditure dependent on the number of firms.

$$\lambda_i Q_{ii}^o p_i - ah_i - \frac{1}{\mathrm{k_f}} \frac{dx_{\boldsymbol{i}}}{dt} = \sum_{j=1}^{n} \lambda_i Q_{ij} p_j + \lambda_i B_i^{cap} + \lambda_i B_i^{trab}$$

The components of the savings vector are not problematic. A very reasonable assumption is to accept that the aggregate savings of any sector is the sum of the typical savings of each of them. ah_i of any sector is the sum of the typical savings of each of them. In such a case, the credit or savings needs of any sector is proportional to the number of basic companies in the sector and to the credit or savings needs of each basic company. In other words:

$$ah_i = \lambda_i ah_i^{tipo}$$

It has the functional form we are looking for, so the term does not give any problems.

The problem comes from the differential term $\frac{1}{\mathrm{k_f}} \frac{dx_i}{dt}$ which needs to be made to depend also on the number of firms in the sector, which will only be true to a first approximation when we assume that the number of basic firms changes slowly (although this is cheating, since it assumes what you want to prove, that output does not change):

$$\frac{dx_i}{dt} = \frac{d}{dt}\left(\sum_{j=1}^{n} \lambda_i Q_{ij} p_j + \lambda_i B_i\right) = \lambda_i \left(\sum_{j=1}^{n} Q_{ij} \frac{d}{dt} p_j + \frac{d}{dt} B_i\right) + \frac{d\lambda_i}{dt}\left(\sum_{j=1}^{n} Q_{ij} p_j + B_i\right)$$

Therefore, when we assume that the number of basic firms changes very slowly, the second term is very small and we can eliminate it:

$$\xrightarrow{\frac{d\lambda_i}{dt}=\mathbf{0}} \qquad \frac{dx_i}{dt} = \lambda_i\left(\sum_{j=1}^{n} Q_{ij}\frac{d}{dt}p_j + \frac{d}{dt}B_i\right)$$

In such a case, we can decouple the two systems of equations with respect to the variable prices and quantity of firms and recover the causal line that we have named the Principle of Asymmetry. The equation dependent on the variable prices is now left:

$$Q_{ii}^{o}p_i = \sum_{j=1}^{n} Q_{ij}p_j + B_i + ah_i^{tipo} + \frac{1}{\mathrm{k_f}}(\sum_{j=1}^{n} Q_{ij}\frac{d}{dt}p_j + \frac{d}{dt}B_i)$$

In which it is very clear that the dependence is much more complicated than the one we obtained before, although prices still depend only on profits, because they are the only two variables that appear in the expressions.

It can also be observed that the causal line is recovered when we assume that expenditure in each sector does not change over time, although income and savings may change. In such a case the variation of the expenditure vector is zero and the expression relating prices to profits is:

$$\boxed{\frac{dx_{\boldsymbol{i}}}{dt} = 0} \rightarrow \qquad Q_{ii}^{o}p_i = \sum_{j=1}^{n} Q_{ij}p_j + B_i + ah_i^{tipo} \rightarrow \quad \boldsymbol{P} = (\boldsymbol{Q}_0 - \boldsymbol{Q})^{-1} \times (\boldsymbol{B} + \boldsymbol{Ah})$$

Which is a more general result that can be arrived at when the change in savings is taken into account, and contains as a particular case the equality between income and expenditure. It tells us that prices depend on the value of the **profits available to** each basic firm in the sector:

$$Beneficio\ Disponible = b_i + ah_i$$

$$b_i + ah_i \uparrow \rightarrow\ decrecimiento\ de\ los\ precios\ del\ sector\ i$$
$$b_i + ah_i \downarrow \rightarrow\ crecimiento\ de\ los\ precios\ del\ sector\ \ i$$

It is observed that the expression allows the price of what a sector produces to go down at the cost of the sector's indebtedness ($ah_i < 0$), i.e., it allows credit dumping. It is logical, if expenditure does not change and income falls, then the only possibility is that the sector is borrowing, there is no other way.

Never have so few done so much harm to so many. *We have lived for centuries in a monetary economy where money matters a lot.*

If we open "Samuelson" or "Mankiw", books on macroeconomics that serve as a guide for university teaching of the discipline, we will be astonished to find that money does not seem to exist in today's society, despite the fact that it is practically impossible to live without a credit card in any country in the world. For economists working for private universities in the United States, we do not seem to live in a monetary economy but in a barter economy.

Engels' Pause is perhaps the most evident manifestation of the bad use that can be made of money in monetary economies. We see how a society immersed in a revolution of productivity unprecedented in the history of mankind, which should have as a consequence the increase of wages and the generalized increase of the welfare of the whole population, is condemned to generalized unemployment and to the decrease of the purchasing power of wages, reaching unthinkable levels of human misery. All this, as a consequence of limiting the increase of the monetary mass, either by the imposition of the gold standard or by restrictive policies.

Wage stagnation is by far the most damaging and miserable manifestation of the austerity imposed in the 19th century by the gold standard and which, today, economists working for private universities in the United States defend in their books as the ideal option for the material progress of humanity.

CHAPTER 6

THE REASON SRAFFA PATTERN

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1. INTRODUCTION

In the previous chapter we have developed a complete theory of price formation within monetary economies, showing that the decisions made by those who sell and those who buy influence very differently the setting of prices and the quantity of goods produced. But, although we have analyzed many of the consequences of the different nature of buyers and sellers because of money, we have not found any way to compare monetary economies that produce similarly with different prices and number of firms.

In this sense, we will now continue the work of Piero Sraffa in the book published in 1956, "Production of commodities by other commodities", but from a more general point of view and without limiting ourselves with the premises that Sraffa was forced to use.

We will begin by finding the concrete expression of the monetary surplus in an economy of simple production at constant yields, in which we will impose, as we have been doing, that any agent spends all the income he obtains. Then, we will use the expression to find what is the vector of prices and the vector number of firms that make this monetary surplus minimum. Our intention, like Sraffa, is to find a unique or special point at which the economy can operate (even if it does not operate there in reality), which allows us to compare equivalent economies when they operate differently.

2. MONETARY SURPLUS

Let us begin by finding the expression of the monetary surplus as a function of price and quantity of basic enterprises when two basic assumptions are met in the economy:

1) Simple Production Economy at Constant Yields.
2) Economy where the income of any agent is spent entirely on purchases of goods and services.

$$y_i = x_i$$

The monetary surplus of an economy is understood as the monetary flow dedicated to consumption that is not necessary to maintain production. The definition is somewhat imprecise because it is not easy to distinguish which part of consumption is necessary and which is not. For example, money spent on food is considered here as part of the surplus, although it is clear that if people do not eat, the economy cannot function. Here, we will identify surplus with the flow of people's income, which includes income from labor and income from profits. To obtain it, let us first recall that the functional form of the income and expenditure matrices $\boldsymbol{Y}$ and expenditure $\boldsymbol{G}$ for a simple production economy at constant returns depends on the number of firms, prices and technical coefficients**:**

$$\boldsymbol{Y} = \begin{bmatrix} \lambda_1 Q_{11}^o p_1 \\ \vdots \\ \lambda_n Q_{nn}^o p_n \\ y^{trab} \\ y^{cap} \end{bmatrix}$$

$$
\boldsymbol{G} = \begin{bmatrix} \begin{vmatrix} \lambda_1 Q_{11} p_1 & \cdots & \lambda_1 Q_{1n} p_n \\ \vdots & \cdots & \vdots \\ \lambda_n Q_{n1} p_1 & \cdots & \lambda_n Q_{nn} p_n \end{vmatrix} & \begin{vmatrix} \lambda_1 B_1^{trab} & \lambda_1 B_1^{cap} \\ \vdots & \vdots \\ \lambda_n B_n^{trab} & \lambda_n B_n^{cap} \end{vmatrix} \\ \begin{vmatrix} q_1^{trab} p_1 & \cdots & q_n^{trab} p_n \\ q_1^{cap} p_1 & \cdots & q_n^{cap} p_n \end{vmatrix} & \begin{vmatrix} 0 & 0 \\ 0 & 0 \end{vmatrix} \end{bmatrix}
$$

The expenditure matrix ***G*** is divided into four zones that have a very specific economic meaning. The first quadrant, above and to the left, contains all the expenditure flows generated by the exchanges between the basic firms present in the economy. The second quadrant, above and to the right, contains the profit flows that firms spend on paying workers' incomes (wages) and employers' profits (rents). Finally, the third quadrant, below and to the left, contains the spending preferences of workers and entrepreneurs in the purchase of goods from the basic firms.

Now, let us impose on each agent that his income is equal to his expenditure, i.e., that firms, workers and entrepreneurs, each of them meet that $x_i = y_i$. This allows us to find the expression that relates the benefits or monetary surplus $B(\lambda_i, p_i)$ to the $PIA(\lambda_i, p_i)$but as a function of the new variables, i.e., prices, number of firms and technical coefficients,

$$
\left.\begin{array}{l}
\left.\begin{array}{l} x^{trab} = \sum_{i=1}^{n} q_i^{trab} p_i \\ y^{trab} = \sum_{i=1}^{n} \lambda_i B_i^{trab} \end{array}\right\} \xrightarrow{x^{trab}=y^{trab}} \sum_{i=1}^{n} q_i^{trab} p_i = \sum_{i=1}^{n} \lambda_i B_i^{trab} \\
\left.\begin{array}{l} x^{cap} = \sum_{i=1}^{n} q_i^{cap} p_i \\ y^{cap} = \sum_{i=1}^{n} \lambda_i B_i^{cap} \end{array}\right\} \xrightarrow{x^{cap} x_i=y^{cap}} \sum_{i=1}^{n} q_i^{cap} p_i = \sum_{i=1}^{n} \lambda_i B_i^{cap}
\end{array}\right\} \rightarrow
$$

$$
\rightarrow \left\{ beneficios = \overbrace{\sum_{i=1}^{n} q_i^{trab} p_i + \sum_{i=1}^{n} q_i^{cap} p_i}^{\substack{gastos \\ trabajadores\ y\ empresarios}} = \underbrace{\sum_{i=1}^{n} \lambda_i B_i^{trab} + \sum_{i=1}^{n} \lambda_i B_i^{cap}}_{\substack{ingresos \\ trabajadores\ y\ empresarios}} \right.
$$

Using the second expression, we have for the surplus:

$$\boxed{B(\lambda_i, p_i) = \sum_{i=1}^{n} \lambda_i Q_{ii}^{o} p_i - \sum_{i,j}^{n} \lambda_i Q_{ij} p_j}$$

Where $B(\lambda_i, p_i)$ is the monetary surplus of the whole economy, which is shared between workers and employers. In addition, the following expressions can be shown to be valid:

1) Provided that $x_i = y_i$, the aggregate cash flow, or *PIA*, can be expressed as :

$$PIA(\lambda_i, p_i) = \sum_{j,i}^{n} \lambda_i Q_{ij} p_j + 2 \cdot B(\lambda_i, p_i)$$

Expression obtained by simply adding each of the terms of the expenditure matrix and equaling the income and expenditure of workers and employers. $\boldsymbol{G}$ and equaling the income and expenditure of workers and employers.

2) Using the latter expression, and eliminating from it the benefits, we obtain:

$$PIA = 2\sum_{i}^{n} \lambda_i Q_{ii}^{o} p_i - \sum_{j,i}^{n} \lambda_i Q_{ij} p_j$$

3) Using the last two expressions and eliminating the terms in which the coefficients of the matrix appear, we obtain the expression that links the PIA with the profits or monetary surplus: "PIA". $\boldsymbol{Q}$ we obtain the expression that links the PIA with the profits or monetary surplus:

$$\boxed{PIA(\lambda_i, p_i) = B(\lambda_i, p_i) + \sum_{i}^{n} \lambda_i Q_{ii}^{o} p_i}$$

This last expression is remarkable, since it tells us that, in an economy of simple production at constant returns, and provided that all income is spent, the *PIA* of the economy is equal to the sum of all income earned by the basic enterprises plus the profits or monetary surplus:

MONETARY SURPLUS. In an economy of simple production at constant returns, and provided that all income is spent, the PIA of the economy is equal to the sum of the income and profits earned by the basic enterprises:

$$PIA(\lambda_i, p_i) = B(\lambda_i, p_i) + \sum_{i}^{n} \lambda_i Q_{ii}^{o} p_i$$

Where $B(\lambda_i, p_i)$ *is the monetary surplus (or profit):*

$$B(\lambda_i, p_i) = \sum_{i=1}^{n} \lambda_i Q_{ii}^{o} p_i - \sum_{i,j}^{n} \lambda_i Q_{ij} p_j$$

The latter expression makes it possible to calculate the *IPA* with knowledge of *GDP* without much difficulty.

3. THE MINIMUM MONETARY SURPLUS

Now, using the expressions we have found for the *PIA* and for the monetary surplus, we can ask what are the components of the vector of prices ***P*** and the components of the vector quantity of firms λ that make the monetary surplus of firms maximum or minimum $B(\lambda_i, p_i)$ keeping *PIA* constant. That is, we want to know which values of prices and of the quantity of firms make maximum or minimum monetary surplus, or the sum of the income flows of workers and entrepreneurs, always assuming that the *PIA* of the economy remains unchanged. The problem, thus posed, is equivalent to posing a maximization problem that can be solved very easily by resorting to the Lagrange Multipliers method.

As a reminder of the Lagrange Multipliers Method for maximizing or minimizing a function with restrictions, we will explain it as we apply it to the particular economic problem that concerns us here. We want to maximize, or minimize, the monetary surplus of a simple production economy at constant returns in which it is satisfied that each agent's expenditure is equal to his income and subject to the restriction that the *PIA* is constant.

<u>LAGRANGE MULTIPLIERS</u>. Given the business profit function $B(\lambda_i, p_i)$ *which depends on 2N variables* λ_i y p_i *which is to be maximized (or minimized) subject to* the *constraint expressed by equation* $g(\lambda_i, p_i) = 0$ *which is also a function of the 2N variables* λ_i y p_i *then the values of* λ_i y p_i *which maximizes (or minimizes) the objective function* $B(\lambda_i, p_i)$ *are also a solution of the system of 2N+1 equations given by:*

$$\begin{cases} \dfrac{\partial B(\lambda_i, p_i)}{\partial \lambda_i} + \eta_S \dfrac{\partial g(\lambda_i, p_i)}{\partial \lambda_i} = 0 & (N\ ecuaciones) \\ \dfrac{\partial B(\lambda_i, p_i)}{\partial p_i} + \eta_S \dfrac{\partial g(\lambda_i, p_i)}{\partial p_i} = 0 & (N\ ecuaciones) \\ g(\lambda_i, p_i) = 0 & (restrincion) \end{cases}$$

Where the parameter η_S *is given the generic name of the Lagrange multiplier of the maximization (or minimization)* $problem$ *posed.*

In the particular economic problem at hand, the objective function we want to maximize (or minimize) is the one that expresses the monetary surplus of the economy as a function of prices and the number of basic companies, and which is equal to the company profits shared between workers and entrepreneurs:

$$B(\lambda_i, p_i) = \sum_{i=1}^{n} \lambda_i Q_{ii}^{o} p_i - \sum_{i,j=1}^{n} \lambda_i Q_{ij} p_j \qquad \leftarrow \Big|\begin{matrix} maximizar \\ o\ minimizar \end{matrix}$$

Subject to the restriction that the *PIA* does not change and is a constant of the economy, which is expressed by saying that the restriction $g(\lambda_i, p_i) = 0$ is given in our case by the expression:

$$g(\lambda_i, p_i) = PIA - 2\sum_{i}^{n} \lambda_i Q_{ii}^{o} p_i + \sum_{j,i}^{n} \lambda_i Q_{ij} p_j = 0 \quad (restrincion)$$

Both expressions, the function to be maximized or minimized and the constraint, meet the necessary conditions that allow us to apply the Lagrange Multipliers Method and find the system of equations that must satisfy the variables λ_i y p_i that maximize or minimize the expression of the company's profits $B(\lambda_i, p_i)$ when the PIA is constant:

$$\begin{cases} \dfrac{\partial B(\lambda_i,p_i)}{\partial \lambda_i} + \eta_S \dfrac{\partial g(\lambda_i,p_i)}{\partial \lambda_i} = 0 \;\rightarrow\; Q_{ii}^{o}p_i - \displaystyle\sum_{j=1}^{n} Q_{ij}p_j - \eta_S \left(2Q_{ii}^{o}p_i - \sum_{j}^{n} Q_{ij}p_j \right) = 0 \\ \dfrac{\partial B(\lambda_i,p_i)}{\partial p_i} + \eta_S \dfrac{\partial g(\lambda_i,p_i)}{\partial p_i} = 0 \;\rightarrow\; \lambda_i Q_{ii}^{o} - \displaystyle\sum_{j=1}^{n} \lambda_j Q_{ji} - \eta_S \left(2\lambda_i Q_{ii}^{o} - \sum_{j=1}^{n} \lambda_j Q_{ji} \right) = 0 \\ g(\lambda_i,p_i) = 0 \;\rightarrow\; PIA - 2\displaystyle\sum_{i}^{n} \lambda_i Q_{ii}^{o} p_i + \sum_{j,i}^{n} \lambda_i Q_{ij} p_j = 0 \end{cases}$$

Where the constant η_S is the Lagrange multiplier associated with the constraint that the IPA remains constant. It is not complicated to demonstrate that, from an economic point of view, the multiplier η_S is the quotient between B_{min} the minimum value of the monetary surplus that can be obtained from a simple production economy at constant yields producing with given technical coefficients and the IPA of the economy. To do this, we take the first set of N equations and multiply it by the variable number of firms, and add it up:

$$\xrightarrow{\times\lambda_i} \quad \lambda_i \times \left\{ \quad Q_{ii}^{o}p_i - \sum_{j=1}^{n} Q_{ij}p_j - \eta_S \left(2Q_{ii}^{o}p_i - \sum_{j}^{n} Q_{ij}p_j \right) = 0 \quad \right\} \xrightarrow{\sum\{\dots\}}$$

$$\rightarrow \left(\sum_{i=1}^{n} \lambda_i Q_{ii}^{o} p_i - \sum_{i,j=1}^{n} \lambda_i Q_{ij} p_j \right) - \eta_S \left(2\sum_{i=1}^{n} \lambda_i Q_{ii}^{o} p_i - \sum_{i,j=1}^{n} \lambda_i Q_{ij} p_j \right)$$

Now η_S is the quotient between two summations that have a very precise meaning, when we identify the monetary surplus with nominal *GDP:*

$$\left. \begin{aligned} PIB &= \sum_{i=1}^{n} \lambda_i Q_{ii}^{o} p_i - \sum_{i,j=1}^{n} \lambda_i Q_{ij} p_j \\ PIA &= 2\sum_{i=1}^{n} \lambda_i Q_{ii}^{o} p_i - \sum_{i,j=1}^{n} \lambda_i Q_{ij} p_j \end{aligned} \right\} \rightarrow \eta_S = \frac{PIB}{PIA}$$

Furthermore, demonstrating that the extreme point associated with the Lagrange multiplier is a minimum and not a maximum, as might be expected, is not very complicated either, so that the multiplier tells us what the minimum monetary surplus is in an economy that produces with certain production techniques (the technical coefficients of the matrices Q y Q^o) and when the nominal *PIA* does not change:

$$\eta_S = \frac{PIB_{mín}}{PIA} \qquad (\eta_S \equiv Eficiencia\ de\ Sraffa)$$

The parameter η_S we call it Sraffa Efficiency because, as we shall see in a moment, it is closely related to the "Standard Ratio" used by the Italian economist Pietro Sraffa in his work "Commodity Production by Means of Commodities". For any given economy characterized by the technical matrices $\boldsymbol{Q^o}$ y $\boldsymbol{Q}$the monetary surplus with which it produces is always greater than the minimum expressed by Sraffa's Efficiency:

$$\eta = \frac{PIB}{PIA} > \eta_S \quad \leftrightarrow \quad PIB \geq PIB_{mín}$$

The result is somewhat counter-intuitive. The expression tells us that, when the *PIA* remains constant and unchanged, the nominal *GDP* of the economy can come as close as one wants to the value of the *PIA,* but, nevertheless and contrary to expectations, a monetary economy has a minimum monetary surplus or $PIB_{mín}$ which cannot be diminished, whatever the prices at which it is sold or whatever the number of firms producing.

<u>A MAXIMUM OR A MINIMUM?</u> Although it may seem strange, the monetary surplus (of a monetary economy (which here we are identifying with GDP, although strictly speaking the identification is not correct) has a minimum from which it cannot fall, and not a maximum, as we might initially expect if we allow ourselves to be carried away by appearances.

This result is of enormous importance that the brevity of this treatise prevents us from analyzing in depth, since there will be no structural impediment for the nominal profits of any one sector to rise at the expense of the nominal profits of another sector, without affecting the total nominal surplus of the economy.

Note that this result implies that, given an economy consisting of any two countries, the surplus sharing between the two countries can be any and is not subject to any structural constraint, while the productive surplus GDP relative to the IPA itself must always remain above a minimum.

4. SRAFFA'S PATTERN REASON

If we take the system of 2N+1 Lagrange equations found in the previous section and skip a few intermediate steps that add nothing new, but slow down the explanation a lot, we can regroup the terms of each expression and obtain the same system of equations expressed in a slightly different way:

$$\frac{(1-\eta_S)}{(1-2\eta_S)} \cdot \sum_{j=1}^{n} \lambda_j q_{ji} = \lambda_i Q_{ii}^{o} \qquad (variable\ \ \lambda_i)$$

$$\frac{(1-\eta_S)}{(1-2\eta_S)} \cdot \sum_{j=1}^{n} q_{ij}\, p_j = Q_{ii}^{o} p_i \qquad (variable\ \ p_i)$$

$$PIA = 2\sum_{i}^{n} \lambda_i Q_{ii}^{o} p_i - \sum_{j,i}^{n} \lambda_i Q_{ij} p_j \qquad (restrinción)$$

The new way of expressing the same system of equations makes it possible to easily identify the two sets of *N* equations with the two systems of equations derived by Sraffa in his work "Production of Goods by other Goods".

Let us note that the first set of N equations, those that depend on the variable number of companies, is the same system of equations that Piero Sraffa uses to obtain the "Standard Ratio". R and which he calls "Standard System":

$$(1+R) \cdot \sum_{j=1}^{n} \lambda_j q_{ji} = \lambda_i Q_{ii}^{o} \qquad (Sistema\ Patrón)$$

If we identify both expressions, the one we have obtained here and the one obtained by Sraffa in his search for the standard commodity we have that:

$$\frac{(1-\eta_S)}{(1-2\eta_S)} = 1+R$$

Moreover, it is also possible to identify the second set of N Lagrangian equations, those that depend on the price variable, with the N equations used by Sraffa to obtain the maximum profit rate of each basic firm, equal for all of them, when workers are paid a zero wage $r_{máx}$ of each basic firm, equal for all of them, when workers are paid a zero wage:

$$(1 + r_{máx}) \cdot \sum_{i=1}^{n} q_{ki}\, p_i = Q_{kk}^{o} p_k \qquad (salario\ nulo)$$

If we identify both expressions, the one we have obtained here and the one obtained by Sraffa in his search for the maximum profit rate we have that:

$$\frac{(1 - \eta_S)}{(1 - 2\eta_S)} = 1 + r_{máx}$$

Piero Sraffa demonstrates in his work, as it could not be otherwise, that the pattern ratio and the maximum rate of return are the same. R and the maximum rate of profit $r_{máx}$ are equal. This is not at all evident in itself, since for such a coincidence to occur, Piero Sraffa forces the demonstration by accepting the validity of two very debatable hypotheses:

1. It defines the "*profit rate*" of any basic company as *"the ratio of monetary profit to monetary expenditure, but not including wages",* which is a slight departure from the usual definition of the profit rate, which usually includes wages as an additional company expense.

   Assumes that, whatever the rate of profit, its value is the same for all the basic companies.

The first hypothesis, the definition of the rate of profit, although a completely arbitrary definition, is not, in itself, more objectionable than other more usual definitions of the rate of profit in which wage costs are included in the calculation of the rate of profit. The definition can be considered a matter of taste and its acceptance does not change the substance of the conclusions Sraffa reaches.

Quite different is the second hypothesis, which is completely unacceptable. There is no empirical or theoretical justification for assuming that the rate of profit, whether as defined by Sraffa or other more usual ones, must be equal in all industries. The assumption, first postulated by the Scottish economist David Ricardo some 150 years ago, has been held to be true ever since and is still accepted as valid by all economists today, although the reason for such a strange consensus in a discipline in which all economists disagree on almost everything is unclear.

Sraffa's starting hypothesis, which is also that of all economists, assumes as a matter of course that the entrepreneur derives his profits from the risk he assumes when he advances the money necessary to carry out production. Without the advance of the money, or investment, production cannot take place, and without the assumption that the money will be invested in the enterprises which will produce the highest rate of profit, the rate of profit will not be equalized in all industries. The reasoning is very easy to follow:

> *"...money moves freely and will go to the companies that produce the most profit, so that when money attracted by higher profit increases the number of companies, production will also increase, inevitably lowering the price of what it sells and, therefore, lowering its higher profit which will end up being equalized with that of the rest of the companies..."*
>
> *David Ricardo*

The reasoning was made, for the first time, by David Ricardo and has been considered an indisputable postulate of economics ever since, in such a way that no one has ever questioned it. It is very clear that the reason for defining the rate of profit as the quotient between money advanced and surplus money is none other than to justify the origin of the profit received by the entrepreneur, and not so much to justify that *"the rate of profit tends to equalize in all industries"*. Therefore, it is not surprising that Piero Sraffa uses in his work the rate of profit and its equalization in all industries without even questioning it. Although in his defense we must mention that Karl Marx not only does not question it either, but uses it to demonstrate that this profit comes from the exploitation of wage labor, or surplus value.

Be that as it may, the pattern reason R obtained by Piero Sraffa is a gift that we can neither reject nor overlook, since it allows us to give economic meaning to the Lagrange multiplier η_S in the analysis we are doing. If we call r_j the quotient between the monetary surplus of a generic industry and its monetary expenditure, and call the quotient between the surplus quantity of a generic industry and its monetary expenditure, and call R_j the quotient between the surplus quantity of a generic commodity and the quantity of that commodity that is spent in all industries, we have just shown that when the economy produces with the minimum possible monetary surplus, all of them have the same value. RSraffa's standard ratio:

$$R = r_j = \frac{(excedente\ monetario)_j}{(gasto\ monetario)_j} = \frac{(excedente\ producto)_i}{(gasto\ producto)_i} = R_i \qquad \forall\ i, j$$

As has become customary, we express this statement as a principle:

<u>SRAFFA'S MONETARY EFFICIENCY</u>. A monetary economy subject to the restriction that the PIA be constant, is said to be producing with the minimum possible monetary surplus when, for any good, the quotient between the surplus produced and the consumption of the surplus used to produce it, measured both in monetary terms and in terms of quantity of product, has the same value, the standard Sraffa ratio R:

$$R = r_j = \frac{(excedente\ monetario)_j}{(gasto\ monetario)_j} = \frac{(excedente\ producto)_i}{(gasto\ producto)_i} = R_i \qquad \forall\ i, j$$

In such a case, the minimum monetary surplus is given by the expression $B_{mín}$ is given by the expression:

$$\eta_S = \frac{B_{mín}}{PIA} = \frac{R}{1+2R} \qquad (\eta_S \equiv Eficiencia\ de\ Sraffa)$$

Where η_S is the Sraffa Efficiency.

From the macroeconomic point of view, the "Employer Ratio R_S is the minimum possible quotient between *GDP* (the income of workers together with the income of employers) and the combined monetary expenditure of all basic enterprises (excluding labor) when the *PIA* of the economy has a given value:

$$\frac{(1-\eta_S)}{(1-2\eta_S)} = 1 + R \rightarrow\ R = \frac{\eta_S}{(1-2\eta_S)} = \frac{\frac{PIB}{PIA}}{1 - 2\frac{PIB}{PIA}} = \frac{PIB}{PIA - 2PIB} \rightarrow$$

$$R = \frac{flujo\ monetario\ excedentario}{flujo\ monetario\ inter\ empresarial}$$

What is really remarkable about Sraffa's analysis is that the standard ratio is a ratio between quantities of goods of a very disparate nature. R is a quotient between quantities of goods of a very disparate nature, so it is very difficult to understand what relationship the physical world of quantities produced by basic firms has with the financial world and its monetary flows. Now we know. Piero Sraffa's mistake was the same one made by Karl Marx and the same one made by all economists today: *"to believe that the rate of profit really exists and that it is equalized over time in all industries"*.

5. THE PRINCIPLE OF CLOSURE

In the previous topic we already commented on the great importance for economics of the Closure Principle as a complement to the Asymmetry Principle. Although it is only now, by using it explicitly as a restriction to obtain the value of the variables that minimize the monetary surplus, that we begin to glimpse the profound consequences it has on the economy:

$$k_F \cdot M = PIA = const. \quad \rightarrow \quad PIA - 2\sum_{i}^{n} \lambda_i Q_{ii}^{o} p_i \; - \sum_{j,i}^{n} \lambda_i Q_{ij} p_j = 0$$

Although on the surface the *IPA* is a function of the variables λ_i, p_i, Q y Q^ovariables, the truth is that the monetary equation tells us that it is a constant independent of all variables insofar as the money supply is. Hence its importance:

$$PIA \neq F(\lambda_i, p_i, Q_i)$$

Therefore, in practice, the expression becomes a macroeconomic binding that the different variables appearing in the expression must comply with. Hence, the importance of the Closure Principle and the reason for using it as a condition to obtain the Lagrange multiplier associated with the monetary surplus of the economy.

We can again appreciate the latent influence of the Closure Principle if we manipulate the set of Lagrange equations a little more and define a new parameter:

$$\omega = \frac{(1 - 2 \cdot \eta_S)}{(1 - \eta_S)} \qquad\qquad 0 < \omega < 1$$

Now, finding the minimum monetary surplus of an economy becomes the problem of calculating the maximum eigenvalue of the matrix ω of the matrix $\boldsymbol{Q} \times \boldsymbol{Q^{o}}^{-1}$dependent on the technical coefficients. Specifically:

THE LAGRANGE EQUATIONS:

$$\{0 < \omega < 1\}$$

$$\begin{cases} \sum_{i=1}^{n} \lambda_i Q_{ik} - \omega \lambda_k Q_{kk}^{o} = 0 & \leftrightarrow \quad \boldsymbol{\lambda} \times \left[\boldsymbol{Q} \times \boldsymbol{Q^{o}}^{-1} - \omega \boldsymbol{I}\right] = 0 \\ \sum_{i=1}^{n} Q_{ki}\, p_i - \omega Q_{kk}^{o} p_k = 0 & \leftrightarrow \quad \left[\boldsymbol{Q^{o}}^{-1} \times \boldsymbol{Q} - \omega \boldsymbol{I}\right] \times \boldsymbol{P} = 0 \end{cases}$$

$$PIA = 2\sum_{i}^{n} \lambda_i Q_{ii}^{o} p_i - \sum_{j,i}^{n} \lambda_i Q_{ij} p_j = \leftrightarrow \quad PIA = \boldsymbol{\lambda} \times (\boldsymbol{2Q^{o}} - \boldsymbol{Q}) \times \boldsymbol{P}$$

Where Sraffa's standard ratio is $R_S = \frac{1-\omega}{\omega}$ *and the Sraffa efficiency is,* $\eta_S = \frac{1-\omega}{2-\omega}$

Now, the calculation of the minimum monetary profit that can be obtained in a simple production economy at constant yields, and where all income is spent, is equivalent to solving the eigenvalue problem of the matrices $\boldsymbol{Q} \times \boldsymbol{Q^{o}}^{-1}$ y $\boldsymbol{Q^{o}}^{-1} \times \boldsymbol{Q}$ described by the technical coefficients of the basic firms:

1) The eigenvalues ω are between 0 and 1 when matrix $\boldsymbol{Q}$ y $\boldsymbol{Q^{o}}$ describes a simple production economy at constant returns with physical surplus.
2) For each eigenvalue, the eigenvector to the right of $\boldsymbol{Q^{o}}^{-1} \times \boldsymbol{Q}$ corresponds to a possible vector of prices and the eigenvector on the left corresponds to a possible vector of the number of basic $\boldsymbol{Q} \times \boldsymbol{Q^{o}}^{-1}$ corresponds to a possible vector of the number of basic companies.
3) Only the maximum eigenvalue ω_m has an associated vector of prices and a vector of number of companies with all positive components.
4) Both eigenvectors, the price vector and the quantity vector of basic enterprises associated with ω_m are necessary to maximize the monetary surplus, or profit. The system of equations determines both vectors in direction, but not in modulus.
5) The Closure Equation can determine only the modulus of one of the two vectors, but then the other remains undetermined. That is, the variables prices and number of firms that

determine the economy have a degree of freedom when they produce with the minimum productive surplus.

What we are interested in pointing out now is not only that by knowing the concrete value of the maximum eigenvalue, we know the Sraffa efficiency or standard ratio. ω the Sraffa efficiency or the standard ratio is known:

$$\eta_s = \frac{1-\omega}{2-\omega}$$

In addition, the fourth and fifth statements inform us that the eigenvectors are determined in direction, but not in modulus, so that the closing equation that links both moduli together leaves a degree of freedom:

$$\left.\begin{cases} \boldsymbol{\lambda} \times \left[\boldsymbol{Q} \times \boldsymbol{Q^o}^{-1} - \omega \boldsymbol{I}\right] = 0 \ \rightarrow \boldsymbol{\lambda}(\omega) = \lambda \cdot \hat{\boldsymbol{\lambda}}(\omega) \\ \left[\boldsymbol{Q^o}^{-1} \times \boldsymbol{Q} - \omega \boldsymbol{I}\right] \times \boldsymbol{P} = 0 \ \rightarrow \boldsymbol{P}(\omega) = p \cdot \hat{\boldsymbol{p}}(\omega) \end{cases}\right\} \rightarrow PIA = \lambda \cdot p \cdot \left[\hat{\boldsymbol{\lambda}} \times (\boldsymbol{2Q^o} - \boldsymbol{Q}) \times \hat{\boldsymbol{p}}\right]$$

Where each of the eigenvectors $\boldsymbol{\lambda}$ y $\boldsymbol{P}$ has been decomposed as the product of its modulo λ by its unit direction $\hat{\boldsymbol{\lambda}}$. When we understand that the term $\left[\hat{\boldsymbol{\lambda}} \times (\boldsymbol{2Q^o} - \boldsymbol{Q}) \times \hat{\boldsymbol{p}}\right]$ is the *PIA* calculated with the vector prices and unit number of companies, we have:

$$\boxed{\lambda \cdot p = \frac{PIA}{\widehat{PIA}} = const.} \qquad \widehat{PIA} = \left[\hat{\boldsymbol{\lambda}} \times (\boldsymbol{2Q^o} - \boldsymbol{Q}) \times \hat{\boldsymbol{p}}\right]$$

The same applies to the minimum monetary surplus, which is also fixed when the PIA is known. Bwhich is also fixed when the *PIA* is known:

$$B(\lambda_i, p_i) = \lambda \cdot p \cdot \left[\hat{\boldsymbol{\lambda}} \times (\boldsymbol{Q^o} - \boldsymbol{Q}) \times \hat{\boldsymbol{p}}\right] \quad \rightarrow \ \lambda \cdot p = \frac{B(\lambda_i, p_i)}{\widehat{B(\lambda_i, p_i)}}$$

That is, even in an economy where the *PIA* does not change, because we assume there is no growth of the money supply, and which also produces with the lowest possible monetary profit, the economy is not completely determined and it is still possible to evolve because prices and production change. $M$and which also produces with the minimum possible monetary profit, the economy is not completely determined and evolution is still possible because prices and production change.

THE INFLATIONARY PRINCIPLE. If we now recall that the Inflationary Principle tells us that prices can never fall, then we can again check the influence that the Closure Principle has on the whole monetary economy, since, although we are assuming that there is no nominal growth in the economy, that there are no changes in productivity, and that it is producing at maximum financial profit, the economy can still evolve and move towards a decrease in production as prices rise.

The consequence of the reasoning is remarkable, because the Inflationary Principle, not only tells us that prices cannot fall, but also states that in the case of no nominal PIA growth, the economy will decrease its output. This forces the economy to be minimally inflationary if it is to avoid going into recession.

Of course, it will be highly improbable that a real economy produces with the minimum possible monetary surplus because the consumption preferences of agents will never coincide with the proportion of Sraffa's standard commodity. Nor is it clear why the prices at which goods are sold should be such that different firms produce with as little monetary surplus as possible. Therefore, there is no compelling reason to expect that a real economy has to run even close to the minimum possible monetary surplus.

6. PRACTICAL EXAMPLE OF ECONOMICS

Let's take a numerical example that, despite being very artificial, allows us to visualize a little of what has been said so far.

Basic accounting equations. Let there be an economy that produces wheat, iron and oil. Suppose that the set of accounting equations fulfilled by the different basic companies are:

$$
\begin{array}{lrcl}
trigo \rightarrow & 20kg \cdot p_{trigo} &=& 12kg \cdot p_{trigo} + 1kg \cdot p_{hierro} + 1kg \cdot p_{petroleo} + B_{trigo} \\
hierro \rightarrow & 50kg \cdot p_{hierro} &=& 10kg \cdot p_{trigo} + 5kg \cdot p_{hierro} + 5kg \cdot p_{petroleo} + B_{hierro} \\
petroleo \rightarrow & 42kg \cdot p_{petroleo} &=& 10kg \cdot p_{trigo} + 5kg \cdot p_{hierro} + 13kg \cdot p_{petroleo} + B_{petroleo}
\end{array}
$$

Evidently, the prices at which wheat, iron and oil are sold must be such that the monetary surplus, or profit, generated by each basic enterprise, and distributed among workers and entrepreneurs, are all positive. B_i generated by each basic enterprise, and shared between workers and entrepreneurs, are all positive.

Each accounting equation informs us of the quantities of goods involved in production. For example, to produce 20 kilos of wheat, each basic enterprise engaged in wheat production spends 12 kilos of wheat, 1 kilo of iron and 1 kilo of oil, and the same happens for the other basic enterprises. It is precisely this accounting information which allows us to construct the two matrices of technical coefficients $\boldsymbol{Q}$ y $\boldsymbol{Q^o}$ which describe the economy from the production point of view:

$$\boldsymbol{Q} = \begin{bmatrix} 12 & 1 & 1 \\ 10 & 5 & 5 \\ 10 & 3 & 13 \end{bmatrix} \qquad \boldsymbol{Q^o} = \begin{bmatrix} 20 & 0 & 0 \\ 0 & 50 & 0 \\ 0 & 0 & 42 \end{bmatrix}$$

Let us note that we do not know completely how many basic firms of each type there are in the economy, the vector λ. Nor do we know the concrete prices of goods, the vector of prices. $\boldsymbol{p}$. We do not even know how many workers there are. Despite all this, with the information contained in the matrices of the technical coefficients on the techniques used by the basic enterprises, it is sufficient to know what is the minimum monetary profit with which the economy can produce.

To do this, we only have to find the eigenvalues of either matrix:

$$\boldsymbol{Q} \times \boldsymbol{Q^o}^{-1} = \begin{bmatrix} \frac{3}{5} & \frac{1}{50} & \frac{1}{42} \\ \frac{1}{2} & \frac{1}{10} & \frac{5}{42} \\ \frac{1}{2} & \frac{3}{50} & \frac{13}{42} \end{bmatrix} \qquad \boldsymbol{Q^o}^{-1} \times \boldsymbol{Q} = \begin{bmatrix} \frac{3}{5} & \frac{1}{20} & \frac{1}{20} \\ \frac{1}{5} & \frac{1}{10} & \frac{2}{10} \\ \frac{5}{21} & \frac{1}{14} & \frac{13}{42} \end{bmatrix}$$

Which are concretely:

$$\omega_1 = 0{,}063 \quad \omega_2 = 0{,}283 \quad \omega_3 = 0{,}663$$

Of which only the largest of them, $\omega_3 = 0{,}663$has an associated eigenvector of prices and number of companies with all components positive. Explicitly, although the vectors are not normalized, they are:

$$\omega_m = 0{,}663 \quad \xrightarrow{autovectores} \quad \begin{cases} \boldsymbol{P}_m \equiv (1{,}294 \quad 0{,}637 \quad 1) \\ \boldsymbol{\lambda}_m \equiv (12{,}164 \quad 0{,}538 \quad 1) \end{cases}$$

Knowing the maximum eigenvalue it is possible to know the minimum monetary surplus of the economy:

$$\eta_s = \frac{1-\omega}{2-\omega} = 0{,}25 \quad \rightarrow \quad PIB = 0{,}25 \cdot PIA$$

The two eigenvectors, prices and firms, represent the set of prices and the number of firms that make the monetary surplus minimum, but we see that they are determined only in direction, but not in modulus.

To determine the specific modulus of one of them, we can resort to the binding imposed by the Closure Equation, since we assume that the value of the *PIA* with which the economy produces is known:

$$PIA = \lambda \cdot p \cdot \left[\hat{\boldsymbol{\lambda}} \times (\boldsymbol{2Q^o} - \boldsymbol{Q}) \times \hat{\boldsymbol{p}}\right] \quad \xrightarrow{\widehat{PIA}=\left[\hat{\lambda}\times(\boldsymbol{2Q^o}-\boldsymbol{Q})\times\hat{\boldsymbol{p}}\right]} \quad \lambda \cdot p = \frac{PIA}{\widehat{PIA}}$$

This confirms that the variables describing the economic system have a degree of freedom that cannot be reduced without resorting to some hypothesis external to the model. The same happens with the minimum monetary surplus we are looking for, which we know is related to the *PIA* by Sraffa's Efficiency, although the variables on which they depend also have a degree of freedom:

$$B(\lambda_i, p_i) = \lambda \cdot p \cdot \left[\hat{\boldsymbol{\lambda}} \times (\boldsymbol{Q^o} - \boldsymbol{Q}) \times \hat{\boldsymbol{p}}\right] \rightarrow \ \lambda \cdot p = \frac{PIA}{\widehat{PIA}} = \frac{B}{\hat{B}}$$

To restrict the last degree of freedom it is necessary to resort to an additional hypothesis external to the model that is usually always related to the physical limitations of the economy, which is called the "frontier of possibilities" or the "potential *GDP*", and which is normally the maximum number of workers in the economy. T^o workers in the economy. If we call T_i the vector that gives us the number of workers in each basic firm and call their wage, we have w their wage, we have that:

$$\sum_{i=1}^{n} \boldsymbol{\lambda}_i T_i = T^o \xrightarrow{\boldsymbol{\lambda}=\lambda\cdot\hat{\lambda}} \lambda \cdot \sum_{i=1}^{n} \hat{\boldsymbol{\lambda}}_i T_i = T^o \rightarrow \quad \lambda = \frac{T^o}{\sum_{i=1}^{n} \hat{\boldsymbol{\lambda}}_i T_i}$$

Which allows us to fix the modulus of the vector number of firms and, with it, the modulus of the vector prices when the economy has everyone working. To summarize: the number of workers fixes the specific number of basic firms engaged in the production of each good when consumption preferences are known (the direction of the vector λ), which together with the knowledge of the *PIA* fixes the prices at which it is sold.

But all this tells us nothing new, except that which is obvious and already known: *"production is independent of how production is distributed among workers and employers".*

Empirical data. When we look at the concrete reality around us, in addition to the accounting equations of the basic companies with which we obtain the technical coefficients of the matrices $\boldsymbol{Q}$ y $\boldsymbol{Q^o}$matrices, we usually collect a whole set of empirical data with which we can confirm the consistency of the macroeconomic and microeconomic variables describing the simple production model we are using. For example, let's think that we have found out the value of the following variables:

$$variables\ macroeconómicas \rightarrow \begin{cases} PIA = 2998 \\ PIB = 890 \\ T^o = 335 \end{cases}$$

$$variables\ microeconómicas \rightarrow \begin{cases} \boldsymbol{p} \equiv (3 \quad 2 \quad 4) \\ \boldsymbol{\lambda} \equiv (55 \quad 3 \quad 6) \\ \boldsymbol{T} \equiv (5 \quad 8 \quad 6) \end{cases}$$

From the above data, we can confirm that the number of active workers is indeed 335:

$$T^o = \sum_{i=1}^{n} \boldsymbol{\lambda}_i T_i = 275 + 24 + 36 = 335$$

We can confirm that the *PIA* value is 2998 and the *GDP* value is 890:

$$PIA = \boldsymbol{\lambda} \times (\boldsymbol{2Q^o} - \boldsymbol{Q}) \times \boldsymbol{p} = 2998$$

$$PIB = \boldsymbol{\lambda} \times (\boldsymbol{Q^o} - \boldsymbol{Q}) \times \boldsymbol{p} = 890$$

But, most importantly, we can confirm that, indeed, the nominal *GDP* at which the real economy is producing is greater than the minimum nominal *GDP* at which the economy is producing when the vector prices and the vector number of firms meet the Sraffa standard ratio:

$$\eta = \frac{PIB}{PIA} = 0{,}296 > \eta_S = \frac{1-\omega}{2-\omega} = 0{,}25$$

A result that, although it may seem an insignificant and unimportant fact, is absent in the theory of distribution developed by Piero Sraffa in "Production of Goods by Means of Goods".

7. THE MINIMUM BUSINESS PROFIT OF AN ECONOMY.

It is not at all easy to explain the difference between the theory of distribution we are developing very briefly in these lines and the theory of distribution developed by Piero Sraffa in "Production of Goods by Means of Goods" more than half a century ago. It is very clear that Sraffa shows in his work that commodity prices are fixed within monetary economies for structural reasons, and it is very clear that the Principle of Asymmetry starts from the same mathematical structure used by Sraffa and follows his same path, although using a more general and less "ad hoc" mathematical structure than the one used by him. For example, the problem of calculating the eigenvalues of the technical coefficient matrices is common in both structures, however, we think that the condition used by Sraffa when he postulates "ad hoc" a profit rate common to all industries does so thinking of a profit rate common to all industries. r common to all industries does so with the physical nature of capital in mind, which we have not needed here.

Also the formulation of the Closing Equation, which links the economic variables with the *IPA,* appears as a differentiating element that has nothing to do with Sraffa's use of the surplus (the GDP of the economy) when he uses it only as a normalizing element with respect to which the rest of the variables are measured. But, in spite of all these clear differences between this work and Sraffa's, the fact is that here we are following his path from the beginning and we want to end this chapter by following his path once again.

In the analysis made so far on the monetary surplus, we have not distinguished between the profits kept by employers and the profits kept by workers in the form of wages. It is now time to separate the monetary surplus received by both, as Piero Sraffa did, and to analyze the possible influence that a particular distribution has on the minimum profit of the economy that we have found in the previous section.

To do this, we only have to treat labor as just another commodity, and let all the monetary surplus produced by the economy go exclusively to pay the income of entrepreneurs. To this end, let us keep the matrix of expenditure $\boldsymbol{G}$ and income $\boldsymbol{Y}$ unchanged, but explicitly indicating the number of workers in each basic enterprise and their wages. T_i and their wages $w$and the basic basket of goods and services q_i^{trab} that a generic worker consumes, and the total number of workers T^0:

$$\boldsymbol{Y} = \begin{bmatrix} \lambda_1 Q_{11}^o p_1 \\ \vdots \\ \lambda_n Q_{nn}^o p_n \\ T^o w \\ y^{cap} \end{bmatrix} \qquad \boldsymbol{G} = \begin{bmatrix} \begin{vmatrix} \lambda_1 Q_{11} p_1 & \cdots & \lambda_1 Q_{1n} p_n \\ \vdots & \cdots & \vdots \\ \lambda_n Q_{n1} p_1 & \cdots & \lambda_n Q_{nn} p_n \end{vmatrix} & \begin{vmatrix} \lambda_1 T_1 w & \lambda_1 B_1^{cap} \\ \vdots & \vdots \\ \lambda_n T_n w & \lambda_n B_n^{cap} \end{vmatrix} \\ \begin{vmatrix} T^o q_1^{trab} p_1 & \cdots & T^o q_n^{trab} p_n \\ q_1^{cap} p_1 & \cdots & q_n^{cap} p_n \end{vmatrix} & \begin{vmatrix} 0 & 0 \\ 0 & 0 \end{vmatrix} \end{bmatrix}$$

The expenditure and income matrix is still a square matrix of N+2 as before, and the changes that appear in it are only conceptual, since now labor is just another commodity and its structural cost of manufacture is the basic basket. Thus, the problem of finding the monetary surplus of the economy is reduced to finding the set of prices and the wage that make the entrepreneurs' surplus maximum (or minimum), but now subject to two restrictions. Specifically, we must minimize or maximize the expression:

$$B(\lambda_i, p_i) = \sum_{i=1}^{n} \lambda_i Q_{ii}^o p_i - \sum_{i,j=1}^{n} \lambda_i Q_{ij} p_j \; - \sum_{i=1}^{n} \lambda_i T_i w + \left[T^o w - \sum_{i=1}^{n} T^o q_i^{trab} p_i \right]$$

Where the term in parentheses is identically null, since it represents the expenditure made by each worker, i.e., the basic food basket.

Subject to two restrictions. The restriction that the *PIA* does not change and is a constant of the economy, which is still expressed with the restriction given by the expression of the PIA, where neither wages nor the number of workers appear explicitly. $g(\lambda_i, p_i) = 0$ The restriction given by the *IPA* expression*,* where neither wages nor the number of workers appear explicitly:

$$g(\lambda_i, p_i) = PIA - 2\sum_{i}^{n} \lambda_i Q_{ii}^o p_i \; + \sum_{j,i}^{n} \lambda_i Q_{ij} p_j = 0 \qquad\qquad (restrinción)$$

And a new restriction that links the prices of goods to wages through the basic basket, i.e., it tells us what each worker spends his or her wages on:

$$f(\lambda_i, p_i) = w - \sum_{i=1}^{n} q_i^{trab} p_i = 0 \qquad\qquad (restrinción)$$

All the expressions, the function whose extremum is sought subject to the two restrictions, again fulfill the necessary conditions that allow us to apply the Lagrange Multipliers Method. We can find the system of equations which must satisfy the variables λ_i, p_i, T^0 y w so that they maximize or minimize the expression of business profits $B(\lambda_i, p_i)$ when the PIA is constant and the entire wage is spent on the basic basket:

$$\frac{\partial B(\lambda_i, p_i)}{\partial \lambda_i} + \eta_S \frac{\partial g(\lambda_i, p_i)}{\partial \lambda_i} + \eta_M \frac{\partial f(\lambda_i, p_i)}{\partial \lambda_i} = 0 \ \rightarrow \quad (1)$$

$$\frac{\partial B(\lambda_i, p_i)}{\partial p_i} + \eta_S \frac{\partial g(\lambda_i, p_i)}{\partial p_i} \ \eta_M \frac{\partial f(\lambda_i, p_i)}{\partial p_i} = 0 \ \rightarrow \quad (2)$$

$$g(\lambda_i, p_i) = PIA - 2\sum_{i}^{n} \lambda_i Q_{ii}^{o} p_i + \sum_{j,i}^{n} \lambda_i Q_{ij} p_j = 0$$

$$f(\lambda_i, p_i) = w - \sum_{i=1}^{n} q_i^{trab} p_i = 0$$

By performing some operations, we obtain:

$$(1) \ \rightarrow \begin{cases} \forall i \rightarrow \quad Q_{ii}^{o} p_i - \sum_{j=1}^{n} Q_{ij} p_j - T_i w - \eta_S \left(2Q_{ii}^{o} p_i - \sum_{j}^{n} Q_{ij} p_j \right) = 0 \\ w \ \rightarrow \ 0 \end{cases}$$

$$(2) \rightarrow \begin{cases} \forall i \rightarrow \ \lambda_i Q_{ii}^{o} - \sum_{j=1}^{n} \lambda_j Q_{ji} - \eta_S \left(2\lambda_i Q_{ii}^{o} - \sum_{j=1}^{n} \lambda_j Q_{ji} \right) - \eta_M (q_i^{trab}) = 0 \\ w \rightarrow \quad -\sum_{i=1}^{n} \lambda_i T_i + \eta_T = 0 \end{cases}$$

In which η_S y η_T are, respectively, the multiplier associated with the restriction that the *IPA* remains constant and is the multiplier associated with the basic basket of workers. Note that from the last equation it follows that the multiplier associated with the basic basket is equal to the number of workers:

$$\eta_T = \sum_{i=1}^{n} \lambda_i T_i = T^o$$

The two new systems of equations have changed little compared to the original ones. In reality, the changes reflect only what the new surplus looks like when the workers' share is removed:

$$Q_{ii}^{o}p_i - \sum_{j=1}^{n} Q_{ij}p_j - T_i w - \eta_S \left(2Q_{ii}^{o}p_i - \sum_{j}^{n} Q_{ij}p_j \right) = 0$$

$$\lambda_i Q_{ii}^{o} - \sum_{j=1}^{n} \lambda_j Q_{ji} - T^{o} q_i^{trab} - \eta_S \left(2\lambda_i Q_{ii}^{o} - \sum_{j=1}^{n} \lambda_j Q_{ji} \right) = 0$$

Let us note that the term ($T_i w$) is what each basic firm spends on wages, and the term ($T^{o} q_i^{trab}$) is what is consumed of each basic commodity by all workers, so the Lagrange multiplier can be interpreted in two ways, monetary and physical:

$$\eta_S = \frac{Q_{ii}^{o}p_i - \sum_{j=1}^{n} Q_{ij}p_j - T_i w}{2Q_{ii}^{o}p_i - \sum_{j}^{n} Q_{ij}p_j} \qquad \forall i$$

$$\eta_S = \frac{\lambda_i Q_{ii}^{o} - \sum_{j=1}^{n} \lambda_j Q_{ji} - T^{o} q_i^{trab}}{2\lambda_i Q_{ii}^{o} - \sum_{j=1}^{n} \lambda_j Q_{ji}} \qquad \forall i$$

The remarkable thing about the result is that it is the same result obtained by Sraffa. When the economy operates at a point where the entrepreneurial surplus is minimal, then the value of the surplus depends linearly on the value of wages, the latter varying from zero, when all the surplus is taken by the entrepreneurs and the Lagrange multiplier is maximum, to w_{max} when the Lagrange multiplier η_S multiplier becomes zero:

$$0 < w < w_{max} \qquad\qquad T_i w_{max} = Q_{ii}^{o}p_i - \sum_{j=1}^{n} Q_{ij}p_j \;\leftrightarrow\; \eta_S = 0$$

This is also the case when the physical surplus of any commodity is kept by the workers:

$$T^{o} q_i^{trab} = \lambda_i Q_{ii}^{o} - \sum_{j=1}^{n} \lambda_j Q_{ji} \qquad \forall i$$

With this last attempt to show, from the perspective offered by the expenditure matrix, the physical structure behind the distribution of surplus through price formation, we end this chapter.

But not before recalling, as Piero Sraffa did in "Production of commodities by other commodities", that the present study, as well as the previous chapter where the Principle of Buyer and Seller Asymmetry is enunciated, demonstrate beyond any reasonable doubt the absurdity of the Production Function theory. Therefore, these two chapters, but especially this last chapter especially dedicated to Sraffa's work, are intended as a tribute to the many people who have been ostracized by economists working for private universities in the USA.

PART III

THE CAPITAL MARKET

CHAPTER 7

CAPITAL GOODS

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1. THE TRUTH AND THE LIE

It can be stated in a very general way that the raison d'être of any economic system is to organize the production of goods and services for their subsequent distribution among all the persons taking part in the productive process. In this sense, a monetary economy is no different from any other system used for the purpose of satisfying the many and varied vital needs of society, except in the essential role played by money in making decisions affecting the processes of production and distribution of goods. Some of the many restrictions which the existence of money imposes on the economy we have seen when we studied the Consumer Market and enunciated the Principle of Asymmetry, but it will be in studying the capital goods which are bought and sold in the Capital Market that the special nature which the use of money impresses upon our modern society will really be shown.

One of the greatest successes of the economists working for private universities in the USA, and the most irrefutable proof that they have more than earned the astronomical salaries they enjoy, has been to convince everyone that there is no such thing as income-producing assets. The magnitude of the success they have achieved can only be appreciated when we quantify the immense size of the market they have managed to conceal: *"a Capital Market in which assets are bought and sold whose value in the year of 2019 exceeded 200 million billion euros, only in publicly* *traded assets".* There is, therefore, no doubt that economists working for private universities in the USA have earned the splendid salaries they receive, and that is why, far from making us feel indignation or contempt for the immense deception to which they have subjected us, what we feel for these teachers is admiration and amazement at such a feat. Even more so, when we see how they have achieved it.

In the economics textbooks used by professors at private universities in the United States, goods are divided into two broad categories, differentiated solely on the basis of who consumes them. On the one hand, there are those goods that people consume in order to satisfy one of the many immediate human needs and which are called "**consumer goods**". On the other hand, there are those other goods that are consumed in the production process with the purpose of creating consumer goods, and which are given the generic name of capital or "**capital goods**".

It escapes nobody's notice that there is something very strange and illogical in this classification of goods according to whether they are consumed or not directly consumed by people, since in a monetary economy such a difference has no relevance whatsoever. First, because, although some goods are consumed by people and other goods are consumed by companies in the production process, both goods are consumed and are, therefore, consumer goods. Second, because both goods are bought and sold in the Consumer Market and, therefore, their price is fixed in the same market and with the same rules. It is very clear that, from the point of view of the relations established by the use of money, in a monetary economy there is no difference between the products consumed by a person and the products consumed by a company: both are bought and sold with money, both are bought and sold in the same market, and both are bought to be consumed.

In that sense, distinguishing between both types of goods, those consumed by individuals and those consumed by companies, is very stupid from a monetary point of view, unless, of course, it is an intentional classification intended to propagate a lie. Because, of course, lies are created and propagated with the intention that we cannot distinguish between them and the truth.

But even accepting that everything is a lie, it is hard to believe that it has been possible to keep the truth hidden for so long, because to hide the truth it is not enough to propagate the lie, it is also necessary to prevent the propagation of the truth. Seen in this way, the undoubted success in hiding the financial nature of capital obtained by economists working for private universities in the United States can only be a consequence of the ability to prevent the truth from being explained in textbooks, published in economic journals and becoming known by economists, and not so much by the lies they tell in their university textbooks.

<u>PAUL SAMUELSON.</u> Paul Samuelson is probably the most famous and prestigious contemporary economist in the United States. Recently deceased, he has worked all his life for the private university of Cambridge located in the state of Massachusett s, the famous Massachusetts Institute of Technology better known by its acronym in English, MIT, being there where in 1970 he received the Nobel Prize. It was just before those dates, already in the 1960s, when the so-called Two Cambridge Controversy took place, in which Samuelson proved Joan Robinson right, when he recognized that the defense of the physical nature of capital was unsustainable.

However, that did not seem to matter much to him, and in the most widely distributed university book of the last 50 years, written in his own handwriting, capital appears as a physical factor of production; in fact, the Nobel Prize in Economics was awarded to him for arguing that the nature of capital is physical, even though he himself recognized that such a thing was impossible.

Not only that, the entire book on macroeconomics written by Samuelson, which after being awarded the Nobel Prize in Economics became the most widely read university book in history, is an apology for the Production Function Theory, which requires the nature of capital to be physical in order to have any semblance of plausibility. Why this nonsense? Why does Samuelson lend himself to being the main architect of the greatest hoax ever perpetrated in the history of knowledge and accept the Nobel Prize for a theory that he himself acknowledges to be false?

The answer is straightforward and obvious when we ask ourselves who are the people who run the private universities in the USA, or we ask ourselves about the people who award the Nobel Prize.

If money does not distinguish as different the goods consumed by individuals from those consumed by companies when they are engaged in production, then the distinction between one and the other is superfluous, and such a classification is only part of the lie that serves to prevent the truth from spreading.

2. CAPITAL GOODS

Undoubtedly, the most important peculiarity of the monetary economy, which differentiates it from all other possible systems designed to organize the production and distribution of goods, is the existence of goods which produce "monetary rents":

> *<u>CAPITAL GOODS</u>: "In a monetary economy, we call **capital goods** those goods that produce an income, or that acquire their price from the possibility of producing an income".*
>
> *In the definition, "rent" is identified with the monetary flow received for owning a good (in this case, a capital good) and, therefore, it is completely different from the flow of income received for performing a job, i.e. wages.*
>
> *In this paper, goods, whether consumer goods or capital goods, are assumed to be always reproducible, i.e., there is no limitation to produce them in any quantity, even though the assumption is manifestly false (there are a number of goods that are not reproducible, which can be either consumer or capital goods, but here we will obviate this issue and assume that all goods are infinitely reproducible).*

In general, we will avoid the use of the word "wealth" to refer to the market value of capital goods and will simply refer to it as "capital", although there are authors such as Tomas Pikety who use both words, capital and wealth, interchangeably to refer to the market value of goods that produce rents.

The first thing we must understand is that the existence of income-producing goods is an inevitable consequence of the use of money in the economy. To prove this, we need only remember that, within a monetary economy, any company complies with a conservation of money flow equation, or accounting equation, which obliges it to obtain monetary profits, so that its income from sales must exceed its expenditure on purchases. Specifically, in the model of a simple production economy at constant yields, and when we assume the stationary regime, the accounting equation that any basic company is obliged to fulfill is:

$$\overbrace{q_{ii}^{o}P_i \;=\sum_{j=1}^{n} q_{ij}P_j + B_i^{cap} + B_i^{trab}}^{\text{ec. contable}} \quad \rightarrow \quad \text{renta} \;\equiv\; B_i^{cap} = q_{ii}^{o}P_i - \sum_{j=1}^{n} q_{ij}P_j - B_i^{trab} > 0$$

$$renta \equiv beneficios\ empresariales \geq 0$$

The identification with a rent of the part of the monetary surplus that is devoted to pay corporate profits, is the reason why any enterprise within a monetary economy is a capital good:

PROFIT AS AN INCOME. The existence of entrepreneurial profit, defined as the part of the monetary surplus that cannot be justified by a physical expenditure necessary to carry out production, allows us to identify unambiguously any enterprise with a capital good that produces an income equal to the entrepreneurial profit:

$$renta \equiv \quad \overbrace{B_i^{cap} = q_{ii}^{o} P_i - \sum_{j=1}^{n} q_{ij} P_j - B_i^{trab}}^{ec.\ contable} > 0$$

The company is a capital good because it produces an income, and it produces an income because it produces a profit, and it produces a profit because it is obliged to comply with an accounting equation, and it is obliged to comply with an accounting equation because it exists within a monetary economy:

"Capital goods exist because money exists,
and can only exist within a monetary economy."

Rent" is the income received by the owners of a good by the mere fact of owning the good. Goods that produce rents are called capital goods, and goods that do not produce rents are called consumer goods.

If we accept as true that the business profit that appears in the accounting equation cannot be justified as any physical expense necessary to carry out the productive process, then we will have to take for granted that any business is a capital good that produces monetary rents for those who own it and affirm, without risk of being mistaken, that the existence of money is the necessary and sufficient condition for the existence of capital goods.

To understand that rents from possession really exist, we only have to look at what happens with oil (even though it is a non-reproducible good). It is very easy to see that whoever owns an oil well, which at present is always the sovereign state of a country, obtains income from the exploitation and sale of oil that cannot be associated with any physical expenditure being made in the extraction of the oil. For example, when the price of oil falls from 100 euros per barrel to

70 euros in a short period of time, it is very clear that the operating costs have not decreased by that amount. Therefore, the drop in the price of oil cannot be associated to any physical fact related to the improvement of the exploitation process and, consequently, the profit that was obtained before the drop in the price of crude oil cannot be the consequence of any expense. The same can be said when the price of oil rises sharply, nor can the increase in profits be attributed to a change in the production situation.

It is very evident to anyone, and it is not necessary to insist on it much, that the exploitation of an oil well produces a monetary income to its owners, the origin of which can only be associated with the possession of the oil well.

Another typical example that will allow us to understand very well the difference between a consumer good and a capital good is the possession of a house. A house is a good that is produced, sold and bought to be consumed like any other good or commodity, even if it takes a long time to be consumed. The dwelling is made up of the aggregation of many goods, as is the case with many other consumer goods, from the pipes through which the water runs, the doors and accesses that allow entry into the dwelling, to the furniture with which it is essential to equip it in order to make it habitable. In addition, its function is to provide the "service of habitability" when it is used, so it can be considered without problems as a "consumer good" that satisfies the need to provide shelter and a roof for the people who use it. Moreover, it is normal for a house to be inhabited by its owner, so a house seems to have all the qualities we attribute to a consumer good, even if it takes many decades for a house to age and we can say that we have consumed it.

However, we also know that a dwelling can be used to rent it to other people and obtain a monetary rent from it. A use that its owner is not obliged to give it, but which, according to the definition we have given of capital goods, makes the dwelling a capital good even if it is not used for the purpose of obtaining a rent from it.

What then is a house? Is it a consumer good or a capital good? We must be very clear that housing is always, even when it is inhabited by its owner or remains empty without even being rented, a capital good.

Why is a house that is not being rented a capital asset if no rent is being obtained from it? Because the house acquires its price from the fact that it generates a rent when it is rented. A house acquires its price from the possibility that whoever owns it has of obtaining a rent from it when he dedicates it to renting, and not from the fact of whether he is obtaining, or not, a rent from it.

This is the reason, and there is no other, why we have required capital goods to be able to produce a rent, because their market price comes from that possibility. In this sense, the price of a house does not depend on whether or not you rent it.

HOUSING IS A CAPITAL GOOD. A dwelling can be considered as a company that provides the service of habitability to the people living in it. What people are buying with the payment of rent is a consumer good, "the habitability", but housing is not the consumer good that you buy with the rent, but "the enterprise" that is producing the consumer good that you pay for with the rent. You build housing to produce a consumer good, "habitability". Housing, seen in this way, is an income-producing enterprise and is therefore a capital good.

Although the two examples above, an oil well and a house, are not strictly what is meant by an enterprise, they do make it very clear that it is the fact that they are assets that can produce an income that differentiates them from a car, a snack or the viewing of a movie.

3. MONEY AS A CAPITAL GOOD

Our next step, now that we know that rent-producing goods exist, is to find out how they are priced in the Capital Market solely on the basis of the amount of rent they produce, and without falling into the easy temptation of assigning them a price according to the possible physical cost of manufacturing each of the capital goods.

The only way to give a price to the numerous and heterogeneous set of capital goods existing in a monetary economy is to compare them with a single capital good whose price is known and which is used as a numeraire. This is the same thing that is done with money when it is used to endow consumer goods with a price, with which to compare them with one another. Even when money has no intrinsic value because it is fiat money, consumer goods still acquire relative "price" from their exchange for money in the Consumer Market.

As the essential characteristic of a capital good is to produce an income, the universal capital good we are looking for must also possess the capacity to produce an income. As it is used in the

Capital Market to endow capital goods with a monetary price, it is necessary that the universal good we are looking for also has a definite and stable monetary price. Fortunately for all of us, we do not have to look far to find in the Capital Market a good that fulfills these two essential requirements we have mentioned: Therefore, in order to be able to give a price to each capital good based only on the rent they produce, we have to find a universal capital good that has a specific monetary price, that produces rents and that is exchanged in a generic way with the different capital goods that exist in the Capital Market.

> *"Money is a capital good whose price is itself and which produces an income when it is given on loan: the rate of interest. "*

Everyone knows that whoever needs money can borrow it from a bank in exchange for paying an interest rate for the borrowed money. As long as the money is not paid back, the bank will receive an annual income in exchange for the borrowed money, which is what the interest rate indicates. Banks also usually pay us a small income when we give up our money and give it temporarily as a deposit. Of course, everyone knows that the two interest rates, the one charged by the bank for the money it lends and the one charged by the bank for the money lent to it, are different.

Although the reason why a rent, or interest, is paid when money is lent has been interpreted in many and varied ways throughout the history of economics, what we are interested in pointing out here is that, thanks to the existence of interest, lending money can be interpreted by the lender as the purchase of a capital good, whose price is the amount of money that is lent and whose rent is the annual interest or income it produces as long as the money is lent.

Precisely, the "annual interest rate" or "interest" is defined as the percentage of the money lent that is received annually as income when the money is lent.

MONEY AS A CAPITAL GOOD. Money is a capital good because it has the capacity to produce an income when it is lent, and its price as a capital good is itself:

$$renta\ dinero = tasa\ de\ interes \cdot cantidad\ dinero\ prestada$$

$$r = i \cdot d \qquad \begin{cases} r \rightarrow flujo\ de\ renta \\ i \rightarrow tasa\ interes \\ d \rightarrow cantidad\ dinero \end{cases}$$

The identification of the money lent with the fictitious purchase of a capital good, the debt, whose price is the amount of money we lend and whose rent is the flow of money associated with the *interest rate we receive in exchange, will allow us to use the loan as the reference capital good with which to give a price to all capital goods.*

Economists usually consider the interest rate a dimensionless constant, which is not true, since the monetary income it produces is obviously a monetary flow and not a monetary stock. Care must be taken with this, because in all calculations made here, the interest rate will always have time-1 dimensions:

> *The interest rate relates a monetary stock, the amount of money that is lent, to a flow of money, the annual income that is received, so its dimensions are that of "time to the minus one".*

Let us observe that it is completely consistent to state that money is a capital good. It is also consistent to consider that the interest rate of money "i", the quotient between the income received and the amount of money lent, is a constant of the economy that does not change over time.

The identification of money with a capital good is a process that appears naturally in monetary economies and what we are doing here is simply stating this empirical fact, assuming it to be true and analyzing its consequences. The strange thing is that no one so far seems to have explicitly pointed out this fact, except the English economist Joan Robinson, who was always very clear that in order to define capital goods it is necessary to have a prior rate of interest, outside the productive process, which would allow us to escape the trap that associates capital with a physical accounting stock. The curious thing is to discover that Robinson was always right and, within the complex nature of money that we used as a universal standard of exchange in the Consumer Market is also that of being a capital good. The reading of Joan Robinson's work is proof of this.

4. THE FIRST LAW OF CAPITAL OR FIRST ROBINSON'S LAW

Although lending is not usually thought of in this way, we have formally identified the act of lending money with the acquisition, or purchase, of a capital good whose income is proportional to the interest rate of the loan and whose price is the amount of money being lent:

$$r = i \cdot d \qquad \begin{cases} r \rightarrow \text{flujo de } renta \\ i \rightarrow tasa\ interes \\ d \rightarrow dinero \end{cases}$$

Seen in this way, it is easy to understand why money can be used as a reference or standard to assign a price to other capital goods and to compare them with each other according to the income they produce.

The way to proceed is to compare the income produced by any capital good with the income produced by a loan. When both rents are equal we can suspect that the prices of both forms of capital, although of very different nature, are equivalent and have the same book value. When we take this assumption as provisionally valid, and accept that the price of any capital good is equal to the amount of money that it is necessary to lend in order to receive the same income it produces, then the price of any capital good would be given by the same expression that links money with the income it produces when it is lent:

$$precio_{capital} = \frac{renta_{capital}}{i}$$

> *"When the rent obtained for lending a quantity of money is the same as that obtained for the possession of a capital good it may be suspected that both forms of capital, however different in nature, have the same price in the Capital Market, it being indifferent in accounting terms to possess one form of capital or to possess the other form of capital."*

But this natural way of proceeding, which allows us to price capital goods solely on the basis of the rent they produce, regardless of the nature and origin of the rent, runs up against a serious empirical difficulty. It can be seen in the Capital Market that the price at which the various capital goods are bought or sold is not equal to the amount of money which it is necessary to lend in order to produce an income equal to that which they produce. On the contrary, what we observe in the Capital Market is that the price at which each of the capital goods is bought and sold is, in general, lower than its equivalent in money.

Or, to put it another way, it is necessary to define a new parameter associated with each capital good, uncertainty, in order to generalize the expression linking the income of money lent to its value. $\aleph_j$in order to generalize the expression linking the income of money given on loan with its value. An empirical observation that leads us to formulate the First Law of Capital or Robinson's First Law:

ROBINSON'S FIRST LAW. "In a monetary economy, the market price of any capital good is proportional to the amount of money it is necessary to lend to obtain the same rent it produces, the constant of proportionality being what is called the "Uncertainty" of the capital good."

$$renta\_capital = i \cdot Incertidumbre \cdot precio\_capital$$
$$\downarrow$$
$$k_j = \frac{r_j}{i \cdot \aleph_j} \qquad \begin{pmatrix} \aleph_j & \geq 0 \\ \aleph_{dinero} & = 1 \end{pmatrix} \quad \rightarrow \begin{cases} r_j \rightarrow renta\_capital \\ \aleph_j \rightarrow Incertidumbre \\ i \ \rightarrow tasa\ de\ interes \\ k_j \rightarrow precio\_capital \end{cases}$$

The expression makes it possible to determine the price of a capital good knowing the income it produces and its uncertainty.

Joan Violet Robinson was an English economist of the second half of the twentieth century, very critical of the physical conception of capital propagated by economists working for private universities in the United States. Her first contributions to economics were in the study of "imperfect competition", a concept that she herself developed in depth and that only after many decades of silence, began to appear in the textbooks of private universities in the U.S. without even mentioning it. Much more important was her contribution to the concept of "capital", identical to the one we have developed here and that even today, after more than 50 years have passed, economists working for private universities in the USA continue to prevent its diffusion. By naming the first of the three laws of capital as Robinson's First Law, we only make a posthumous, belated and just recognition to one of the best economists of the twentieth century, whose ideas have been fundamental for the development of the ideas of the authors.

The expression with which capital goods have been given a price is more general than that which has been used to define the loan of money as a capital good, and contains it. The value of uncertainty for money, as it cannot be otherwise, is worth "one":

$$k_j = \frac{r_j}{i \cdot \aleph_j} \qquad \xrightarrow{\aleph_{dinero}=1} \qquad k_{dinero} = \frac{r_{dinero}}{i}$$

Uncertainty $\aleph_j$ is an unknown parameter, characteristic of each capital good, which is postulated in the theory for empirical reasons, and which gives meaning to the name "law" that we have used to define it. It is well understood that the expression with which uncertainty is postulated will only make sense to the extent that it is:

a) A constant parameter.
b) That it can be determined for each specific capital asset.
c) That it does not depend on the other usual variables of the economy.

In particular, in order for the "law" to make sense, the uncertainty parameter associated with any $\aleph_j$ associated with any given capital must be independent of the interest rate:

$$r_j = i \cdot \aleph_j \cdot k_j \qquad \rightarrow \qquad \aleph_j \neq f(i)$$

It is important to note that the Law of Capital is formally equivalent to the definition of γ_j the "rate of return on capital," or rate of profit, which is usually defined as the ratio of the income produced by a capital good to the physical cost of producing it (there are other definitions):

$$tasa\ de\ retorno\ del\ capital \equiv \qquad \gamma_j = \frac{beneficio}{costo\ del\ capital} = i \cdot \aleph_j$$

Where, of course, the cost of capital is identified with the physical price of creating the capital good, which indicates the physical origin of the concept of capital.

Although both expressions are formally identical and seem to be saying the same thing, the truth is that each of them attributes a different nature to capital. Robinson's Law shows the financial nature of capital, and states that the market price of a capital good is a consequence of the rent it produces. On the contrary, the rate of return on capital shows the physical nature of capital, and states that the rent is a consequence of the physical price of manufacturing the capital good. Both statements are completely different because both show a completely different nature of capital.

<u>DAVID RICARDO AND KARL MARX</u>. David Ricardo is perhaps, together with Karl Marx, the most influential economist of all times. He lived in England in the first half of the 19th century, just a

few decades after the Independence of the USA and the French Revolution, when liberal ideas were spreading throughout Europe at the pace set by Napoleon's armies.

It is very important to understand that the liberalism of the time needed not only to delegitimize the hereditary origin of the monarchy's power, but above all it needed to delegitimize the origin of its economic power.

As Karl Marx would also do decades later when he published "Capital", David Ricardo published the "Treatise on Political Economy and Taxation" with the intention of demonstrating that the income on which the aristocracy of his time lived came from the possession of land, and its origin was almost always inherited. They are, therefore, incomes that are obtained without doing any work and without assuming any risk. On the contrary, the income obtained by entrepreneurs is obtained thanks to the investment of money to create new wealth that did not exist before, which implies at least an economic risk that differentiates entrepreneurs very clearly from landowners.

Ricardo, in his Theory of Rent, is denouncing the social structure of his time and the real reason why liberalism arises. In his book, he differentiates three sources of income: rent, profit and wages. Rent is the income obtained from the possession of land. Profit is the income from the investment of money in productive or capital goods. And wages are the income from labor. But he hides very well, and leaves out of the division into three classes, the moneylenders who derive their income from interest from the lending of money.

Ricardo's great achievement was, therefore, ideological, when with the Theory of Differential Rent he succeeded in demonstrating in a very convincing way, that landowners obtain their income from owning land, which at that time was the main source of wealth. While the industrious businessman, who at that time was beginning to be associated with the nascent liberal bourgeoisie, obtains his income from investing his money in the creation of new means of production.

It is against this idyllic idea about the beneficial and productive investments of the capitalist bourgeoisie, against which Karl Marx tries to fight fifty years later, with much success or without any success, depending on who looks at it and how you look at it, but ignoring both in their dialectical struggle that capital goods and their benefits, in little or nothing differ from the income produced by the possession of land.

Does Robinson's First Law make sense?

It does make sense. The very existence of the Capital Market within monetary economies as the place where capital goods are bought and sold fully confirms the concept of capital as we have defined it, since the basic function of the Capital Market is to determine what is the concrete value of the uncertainty associated with each of the different forms of capital goods. $\aleph_j$ associated with each of the different forms that capital goods take.

5. THE SECOND LAW OF CAPITAL OR ROBINSON'S SECOND LAW

In the previous section we postulated, in the form of a microeconomic law, the existence of uncertainty in order to explain the market's different valuation of the income of different capital goods. $\aleph_j$ in order to explain the different valuation made by the market of the income of the different capital goods. It escapes no one's notice that there must be an analogous parameter, but associated with the whole economy, that allows us to know the aggregate value of all the capital goods of an economy, knowing the aggregate income they produce.

<u>ROBINSON'S SECOND LAW</u>: "In a monetary economy, the aggregate price of capital is that which makes the average rate of return on capital equal to the product of the rate of interest times the Uncertainty Factor. γ equal to the product of the rate of interest times the Uncertainty Factor. "

$$k_{capital} = \frac{r_{capital}}{\overline{\aleph} \cdot i} \qquad \leftrightarrow \quad \gamma = \overline{\aleph} \cdot i \qquad\qquad (2^{\underline{a}}\ Ley\ de\ Robinson)$$

It can be shown that the uncertainty factor is equal to the weighted average with respect to the capital of the uncertainties:

$$\overline{\aleph} = \frac{\sum \aleph_j \cdot k_j}{\sum k_j}$$

Robinson's Second Law is the macroeconomic version of Robinson's First Law. It introduces a new parameter, the Uncertainty Factor, by considering all the capital goods present in the economy as if they were a single capital good. $\overline{\aleph}$by considering all the capital goods present in the economy as if they were a single capital good, and calculating the uncertainty associated with the total income it produces in the same way as we have done for each of the capital goods. Obviously, the sum is made only on the capital goods that produce rents, although here we always assume that all the capital in the economy is producing rents.

As with the first law, in order for the expression to make sense and be called a "law", the Uncertainty Factor $\overline{\aleph}$ that appears in the expression must be independent of the other economic variables. In particular, it must be independent of the interest rate:

$$r_{capital} = \overline{\aleph} \cdot i \cdot k_{capital} \quad \rightarrow \quad \overline{\aleph} \neq f(i)$$

But this is something that is fulfilled automatically, since the value of the Uncertainty Factor is deduced from the first law, and is valid when it is valid. $\overline{\aleph}$ is deduced from the first law, and it is valid when the first law is valid. In fact, the second law will be valid when the first law is valid, since the second law is equal to the weighted average of the uncertainties. $\overline{\aleph}$ is equal to the weighted average of the uncertainties with respect to the value of the different capital goods:

$$r_j = i \cdot \aleph_j \cdot k_j \quad \rightarrow \begin{Bmatrix} k_{capital} = \sum k_j \\ r_{capital} = \sum r_j = \sum \aleph_j \cdot i \cdot k_j \end{Bmatrix} \xrightarrow{\overline{\aleph}=\frac{r_{capital}}{i \cdot k_{capital}}} \overline{\aleph} = \frac{\sum \aleph_j \cdot k_j}{\sum k_j}$$

It follows that the rate of return of the entire economy is equal:

$$\gamma = \frac{r_{capital}}{k_{capital}} = \overline{\aleph} \cdot \mathrm{i}$$

Recall that the product $\aleph_j \cdot \mathrm{i}$ is the rate of return γ_j of a generic capital good "j" according to Robinson's First Law (microeconomics), while output is the rate of return of a generic capital good "j" according to Robinson's First Law (microeconomics), while product $(\overline{\aleph} \cdot \mathrm{i})$ is the rate of return γ of all capital in the economy. It is therefore correct to formulate the above macroeconomic relationship as a law, Robinson's Second Law, although in reality, both the parameter and the law itself are a consequence of Robinson's Second Law. $\overline{\aleph}$ and the law itself are a consequence of the first law and are deduced from it.

From the interpretation that we have given in the theory to the uncertainty of capital goods, it is not difficult to demonstrate that, in general and in the real world in which we live, the value of the Uncertainty Factor $\aleph_j$ as the lack of knowledge about the future income flow, it is not difficult to demonstrate that, in general and in the real world in which we live, the value of the Uncertainty Factor $\overline{\aleph}$ must always be greater than or equal to "1", reflecting the belief that the rents created by the different forms in which capital currently exists will not be maintained in the future. This is what is expected to happen in an evolving economy, where part of the companies disappear to give way to new companies in a process of creative destruction similar to that described by the economist Schumpeter.

But this same interpretation of the parameter $\overline{\aleph}$ also leads us to suspect that there must be capital goods that are expected not only to maintain rents in the future, but also to increase them. These assets will have an uncertainty $\aleph_j$ less than "1" and are easily identifiable in the real economy in housing built in the centers of major cities, and with other forms of real estate capital, such as office space, also in urban centers. Unsurprisingly, capital goods with an uncertainty value of less than "1" appear in speculative bubbles, so the parameter can be used without difficulty to detect their presence.

6. THE THIRD LAW OF CAPITAL OR PIKETTY'S LAW

A question that arises naturally from the exposition we are making on the financial nature of capital and its valuation in the market, is the one that concerns the evolution over time of the Uncertainty Factor that appears in Robinson's Second Law:

> *Towards what value does the Uncertainty Factor tend to be $\overline{\aleph}$ in an economy that does not change, or changes very slowly over time?*

It can be reasoned that, if the Uncertainty Factor is measuring the unknown future income produced by capital goods, then in a quasi-stationary, or slowly growing, economy, future income will also be very stable and change in value slowly, so that the Capital Market's valuation of capital goods can be expected to be about the same as that of the money being lent. In such a situation, the Uncertainty Factor $\overline{\aleph}$ of the economy should have a value close to and slightly above "1", indicating that there is no substantial difference between money on loan (monetary capital) and the rest of the different forms of capital:

$$\gamma = \frac{\alpha}{\beta} = \overline{\aleph} \cdot i \xrightarrow{\overline{\aleph} \to 1} \begin{cases} \gamma = i \\ \beta = \frac{\alpha}{i} \end{cases}$$ (*Economics without uncertainty)*

The reason for such a development is to be found in the concept of uncertainty itself. If an economy is so predictable that we know when a capital good will stop yielding rents and when a new capital good will start yielding rents, it will be possible to diversify investments in such a way that the rent coincides with a rent produced by a capital good whose uncertainty is equal to "1". This is the inevitable conclusion to which the financial nature of capital and the interpretation of the uncertainty parameter that we introduced when we formulated Robinson's First and Second Laws, and which we will now culminate by formulating the Third Law of Capital or Piketty's Law:

PIKETTY'S LAW: In a stationary, monetary economy, with no change in production or distribution, the Uncertainty Factor of capital $\overline{\aleph}$ is worth "one":

$$\gamma = \mathrm{i} \quad ó \quad \overline{\aleph} = 1 \quad ó \quad \beta = \frac{\alpha}{\mathrm{i}}$$ *Piketty's Law*

Or, in another way: "In an economy without uncertainty the rate of return on aggregate capital is equal to the rate of interest on money."

As we have discussed, in a stationary or unchanging economy, there will be no reason for the rents of capital goods to be subject to future uncertainties, so the uncertainty factor $\overline{\aleph}$ of the economy, as well as the uncertainty of the $\aleph_j$ of each of the capital goods, should in such a case be slightly higher than "1".

Thomas Piketty's "Capital in the 21st Century".

It is interesting to note that Piketty also asks this same question about the future value of the aggregate capital of an economy in his publication, "Capital in the 21st Century", and, like us, answers the question by formulating a law. In his case, by formulating his "Second Fundamental Law of Capitalism", going deeper and deeper into the swampy conceptual trap that defines capital as a "countable asset":

...The second salient fact concerns the comparison between Europe and the United States. As expected, the shocks of the 1914-1945 period hit Europe much harder, so that the capital/income ratio was lower there from the 1920s to the 1980s. Excluding this long period of war and its aftermath, however, we find that the capital/income ratio has always tended to be higher in Europe.

This was the case in the 19th and 20th centuries (when the capital-to-income ratio was 6 to 7 in Europe, compared to 4 to 5 in the United States) and again in the late 20th and early 21st centuries: private wealth in Europe again surpassed U.S. levels in the 1990s, and the capital-to-income ratio is now close to 6, compared to just over 4 in the United States.

These facts have not yet been explained. Why is the capital/income ratio at historical highs in Europe, and why should it be structurally higher in Europe than in the United States? What magical forces imply that a society's capital should be six or seven years of national income instead of three or four? Is there an equilibrium level of the capital/income ratio, and if so how is it determined, what are the consequences for the rate of return on capital, and for the relationship between it and the capital-labor division of national income? To answer these questions, I will begin by presenting the dynamic law that allows us to relate the capital/income ratio in an economy to its saving and its rate of growth.

The second fundamental law of capitalism: $\beta = s/g$

In the long run, the ratio of capital to income β is related in a simple and transparent way to the savings rate s and the growth rate g according to the following formula:

$$\beta = s/g$$

For example, if $s = 12\%$ and $g = 2\%$, then, $\beta s/g = 600\%$.

In other words, if a country saves 12 percent of its national income each year, and the growth rate of its national income is 2 percent per year, for large times, the capital/income ratio will be equal to 600 percent: the country will have accumulated capital equivalent to six years of national income.

Tomas Piketty, Capital in the 21st Century (2012).

Needless to say, if in the Madrid Theory we have tried to answer this and other questions on the valuation of capital goods, it has been only after reading Piketty's book, so that the Third Law of Capital that we have formulated would never have been possible without the precedent created by Piketty in his work, where he asks the right questions, but fails to set out a coherent Theory of Growth with which to answer them, which is what he needs to justify the relationship between savings and the valuation of capital that he has introduced with his second fundamental law.

Regardless of whether "the second fundamental law of capitalism" as formulated by Piketty is true or not, and regardless of whether it can be more or less supported by the empirical data he presents in his book (something that is far from clear), it is very clear that the theory that Piketty puts forward is a theory of growth based, once again, on the physical nature of capital, where the value of capital increases thanks to the accumulation of physical capital that buys savings:

To see that Piketty's theory of capital speaks of the physical nature of capital, let us assume an economy in which 12% of GDP is saved and invested in capital. If the value of GDP is €1,000, €120 per year is being saved, and the physical increase in capital will be €120 per year, i.e. capital grows at 12% of *GDP*. But if *GDP* also grows, the race between accumulated capital and *GDP* growth will remain even only when its quotient β has the value of 6:

$$\frac{K + \Delta K}{PIB + \Delta PIB} = \frac{6120}{1020} = 6 = \beta$$

That is, in an economy growing at 2% per year, in which 12% of GDP is saved, and which has a value of β value of less than 6, capital grows faster than *GDP* . Or again, in an economy that grows by 2% per year, in which 12% of GDP is saved and which has a value of β greater than 6, capital grows slower than *GDP*. Therefore, the parameter β tends to:

$$\beta_{t\rightarrow\infty} = \frac{s}{g}$$

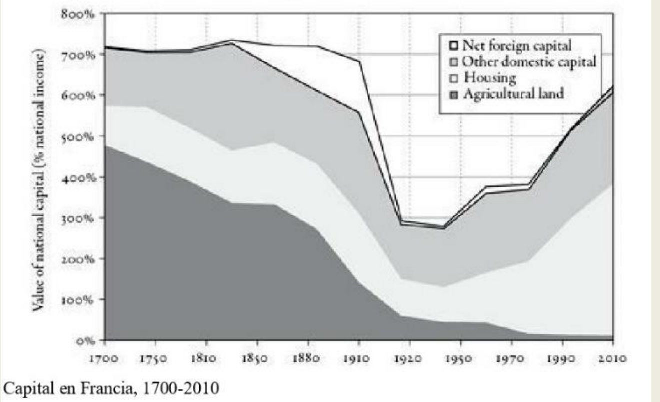
Piketty's idea is very brilliant, but only if the nature of capital is physical. In fact, it can be shown very easily that the law is fulfilled only if it is also fulfilled that *the growth rate of capital in an economy is equal to its saving rate,* which is not at all clear that this is the case.

Evidently, care must be taken not to fall into a tautology by identifying the increase in capital held by individuals with the increase in their savings, since in such a case it is evident that Piketty's second law is fulfilled. When Piketty speaks of savings he is referring to money that is consumed in the purchase of physical capital goods (i.e., goods that are consumed in the physical formation of firms). Strictly speaking, it is money that is not spent on consumer goods but which is not saved either, so it is not at all clear how it can be measured, in fact, Piketty never shows a graph of how monetary saving evolves within the economy, so he cannot demonstrate empirically the validity of his second law.

<u>PIKETTY'S PHYSICAL CAPITAL</u>. Despite all the doubts about the physical nature of capital, the motivation that follows throughout the book, and what we think is Piketty's central idea throughout "Capital in the 21st Century", is that the value of capital tends towards a constant value:

$$\beta_{t\to\infty} = \frac{s}{g}$$

This can be seen very well in the graph with which Piketty shows the evolution of β and in which it is easy to see that the parameter has remained unchanged for more than 200 years, which evidently indicates the presence of a law.



Capital en Francia, 1700-2010

Piketty thinks that he can easily justify the constant value of β equal to about 7 times GDP by associating a savings rate, also constant, of 14% of GDP. This is consistent with the flatness of the graph and allows to explain it very well.

Although he then, logically, finds it very difficult to find an explanation for the immense "hole" that appears throughout the 20th century in the valuation of capital, using the same second law. Despite this, Piketty does make an extraordinary observation when he predicts that the value of *aggregate capital relative to GDP is heading towards the value it had throughout the eighteenth and nineteenth centuries. In fact, it is the almost constant slope of the valuation of capital, when the economy comes out of the doldrums, that makes him believe that he is facing a clear demonstration of the physical nature of capital.*

The authors of this paper recognize that we would never have asked ourselves the question of what value aggregate capital tends to if we had not seen it formulated earlier in Thomas Piketty's book. Therefore, we would also never have attempted to explain the evolution of the parameter β if we had not first seen Piketty's "Piketty's Hole" in the graph that appears in his book. Therefore, although we will shortly see that it is very easy to explain from a financial point of view the changes observed in the graph of the valuation of capital, we have not the slightest doubt that the Third Law of Capital that we have formulated here, if it turns out to be true in the end, has to be named "Piketty's Law":

$$\beta = \frac{\alpha}{i} \qquad \textit{Piketty's Law}$$

CHAPTER 8

FINANCIAL THEORY OF CAPITAL

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1. THE PARAMETERS ON WHICH CAPITAL DEPENDS.

The three laws of capital tell us about the financial nature of capital and how capital goods are valued in the capital market, so it is necessary, first of all, to explain the meaning of the different parameters that appear in the three laws, their possible values and what they depend on. Only in this way can the validity or falsity of the three laws be ascertained.

In particular, it is necessary to explain in more detail what is the parameter of uncertainty, which is the interest rate and who sets it, the market or the monetary authorities? But it is also important to explain other parameters that do not appear implicitly in the laws, but that we can reasonably expect to influence the valuation of capital goods, such as inflation or taxes.

We are going to evaluate these issues.

2. THE MEANING OF THE UNCERTAINTY PARAMETER.

From the beginning we have understood that the parameter that measures uncertainty must be closely linked to the probability that the monetary rent produced by each specific capital good will be maintained in the future. $\aleph_j$ must be closely linked to the probability that the monetary income produced by each specific capital good will be maintained in the future. This is logical. If the price of a capital good comes from its capacity to produce an income, and income is by definition a flow of income that is maintained over time indefinitely, then it is logical to think that the greater the doubt about the amount of income in the future, the lower the price at which the capital good is currently sold and the greater the value of the uncertainty that appears in Robinson's Law. $\aleph_j$ that appears in Robinson's Law.

But, although this simple idea of uncertainty is very attractive, it should not be forgotten that capital goods are valued in the Capital Market by comparing them with the income that comes from the money that is lent, so that for arbitrage to take place it is necessary that any person who wishes to do so can request a loan at the current interest rate in order to buy a capital good that he thinks is undervalued. Without this indispensable requirement, which is implicit in the financial nature of capital, it would be impossible to affirm the validity of Robinson's law and to speak of a Capital Market where the law is fulfilled:

$$r_j = \aleph_j \cdot i \cdot k_j$$

Let's see why.

If we accept as true, that anyone who asks for it can obtain a loan at the market interest rate to buy a capital good, then anyone who thinks that he will be able to pay back the interest and principal with the income produced by a capital good, will ask for a loan and buy that capital good. But this will happen when he thinks that the uncertainty factor of the capital good he buys with the loan is greater than "1", since otherwise he will have to put in extra money to repay the loan. If we call k_j the price of the capital good:

$$\left.\begin{array}{lc} (renta) \rightarrow & r_j = \aleph_j \cdot i \cdot k_j \\ (intereses) \rightarrow & r_{dinero} = i \cdot k_j \end{array}\right\} \xrightarrow{\aleph_j > 1} \quad r_j > r_{dinero} \quad \rightarrow \quad r_j = r_{dinero} + \frac{principal}{n\ cuotas}$$

The expression tells us that the buyer of a capital good whose uncertainty is greater than "one" can use the income produced by the capital good to pay the interest on the loan and gradually repay the principal. r_j that produces the capital good to pay the interest on the loan and gradually repay the principal. In such a case, after some time, "the investor" will have repaid the loan and will still have the capital good.

Therefore, there must be a good reason for agents not to run out and ask for money on credit to buy capital goods whose uncertainty is greater than "1", which is almost all of them. And the reason is none other than that what is really indicating to the prospective buyer an uncertainty $\aleph_j$ greater than "1" is that the income produced by the capital good will not be maintained long enough for him to repay the loan, which is the interpretation we have given to uncertainty from the beginning. In fact, we can do some simple mathematical operations (which we will not do) and obtain the relationship between the uncertainty factor and the time during which the rent is expected to be maintained:

$$T = \frac{1}{(\aleph_j - 1) \cdot i}$$

Where T is the number of years during which the asset will be maintained giving an income, e i is the interest rate of money. The expression tells us that when the uncertainty is "1" the good will be maintained indefinitely giving rents, but the greater the uncertainty the shorter the time it will give rents.

But, the important thing is to understand that we can only be sure that the Capital Market is doing its job, when anyone who wants to can borrow at the market interest rate to buy capital goods, because only then, the uncertainty will be expressing the doubts that people have about the future of rents.

This is what happens when someone believes that a capital good has a real uncertainty that is below the value assigned to it by the market, who will try to buy it if he has access to credit. $\aleph_j$ uncertainty that is below the value assigned to it by the market, that he will try to buy it if he has access to credit. And, he will do the opposite when he thinks, rightly or wrongly, that the uncertainty associated with some capital good he owns is above the value assigned to it by the market, that he will try to sell it to liquidate his savings and acquire another capital good instead.

<u>CAPITAL MARKET ARBITRAGE</u>. From the point of view of the Capital Market, and provided that the agents participating in the economy have unlimited access to loans at the interest rate of money, we can be sure that the uncertainty of a capital good indicates the limit above which it will be advantageous to borrow to buy it, and below which it will be advantageous to sell it and

lend the money. $\aleph_j$ *of a capital good indicates the limit above which it will be advantageous to borrow to buy it, and below which it will be advantageous to sell it and lend the money.*

The business of borrowing money to buy a capital good that is thought to be undervalued is known in economics as "leverage". It is a market mechanism that has a very bad reputation among left-wing economists (those who tend to hate financial markets) because they think that the profit obtained by the one who is leveraged does not come from the provision of any service, but from betting and gambling, which is completely wrong.

Unlike in the Consumer Market, where prices are set by sellers, in the Capital Market prices are set by buying and selling, so there must be sufficient "liquidity" for buying and selling to take place smoothly. Without liquidity it is not possible for capital goods to have their real price because the leverage that allows arbitrage in the Capital Market cannot take place.

Of course, here we are not defending speculation, which can almost never take place without criminal control of the market, nor are we claiming that speculation is not harmful to the economy, but we must not forget that speculation and arbitrage are completely different things. Precisely, it is liquidity and the fact that anyone can borrow at the market interest rate, which guarantees that there is no speculation in the market.

Capital market liquidity, and therefore leverage, is vital to the capitalist economy.

3. THE INTEREST RATE OF MONEY

For as long as there has been historical evidence of the presence of money within society, there seems to have existed alongside it, the inevitable rate of interest that is claimed when money is lent. No one should be surprised then, that one of the greatest controversies in which economic theory has been involved since the dawn of time, is the inevitable question as to the origin of the interest rate of money and what determines its value, without ever arriving at any satisfactory answer that most economists accept as valid.

In the theory we are developing we have unequivocally identified "money" as the capital good that is used as a reference to give a price to the rest of the capital goods thanks, precisely, to the rent it produces when it is lent. But this should not make us forget that the question of why money produces a rent when it is lent has not been answered, nor has anything been said about who or what fixes its value.

Therefore, to affirm that the interest rate of money exists because income-producing goods exist, although it may be a very counter-intuitive and almost tautological statement, the truth is that it is a very old idea that has been defended by almost all economists.

THE INTEREST RATE of money exists and is always positive, because the money borrowed can be used to buy capital goods that produce income. That is to say, the interest rate of money is positive because there are goods that produce income.

Let's start by giving an example to understand why the existence of rent makes it necessary to ask for interest on the money that is lent.

A house, as we all know, is a capital good that has a price and that the owner can rent in exchange for a rent. Let us imagine, to be a little more specific, that the price of the house is 100,000 euros and that it can easily be rented in exchange for an annual rent of 5,000 euros, after deducting expenses.

No one is unaware that, if a bank were to give us a loan of 100,000 euros to buy a house, with the only obligation to repay the 100,000 euros of principal little by little, but without having to pay any interest on the money we have borrowed, we could buy the house and repay the loan principal without difficulty over a more or less long period of time, using only the income obtained from renting the house.

In the example, we see clearly that the existence of goods that produce rents obliges the money that is lent to pay interest, for the simple and silly reason that with the money that is lent, goods can be bought that produce an income with which it is possible to pay back the principal of the loan without any problem. The existence of the interest at which they lend you the money, invariably spoils what otherwise would be a round business for people who have unlimited access to credit. We see with clear clarity that, effectively, interest exists because there are goods that produce income.

Another way of explaining the same thing, and which surely makes it easier to understand the basic idea, is to imagine a monetary economy in which rent-producing goods do not exist and to show why, in such a case, no interest should be asked for when money is lent.

Let us imagine for a moment a monetary economy in which there are no income-producing goods, i.e., no capital goods, but there is money. In such an economy, money can only be used to buy consumer goods, which leads us to ask, first of all, why anyone would want to save money. If we think about it a little, we will come to the conclusion that the only intention that someone who saves money in such an economy can have is to reduce his current consumption in order to increase it later, i.e., he who saves money is using it as a store of value to buy consumer goods in the future.

We must also ask ourselves about what may be the intention for which a person takes out a loan. In an economy without capital goods, the only reason someone might borrow money is to increase his current consumption, at the cost of decreasing his future consumption when he has to pay back the loan money.

This situation is very curious, because we are facing an exchange of services between those who wish to advance consumption and those who wish to defer it. An exchange between those who save and those who spend on credit. In such a situation, it is very reasonable to suspect that the interest rate will hover around zero, being negative when there are more people wanting to defer consumption, i.e., wanting to save, and being positive when there are more people wanting to advance consumption, i.e., wanting to spend on credit. In an economy like the one described above, when the flow of spending to be deferred equals the flow of spending to be brought forward, the interest rate should be zero.

We see very clearly that in an economy in which capital goods cannot be purchased, the interest rate is around zero, and will only be different from zero when the aggregate desire to save and the aggregate desire to spend differ (provided that the legal system guarantees the repayment of loans, which is usually the case).

In short, if in real monetary economies the interest rate is positive, it is because those who borrow money can use it for the purchase of capital goods from which they expect to obtain an income with which they can repay the principal of the loan. This is what we call leverage.

LEVERAGE. The mechanism of borrowing money to buy capital goods with the intention of paying it back with the income it produces is known as leverage. In general, leverage is frowned upon by some economists because they tend not to understand that it is through this mechanism that the price of different capital goods is arbitraged in the capital market.

How much is a capital good worth? How much is the income it produces worth? It can only be known when there are people who are willing to borrow at the market interest rate to acquire them. With such leveraged purchases, agents set the price of capital goods by fixing the uncertainty they attach to the rent they produce.

Specifically, in an economy in which any amount of money is available without limitation at the market interest rate, a capital good that yields a rent r_j and which has a price k_j must have an associated uncertainty $\aleph_j$ that it is worth:

$$k_j = \frac{r_j}{\aleph_j \cdot i} \rightarrow \qquad \aleph_j = \frac{r_j}{k_j \cdot i} = \frac{r_j}{r_{dinero}}$$

Obviously, it is the interest rate of money that fixes the value of capital goods, but this is only possible to the extent that credit can be obtained in an unlimited manner. Otherwise, when leverage cannot occur and there will be no arbitrage.

Who sets the value of the interest rate?

We can conclude that, in a monetary economy, not only money has to be lent at a rate of interest greater than zero, but also access to credit has to be unlimited so that leverage can fix the value of capital goods. But who sets the value of the interest rate? Who decides what value it has?

Obviously, fixing the interest rate of money at a specific value necessarily implies having the ability to lend any amount of money requested at that interest rate. If this condition is not met, it makes no sense to speak of anyone fixing the interest rate of money. In that sense, only commercial and investment banks have the legal privilege of creating money out of nothing and lending it, so they are the ones who set the interest rate of money when they grant credit. However, it is very clear that in deflationary crises the banking system runs out of liquidity and banks are unable to sustain the granting of credit without the help of the Central Bank, so it is not very clear that the banking system is really able to set the interest rate of money when it gives liquidity to the system.

<u>WHAT INTEREST RATE</u>? In today's monetary economies, it is the Central Bank who creates money out of nothing and lends it to commercial and investment banks at their request, at the "interbank interest rate" with a mechanism that we will see later, when we analyze the "Banking System". But here we have called "interest rate" the price at which banks lend money when someone is going to buy a house or when some company wants to make an investment, and which is much higher than the interbank interest rate, so it seems that there are two interest rates in the economy, one used for consumer loans and investment, and the other used by the Central Bank to provide liquidity to the banking system. This is not true.

Moreover, to complicate matters further, economists generally associate the interest rate of money with the interest rate paid by the government on its credits, treasury bonds, and whose value is set by commercial and investment banks when they lend money to the government.

As if the situation were not complex enough, the current massive purchase of assets by the Central Bank in the Capital Market to provide liquidity to the economic system, alters the interest rate of treasury bonds in such a way that it is difficult to determine what the interest rate of money is, and who is setting it, the commercial and investment banks or the Central Bank.

However, here we have called "interest rate" the price at which money is lent to carry out the leverage in the Capital Market, which is not possible to identify with either of the two previous rates, because money is lent at a different interest rate according to who the debtor is and according to the creditworthiness attributed to him.

It is logical. A government borrowing 10 billion euros is not going to be charged the same interest rate as a private individual borrowing money to buy a car. It would not make sense. Therefore, we cannot speak of a defined interest rate, but of an interest rate ranging from the interbank interest rate to the onerous credit card interest rate.

We see that in the economy there is some confusion about what is meant by interest rate because there are different lenders and different access to different lenders. The *confusion, therefore, has its origin in the privilege granted by the Central Bank to certain actors, such as private banks, to the detriment of other actors such as companies or individuals, without it being very clear that this differential treatment is really justified.*

(see below for a further discussion on the subject, in connection with the liquidity of the Capital Market).

4. INFLATION AND CAPITAL APPRECIATION.

In theory, "capital" has been identified with the valuation made by the Capital Market of the different income flows that occur in the economy, so it is important to know how the valuation changes when there is inflation within the economy. In particular, it is important to check whether the concrete form of the three laws of capital remains valid when the economy is inflationary, or on the contrary undergoes some change.

The economist who first worked in depth on the influence of inflation on the value of capital goods was the American Irving Fischer, whom we already know here from the constant that bears his name. We will now limit ourselves to repeat very quickly some of the conclusions of his work, which is already more than 100 years old, without going into the details of how they are reached, but within the context of the formulation of the three laws of capital.

Inflation is defined in monetary economies as a generalized rise in the prices at which consumer goods are sold. In practice, since not all prices change in the same way or in the same proportion, the average inflation rate is defined as the percentage change in the price of a "basket of goods" chosen for that purpose, in terms of the average inflation rate. π as the percentage change in the price of a "basket of goods" chosen for that purpose, over a period of time, usually one year. Δt which is usually one year:

$$\pi \equiv tasa\ de\ inflacion \quad \rightarrow \quad \pi = \frac{1}{p_{canasta}(t)} \frac{p_{canasta}(t + \Delta t) - p_{canasta}(t)}{\Delta t}$$

Since the variables with which the economy is described are not monetary stocks, but monetary flows, it is better to define inflation in reference to the expenditure necessary to purchase a standard flow of goods. Thus, inflation is the percentage by which the standard flow of expenditure that allows the purchase of the standard flow of goods changes annually. If we call $\varphi(t)$ to the flow of expenditure that allows the purchase of the standard flow of goods (the basic basket of goods), and if we call $\varphi(t+\Delta t)$ the expenditure flow, which after a period of time, allows the purchase of the same basket of goods. Δtperiod, allows the purchase of the same basket of goods, then:

$$\pi = \frac{1}{\varphi(t)}\frac{\varphi(t+\Delta t)-\varphi(t)}{\Delta t} \qquad\qquad \varphi(t) \equiv flujo\ monetario$$

With this definition the inflation rate has time-1 dimensions (as in the first expression), which can complicate our life a lot because in today's economy the inflation rate, the interest rate, the interest rate, the interest rate, the interest rate, the interest rate, the interest rate, the interest rate, the interest rate, the interest rate, the interest rate, and the interest rate. $\pi$the interest rate i and the real interest rate i^o are considered dimensionless parameters that relate monetary stocks, although they are clearly not. This can be seen very well in "Fisher's equation" that relates the three parameters, where all of them are clearly dimensionless:

$$(1+i^o) = (1+\pi)(1+i) \qquad\qquad \begin{cases} \pi \to tasa\ de\ inflación \\ i\ \to tasa\ de\ interés \\ i^o \to tasa\ de\ interés\ real \end{cases}$$

We are not going to go into this problem of dimensions now, but to find out how Robinson's law changes when there is inflation. Let us clarify this a little by comparing two economies, one with inflation and the other without inflation:

$$r_j = \aleph_j \cdot i \cdot k_j$$
$$r_j^o = \aleph_j \cdot i \cdot k_j^o$$

The first expression is Robinson's law in an economy in which there is inflation, while the second expression is the same law, but using the supra index zero to indicate that they are the variables in an economy without inflation. We assume that the rate of interest is the same in both economies, and that the uncertainty $\aleph_j$ that appears in the law does not depend on either the interest rate or the inflation rate. What we are going to show is that this is only possible if, on average, both rents and the price of capital suffer the same inflation as consumer goods. Let us accept that this is true, and that income suffers the same inflation as consumer goods, and let us take a generic good j:

$$r_j = (1+\pi)\cdot\ r_j^o \xrightarrow{r_j^o = \aleph_j \cdot i \cdot k_j^o} r_j = (1+\pi)\cdot \aleph_\mathrm{j} \cdot \mathrm{i} \cdot \mathrm{k_j^o} \xrightarrow{r_j = \aleph_\mathrm{j} \cdot i \cdot k_j} k_j = (1+\pi)\cdot \mathrm{k_j^o}$$

We see that when capital suffers an inflation equal to the inflation suffered by income, the expression of the 1st law is consistent and only depends on the nominal rate of interest, which is what we can expect to happen in an economy where income comes from the profits obtained from the sale of consumer goods, so they will rise in nominal terms when these rise and fall in nominal terms when these fall. Therefore, we can expect an inflation in the valuation of capital, equal to the inflation suffered by the rest of consumer goods, which is consistent with the formulation of Robinson's law and is also consistent with the other two laws. According to the above, the uncertainty $\aleph_\mathrm{j}$ of capital goods must also be independent of the inflation rate:

<u>THE THREE LAWS OF CAPITAL</u>

$$r_j = \aleph_j \cdot i \cdot k_j \qquad 1^{\underline{a}}\ \mathit{Ley\ de\ Robinson}$$

$$r_{capital} = \overline{\aleph} \cdot i \cdot k_{capital} \qquad 2^{\underline{a}}\ \mathit{Ley\ de\ Robinson}$$

$$\overline{\aleph} = 1 \qquad \gamma = i \qquad \beta = \frac{\alpha}{\mathrm{i}} \qquad \mathit{Ley\ de\ Piketty}$$

The formulation of the three laws of capital is independent of the rate of inflation, which is consistent with the statement that the value of capital goods changes nominally at the same rate at which consumer goods change, confirming the financial nature of capital.

5. EXPERIMENTAL VERIFICATION OF PIKETY'S LAW

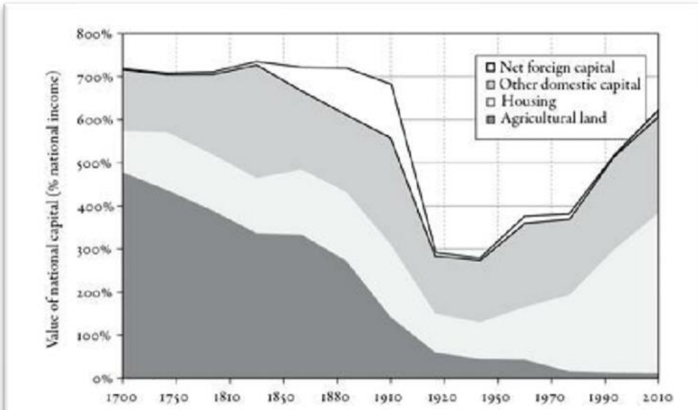
Although both Robinson's first and second laws are so logical that it seems impossible for them not to be fulfilled, it is true that the theory leaves the uncertainty parameter undetermined $\aleph_j$ so that it is always possible to choose the value of the parameter in such a way that both laws are fulfilled. However, the latter is not possible with the third law, which we have named Piketty's Law, because in its statement the uncertainty parameter must be "1" for the law to be fulfilled:

$\overline{\aleph}=1$ $\gamma=i$ $\beta=\alpha/i$ Piketty's Law

Each of the variables in Piketty's formulation of the law can be determined experimentally, so it is easy to test whether the law is, or is not, valid. That is, one can test the value slightly above "1" that the theory predicts for the Uncertainty Factor when the economy is stationary, which should be the case most of the time in any economy.

The curious thing is that there is no problem in verifying it. The book written by Tomas Piketty that we have already mentioned several times here, "Capital in the 21st Century", is an excellent compendium in which all the information we have on the valuation of aggregate capital in the world's major economies over the last 300 years, specifically, from the French Revolution to the present day, is collected in a graphic way. Not only that, the book also includes the changes in the tax rate at which capital income and capital itself are taxed, and what the value of aggregate capital was.

The reason Piketty collects this data is not only informative, since he needs it to try to justify the two fundamental laws of capitalism that he formulates in his book. In addition, he also needs the data to demonstrate that the decline in the tax rate is the most likely source of the growing income inequality that almost all the world's economies are experiencing, which makes Piketty's work very complete and invaluable.



Capital en Francia. 1700-2010

For example, the attached graph that we have shown many times here is taken from Piketty's book. It shows the market value of aggregate capital as a percentage of *GDP over the* last 300 years in France, which is known as the parameter β. The graph, which refers to the French economy, is not different from other graphs referring to other countries that appear in the book, but it is the one we are using here as a sample button to try to explain the changes in the valuation of capital that the economy has experienced over the last 300 years because it is the most complete and surely also the most accurate:

The great merit of Thomas Piketty, if it is possible to highlight one among the many merits treasured in "Capital in the 21st Century", is the graph that serves as a guiding thread to explain the unstoppable increase that inequality has experienced during the last half century in our economies. In it he manages to synthesize, in a simple glance, the theoretical problem facing the economy as a science:

"explain the sharp drop and subsequent slow recovery observed in the parameter. β"

This is what we have called "Piketty's Hole", which in our opinion is more than enough reason to award him the Nobel Prize in Economics.

We will now explain what can be seen in the graph.

a) Piketty's Economics

The graph shows that during two long centuries, the eighteenth and nineteenth centuries, the valuation of capital remained constant and stable at around seven times the annual value of production in France, so that according to the financial nature of capital as we have just explained, the Uncertainty Factor $\overline{\aleph}$ in Piketty's Law remained slightly above "1" throughout the whole period, the average rate of return on capital being very close to the rate of interest on capital. γ very close to the interest rate of money.

<u>PIKETTY ECONOMY</u>: We call Piketty economics an economy in which the rate of return on aggregate capital is equal to the rate of interest on money:

$$\gamma = i \qquad\qquad Economía\ de\ Piketty$$

This is the type of economy to which, according to Piketty's Law, any stationary economy tends.

For at least two centuries, the 18th and 19th centuries, the interest rate on government bonds, which we can identify with the interest rate on money, although they are not exactly the same thing, remained unchanged at around 4% or 5%, while the share of income in *GDP*, the parameter of the economy, averaged around 30% of GDP, as Piketty tells us in his book. α of the economy, was on average around 30% of GDP, as Piketty tells us in his book. Moreover, we can see in the graph that the value of the aggregate capital of the economy remained constant at around 6 times GDP, so it can be said that for two long centuries the world economy was a Piketty economy with an Uncertainty Factor slightly above "1":

$$\left.\begin{aligned} \alpha &= \frac{r_{capital}}{PIB} = 30\% \\ \beta &= \frac{k_{capital}}{PIB} = 6 \end{aligned}\right\} \xrightarrow{\text{Econ. Pikety } (\gamma=\text{i})} \gamma = \frac{\alpha}{\beta} = \frac{30\%}{6} = 5\% = i$$

An economy without uncertainty in the income produced by capital goods might seem an impossible event in today's economies were it not for the empirical evidence provided by Piketty's work, and they are a very strong proof of the validity of the three laws of capital that we have stated, but, above all, a very strong proof of the financial nature of capital.

b) Piketty's Hole

If the constancy of the parameter β during the eighteenth and nineteenth centuries that Piketty shows us confirms without any doubt the third law of capital, the same is not true of the data showing the evolution of the parameter since the beginning of the twentieth century, which, on the contrary, seem to contradict it. If it is not at all clear what could have caused the tremendous fall in the valuation of capital income at the beginning of the second decade of the twentieth century, it is even less clear why the valuation of capital has not yet reached, after a century, the stationary regime predicted by the third law.

We believe that the abrupt fall in the valuation of capital and its prolongation for at least 20 years can almost certainly be explained by a combination of several causes, the first and most important of them being the banking panic that originated in the USA in 1907 and spread to all the economies of the world, and the second being the world war that broke out only a few years later. According to the chronicles of the beginning of the 20th century, a strong banking crisis hit the US banking system in 1907 and, although it was apparently solved thanks to the energetic intervention of the banker J.P. Morgan and the subsequent creation of the Federal Reserve, everything leads us to suspect that it affected the world economy to the point of giving rise, only a few years later, to the First World War in 1914.

In addition to these two "obvious" causes, we can add a third cause that undoubtedly aggravated the problem, which was the fall in the income of the capital coming from the colonies that the Europeans, and especially the French, had invested all over the world.

What is not so easy to explain is the reason why the low valuation of incomes continued in France throughout the 1920s until it culminated in the great final crisis of 1929 which, only ten years later, gave way to the Second World War. The three disastrous decades, that of the First World War, that of the "happy twenties" and that of the "fascist thirties", are the floor of the hole seen in the graph and which it is necessary to justify from the point of view of the financial theory of capital.

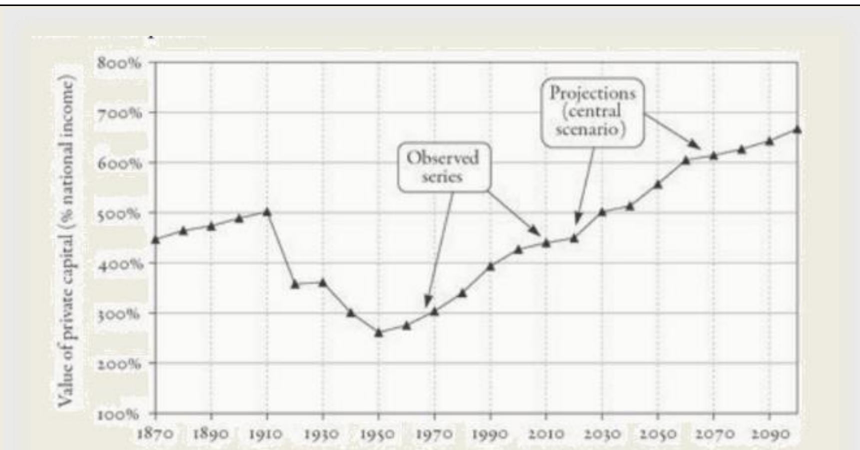
Since the first great war did not appreciably destroy the physical capital of any of the belligerent countries, and as Piketty comments in his work, the war alone cannot explain the fall in the valuation of capital goods, there must be a financial explanation for what is observed. Something very different happened years later during the Second World War, in which both Russia and the whole of central Europe were completely devastated. Even France and the United Kingdom suffered appreciable damage.

The graph shows that, only very slowly and only after almost a century has elapsed, the value of capital measured in terms of *GDP, the* parameter βseems to approach the theoretical value predicted by the Third Law. Precisely, Piketty formulates in his book the "Second Fundamental Law of Capital" to explain the almost constant slope shown in the graph during the last 80 years:

$$\beta \approx \frac{s}{g} \qquad \rightarrow \begin{cases} s \equiv tasa\ de\ ahorro \\ g \equiv tasa\ de\ crecimiento \end{cases}$$

And, he predicts, it will not be until the end of the 21st century that continued savings of 10% of *GDP* and average growth of 1.5% will accumulate enough physical capital to return the economy to a situation similar to that of the 18th and 19th centuries.

$$\beta_{t\rightarrow\infty} = \frac{10\%}{1,5\%} = 7$$



Cociente entre el capital y los ingresos mundiales
(El capital del siglo XXI - Piketty)

" The more interesting question is that of the extrapolation of this curve into the future. Here I have used the population and economic growth forecasts presented in Chapter 2, according to which world output will gradually decline from the current 3 percent per year to only 1.5 percent in the second half of the 21st century. I also assume that the savings rate will stabilize at around 10 percent in the long run.

Under these assumptions, the dynamics β=s/g implies that the global capital-to-income ratio will logically continue to rise and could approach 700 percent before the end of the 21st century, i.e., roughly the level observed in Europe from the 18th century until the Belle Époque. In other words, by 2100, the entire planet could resemble Europe at the turn of the 20th century, at least in terms of capital intensity. Obviously, this is only one possibility among others. As noted, these growth predictions are highly uncertain, as is the prediction of the savings rate. These extrapolations are nevertheless plausible and valuable as a way of illustrating the crucial role of the growth slowdown in capital accumulation."

Tomas Piketty, Capital in the 21st Century (2012).

Once again, we see that Thomas Piketty always thinks of capital as an "accounting asset" that accumulates thanks to savings, and not as the financial valuation of the income produced by the physical "reality" of production. Specifically, Piketty's prediction is based on the assumption that the value accumulated by savings is equal to the growth of capital, which seems to corroborate the evolution of the last 80 years in the industrialized countries:

$$\left.\begin{array}{r} ahorro \equiv 15\% \cdot PIB \\ \Delta capital \equiv 3\% \cdot \beta \cdot PIB \end{array}\right\} \rightarrow \textit{savings}{=}\Delta \textit{capital} \ \rightarrow \ \beta \sim 7$$

With the data assumed by Piketty, capital increases, on average, by the value of GDP every 40 years, which lends much credibility to the belief that savings is the origin of the physical accumulation of capital, since the savings accumulated in the 80 years since the end of World War II coincide with the increase observed in aggregate capital, which has gone from being about 4 times GDP when the war ended, to having at present the value of about 6 times GDP.

However, we know that, from the point of view of the third law, the value of capital has a ceiling that is reached when the economy enters a stationary regime, no matter what the value of growth is and no matter what the amount that is saved (as long as we do not enter into the tautology of defining saving as the increase of capital):

$$\begin{matrix} economía \\ estacionaria \end{matrix} \quad \leftrightarrow \quad \beta = \frac{\alpha}{i} \qquad\qquad\qquad (Ley\ de\ Piketty)$$

If the upward slope shown by the value of capital over the last 80 years seems to support the nature of the physical accumulation of capital advocated by Piketty, the opposite is true for the prediction based on the financial nature of capital that we are advocating here.

When we assume, as we are doing here, a share of rents in *GDP*, (the parameter α), around 30% of *GDP*, and a money interest rate of around 4%, it does not seem at all simple to justify why, contrary to what the third law of capital predicts, the economy is approaching so slowly the concrete value of about 6 or 7 times the value of *GDP*:

$$\left. \begin{matrix} \alpha = \dfrac{r_{capital}}{PIB} = 30\% \\ i = 4\% \end{matrix} \right\} \xrightarrow{Econ.\ Piketty\ (\gamma = i)} \beta = \frac{k_{capital}}{PIB} = \frac{\alpha}{i} = \frac{30\%}{4\%} \cong 7\ veces\ el\ PIB$$

In fact, our problem is to explain why the prediction has not already been fulfilled, and the value of capital has not reached six or seven times the value of *GDP* decades ago.

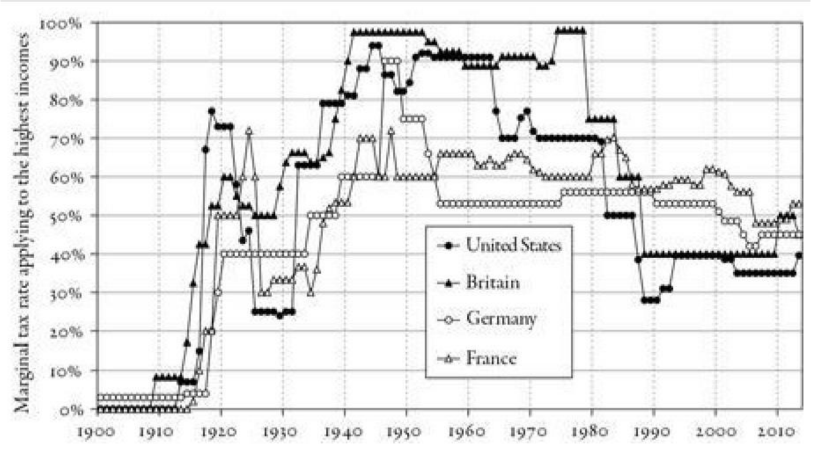
c) Marginal tax on capital income.

Unless we judge the postwar economies to be very unstable, which clearly contradicts the name "the glorious thirty years" by which the three decades after World War II are known, there seems to be no justification for the failure to reach the Piketty ceiling predicted by the third law. Of course, one can assume a high value for the uncertainty factor in the second law of capital. $\overline{\aleph}$ in the second law of capital and justify, in this way, the low value of the parameter βbut that seems a very unscientific attitude:

$$\gamma = \overline{\aleph} \cdot i \quad \xrightarrow{i=5\% \quad \gamma\sim 8\%} \quad \overline{\aleph} \cong 1{,}6$$

A value so far from "1", in the case of the French economy (and any other economy of the time), is at odds with the stability and growth observed in the post-war period and simply contradicts the third law. Even more so when one realizes that most of the companies and large fortunes that were born and grew in those thirty glorious years are in excellent economic health today. It is impossible to think that after 80 years, the stationary regime has not yet been reached.

The discrepancy we find between the theory's prediction and the market's low valuation of the income produced by capital throughout the second half of the twentieth century is easy to explain when we take into account a factor that we have overlooked in all the previous analysis: "*the taxes on capital that were introduced, precisely, from the second decade of the twentieth century onwards".*



Evolucion del impuesto marginal sobre el capital
(El capital del siglo XXI)

The attached graph, also taken from Piketty's book, shows that it was precisely at the beginning of the second decade of the 20th century that the growing public spending began to be financed by a sharp rise in the marginal rate on income from capital income and its inheritance. It is well observed that the various taxes on capital income reached their peak in the 60s and 70s of the last century in the world's major economies, gradually decreasing thereafter in all of them to levels similar to those existing in the so-called happy 20s, maintaining an inverse correlation with the evolution followed by the parameter β which began to grow almost steadily after the postwar period.

In view of the data shown in the graph, and given the inverse correlation that seems to exist between the marginal rates on capital and the value of capital, it is inevitable to wonder about the role of taxes in the valuation of capital income, and whether they are not the missing piece in the whole puzzle of the evolution of capital, which will explain the discordance between theory and practice. βThe question of taxation, which will explain the discordance that we observe between theory and practice, is not the missing piece in the whole puzzle of the evolution of capital.

Recall that Robinson's law, expressed by means of the parameters α y βparameters, states that the value of aggregate capital depends on the share of *GDP* devoted to income, the parameter α:

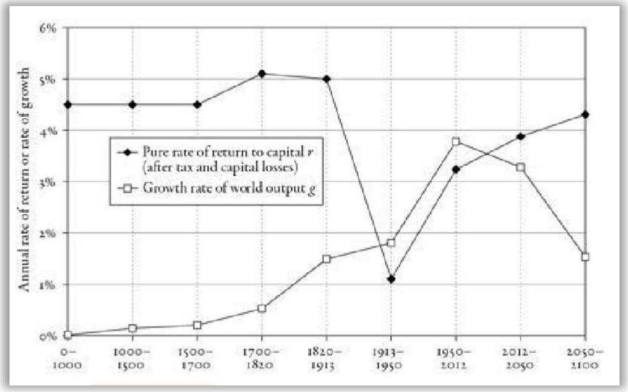
$$k_{capital} = \frac{r_{capital}}{\bar{\aleph} \cdot i} \quad \leftrightarrow \quad \beta = \frac{\alpha}{\bar{\aleph} \cdot i} \qquad 2^{\underline{a}}\ Ley\ de\ Robinson$$

But the parameter α divides national income into two parts, that which goes to pay wages and that which goes to pay capital income, leaving out of the distribution the money destined for public spending, which makes a lot of sense in aggregate terms, since the service provided by the "government" is to workers and companies, but makes no sense in microeconomic terms, since the public sector captures through taxes an important part of the income produced by companies and workers' income, although it is not finally reflected in the *GDP,* which is distributed only in income from work and in income.

For all these reasons, the parameter measuring the share of capital income in GDP should be calculated α which measures the share of capital income in *GDP,* after paying taxes and not before, since, from a purely economic point of view, taxes are a necessary expense to carry out the economic activity of any company and, like wages, they are not part of the income produced by the capital good and should not be counted as such.

This is much better understood when we remember that the valuation of uncertainty, and therefore of the valuation of any capital asset, is carried out by arbitrage through leverage. $\aleph_j$ and, therefore, of the valuation of any capital good, is carried out by arbitrage by means of leverage. It is very clear that, when a capital good is purchased with money that is borrowed, the income that is going to allow repayment of the debt is the income that remains after taxes are paid. If taxes are not taken into account as an additional expense, the buyer will probably find that he will not be able to repay the loan.

The luck we have is that Piketty has also done in "Capital in the 21st Century" an extraordinary job of compiling data on this issue of the tax rate, and despite the precautions with which he recommends that we use them, the truth is that it greatly facilitates the justification and defense of the thesis on the cause of the apparent lack of agreement between the third law and the reality we observe, and that is none other than *"the effect of taxes on the valuation of capital*".



When we look at the curve shown by Piketty on the evolution of the after-tax rate of return on capital, we see that it is exactly the same as the curve showing the valuation of aggregate capital as a percentage of *GDP* over the last three hundred years. So, if in the expression of the three laws of capital we use the after-tax return to capital $\langle\alpha\rangle$which is correct, instead of the income before taxation α:

$$\beta = \frac{\langle\alpha\rangle}{\bar{\aleph}\cdot i} \qquad\qquad \langle\alpha\rangle \rightarrow \begin{matrix} renta\ despues \\ de\ impuestos \end{matrix}$$

We find that uncertainty has been almost equal to "1" for almost the entire 20th century, and Piketty's Law has been almost always being fulfilled during the last 300 years, as it could not be otherwise. With the exception of the two world wars and the two long credit crises that preceded them, it can be safely said that the most developed economies have been growing steadily almost all the time. In other words, the uncertainty parameter $\bar{\aleph}$ has been slightly greater than "1" from the end of World War II to the present day, as Piketty's Law states and was foreseeable.

We can verify this very easily by normalizing the rate of return on capital to the value it had during the 18th and 19th centuries, which was 5%, and also normalizing the value of capital to the value it had during that same period, which was about 7 times *GDP:*

$$\overline{\aleph} = \frac{\langle\alpha\rangle}{\beta \cdot i} \xrightarrow{\langle\alpha\rangle = 7 \cdot PIB \cdot \langle\gamma\rangle} \overline{\aleph} = \frac{\frac{\langle\gamma\rangle}{i}}{\frac{\beta}{7PIB}} \approx 1$$

When we make the quotient between the two normalized variables, that of the rate of return and that of the value of capital, it is easy to verify that their quotient remained very close to "1" during the last 300 years. Hardly refutable proof of the financial nature of capital, and of course of Piketty's Law that we have enunciated.

<u>THE THREE LAWS OF CAPITAL</u>

$$k_j = \frac{\langle r_j\rangle}{\aleph_j \cdot i} \qquad 1^{\underline{a}}\ Ley\ de\ Robinson$$

$$\beta = \frac{\langle\alpha\rangle}{\overline{\aleph} \cdot i} \qquad 2^{\underline{a}}\ Ley\ de\ Robinson$$

$$\overline{\aleph} = 1 \qquad \gamma = i \qquad \beta = \frac{\langle\alpha\rangle}{i} \qquad Ley\ de\ Piketty$$

In which $\langle r_j\rangle$ y $\langle\alpha\rangle$ are, respectively, the income produced by each capital good and aggregate income as a percentage of GDP, both measured after taxes.

6. SAVINGS AND CAPITAL

We have shown, beyond any reasonable doubt, that there are two types of goods, those that we buy to consume, which we call consumer goods, and those that we buy because they produce income, which we call capital goods.

The essential characteristic of a monetary economy, which manifests itself in the obligation of any participant in the production and distribution process to comply with an accounting equation that conserves the quantity of money, is what makes it possible to distribute the productive surplus within society and what creates the income that converts any factory or means of production into a capital good, completely different from consumer goods:

$$renta \equiv \overbrace{B_i^{cap} = q_{ii}^{o} P_i - \sum_{j=1}^{n} q_{ij} P_j - B_i^{trab}}^{ec.\ contable} > 0$$

the identification between corporate profit and rent, is the basis of the Financial Theory of Capital and what has allowed us to differentiate, without any possible mistake, the two different types of goods that exist within monetary economies, consumer goods and capital goods, and to find the mechanism used by the Capital Market to fix the price of the latter.

A very important point of the Financial Theory of Capital is the disconnection between capital and savings. Since capital is a valuation of an income, it does not have to be related to the savings made by society nor to the physical investment being made through savings. Although, it will be later when the Financial Theory of Growth is developed, it is not difficult to imagine that it is the existence of capital that is allowing savings and not the other way around, just remembering what the growth equation states:

$$\frac{dPIA}{dt} = -k_F \cdot Ah$$

The equation tells us that IPA growth has nothing to do with the amount of money saved for investment, since it is only the expenditure of new money created that allows for growth.

$$\sum_i ah_i = Ah \neq 0 \quad \rightarrow \left\{ \begin{array}{l} ah_i > 0 \rightarrow \ ahorro \ \rightarrow \quad A = \displaystyle\sum_{ah_i > 0} ah_i \\ ah_i < 0 \rightarrow \ inversión \rightarrow I = \displaystyle\sum_{ah_i < 0} ah_i \end{array} \right\} \rightarrow A + I \neq 0 \rightarrow \frac{dPIA}{dt} \neq 0$$

We see that the amount of money that is saved has nothing to do with the amount of capital that is created within a monetary economy, since it is only the creation of money that increases capital in aggregate terms. On the contrary, it is savings that can cause a serious problem when there is no capital to invest.

CHAPTER 9

THE CAPITAL MARKET

Clara Rojas García, Julia Rojas García, Pedro Rojas Sola
06 March of the year 2021

1. THE CAPITAL MARKET

Observing the economic reality that surrounds us, we have postulated as the only logical possibility to explain it that the price of capital goods has its origin in the rent it produces for its owners, and not in the physical price of creating them (as stated in the textbooks of economists working for private universities in the USA). That was the reason why we formulated the two Robinson's Laws and introduced two new parameters allowing to price capital goods: the interest rate of money *i*, as a common reference parameter of the whole economy, and uncertainty as a specific parameter of each one of the capital goods. $\aleph_j$ as a specific parameter for each of the capital goods.

It escapes no one's notice that we are doing all this logical-mathematical construction with the sole intention of understanding the economic reality in which we live, so we can add little or nothing to what has already been said about the nature of capital uncertainty, beyond trying to find traces of its existence. $\aleph_j$ beyond trying to find traces of its existence. That is why it is very gratifying to see that there exists out there an immense specific market, the Capital Market, which at present has gigantic proportions and in which the uncertainty factor associated with the various capital goods and capital goods is valued with more or less accuracy, and in which the uncertainty factor associated with the various capital goods is valued with more or less accuracy. $\aleph_j$ associated with the various capital goods and which, in shares of companies listed on the stock exchanges alone, currently has a price of more than 200 million billion euros.

Although the variety of capital goods is immense, encompassing goods as different as housing and patents, it is possible to classify them into four major groups according to their relationship with money:

a) The money supply.
b) Monetary capital.
c) Debt securities.
d) Capital goods

The money supply is what we understand by money, and is at present made up almost entirely of credit money, manufactured out of nothing by the banking system (bank deposits), and to a much lesser extent by money in current currency and bank bills. Although serious doubts can be raised as to whether credit money is really a capital good, the fact is that it is, but with a nuance that we will explain later.

Monetary capital, the second in the list, is also credit money and in no way differs from bank money, which is part of the money supply. It is hoarded money that has been extracted from the money supply and is kept unused in the Capital Market.

The third form of capital is debt securities. This is what is normally understood as debt and always implies a commitment to repay an amount of money in the future. Debt securities should never be confused with bank credit that may be contracted by the public sector or by the private sector with the banking system (this is what is traditionally understood as debt), and it should be understood that any debt security is equivalent to buying or holding a capital asset, even if there is a commitment to be repaid in money after a period of time. The reason, as we will see below, is that the issuance of a debt security does not imply the creation of credit money, as does the granting of a bank loan.

Therefore, a debt security is not money and can never be considered money because, as we shall see, it is only an indirect way of owning a capital good. The reason for the confusion stems from the fact that some debt securities, for example, government bonds, are perfect substitutes for money because the Central Bank exchanges them for money without any loss (at least this is what happens with the treasury securities of the most solvent countries), but it is clear that despite this they cannot be considered as money.

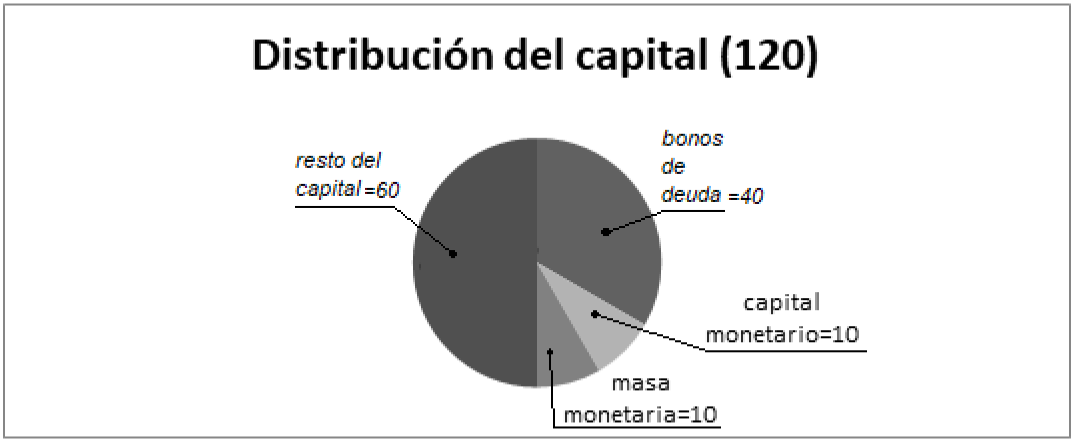
<u>DEBT</u>. Debt is understood as the money owed to someone as a result of a loan. Part of the debt comes from the credit granted by the banking system, but it is by no means the most important part of the debt securities that exist in the market, which are mostly made up of the issuance of private debt securities.

Commitments acquired through the issuance of debt securities cannot be considered debt, since in reality it involves the indirect assignment of the capital asset backing the debt and, at all times, will be what is received in the event that the debt security is not recovered at maturity.

Technically, a debt security is equivalent to the object received by a lender in exchange for a sum of money. The pawner can return the money and get the item back, but if the money is not returned, the pawnbroker keeps the pawned item. Therefore, whoever buys a debt security must make sure that the capital asset backing it is of sufficient value to cover the debt.

The fourth form of capital is capital itself. This is what we identify with housing, property rights, various publicly traded assets, debt securities, bank money and the many other assets that also fall into this category because they produce income or have the potential to produce income.

We know that the arbitrage of the Capital Market converts all capital goods into equivalents, and although the reason for the existence of capital goods is only physical, i.e., productive, the function of capital within a monetary economy goes beyond this, since it is the means used within the economy to conserve savings. We will have to wait for the exposition of the Financial Theory of Growth to know the relationship between savings and capital goods. For now, it is sufficient for us to indicate what amount of savings (of wealth) is conserved in each of the forms of capital we have named. We are going to choose a large country such as the USA to show this, which will give us a very general and exact view of the composition of the Capital Market:



The accompanying chart shows what proportion of wealth is held in each of the four forms of capital in the U.S. and in the year of 2019:

$$\begin{array}{ll} \textit{bienes de capital} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 120\ MM \\ \textit{titulos de deuda} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 40\ MM \\ \textit{dinero bancario} \ \begin{cases} \textit{capital monetario} \ldots\ldots\ldots\ldots\ldots\ldots\ldots 10\ MM \\ \textit{masa monetaria} \ldots\ldots\ldots\ldots\ldots\ldots\ldots..10\ MM \end{cases} \end{array}$$

Thus, the total value of wealth (the aggregate capital valuation) in the US amounts to about $120 MM at the beginning of 2019, of which about $60 MM, 50 percent, is held through direct ownership of capital assets (land, houses, offices, companies, assets, etc.), while the rest is held indirectly in the form of debt securities. About 40 MM, 33 percent of total savings, are debt securities on capital assets: corporate bonds, bank debt, treasury bonds etc. Debt is only an indirect way of owning capital assets, since the interest paid on debt comes from the income produced by the capital backing it (although this is not entirely true for student and consumer credit). The rest, about $20 billion, is bank money circulating in the economy, which in today's economies is bank money (at least it is in the U.S.). Approximately half, about $10 billion, 8 percent of all capital, is money that is not used to buy within the US, while the other $10 billion is used to buy in international markets (the dollar is the reserve currency) so it is not hoarded monetary capital (although here we will consider it monetary capital to differentiate it from the money that forms the money supply within the US). We see that little or no money is kept hoarded as money in the Capital Market.

(Bank money is not, nor can it ever be, a debt security, since it is not a debt for those who possess and use it, but it is formally a debt assumed by those who create it when they accept credit. This invites credit money to be counted twice, once as someone's possession, and again as a debt security issued in favor of the bank that granted the credit).

<u>THE CAPITAL MARKET</u>. The gigantic Capital Market, in which capital goods are bought and sold, must never be confused with the much more modest Consumer Market, in which consumer goods are bought and sold, although both markets seem to be entangled and it is very difficult to distinguish one from the other. The truth is that the nature of both markets is so different and both are so uncoupled from each other that we can affirm that "the money with which one buys and sells in the Consumer Market is different from the money with which one sells and buys in the Capital Market".

This is the reason, and no other, why Fisher's constant seems to be so volatile and the monetary equation does not seem to hold:

$$k_F \cdot (M + MC) \neq PIA \qquad \begin{array}{l} M = masa\ monetaria \\ MC = capital\ monetario \end{array}$$

When the money that is used in the Consumer Market (which forms the money supply) and the money that is hoarded as monetary capital are added together and used to calculate the money supply M of the economy, it is very evident that the monetary equation will not be fulfilled.

2. DIFFERENCE BETWEEN THE CAPITAL MARKET AND THE CONSUMER MARKET

Once we accept that there are two types of goods in monetary economies, then we must accept that the laws by which the Capital Market is governed to set the prices of capital goods are also very different from the laws by which the Consumer Market is governed to set the prices of consumer goods. In fact, this is what we have been trying to show in the last chapters. Let us explicitly list some of the many differences between the two markets:

1) The capital market is, first of all, the place where people save. Although capital as such has nothing to do with savings, nor does its growth have anything to do with the growth of savings, the fact is that people keep their wealth (what they save) in capital goods because the price of capital goods will be constant to the extent that the income it produces is constant. This is the reason why, under normal conditions, people tend to keep very little money hoarded as money, since money tends to suffer inflation and lose its value, while this does not happen to capital goods.

2) It can be said that there are two different kinds of money in the economy, that which is used to buy in the Consumer Market and which forms the money supply, and that which is used to hoard in the Capital Market and which forms the money capital. The two markets are so different and so strongly decoupled that the money used in one market can be said to be different from the money used in the other market. Although this, of course, is only a figure of speech.

3) In the Consumer Market, Fisher's constant links a specific quantity of money *M* with the monetary flow generated by the purchase of goods, the *PIA*:

$$k_F \cdot M = PIA$$

In the Capital Market, on the contrary, no concrete amount of money is needed to maintain the flow of purchase of capital goods, and there is therefore no equation equivalent to the monetary equation. Monetary capital is just another capital good, and in this sense, the Capital Market functions as a barter economy. This is the reason, as already mentioned, why the total quantity of money in the economy, the sum of the money supply M and monetary capital MC, does not fulfill the monetary equation:

$$k_F \cdot (M + MC) \neq PIA \qquad \left.\begin{matrix} cantidad \\ de\ dinero \end{matrix}\right\} = M + MC$$

This does not prevent the monetary equation from being true when only monetary mass M is used in the expression.

4) As for how the prices of different goods are determined, one market is also very different from another. At the microeconomic level, the equation that governs the Capital Market and gives value to capital goods is Robinson's 1st law:

$$r_j = \mathrm{i} \cdot \aleph_j \cdot k_j$$

Whereas it is profits that determine the price of goods in the Consumer Market (the Principle of Asymmetry):

$$\boldsymbol{P} = (\boldsymbol{Q^o} - \boldsymbol{Q})^{-1} \cdot \boldsymbol{B}$$

The same can be said of the difference in the way average prices are set in both markets at the macroeconomic level. Thus, the Closing Equation is responsible for assigning an average price to all goods consumed in an economy:

$$\bar{p} \cdot \bar{q} = PIA$$

In which $\bar{q}$ y $\bar{p}$ are the average value of prices and the average quantity of goods consumed. Whereas it is Robinson's 2nd Law that tells us the aggregate price of all capital goods that exist in the economy:

$$K = \frac{\langle\alpha\rangle}{\bar{\aleph} \cdot i} PIB \qquad\qquad 2^{\underline{a}}\ Ley\ de\ Robinson$$

Both markets, the market for capital goods and the market for consumer goods, are very different and are used for different things, their dual existence being the essential characteristic of the monetary economy, which has nothing to do with a barter economy.

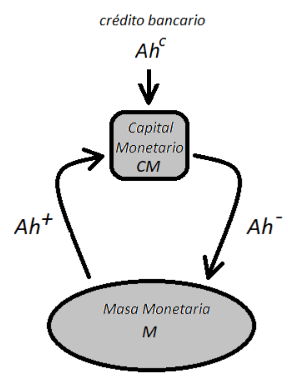
Perhaps the best way to understand the essential difference between money supply money and money capital money is to show two processes of the real economy in which the two forms of money are clearly differentiated:

a) Quantitative easing.

The economic mismatch between the Consumer Market and the Capital Market explains very well why after the deflation of 2008, the immense amount of money spent by the Federal Reserve to buy assets of all kinds has not produced any inflation in the US (more than 4 trillion dollars were created out of thin air and spent by the Federal Reserve between 2009 and 1012). When one accepts that all the money spent on asset purchases tends to stay mostly within the Capital

Market as money capital, without ever being spent in the Consumer Market, then one understands very well why no inflation appears.

Although the cause that gives rise to and maintains an inflationary process is very diverse, an increase in the money supply without an equal increase in real production always results in an increase in prices. Although this is by no means the only cause of price inflation, nor is it the most frequent, it is a very clear consequence of the Growth Equation, so it is impossible that the more than 4 trillion that the Federal Reserve created and spent in the purchase of assets, could have been spent in the Consumer Market. Not even a small part of that amount has been able to become part of the money supply, and that is the reason for the absence of inflation:



Creación de Capital Monetario

"The money injected by the Federal Reserve has either remained hoarded as monetary capital in the Capital Market, or has replaced the money destroyed by the repayment of bank credit."

The attached figure can help us understand the process and the difference between the money used in each of the markets. It shows that the only connection between the Consumption Market and the Capital Market is carried out through the savings and savingsless flows of the agents that participate in the economy; however, the purchase of assets made by the Central Bank with money created out of nothing, occurs within the Capital Market. It is part of the flow Ah^C It is part of the money flow, and it does not have to change the amount of money in the money supply, which is what can affect inflation. What has happened is that savers have exchanged the doubtful assets they hold for money in fear of a generalized fall in their price, but without any intention of spending the money on consumer goods (in aggregate terms). Thus, the huge injection of more than $4 trillion into the purchase of equities of all kinds since 2008 has had virtually no influence on the prices of consumer goods, because savers have no intention of spending their wealth, which they now hold in cash and not in assets.

Of course, some of the money injected by the Federal Reserve has ended up replacing the bank money destroyed by credit repayment, but it has never been spent in the Consumer Market. When we develop the Financial Theory of Growth and understand the nature of credit money it will also be possible to understand what it really means that the money used in the Consumer Market and the Capital Market does not easily convert into each other.

b) The international balance of payments.

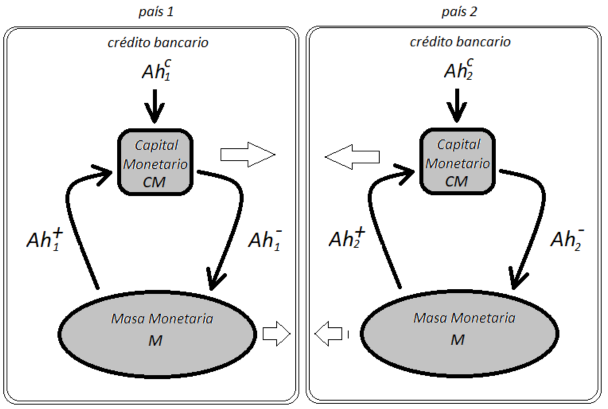
Another place where the immense difference that exists between the money of the monetary mass and the money that is conserved in monetary capital can be appreciated very well can be seen in the exchange problems that originate the commerce between countries that operate with different currencies.

While the decoupling between the Capital Market and the Consumer Market of each country continues to depend only on the flow of savings and dissaving which change slowly, the same does not happen with the monetary flows between the capital markets of both countries, which change rapidly to the extent that the free movement of capital is allowed. The same is true for the flow of trade exchange between the consumer markets of each of the countries, when we assume that there are legal constraints, although their changes, as is logical, are slow (the figure below describes the real situation in which the exchange flows between the two markets appear).

Let us analyze the situation, considering trade between two countries as a single economy divided between two sectors, with the added difficulty that the currencies of each country are different. To simplify the problem without losing realism, we will assume that:

a) There is an exchange ratio between the two currencies.
b) There are two interbank interest rates, one for each country.

c) There is a non-deficit equilibrium in the monetary flow of exchange between the two countries (most importantly). That is, there is no accumulated amount of currency in either country.



Comercio entre dos paises

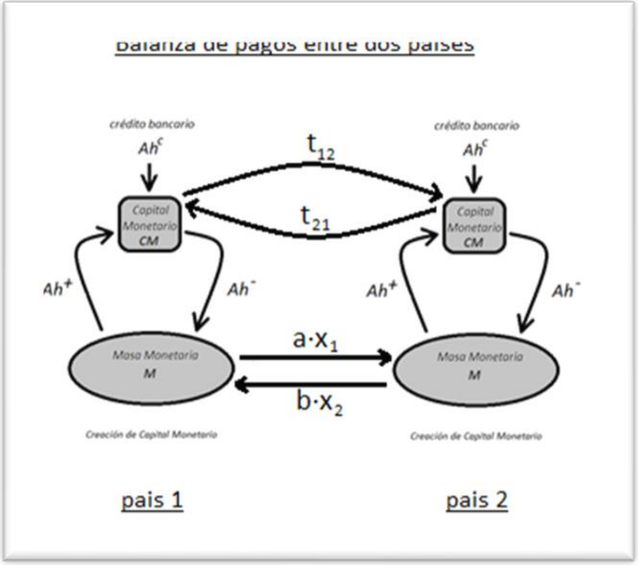
We know that the latter assumption is very unrealistic in the real economy, where it is very difficult to find any country that does not accumulate foreign currency in order to stabilize the exchange rate of its currency. However, it is easy to conclude that any accumulation of foreign currency, however large it may be, will not be able to avoid for a long time the permanent imbalance between currencies, so that imposing the condition of equality in the monetary flows of exchange (the equilibrium) is a necessary imposition to know where the difficulties that force the equilibrium to be fulfilled appear.

We have already deduced in chapter 2, the basic equation that an economy divided into two sectors has to fulfill. Specifically, the set of two equations is as follows:

$$\frac{1}{k_F}\frac{dx_1}{dt} = -a \cdot x_1 + b \cdot x_2 - ah_1$$
$$\frac{1}{k_F}\frac{dx_2}{dt} = a \cdot x_1 - b \cdot x_2 - ah_2 \qquad \textit{(two-country economy)}$$

Where parameter "a" is the percentage of the *IPA* spent by the first country in the second country, and "b" is the percentage of the *IPA* spent by the second country in the first country. The variable x_1 y x_2 are the *IPA* of each of the countries (which we identify here with the expenditure), and the variables ah_1 y ah_2 are the net savings flows between the consumption and capital markets within each of the countries (recall that the equations have their equivalent equations expressed with *GDP*, by simply substituting the Fischer constant for the equivalent for GDP). In other words:

$$a \cdot x_1 \rightarrow \textit{ expenditure of country 1 in country 2}$$
$$b \cdot x_2 \rightarrow \textit{ expenditure of country 2 in country 1}$$
$$ah_2 \;\; y \;\; ah_1 \rightarrow \textit{ net savings of country 1 and country 2}$$



The attached figure clarifies a little the meaning of each of the parameters and flows. What we are interested in showing now is that imposing that the money flow between countries be zero is equivalent to imposing that the trade deficit between countries be equal to the flow of credit between the capital markets of the two countries (the negative savings).

When we assume an exchange rate e_{12} between currencies, then from the point of view of the first country it must be fulfilled that the money entering or leaving the country, in its own currency, is zero:

$$a \cdot x_1 - e_{12}(b \cdot x_2) = t_{12} - e_{12} \cdot t_{21}$$

In which a new parameter has been introduced t_{ij} to account for the financial flows of exchange between the capital markets of the different countries. The expression tells us that, when equilibrium is imposed on the balance of payments, the trade deficit by purchases of a deficit country ends up in the Capital Market itself as foreign savings, either by purchasing capital or by granting credit. Which can be really surprising when you understand what it means:

> *"The net money spent by one country in another country on consumer goods, has to come back as a flow of savings, in the own currency, that the surplus country makes in the deficit country."*

Evidently, the necessary saving of the surplus country within the deficit country, which the balance of payments equilibrium condition requires, is rarely fulfilled between countries and when it is, the fulfillment is temporary and only keeps the balance of payments in equilibrium for a limited period of time, which can be easily verified with empirical data. What we are trying to say, and we will demonstrate it a little later when we study the exchange rate crisis, is that it is impossible to maintain a deficit balance of trade.

THE CAPITAL MARKET. The existence of the Capital Market is the most important social consequence of the monetary economy. If in feudalism, and in other complex forms of social organization, the division of the population into two social classes is based on the "pure and simple" appropriation of what the land produces by the aristocratic class (the only means of production of the time), it is in the property rights over the means of production that capitalism finds the basis for structuring society into two differentiated classes, those who obtain their income from the possession of goods that produce rents and those who obtain their income from their work.

Although at present, the two social classes are not separated into clearly distinct castes, it is very predictable that when the economy stabilizes and economic crises are avoided, the concentration of wealth in the hands of a few will make the separation into two distinct castes according to the origin of their income a reality. In fact, as Thomas Piketty denounces in his book "Capital in the 21st Century", in the USA and Japan the two differentiated social classes are becoming more and more visible.

Let us note that the division into three social classes, rentiers, capitalists and wage earners, made by David Ricardo at the beginning of the eighteenth century according to the origin of income, is ideological and is made with the sole intention of legitimizing the moral superiority of the nascent and enterprising bourgeoisie of Ricardo's time, as opposed to the old and parasitic aristocracy. But the truth is that, from the monetary point of view, business profits are no different from land rent.

Although the German economist, Karl Marx, denounces in "Capital" the tricky conception behind attributing the capitalist's profit to the risk assumed by those who advance the investment money, he fails to see where the trap of Ricardo's argument lies and is misguided when he points to labor as the only source of wealth creation, without understanding that, in sufficiently complex structures, the total is always greater than the sum of the parts. Society creates wealth thanks to the cooperation of the parts, but it is stupid to assert that it can be distributed "fairly" among the parts, which is very clearly belongs to all.

3. HOUSING AS A CAPITAL ASSET

One of the great social problems of all times has been, and continues to be, the high price of housing in relation to wages. The rare mixture that comes together in housing, where the nature of a non-reproducible capital good is combined with the provision of a service essential to people's lives, makes housing a particularly attractive object for those who wish to save while at the same time ensuring the risk-free capture of a monetary income.

If to these two general characteristics, we add two other particular properties that make housing especially attractive as an investment, then no one should be surprised that housing has become a unique capital asset that is almost always behind all speculative bubbles, and whose price rises steadily. We are referring, firstly, to the ease with which investment in housing can be adapted to any pocket, whether rich or poor, since investment in housing ranges from the modest purchase of a single home to rent it out, to the large and anonymous investment funds that own, in the centers of the world's most important cities, entire buildings with a large number of homes and offices for rent. The second great attraction of housing is that it can be kept unoccupied without any appreciable decline in value.

We can understand then that the housing problem comes from far away, as far away as the ancient, legendary and monetary Rome. The chronicles tell us that Marcus Licinius Crassus, who would later go down in history as the consul who defeated Spartacus, owed his immense fortune to obscure and unclear real estate speculation in the old city center of Rome. We see that the housing problem is far from being a new problem, and the world, which has always been a monetary economy in economic terms, has always had to fight against the nature of housing as a capital good, which inevitably makes it a source of all kinds of monetary speculation.

We are going to explain one of the few things that can be done to, if not solve the problem, at least alleviate as far as possible its most harmful consequences.

If housing were a reproducible good, the only thing that would be necessary to solve the problem would be to build housing until the need for it is satisfied, as happens with cars and other reproducible goods. But, since housing can only be produced in very limited quantities and increasingly far from the place where it is needed, any solution to its scarcity must be sought on the side of the buyers: by *limiting the number of people or institutions that can buy a house*.

Let us note that there are two reasons why someone may want to buy a house. One, to live in it, and the other, to save or to acquire a rental income from it. Although it is very clear that many times both motives can go together and become difficult to differentiate, it is clear that if the acquisition of housing as a means of saving or investment is limited, the demand for housing will be greatly reduced and its price will very probably fall on the average in which this is one of the main reasons for acquiring housing and, therefore, the cause that is pulling up prices.

According to the logic of the above reasoning, we can distinguish four sequential levels that must be followed in order to lower prices:

<u>LEVEL ONE</u>. Legalize the purchase of homes for all legal entities (companies, investment funds, banks, etc.) so that only individuals can retain home ownership, whether they use it as their first home or use it to rent. In this way, a good number of potential buyers will be eliminated from the market and the sale prices will drop more or less significantly, depending on the real contribution to the purchase of homes by institutional investors.

<u>LEVEL TWO</u>. It is quite possible that there are not as many institutional savers as we tend to believe, and if there are, they may be interested in very specific sectors, such as city centers or select neighborhoods, and do not influence housing prices outside those sectors. In such a case, the purchase of housing by individuals should also be limited, for example, by limiting the amount of savings they can accumulate in housing, to one or two or three times the price of the official housing they enjoy, of course, setting a maximum ceiling. This can greatly reduce the number of people competing to acquire a home and will not harm almost anyone who uses a second home as a source of income, savings or inheritance for their offspring, but it will leave out of the market many other people who use housing as a means of protecting a large patrimony from the risks of other types of more risky investments.

<u>LEVEL THREE</u>. It is possible that, even by taking the above two measures, there are certain areas that will not see a significant drop in housing prices or rents, especially in urban centers and certain areas considered luxury for various reasons. In such a case, and when it is deemed necessary to lower the price of housing in these "special zones" for reasons of social utility, ownership per person may be limited to a single dwelling within a special zone, whether or not it

is the habitual residence, allowing more dwellings to be owned in zones that are not limited. In other words, it is not allowed to have more than one dwelling in any of the many zones considered special.

LEVEL FOUR. In areas where the above measures fail, then the only thing left to do is to limit the rental price of housing. This is what is usually done as a last resort at present in large urban centers, but we believe it is highly unlikely that the measures proposed in the first three levels will not work, even in large urban centers. Keep in mind that price pressure in the centers of a large city is also a consequence of price pressure in the periphery.

It is obvious that the implementation of the four recommended actions may entail certain pitfalls and traps, but this will be inevitable in any proposed solution and should not be taken into account as a criterion for discarding the proposed solution. There is no reason why the right to private property should be above the right to have a decent first home, especially when the proposed solution only limits the purchase of a home to those who already have a home. The two rights are not incompatible because limiting a right does not imply nullifying it.

PART IV

FINANCIAL THEORY OF GROWTH

CHAPTER 10

THE CONVERSION OF MONEY INTO INCOME

Clara Rojas García, Julia Rojas García, Pedro Rojas Sola
07 March of the year 2021

1. THE PROFIT RATE

Since ancient times it has always been understood that the money spent on the creation of companies, which is usually called investment, is the engine of economic growth. So much so that in the texts of 200 years ago the word "capital" is identified with the money that is lent or spent in order to obtain an income. This idea, for example, can be seen very well in the writings of David Ricardo:

> *Rent is that portion of the produce of the land, which is paid to the owner for the use of the original and indestructible powers of the soil . It is often, however, confused with the interest and profits of capital, and, in popular parlance, the term is applied to what is paid annually by a farmer to his landlord. If, of two adjoining farms of the same extent, and of the same natural fertility, one had all the conveniences of agricultural buildings, and, moreover, was properly drained and removed, and advantageously divided by hedges, fences, and walls, while the other had none of these advantages, more remuneration would naturally be paid for the use of the one, than for the use of the other; yet in both cases this remuneration would be called*

rent. But it is evident, that a part of the money to be paid annually for the improved farm, would be given for the original and indestructible powers of the soil; the other part would be paid for the use of the capital which had been employed in improving the quality of the land, and in erecting such buildings as were necessary to secure and preserve the produce.

David Ricardo (1817)
Principles of political economy and taxation

We have already commented that Ricardo differentiates the profit obtained by an investor from the rent obtained by the owner of the land, so Ricardo observes in the text that, in popular language, there would be no difference between the rent paid for the "*use of the original and indestructible powers of the soil"*, and the rent paid for *"the improvement of the quality of the land, and for the construction of buildings"*. However, we have also commented that this way of interpreting profit responds to purely ideological reasons that seek to justify the physical nature of capital.

From Ricardo onwards, the nature of capital becomes physical and is associated with the physical expense of creating the capital good, and ceases to have a financial nature associated with the financial valuation of the profits it produces, as associated with ... *"the popular language*":

$$tasa\ de\ beneficio = \frac{excedente\ monetario}{cantidad\ de\ dinero\ invertida}$$

It is the same vision that we can find, already in the twentieth century, in the work of Piero Sraffa. In his work, "Production of commodities by other commodities", he defines the rate of profit exclusively in terms of the physical nature of production, as the quotient between the physical surplus of a commodity and the quantity of that same commodity spent in production:

$$tasa\ de\ beneficio = \frac{cantidad\ producida - cantidad\ gastada}{cantidad\ gastada}$$

Sraffa does not seem to realize that what he identifies in his work with "the amount spent" is actually a part of the final production that is reused in the process and, even if it is not used, it is not an expense and cannot be considered an expense because nothing has to be paid for it. For example, part of the oil obtained in the extraction of oil must be spent in the extraction process, which reduces the amount of usable oil obtained, but it makes no sense to consider it an expense since what is consumed is being generated in the same production process.

The abandonment of the financial nature of capital and its replacement by the physical nature of capital is a path of no return that began with David Ricardo, but which is very well exploited by economists working for private universities in the United States to hide without embarrassment what capital really is: *a good that produces an income.* It is therefore a pity that an economist of the stature of Piero Sraffa has not read with sufficient attention the writings of Joan Robinson, where he shows that capital can only be valued using a rate of interest unrelated to the productive process, and has allowed himself to be seduced by the apparent logic of the physical nature of capital when he defines the rate of profit as a quotient linked to the physical nature of production, even though a deeper analysis reveals that the terms that appear in the definition are meaningless.

When an investor buys a barrel of unfermented must and after three years sells it as fermented wine at a higher price, it is clear that one can consistently define the rate of return on investment as the ratio of the profit from the sale of the wine to the expenditure made to buy the barrel of must. But this apparent clarity in the definition of the rate of profit when it refers to the profit obtained from the timely sale of a service, as in the example of wine, clashes with the absence of clarity when one tries to generalize the idea to the business of a winery, that is, when one tries to explain the profit in the production of a reproducible good.

What is the profit to be made from a winery engaged in the business of fermenting wine? Let us explain why this question cannot be answered using the rate of profit.

The accounting equation that must necessarily be fulfilled by any company within a monetary economy is the one that equals the company's income with its expenses, including in the latter the profit shared between workers and employers. Specifically, for a basic company it is fulfilled:

$$Q_{ii}^{o} p_i = \sum_{j=1}^{n} Q_{ij} p_j + B_i^{cap} + B_i^{trab}$$

Let us note that there is no term in the expression that can be associated with the money supposedly advanced by an "investor". Any expense that is necessary to be made in the company, for example, to replace machinery, we assume included in the expenses of the accounting expression and is paid, as happens with all expenses, setting them aside from the monetary income obtained by the company. Also the income obtained by the owner of the company, and the salaries received by the workers, come out of the income. All expenses, whatever they may be, are paid out of income.

All the money spent by the enterprise, the current and maintenance expenses, the expenses to pay the workers, or the expenses with which the income received by the entrepreneurs is satisfied, come out of the income generated by the economic activity, so that the term "amount of money invested" that appears in the expression of the rate of profit is meaningless. The enterprise operates without any investor having to bring in any money from outside.

When, instead of analyzing the profit from the sale of a single barrel of wine obtained from the purchase of a single barrel of must, we analyze a winery in which barrels of must are continuously purchased and in which barrels of wine are continuously sold, we find that it is not possible to identify any investment expenditure. In the case of a winery, talking about investment only makes sense at the beginning, while the winery is being created and no monetary surplus is being produced, but it ceases to make sense when the company is already operating and any expenses necessary to carry out the economic activity are being paid with the difference between the income from the sale of wine barrels and the expenses for the purchase of must barrels. When this occurs, the company is giving an annual flow of profits that does not require any investment, and it is not at all clear how a rate reflecting the profit associated with the winery's business activity should be defined.

We see that the difficulty arises because it is impossible to identify "money being invested" when the company is already producing monetary surpluses, since there is no "money being invested". The very idea of investment on which the usual profit rate formula is based is meaningless for a firm that is already producing. So, if companies do not need continued investment to make a profit, how is the money that appears in the rate of profit to be understood and is assimilated to a necessary expense advanced by the investor? Worse, how do you justify the rent received from owning the enterprise when, as we see, no money needs to be advanced for the enterprise to produce a surplus?

It is very evident that *"the rent that a capital good distributes to its owners is not the benefit they obtain for risking the money needed by the enterprises to produce, and in no way differs from the* *rent that a landowner receives.* The idea that profits are received for risking the money necessary for production does not hold water, just as the very idea of the rate of profit does not hold water.

Lies never walk alone. They are always accompanied by many other lies with the sole purpose of preventing us from distinguishing among them all the truth, which is none other than the pure and simple privilege of the few over the many. The simplest truth of all.

2. THE CONVERSION OF MONEY INTO INCOME

The problem of defining a parameter that, being consistent with the financial nature of capital, determines the profit obtained by whoever creates a capital good is easily solved when we approach the problem in aggregate terms, focusing our attention on the reaction that exists between the aggregate income and the amount of money needed to obtain it, forgetting for now the problem of knowing the concrete profit that a particular entrepreneur can obtain by creating a capital good.

Let us begin by defining a macroeconomic parameter that informs us of the value of the aggregate capital of the whole economy and that will show us the not at all obvious reason why monetary economies are so terribly efficient in their performance when it comes to putting into operation all the productive capacity of society, regardless of the destruction of natural resources that this implies, nor the terrible consequences for the environment of their unstoppable eagerness to grow.

The extraordinary facility of a monetary economy to reach the maximum possible productive capacity is to be found in the immense economic incentive for the conversion of a stock of money into a flow of income, i.e. in the immense incentive for the creation of capital goods. To see this, let us assume an economy in which *GDP* grows thanks to an injection of money, regardless of whether this growth is merely inflationary or, on the contrary, is real and increases production. In such a situation we know, thanks to the Aggregate Conservation Equation, that GDP grows in proportion to Fisher's constant:

$$\frac{dPIB}{dt} = -k_F \cdot Ah \qquad \rightarrow \qquad \Delta PIB = -k_F \cdot Ah \cdot \Delta t$$

The expression says that *when an annual stock of money is injected into the money supply, of value* $(Ah \cdot año)$The expression says that when an annual stock of money, of value, is injected into the money supply*, national income increases in proportion to Fisher's constant and to the annual stock injected*. If we now use the expression to calculate by how much the value of capital goods increases, assuming that parameters αβ, γ change very little annually, we have:

$$dK = \beta \cdot PIB \ \rightarrow \quad \frac{dK}{dt} = -\beta \cdot k_F \cdot Ah \quad \rightarrow \quad \Delta K = -\beta \cdot k_F \cdot Ah \cdot \Delta t$$

The expression relates the aggregate growth of capital to the cause that causes it, monetary injection, which can be stated as a principle:

THE PRINCIPLE OF GROWTH: In a monetary economy, the nominal growth of capital is proportional to the growth of the money supply. M*the constant of proportionality being the product of* β *by Fisher's constant:*

$$dK = \beta \cdot k_F \cdot dM \qquad \qquad \beta = \frac{\langle\alpha\rangle}{\overline{\aleph} \cdot i}$$

Where $\langle\alpha\rangle$ *is the share of capital income in after-tax GDP. Specifically, for a Piketty economy in which* $\overline{\aleph} = 1$*, we have:*

$$dK = \frac{\langle\alpha\rangle}{i} k_F \cdot dM$$

THE PRINCIPLE OF ACCUMULATION: The amount of capital that exists in an economy is proportional to the monetary mass of the economy, being the constant of proportionality the product of β *by Fischer's constant:*

$$K = \beta \cdot k_F \cdot M \qquad \qquad \beta = \frac{\langle\alpha\rangle}{\overline{\aleph} \cdot i}$$

This is a remarkable result because it tells us not only that there is a limit to the amount of wealth that can be accumulated in an economy, but also that the amount is fixed and does not depend on savings within the economy.

Although we will return to this important point later, what interests us now is not so much to point out that the financial nature of capital limits its value to a multiple of the amount of money used to carry out exchanges, something that in itself is quite remarkable, but that the relationship allows us to define a parameter that tells us what benefit is obtained when the money that is invested is converted into capital goods:

The "Capital Efficiency" of the whole economy is defined as the quotient between the increase in capital and the increase in the money supply that causes it:

$$Eficiencia\ del\ Capital \equiv \qquad \mu = \frac{\Delta K}{Ah \cdot \Delta t} = \beta \cdot k_F = \frac{\langle \alpha \rangle}{\bar{\bar{\aleph}} \cdot i} \cdot k_F$$

The parameter, although defined in increments, is clearly a static parameter obtained by dividing the aggregate capital by the money supply. K by the monetary mass M of the economy and allows us to understand without any difficulty, given its high value, the origin of the immense resource-devouring capacity of monetary economies. Recalling that β is at present "six" and that Fisher's constant is "two", we have:

$$\mu = \beta \cdot k_F \cong 12 \qquad \rightarrow \begin{cases} \beta \cong 6 \\ k_F = 2 \end{cases}$$

The efficiency of the conversion of money into income has a value close to 12. That is to say, for every euro injected annually into the money supply we obtain, on average, about 12 euros in capital goods, although, of course, nothing prevents the value of the new capital from being only inflationary. Such a high value of the conversion of money into income gives us a very exact idea of the reason why monetary economies tend to the full use of all resources when the necessary growth of the money supply is not restricted, for some reason or other.

<u>THE CONVERSION OF MONEY INTO INCOME</u>. With a value of capital efficiency close to 12, it is not very difficult to understand why, when the economy is left to the whim of the markets, they become a terrible threat to all the ecosystems that inhabit the planet.

Any natural resource, no matter how insignificant its value may seem to us, will undoubtedly obtain funding to be exploited and produce rents as long as there is such an immense promise of profits.

What is left of the Amazon rainforest will be completely devoured in less than a decade by the immense monetary incentive presented by the destruction of a unique ecosystem to replace it with immense soybean plantations, which will not even be viable in the future due to the low quality of the land on which it sits.

If, at least, the most disadvantaged people in Brazil would obtain some benefit from the destruction of the forest, we could bow our heads and look the other way thinking about the people who will get out of poverty and will have a better life, but unfortunately we will not even have that consolation and what will happen will be very different. Those who have nothing will obtain no benefit, because the logic of those who use money to convert it into income will not allow salaries to increase at the expense of income and what the destruction of the forest will bring will be more misery and more poverty.

Nor is it difficult to understand why the Borneo rainforest, one of the few remaining primary rainforests, will be converted into a huge palm oil plantation. Nor should it surprise anyone that the forests of Canada or the Siberian tundra will soon follow in the same footsteps. Capital has its own logic.

Only through politics is it possible to successfully fight against the immense incentive that fuels the growth of monetary economies. Natural resources belong to all of us, and we have an obligation to preserve them in order to sustain life for generations to come. We cannot continue to let rent-seeking turn human beings into a plague of locusts that devastate the environment in which they live without any real benefit. That is what this work is for, so that we become aware of what is pushing us to the physical destruction of the planet we live in and we can learn to control it.

<u>THE INCENTIVE OF CAPITALISM</u>: A monetary economy, even in the case where it is already at full employment, has a very strong incentive to find ways to further increase production, and with it the share of GDP that will pay the rent of capital, since any increase in expenditure implies an increase in the stock of capital proportional to the parameter β:

$$\Delta K = \beta \cdot \Delta PIB$$

Evidently, when the increase in expenditures is only inflationary, the growth of capital will also be only nominal, but this should not prevent us from seeing that what blindly pushes us to the physical destruction of our planet has its origin in the immense benefit obtained from the use of money to organize ourselves:

"the conversion of a stock of money into a flow of income".

This is the essential characteristic of any monetary economy and wherein lies both its strength and weakness.

Capitalism, or rather the monetary economy, is the most efficient machinery ever conceived for the creation and accumulation of goods producing monetary rents, what we vulgarly call capital. This last point is very well appreciated when we express efficiency as a function of the rate of interest and the rest of the variables:

$$\mu = \frac{\langle \alpha \rangle}{\overline{\aleph} \cdot i} \cdot k_F \quad \rightarrow \quad K = \frac{\langle \alpha \rangle}{\overline{\aleph} \cdot i} \cdot k_F \cdot M$$

1) The value of capital depends inversely on the interest rate, so that the conversion of money into income will be greater the lower the interest rate in the economy. Not only will newly created capital be more valuable when the interest rate is reduced, but also existing capital will see its value increase.

2) The value of capital added will also increase as the share of income in after-tax *GDP* increases, the parameter $\langle \alpha \rangle$. That is why the share of capital income in *GDP* should be measured after taxes and not before taxes, because the value of capital depends only on the income it produces for its owners.

   (It is also the reason, and there is no other, why economists working for US universities propagate in textbooks that lowering taxes is good for the economy).

3) Last but not least, the value of uncertainty should be as close as possible to 1, which will only be the case to the extent that there is legal certainty. $\overline{\aleph}$ should be as close as possible

to 1, which will only occur to the extent that there is legal certainty. Or to put it bluntly, the more guarantees there are that legislation will not change capriciously or that taxes will not go up, the closer the value of uncertainty will be to 1. Therefore, the fewer political decisions that can be taken, the more peace of mind there will be that the status quo will not be altered and the closer the uncertainty will be to "1". Economists working for private universities in the United States also play a very active role in this, and they are constantly propagating economic theories that advise governments not to act.

Summarizing, the variables on which the value of capital goods depends are:

- The interest rate.
- Taxes on capital.
- Legal security over private property.

The origin of the monetary injection that makes the economy grow can be diverse, and we will deal with the subject in a little more detail when studying the Financial Theory of Economic Growth. In the case of an isolated economy, the origin of the injection is twofold, credit money backed by debt, or money hoarded in the Capital Market which is spent in the Consumption Market (we will see this in the next chapter). In the case of a non-isolated economy, a third source must be added to the two sources already mentioned, money coming from outside the economy, either through imbalances in the balance of trade or through imbalances in the inflow or outflow of monetary capital.

In the next article we will analyze in depth the Credit System and we will see the mechanism of money creation in monetary economies, but now all that does not affect us.

3. THE MICROECONOMIC EFFICIENCY OF CAPITAL

The analysis in the previous section was based entirely on the aggregate conservation equation and is, therefore, a macroeconomic analysis. Monetary efficiency relates the aggregate value of capital goods to the cause that causes it, the quantity of money that forms the money supply, but it does not answer the question of what is the benefit obtained by creating a specific capital good, such as, for example, any of the basic enterprises into which we have divided the economy. To answer the question, and remain consistent with the macroeconomic definition we have given of efficiency, we have to relate the price of any capital good to the money supply needed to carry out economic activity:

$$\mu_j = \frac{(valor\ capital)_j}{(masa\ monetaria)_j}$$

The monetary efficiency μ_j of any capital good is defined as a quotient between two monetary stocks, the market value of the capital good (e.g., a company) and the amount of money it brings into play during economic activity, as the definition states:

$$\mu_j = \frac{k_j}{m_j} \quad \rightarrow \quad \begin{cases} k_j = \dfrac{\alpha_j}{i \cdot \aleph_j} \cdot \left(B_j^{cap} + B_j^{trab}\right) \\ m_j = \dfrac{1}{k_F} \cdot \left(B_j^{cap} + B_j^{trab}\right) \end{cases} \quad \rightarrow \quad \mu_j = \frac{\alpha_j \cdot k_F}{i \cdot \aleph_j}$$

In which the different parameters that appear have the usual meaning. Thus, the term α_j is the part of the surplus $\left(B_j^{cap} + B_j^{trab}\right)$ the firm devotes to paying the rent on capital, and the uncertainty parameter is determined in the market. $\aleph_j$ is determined in the market. It should also be noted that the Fisher constant k_F which appears in the expressions is that which relates the money supply to the surplus or *GDP,* and which we are assuming remains valid in each of the sectors and for each of the basic companies into which production has been divided. The money supply, $m_j$associated to a basic company or sector of the economy is the same monetary mass that was postulated so that the monetary equation is also fulfilled at the microeconomic level; what we call the Fischer Equation. Now we use the monetary mass to generalize monetary efficiency to each and every basic company.

We define the "Microeconomic Capital Efficiency" of a generic company as μ_j of a generic company is defined as the quotient between the company's valuation in the Capital Market and the monetary mass it puts at stake when carrying out its economic activity:

$$\mu_j = \frac{(valor\ del\ capital)_j}{(masa\ monetaria)_j} = \frac{\alpha_j \cdot k_F}{i \cdot \aleph_j}$$

The expression makes sense to the extent that it makes sense to assign to each company the same value that Fisher's constant has for the whole economy. Otherwise, the expression is meaningless.

The meaning of Microeconomic Efficiency is very subtle, because unlike what happens with the rate of profit, there seems to be nothing in the definition that is related to the physical cost of creating the company, which is not entirely true. The monetary mass that appears in the denominator is the amount of money that is necessary to immobilize in order to carry out the economic activity of the company, and although it can never be considered a physical expense, the truth is that it cannot be extracted, saved, or used for anything other than sustaining the economic activity of the company.

But what is the benefit of creating a new company? That matters very little.

When an entrepreneur sees the opportunity to build a company at a price lower than the price it will fetch in the capital market, he is very likely to build it by borrowing money. This is what Keynes was referring to when he coined the term "animal spirits". But it is well understood that the profit that an entrepreneur obtains from an investment will be completely uncertain and will depend on the real difference he obtains between the money he has spent in building the company and the price at which the capital market finally values it, which, as we know, will depend on the income he has been able to capture.

There is, therefore, no such thing as a rate of profit which is equalized in all industries by the free flow of capital, as David Ricardo assumes. Nor is there such a thing as capital as a factor of production, as propagated by economists working for private universities in the USA. Although this does not prevent, evidently, that the "money" that is borrowed to carry out the investment (which was how they called "capital" in David Ricardo's time) is directed towards those industries where entrepreneurs think there are more business opportunities. In Ricardo's words:

"It is then the desire, which every capitalist has, to divert his funds from a less profitable employment to a more profitable one, which prevents the market price of commodities from continuing for a period of time far above or far below their natural price. It is this competition which adjusts the exchangeable value of commodities, that after paying wages for the labor necessary for their production, and all other expenses necessary to place the capital employed in

its original state of efficiency, the remaining value or surplus of each trade must be proportionate to the value of the capital employed."

David Ricardo, 1817
(Principles of Political Economy and Taxation)

In this paragraph, Ricardo explains that entrepreneurs who pay a higher rate of interest for borrowed money, attract to their industry the money that capitalists have to invest, which will eventually equalize the rate of profit in all industries (which we know is a misconception). In David Ricardo's time, the term "capital" is used to refer to money that lends in exchange for interest, which is what a lender lives on and that is very clear in the paragraph.

Ricardo also makes it very clear with the phrase "...the remaining value or surplus of each trade must be proportional to the value of the capital employed...", that the value he assigns to an enterprise is the physical cost of creating it, understanding it to be proportional to the surplus, although he never explains why it has to be proportional. That is to say, Ricardo affirms that business profit is proportional to the capital invested, without it being clear why.

Ricardo also distinguishes between the "lender" and the "investor", surely because he realizes the trap into which one falls when both figures are identified, since it is very clear that the one who lends money is a rentier not very different from the one who owns land, even more so when a legal system supports the repayment of debts. On the contrary, the investor is someone who risks his own money, with nothing clear that differentiates him from a lender who lends to himself.

However, thanks to the tireless work of economists working for private universities in the U.S., there are no rentiers today; they are all investors who earn their income from risking their money.

What is the Monetary Efficiency of money? Money is a capital good and, as such, has a given efficiency:

$$\mu_{\mathrm{dinero}} = \frac{\alpha_{\mathrm{dinero}} \cdot k_F}{i \cdot \aleph_{\mathrm{dinero}}} \xrightarrow[]{\substack{\alpha_{\mathrm{dinero}}=1 \\ \aleph_{\mathrm{dinero}}=1}} \mu_{\mathrm{dinero}} = \frac{k_F}{i}$$

What is the monetary efficiency of a house? Very high, indeed. The amount of money spent annually to maintain a home is usually very small in relation to the market value of the home.

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What is the relationship between the efficiency of the whole economy and the efficiency of each of the capital goods that make up the economy? The efficiency of the whole economy is the weighted average of the efficiency of each of the capital goods with respect to profits:

$$\mu = \frac{\Delta k_{capital}}{Ah \cdot \Delta t} = \frac{\sum \mu_j \cdot (B_j^{cap} + B_j^{trab})}{\sum (B_j^{cap} + B_j^{trab})} = \beta \cdot k_F$$

The same can be said for the efficiency of any good formed by the sum of several capital goods.

Influence of inflation. It only remains for us to comment briefly on the influence of inflation on capital creation. As has already been said, and according to the theory we have presented, in order for an economy to grow it is necessary for the money supply to grow without hindering economic processes:

$$\frac{dPIA}{dt} = -k_F \cdot Ah$$

But, the Conservation Equation cannot tell us what part of the monetary flow injected into the economy will produce inflation and what part will go to increase the production of goods. In general, we must assume that both events are occurring to a greater or lesser extent, and that both the average prices of products $\bar{p}$and the total quantity of products present in the economy will be growing. $\bar{q}$ in the economy, will be growing. It is easy to see that when real capital growth is separated from inflationary growth, and the real growth rate of capital and the inflationary growth rate of capital are defined in the same way as they are defined for *GDP,* both coincide:

$$\begin{cases} tasa\ de\ inflación \equiv \pi = \dfrac{\bar{q} \cdot \Delta\bar{p}}{\bar{q} \cdot \bar{p} \cdot \Delta t} = \dfrac{\Delta k_{inflación}}{k \cdot \Delta t} = \pi_k \\ tasa\ de\ crecimiento \equiv g = \dfrac{\bar{p} \cdot \Delta\bar{q}}{\bar{q} \cdot \bar{p} \cdot \Delta t} = \dfrac{\Delta k_{real}}{k \cdot \Delta t} = g_k \end{cases}$$

Which is not an unexpected result, since *GDP* and capital are related by the parameter β which we assume changes little over time. Thus, the real growth rate of capital is equal to the real growth rate of *GDP,* and the same is true for the inflationary growth rate, which are both identical for capital and for *GDP*. Taking both rates to the conservation equation we have that:

$$\pi + g = k_F \cdot \frac{Ah}{PIB} \rightarrow \boxed{\pi + g = k_F \cdot \tau} \qquad \left\{\begin{array}{l} \tau = \frac{Ah}{PIB} \rightarrow \begin{array}{l} tasa\ de\ creacion\ del\ dinero \\ respecto\ al\ PIB \end{array} \\ \tau_k = \frac{Ah}{K} \rightarrow \begin{array}{l} tasa\ de\ creacion\ del\ dinero \\ respecto\ al\ capital \end{array} \end{array}\right.$$

$$\pi_k + g_k = k_F \cdot \frac{Ah}{PIB} \rightarrow \boxed{\pi_k + g_k = \beta \cdot k_F \cdot \tau_k}$$

The new money injected into the money supply has a double function, part is dedicated to the inflationary increase of the existing capital and part is dedicated to increase the real quantity of new capital, or what is the same, to increase the quantity of consumer goods that support the new capital.

CHAPTER 11

FINANCIAL THEORY OF GROWTH

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1. CREDIT MONEY

All the work developed so far would be condemned to the most absolute irrelevance if we did not address the most important issue underlying a monetary economy:

Who makes the money?

But it is very evident that, in order to answer this question, it is first necessary to answer the question of what money is and what is being used as money in economics, because we can verify, with no little astonishment, that when money is talked about in any book on economics, money is never defined and it is taken for granted that whoever reads the book knows what it is.

Of course, we all have a very clear idea of what money is, but it is very scary to think that those who run the Central Bank have no idea what money is, even though they are quite capable of creating 4 trillion dollars without even blinking an eye.

MONEY. We define money as that which exists within a monetary economy that fulfills:

1) *You may purchase any goods or services offered for sale.*
2) *Fulfills the Monetary Equation:*

$$k_F \cdot M = \sum p_i \cdot q_i$$

where M is the amount of money used within the economy, k_F is a constant and the sum represents the monetary flow of purchases.

Throughout history, many things have been used as money. From gold, a scarce metal with which we almost always associate money, to salt or tobacco, which in specific regions and in a very specific way have been used as money without too many problems. It can be said that almost anything can be used as money, and it can be demonstrated that almost anything has been used as money at some point.

Therefore, the nature of money cannot be material, and whatever is used as money, it cannot be its material nature from which its value derives. In this sense, neither what money is, nor what gives money its value, can have its origin in the physical nature of what we use as money. Its nature and its value must come from somewhere else.

Here we have defined money by stating the only two properties that "something" must fulfill to be considered "money". There is no other coherent way to define it.

In today's economies, although it may seem strange to us, what has been used as money for more than a century is bank credit. It is not difficult to see that bank credit fulfills the two properties that define money:

1) It can be used to purchase anything available for sale, at least within the country where the bank credit is issued.
2) Their use complies with the Monetary Equation, at least that is what we believe we have shown to be the case in economies in which productive assets are mostly private.

Therefore, from now on, we are going to consider that all the money that exists within the economy is credit money, that is, *"the money that banks lend when they grant credit"*, so that commercial and investment banks are the only ones that have the legal privilege of creating money when they grant credit and of destroying it when it is repaid, always assuming that:

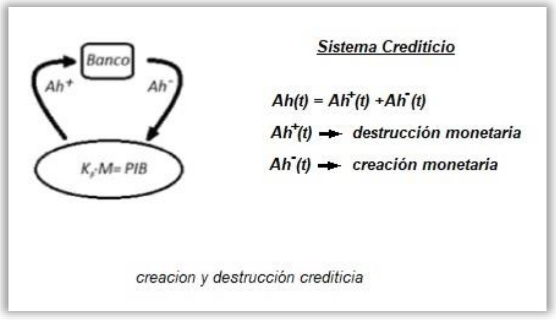
a) All money is created through credit.
b) Money has no physical value.
c) Money can be manufactured in any quantity desired.

The current confusion about the nature of money is tremendous, and the reason for this is not because it is difficult to know who, how and when money is made, but because economists working for private universities in the USA do their best to hide who, how and when money is made in the USA. Now that we know what money is and that it is being used we can create a coherent theory of how the banking system works.

Let us remember that, whatever the nature of what is being used as money within the economy, it is the flows of savings and dissaving that appear in the Vector Conservation Equation, what creates and what destroys the money of the money supply, regardless of whether the money is cash, credit money or of any other nature:

$$y_j = x_j + ah_j + \frac{1}{k_F}\frac{dx_j}{dt} \qquad \begin{cases} ah_i^+ \equiv \ ah_j > 0 \ \rightarrow ahorro \\ ah_i^- \equiv \ ah_j < 0 \rightarrow desahorro \end{cases}$$

In the equation, the positive components of the savings vector represent the flow of money that is extracted from the money supply, which we identify with the savings that go to the Capital Market; while the negative components represent the money that is injected into the money supply, which we identify with what we call dissaving (or credit) and which comes from the money in the Capital Market.



In fact, the Aggregate Conservation Equation, which relates the *PIA (*or *GDP)* to the aggregate flow of savings, was obtained from the relationship between the money supply and the flows of savings and dissaving: the following is the relationship between the money supply and the flows of savings and dissaving. M with the flows of savings and dissaving:

$$\frac{d}{dt}PIA(t) = k_F \cdot \frac{dM}{dt} \quad \xrightarrow{\frac{dM}{dt}=-[Ah^+(t)+Ah^-(t)]} \quad \frac{1}{k_F}\frac{d}{dt}PIA(t) = -[Ah^+(t) + Ah^-(t)]$$

But in the above equation, it is not at all simple to know what the savings and credit flows are. $Ah^+(t)$ and credit flows $Ah^-(t)$ in an economy in which money is created by banks when they grant credit.

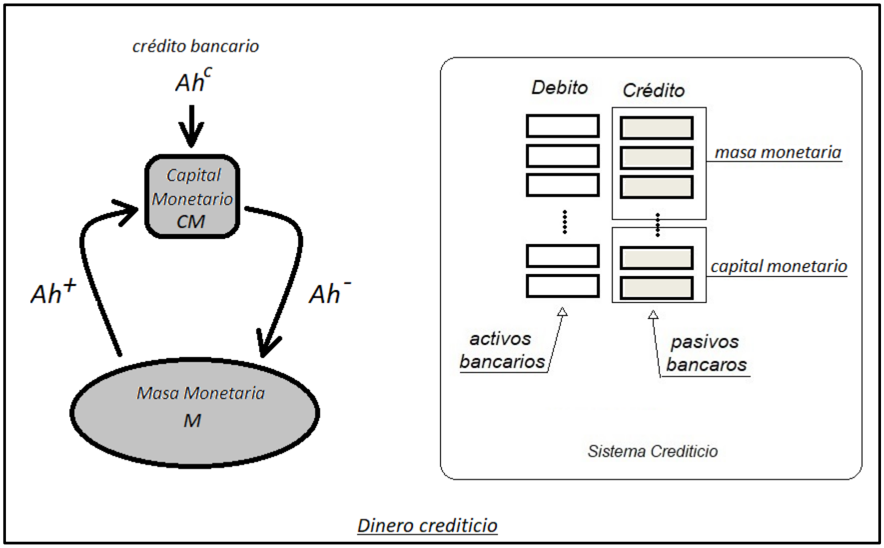
In today's economies, money has no physical nature and is only a bank record that changes its holder when it is used to pay in exchanges, and which is created out of nothing when a bank credit is granted and destroyed when it is repaid. For all these reasons, it would be desirable to express the flows of saving $Ah^{+}(t)$ and credit flows $Ah^{-}(t)$ which appear in the conservation equation, as a function of the flow of credit and the flow of hoarding. $Ah^{C}(t)$ and the flow of hoarding $Ah^{S}(t)$These are variables that we can know and predict very well because they are closely related to the changes in bank records.

In the analysis, we will not introduce new concepts neither on money nor on the economy and we will limit ourselves to explaining the relation that the bank records have with the savings vector Ah that appears in the Vector Conservation Equation. To do this, we will begin by making a simplified and idealized description of the banking system, but at the same time completely realistic, which will help us to establish in a very general way, the limitations imposed by the creation and destruction of money on the economic growth of the economy.

2. PURE CREDIT MONETARY ECONOMY

The process of credit money creation is extremely simple, and is the result of the evolution from an economy based on metallic money (gold standard) to an economy based on bank money created as bank credit. The process of credit creation is represented in the attached figure in a very simplified but rigorous way and implies accepting that there is only bank money created by banks as an accounting notation when they grant a loan, which is in accordance with the reality that surrounds us and with the idea that the Central Bank does not manufacture any money, as in fact happens, however strange it may seem to us.

The figure shows the two markets, the Capital Market and the Consumer Market, together with the monetary inflows and outflows that reflect banking activity. On the right hand side, the bank records with which accounting is carried out within the banking system are shown. Let's take a closer look at the various monetary flows that are created in the process.



<u>Credit Flow Ah^C</u>

The banking system creates money by an extraordinarily simple procedure:

1) When a bank gives a loan, it creates two bank accounts in the name of the person receiving the loan. In one of them a positive balance is recorded, which will allow the person who receives the loan to spend more than what he is earning from his economic activity. This is what we call credit money, bank money or, simply, money, and it will increase the money supply when the loan is spent on consumer goods. In the other account a negative balance is recorded, indicating the amount of money that has to be repaid to pay off the loan, either in the form of periodic installments, at maturity, or in some other way. The latter record is generally considered an asset of the bank. The annual flow of bank money that is created by the loan is the flow that comes out of nothing and ends up in the bank's account. Ah^C that comes out of nothing and ends up in the capital market, in figure.
2) When the person spends the positive balance of the credit account, the money will end up distributed among the accounts held by the different banks. It is a part of the flow

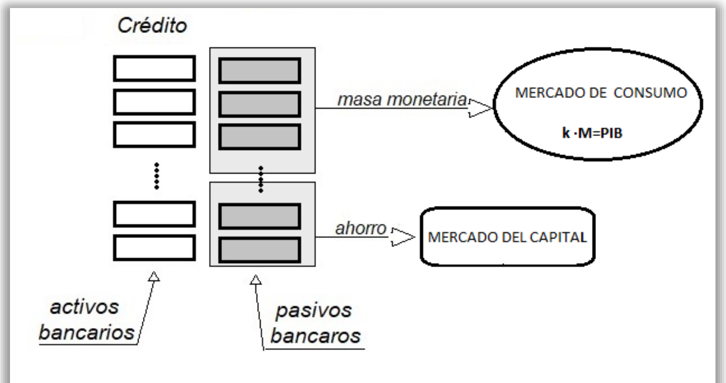
Ah^{-} that appears in the figure coming out of the Capital Market and going into the Consumer Market, indicating three things. First, that bank money is accepted by all and is the money with which the economy works. Second, it is money that did not exist before the loan was granted. Third, it is virtual money that has no reality outside the banking system and the legal system that supports it, so it always remains within it (we have assumed that there is no other type of money, such as paper money, gold, etc.).).

3) No bank "formally" creates any money when it grants credit because the net balance of all bank records is always zero: *"when credit is granted, two accounts are created, one with a positive balance and one with a negative balance, which cancel each other out"*. However, the account with a positive balance is the legal tender money that is used to buy goods and is backed by the country's legal system. It is the "fiat" money which will circulate from then on throughout the economy and which forms both the money supply and the monetary capital, and can only be destroyed when the credit is repaid and the two accounts, the one with positive balance and the one with negative balance, are cancelled. That is the reason why bank money always fulfills that:

$$\text{Bank money} = \text{credit debt}$$

The mysterious equality that always exists between the amount of bank money held by the agents inside the banks and the amount of money owed by the agents to the banks shows that all the money being created in the economy is being created as debt.

This is precisely where the magic and charm of a fully credit economy lies: *"All the money in the economy is someone's debt and it is being backed by someone's assets or someone's income"*. It can be said that the people who are really making the credit money are the people who apply for the credit and spend it, and that is the reason why they are obliged to pay it back in the future. They are the ones who are actually backing the credit money created by the banks.



El Dinero Bancario

The attached figure shows the result of the credit creation process described above. It shows the bank records used for accounting purposes and indicates the function of each one of them:

a) The registers on the right are the total amount of money in the economy, what we have called "credit money" or "bank money", and are divided between those that form the money supply money, and those that form the monetary capital with which the Capital Market functions, the latter being what people keep inside the Bank as savings (in reality, hoarding). Both types of money are only records and, therefore, indistinguishable one from the other, but they have in common that they are money that is always owed by someone. ALL BANK MONEY IS SOMEONE'S DEBT.
b) The records on the left are the records in which the money owed to the banks is recorded, but they are not money, but the bank's *"asset"* backing the money that has been created in the form of credit.

The pairing of the debit registers (the Bank's assets) and the credit registers (the Bank's liabilities) is observed, which forces the sum of both to be always zero, indicating that all the money created by the bank is credit and is backed by debt. There is no net money creation, but there is creation of credit or bank money, the flow Ah^C.

<u>Who creates bank money?</u> Let us note that who has really created the credit money is the one who receives the loan money and spends it, since it is he who backs it with his wealth or income.

The role of the bank in this whole story is of vital importance for the trust in "the fiduciary system", because it is the bank that guarantees to the Central Bank and to the whole society that the real issuer of the bank money will return the money that the bank has created for him or, if not, it will be the bank itself who will return it. In this sense, the bank is the one who is backing the money issued by the debtor.

The beauty of credit money, and its danger, lies in the fact that the money is created with the commitment to be repaid, which forces banks to find new debtors to take over the old credits they are cancelling, otherwise the money with which the economy works will be destroyed, with dire consequences:

"Money is debt, and when the debt is repaid the money disappears."

The immense beauty of this fact is not without a very real danger, and just as the rose has thorns so that no one can pick it, so too credit money can make us bleed when it is not handled with care, since the amount of money in the economy depends on the fickle desire of agents to spend money on credit, what Keynes called the animal spirits.

Aggregate savings flow Ah

The figure also shows the flows and Ah^+ y Ah^-which continue to have the same meaning as always and represent, respectively, the money that is extracted from the money supply through savings and the money that is injected through dissaving, the latter being able to come, as we know, both from previous savings and from credit. The sum of both flows is the aggregate savings $Ah(t)$ which appears in the conservation equation and governs both the *GDP* and the *IPA* of the economy:

$$\frac{1}{k_F}\frac{d}{dt}PIA(t) = -Ah(t) = -(Ah^+ + Ah^-) = -\sum(ah_i^+ + ah_i^-)$$

$$ah_i = ah_i^+ + ah_i^- \qquad \rightarrow \begin{cases} ah_i^+ \rightarrow ahorro\ del\ agente \\ ah_i^- \rightarrow \left| \begin{array}{l} credito\ del\ agente \\ desahorro\ del\ agente \end{array} \right. \end{cases}$$

The components of the savings vector represent the sum of the two different flows that each of the agents extracts or enters the Consumption Market (the money supply).

<u>Savings Flow Ah^S</u>

In the same way that the Banking System creates money by granting credits, it also destroys money when credits are repaid; the process of creation implies the process of destruction and both are indissoluble one from the other. Therefore, we have defined a single vector $Ah^C$to represent both the creation and destruction of money by the banking system, the sign of the vector indicating which of the two processes dominates in aggregate terms.

However, not all the money that is created when banks grant credit ends up being spent on consumer goods, nor is all the money that is saved (and has been extracted from the money supply) used to repay a bank loan. In both cases, the money ends up hoarded in the Capital Market. This is what we have called money capital, and it can originate either from the creation of money through bank credit or from the extraction of money from the money supply. Changes in the quantity of money capital is what we call the flow of savings, although it would have been correct to call it the flow of money. Ah^Salthough it would have been correct to call it the flow of hoarding.

<u>THE PROBLEM OF CREDIT MONEY.</u> When the quantity of bank money decreases because more credit is being repaid than is being granted, it is very likely that savings is extracting more money from the money supply than is being injected with credit. Then the amount of money in the money supply decreases and the economy goes into recession:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = -Ah(t) \quad \xrightarrow{Ah(t)>0} \quad \Delta PIB < 0 \qquad (recesion)$$

The granting of credit normally ends up being injected into the economy and the extraction of savings is not always done to repay a loan, so the credit system can create bubbles and recessions depending on whether it grants more or less credit.

The problem, or the great disadvantage, of using bank money created in the form of debt is that the amount of money in the money supply depends on the amount of bank debt taken on by the agents. If, for some reason, they decide to decrease their debt to the banks, or the banks decide to reduce the amount of credit they have granted, then the amount of money in the money supply will most likely decrease as well, which will inevitably send the economy into a recession.

Although we have just briefly outlined where to look for the origin of credit crises (the destruction of credit money because of the explicit obligation to repay it), it is necessary to go a little deeper in our analysis before deducing precisely the equation that governs economic growth in monetary economies.

3. THE GROWTH EQUATION

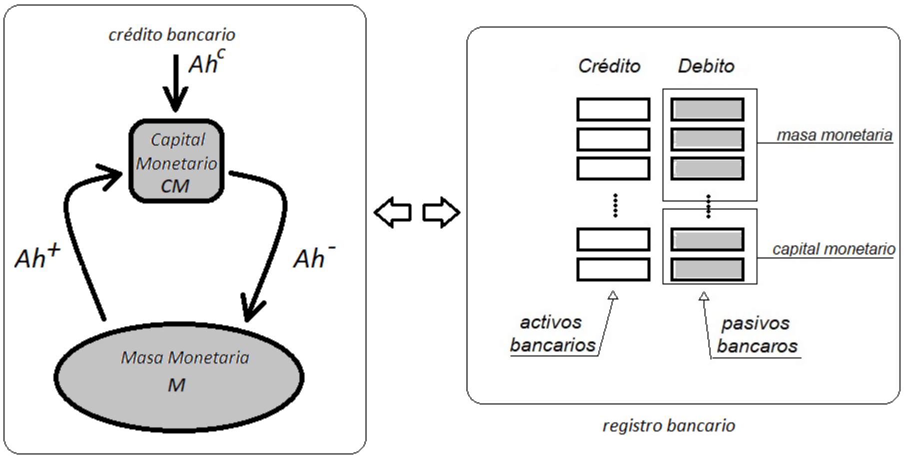
People often think of money as a physical thing that has value in and of itself, however, the money that every economy in the world runs on is credit money that has been created by commercial and investment banks through credit and has no value in and of itself. At least 90% of all money circulating in the economy is someone's debt and the banks make their profits from the interest they are charging on that debt.

For example, in the US there is about $20MM of bank money of which, $10MM is the money that forms the money supply and the other $10MM is, almost entirely, the money that is used for international trade. So here we have assumed from the beginning that the real economy is a pure credit economy in which all the money out there is credit money that has been created as debt, which is almost entirely true. That will not alter in any way the generality of the conclusions we are going to reach, despite the fact that bank money can coexist with another type of fiat money, such as banknotes.

Our problem is not so much to understand that money is a bank credit that can be created as well as destroyed, but to express the aggregate conservation equation as a function of the changes in bank records due to flows Ah^C y Ah^Sflows, instead of making it depend on the flow of saving Ahas the equation is now expressed:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = -Ah(t) = -(Ah^+ + Ah^-) = f(Ah^C, Ah^S)$$

To do this, let us look again at the right side of the attached figure where the bank records are shown with the two types of money, the one that forms the money supply and the one that forms the monetary capital. We know that both types of money are used for different things, since one



Creación del Dinero Bancario

is used for purchase and the other remains idle, but we also know that both types of money are indistinguishable from each other because both are a bank register that in no way differ. Therefore, expressing monetary flows Ah^+ y Ah^- that enter and leave the Consumer Market, according to the changes that occur in the bank records, is not at all simple, although it is not an impossible task to carry out either:

1) The flow $Ah^C(t)$ which arises from nothing to end up in the Capital Market, is the amount of (bank) money created or destroyed by banks when granting and cancelling loans. It represents the annual change in the amount of bank money, MB, which is created by credit and can become negative when the flow of credit repayment is greater than the flow of credit creation, which basically destroys bank money. Therefore:

$$\frac{d\,MB}{dt} = Ah^C \qquad\qquad MB \equiv \textit{Monetary capital}$$

2) Money capital, MC, is the amount of money that agents hold for various reasons (mainly for liquidity reasons) in the Capital Market. It is, of course, savings or hoarded money and in the figure it is implicitly assumed that all credit money is always created as money

capital and that it is then, when it is spent in the Consumption Market, that it becomes money in the money supply. Therefore:

$$\frac{d\,MC}{dt} = Ah^C + Ah^+ + Ah^- \qquad\qquad MC \equiv \textit{monetary capital}$$

3) The flow $Ah^-(t)$ leaves the Capital Market and ends up in the Consumer Market, it is what we have been calling dis-saving. It is the annual amount of monetary capital that is spent in the Consumer Market becoming monetary mass and its origin can be, the previous savings or the bank credit that is spent in investment or consumption. It is also the sum of the negative components of the savings vector ah_i which appears in the conservation equation.

4) The flow $Ah^+(t)$ flows out of the Consumer Market and ends up in the Capital Market. It is the annual amount of money that extracts savings from the money supply and is converted into monetary capital. Its origin can be real savings or savings forced by the repayment of a loan, although this is irrelevant.

From the figure it follows that the quantity of money supply *M*, the quantity of monetary capital *MC*, and the quantity of bank money *MB* (credit), are related to each other by the Banking Equation:

<u>Banking Equation</u>

$$deuda\ bancaria = masa\ montaria + capital\ monetario$$
$$(MB = M + MC)$$

The Banking Equation is the basic expression describing the whole financial system, and we should not let its apparent simplicity fool us. Its importance can be appreciated very well when, thanks to it, we can relate in aggregate terms the different monetary flows with the changes in the banking records:

$$\left.\begin{array}{l} \dfrac{dM(t)}{dt} = -Ah^+ - Ah^- \\ \dfrac{dCM(t)}{dt} = Ah^S = Ah^+ + Ah^- + Ah^C \\ \dfrac{dBM(t)}{dt} = Ah^C \end{array}\right\} \xrightarrow{BM=M+CM} \quad \frac{dM}{dt} = Ah^C - Ah^S$$

This last expression, when substituted into the aggregate conservation equation, gives us the most important expression of all economics, the Growth equation:

$$\frac{d}{dt}PIB(t) = k_F \cdot [Ah^C - Ah^S] \qquad Ec.\ del\ Crecimiento$$

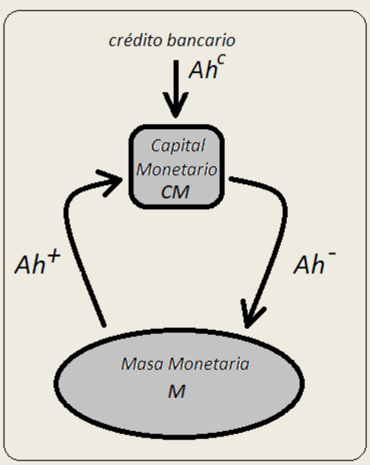
The Growth Equation tells us that *"economic growth is proportional to the difference between the growth of the quantity of bank money and the growth of the quantity of bank money". Ah^C and the growth of the amount of money hoarded. Ah^S”*:

$$\frac{d}{dt}PIB(t) = k_F \cdot \left[\frac{dMB(t)}{dt} - \frac{dMC(t)}{dt}\right]$$

This is logical, since the difference between the money that banks create when they grant credit and the money hoarded by savings is the money that flows into the money supply and makes *GDP* grow.

We call the expression of the Aggregate Conservation Equation as a function of the flow of credit and savings the Growth Equation because it is the equation that governs economic growth within monetary economies.

<u>DEDUCTION OF THE GROWTH EQUATION</u>



<u>Deducción de la Ecuación del Crecimiento</u>

$$\left.\begin{aligned} \frac{dM(t)}{dt} &= -Ah^+ + Ah^- \\ \frac{dCM(t)}{dt} &= Ah^S = Ah^+ - Ah^- + Ah^C \\ \frac{dBM(t)}{dt} &= Ah^C \end{aligned}\right\} \xrightarrow{BM=M+CM} \frac{dM}{dt} = Ah^C - Ah^S$$

$$\boxed{\frac{d}{dt}PIB(t) = k_F \cdot [Ah^C - Ah^S]}$$

The curious thing is to see that the expression states that, in aggregate terms, it is possible to hoard any amount of money desired, as long as the amount of credit money grows faster than the amount of money hoarded; In other words, the flow of savings (hoarding) can be as large as desired as long as the money comes from the creation of bank credit and not from the money supply (this is what explains why the monetary injection of more than 4 trillion dollars has not affected the real economy or inflation, because the money is hoarded in the Capital Market).

Evidently, the reason why credit crises appear and the economy goes into recession is none other than because the money supply decreases, regardless of the amount of savings accumulated:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = [Ah^C(t) - Ah^S(t)] \quad \overset{\underline{Crisis\ Crediticia}}{\underset{\downarrow}{}} \xrightarrow{Ah^C(t) < Ah^S(t)} \quad \Delta PIB(t) < 0$$

We will see later that this is what explains the economic crises that periodically plague the real economy.

We will use the rest of this chapter to explain the exact meaning of the Growth Equation.

<u>STEVE KEEN</u>. In the first edition of the Madrid Theory, we named the Growth Equation "The Keen Equation". We thought that, by naming it this way, we were only acknowledging the work of Australian economist Steve Keen in identifying the growth of debt as the origin of economic crises. Something all economists would agree to acknowledge, even though, in reality, Keen is way off the mark in 2010 when he formulates a relationship between aggregate demand, an economy's GDP and debt to explain the fall in output, completely ignoring that it is bank credit that drives changes in GDP in the economy:

"This is obvious when you look at aggregate demand according to my definition: as the sum of GDP plus the change in debt (where that demand is diffused by goods, services and asset markets). Even if debt levels are still falling, since they are falling less rapidly, there has been a boost to aggregate demand coming from debt, because debt is falling less rapidly in 2010 than in 2009."

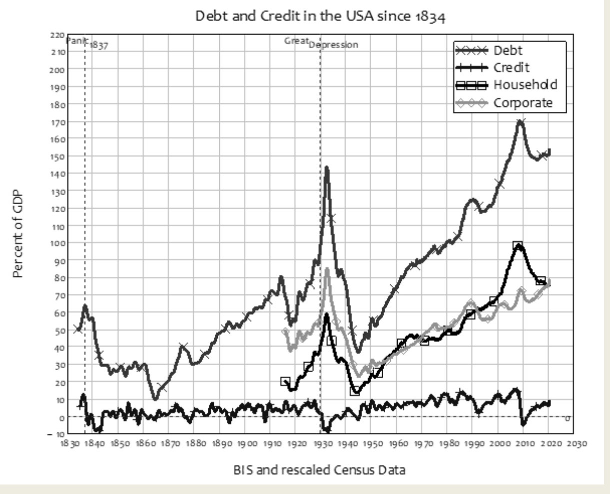
The problem is private debt and the future of the US is deleveraging.
Steve Keen, 20 September 2010

However, the situation changes completely at the end of the second decade, when Steve Keen, perhaps under the influence of the misnamed "Modern Monetary Theory", seems to realize that *it is only in the destruction of bank money that we must look for the cause of the credit crisis that periodically afflicts monetary economies. For example, and well into his third decade, Steve Keen seems to have understood that aggregate demand depends on bank credit, as he advances in a draft of chapter 2 of his next book published in December 2020:*

"This is similar to Aristotle's theory of comets (which was retained in Ptolemaic astronomy) that comets were unpredictable, because they were atmospheric phenomena (Aristotle 350 BC). The Copernican scientific revolution, which overthrew this worldview, showed that comets were inherently predictable, since they are celestial objects orbiting the Sun.

Similarly, the "unpredictability" of crises like the Great Recession is a product of the false money model of loanable funds of the neoclassical paradigm. The correct model of bank-originated money and debt shows that crises are caused by credit turning negative (Vague 2019), and that most recessions are caused by credit declining, but not entirely negative. This causal relationship between credit (which is identical in magnitude to the annual change in private debt) and economic performance endows capitalist economies with a tendency to accumulate higher and higher levels of private debt. This phenomenon is most evident in most capitalist economies, the United States of America, see Figure 6.

Figure 6: Private Debt and Credit in the U.S. since 1834



This chart identifies the three great U.S. economic crises: the Great Recession, the Great Depression and the "Panic of 1837". What, you haven't heard of the "Panic of 1837"? Neither had I, until I produced this chart (Census 1949, Census 1975), but after doing so, it struck me at the time as "an economic crisis so extreme as to erase all memories of previous financial upheavals" (Roberts 2012, p. 24). In each of these crises, credit plummeted from a historically high level, turned negative, and remained negative for a substantial period, see Table 4.

Table 4: Credit size and duration of negative credit in major U.S. economic crises.

	Credit			
	% GDP			Years
Crisis	Maximum	Minimum	Change	Negative Duration[18]
Panic of 1837	12.2	-8.9	21.1	6.2
Great Depression	9.1	-9.1	18.2	8.2
Great Recession	15.4	-5.3	20.7	2.6

Each crisis changed only when the credit decline stopped. But the renewed growth generated by increased credit came at the expense of a rising private debt-to-GDP ratio, with this increase terminated either by another crisis, or by wars that caused the private debt ratio to fall sharply due to the "War Economy" boost to GDP: nominal GDP growth reached 32% p.p. a. during the U.S. Civil War in (1861-65), 29% during World War I (1914-1918) , and 29% again during World War II (1939-45), far exceeding the maximum rate of credit growth during those periods (0.2% of GDP p.a., 8.6% and 4.5%, respectively). ”

Steve Keen, 2021

This remarkable change in the way of looking at the problem of the crisis allows us to prove that the Growth Equation is indeed valid, which makes Steve Keen even more deserving of having the equation named after him. However, we have the impression that Steve Keen is being seduced by the misnamed Modern Monetary Theory and is helping to spread it, which we deplore very much.

Steve Keen does not seem to realize that the misnamed Modern Monetary Theory is a theory that has been constructed solely with the intention of destroying the euro, something we think he will not agree with. Our fear is that, like many other prestigious economists, he will become one more acolyte of those who have constructed the theory and unwittingly contribute to propagating the idea that it is necessary to destroy the euro.

For this reason, and for no other, we do not think it very unwise to name the most important equation in economics after Steve Keen, linking the Growth Equation to a person who is very likely *to end up being manipulated by those behind the Levy Economics Institute of Bard College, who are the ones who have actually constructed the theory.*

Let us hope that our fears are unfounded.

4. FINANCIAL THEORY OF ECONOMIC GROWTH

Now that we know how banks manufacture money through credit, it is possible to explain how money ends up converted into capital goods (into income) and to outline, albeit in a very summarized form, a theory of growth that is consistent with the financial nature of capital and with the role of bank credit in economic growth. Let us begin by explaining two basic aspects that are always present when new capital goods are created:

a) The monetary injection that produces the expenditure on physical goods thanks to the loan.
b) Repayment of the loan.

Although the most likely source of money used for investment in new capital is almost always money from corporate profits, here we will assume that any investment is always made with borrowed money and therefore has to be repaid with interest.

When an entrepreneur asks for a loan to dedicate it to the creation of new capital, and it is granted, he receives an amount of money that will end up being spent on wages and goods in the Consumer Market. In this sense, whoever invests by means of a loan, first injects money into the economy in the short period of time that the investment lasts, to then slowly extract it from the economy and finally pay it back. Therefore, the question that always underlies the granting of any loan is very simple to ask: *where does all the money that the borrower has committed to repay come from?* More specifically, where does the debtor get it from?

- Principal's money.
- Interest money.
- Earnings money.

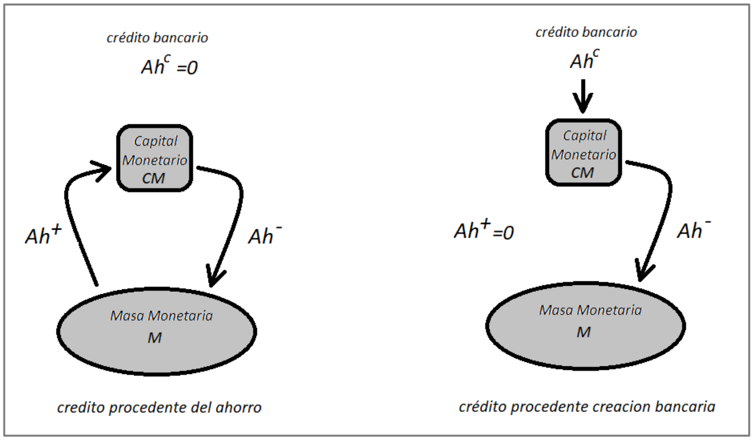
The question is not an idle one. The amount of money to be repaid is always higher than the amount of money that is granted with the loan, so it is very important to understand where the larger amount of money that has to be repaid to pay off the debt comes from, because, although it is obvious that an individual debtor can get the money from many places, the same is not true in aggregate terms.

> *Investment in a capital good should always return more money than was spent to create it, but where does that money come from in aggregate terms?*

Let us note that, even if we think that the money spent on the investment was created out of nothing, it is urgent to answer the question of how it is possible to extract from the economy more money than is injected, since the repayment of the credit always implies returning a larger amount than was received with the loan, and this without counting the benefits that the investment must produce. Here we will answer the question from a strictly financial point of view, and we will soon see why.

a) <u>Monetary injection.</u>

The attached figure shows the two possible sources of the money used to make an investment: previous savings and the creation of bank money. When the money comes from previous savings (we assume that through the issue of a debt security) there will be no net creation of bank money and no increase in the money supply, while in the second case, when the money is newly created because it is money coming from a bank loan, there will be an increase in the money supply.



The left side of the figure shows the case in which there is no money creation and the money comes from previous savings, in which case $Ah^C = 0$. In the right zone, there is no previous saving and all the investment money comes from bank credit, in such a case there is monetary creation and $Ah^C > 0$. To see the difference between the two situations, it is better to decompose aggregate savings into its two components, savings and dissaving or credit:

$$\frac{d}{dt}PIB(t) = -k_F \cdot [Ah^+ + Ah^-] \quad \rightarrow \quad \begin{cases} Ah^+ = Ah^- & \rightarrow \ \Delta PIB = 0 \quad \begin{matrix} ahorro \\ previo \end{matrix} \\ \begin{cases} Ah^+ = 0 \\ Ah^- < 0 \end{cases} & \rightarrow \ \Delta PIB > 0 \quad \begin{matrix} creación \\ bancaria \end{matrix} \end{cases}$$

When the investment money comes from previous savings, the net injection of money into the money supply is zero, since the amount spent by the entrepreneur on the investment is the same as the amount previously withdrawn from savings. Ah^- is the same amount that was previously withdrawn from savings Ah^+ and the economy's *GDP* is unchanged. On the contrary, when $Ah^+ = 0$the money spent by the entrepreneur Ah^- comes from the creation of bank money, then *GDP* grows because there is a net injection of money into the money supply.

From the point of view of capital, the same happens as with *GDP*. When investment money comes from previous savings, capital growth will be zero in aggregate terms, while when there is monetary creation, since Fisher's constant is worth about "two" and has a value of about 6, the increase in capital will be about twelve times the flow of monetary injection that has caused it: the increase in capital will be about twelve times the flow of monetary injection that has caused it. β has a value of about 6, the increase in capital will be about twelve times the flow of monetary injection that caused it:

$$\Delta k_{capital} = \beta \cdot k_F \cdot Ah \cdot \Delta t \quad \rightarrow \qquad \Delta k_{capital} \approx \ 12 \cdot \ préstamo$$

We see that the aggregate result is as expected. Even if there is no problem for an individual entrepreneur to raise with his productive activity the necessary income so that the value of the capital he has created is greater than the debt he has incurred, in aggregate terms there will only be net capital creation, and therefore growth, when the investment money comes from newly created bank money:

> *"Savings money can be invested and create new capital in individual terms, but it cannot create new capital in aggregate terms."*

(The process by which new capital goods are created using only previous savings is the typical process of creative destruction described by the early 20th century Austrian economist Josep Schumpeter, where the creation of new capital is always at the cost of the destruction of existing capital. This is explained in detail below).

b) Repayment of the debt.

Suppose an entrepreneur has borrowed money for the creation of a new capital good (either from individuals or from a bank), borrowed it and spent it on making the investment. Suppose he has managed to raise enough income to make the market value of the new capital good greater than the debt he incurred. It is now, on repaying the loan, that it is found that in aggregate terms the debt can never be repaid.

Let us imagine the most favorable case for the entrepreneur, when the creditor (be it a private individual or the bank) only requires him to pay him indefinitely the interest on the debt, without ever obliging him to repay the principal. In such a case, the income produced by the company built with the borrowed money must be sufficient to satisfy, at least, the interest on the debt. Specifically, and according to Robinson's First Law, we have:

$$B_i^{cap} = q_{ii}^o P_i - \sum_{j=1}^{n} q_{ij} P_j - B_i^{trab} \ > intereses\ bancarios \rightarrow \qquad k_i = \frac{B_i^{cap}}{i \cdot \aleph_i} > deuda$$

Let us note that when the entrepreneur succeeds in meeting the above condition and the market value of the newly created company is greater than or equal to the value of the debt he has incurred to create it, he can meet his commitments in three ways k_i is greater than or equal to the value of the debt incurred to create it, he can meet his commitments in three different ways:

1) You can use the income produced by the new capital to repay the principal and interest on the loan:

$$B_i^{cap} > \textit{bank interest + principal installment}$$

2) You can repay the debt by selling a portion of the new equity, since it has a higher market value than the debt:

$$k_i > \textit{debt}$$

3) A portion of the income produced by the new capital can be used indefinitely to pay interest on the debt, without ever repaying the principal:

$$B_i^{cap} > \textit{bank interest}$$

And here is the surprise. In individual terms, an entrepreneur can repay the debt in any of the three ways without any problem, but, in aggregate terms, such a thing is not possible and the principal of the credit can never be repaid. Understanding why, in aggregate terms, the credit money created by the banking system can never be repaid is the reason for this section and that is where the grace of the Financial Theory of Growth that we are developing lies because it is the idea that we are going to explain now that gives internal coherence to the Financial Theory of Capital developed in the previous topic.

Let us begin by discarding the first and second options, in which the entrepreneur repays the debt. It is not difficult to see that, in aggregate terms, the repayment of the principal together with interest, the first option, implies extracting from the money supply at least as much money as he injected into the investment, i.e., it implies zero or positive net savings. It implies this, even when the credit money comes from the creation of bank money, since the payment of interest means that more money is returned than was invested. It is also what happens in the second option, when part of the new capital is sold to obtain money with which to repay the principal of the debt, since whoever buys the new capital must have previously saved the amount of money spent on the investment. In both cases, at least as much money is extracted from the money supply as was injected by the investment and, therefore, there can be no net growth of the money supply, nor can there be net growth of the economy or of capital.

Only in the third option, when the principal of the debt is never repaid and the payment of interest is maintained indefinitely, is there growth of the money supply and there is growth in aggregate terms, since it guarantees that no more money is ever extracted from the money supply than is injected into investment. In other words, only in the third case, when the debt is never paid off, is aggregate inequality fulfilled:

$$\textit{loan} \geq \textit{savings}$$

Inequality that guarantees that there will be economic growth and, therefore, growth of capital, although this may only be nominal, because it guarantees the creation of bank money. Let us remember that the condition for growth to occur according to the Growth Equation is:

$$\boxed{\frac{1}{k_F}\frac{d}{dt}PIB(t) = [Ah^C(t) - Ah^S(t)] \quad \xrightarrow{Ah^C(t) > Ah^S(t)} \quad \overset{\underline{Crecimiento\ Económico}}{\overset{\downarrow}{}} \quad \Delta PIB(t) > 0}$$

Specifically, the expression tells us that the nominal increase in *GDP* is twice the flow of monetary injection that has caused it (throughout the paper we are assuming that Fisher's constant is worth "two"). What we know, also causes a proportional increase in the share of *GDP* that goes to pay capital income:

$$\Delta PIB = k_F \cdot Ah(t) \cdot \Delta t \quad \xrightarrow{r_{capital} = \alpha \cdot PIB} \quad \Delta r_{capital}(t) = \alpha \cdot k_F \cdot Ah(t) \cdot \Delta t$$

The value of aggregate capital increases proportionally to Fisher's constant and to the injection flow of bank money granted with credit:

$$\textit{loan-savings} = Ah^C(t) - Ah^S(t) = Ah(t)$$

$$\Delta k_{capital} = \beta \cdot k_F \cdot Ah \cdot \Delta t \quad \rightarrow \quad \Delta k_{capital} \approx 12 \cdot \textit{bank credit}$$

From the aggregate point of view, as long as the investment money comes from monetary creation and as long as it is not repaid, the monetary injection produces about twelve times its "value" in capital goods. A result already arrived at earlier, but which now allows us to explain why credit money can never be repaid.

Let us note that the Growth Equation states that money in the money supply cannot be decreased without the economy going into recession, which forces the money coming from savings to be returned to the economy with the dis-saving. But it is not savings that is creating the new capital, but the increase in bank money that is created by the granting of bank credit (the flow of credit, when we assume zero hoarding):

$$\Delta K = \frac{\langle \alpha \rangle}{\overline{\overline{\aleph}} \cdot i} k_F \cdot \Delta M = \frac{\langle \alpha \rangle}{\overline{\overline{\aleph}} \cdot i} k_F \cdot Ah^C \cdot \Delta t \sim 12 \cdot Ah^C \cdot \Delta t$$

But in aggregate terms, the money from savings is being used to invest in the purchase of new capital, which is only possible when the monetary injection produced by credit succeeds in creating it. Let us note that the entrepreneurs have created the new capital by borrowing money coming from savings and money creation, so that a part of the new capital they manage to create does not belong to them, but belongs to those who have lent them the money. The new capital belongs, a part to the savings money, another part to the bank credit and the rest to the entrepreneur, this last part being the real profit that the entrepreneur obtains from his investment:

$$\Delta K = \Delta K_{ahorro} + \Delta K_{crédito} + \Delta K_{empresario} \sim 12 \cdot Ah^C \cdot \Delta t$$

The expression tells us that, although savings money is not what is creating new capital, in financial terms, that does not mean that it is not needed to create it in physical terms. In fact, in order to save it is necessary that the savings money be invested, either by buying new capital or by borrowing it, which is indifferent and which forces the growth of capital to be sufficient to absorb the savings that are made within the economy. Otherwise savings will end up hoarded and the economy will end up in recession.

There is a relationship between the money to be saved and the bank money to be created, which is not difficult to obtain. When we put the above expression in annual terms, we have:

$$\frac{\Delta K}{\Delta t} = \frac{\Delta K_{ahorro}}{\Delta t} + \frac{\Delta K_{crédito}}{\Delta t} + \frac{\Delta K_{empresario}}{\Delta t} = \frac{\langle \alpha \rangle}{\overline{\overline{\aleph}} \cdot i} k_F \cdot Ah^C$$

But, $\frac{\Delta K_{crédito}}{\Delta t} = Ah^C$ so:

$$\frac{\Delta K_{ahorro}}{\Delta t} + \frac{\Delta K_{empresario}}{\Delta t} = \left(\frac{\langle \alpha \rangle}{\overline{\overline{\aleph}} \cdot i} k_F - 1\right) \cdot Ah^C$$

The new capital created by the monetary injection will be distributed, almost entirely, between the entrepreneurs who create it and the investors (lenders) who finance them, which seems logical and coherent until we realize that the above relationship forces that:

$$\frac{\Delta K_{ahorro}}{\Delta t} \leq \left[\frac{\langle\alpha\rangle}{\overline{\aleph}\cdot i} k_F - 1\right]\cdot Ah^C \qquad \sim 11\cdot Ah^C$$

Or, in other words, in aggregate terms, the increase of the money supply, which we are now identifying with Ah^{C} (the creation of bank money), must be sufficient for the growth of capital to absorb savings.

Simple numbers tell us that this is not always going to be easy to achieve, especially when the economy is growing slowly. For example, when the real growth of an economy is 1%, the real creation of new capital is around 12% of GDP, so annual savings must remain well below that figure (in order to be saved). When we accept that part of the new capital is kept by the entrepreneurs as profits (part of the new capital must be kept by the entrepreneurs, or else they would not start any new business), then the constraint is even stronger.

The problem with saving is that it forces the economy to maintain a minimum growth rate in order to absorb it, which is not always possible in an environment of little or no growth. In fact, what we have just demonstrated is that in a monetary economy, GDP growth must be at least one-sixth of the money that is saved:

$$\Delta K_{ahorro} \ll \frac{\langle\alpha\rangle}{\overline{\aleph}\cdot i}\cdot\Delta PIB \qquad\rightarrow\qquad ahorro \ll 6\cdot\Delta PIB$$

Which is a remarkable result.

There is much beauty in credit money. In aggregate terms it is a whale that bites its own tail: *"credit increases nominal expenditure, the increase in nominal expenditure increases nominal income, the increase in nominal income increases the nominal amount of capital, and finally the nominal increase in capital backs credit money"* which can be formulated as a law, the Law of Capital Accumulation:

<u>THE LAW OF ACCUMULATION</u>. In a monetary economy, the aggregate value of capital is proportional to the quantity of money that forms the money supply, the proportionality constant being the product of β by Fischer's constant:

$$K = \frac{\langle \alpha \rangle}{\overline{\aleph} \cdot i} k_F \cdot M$$

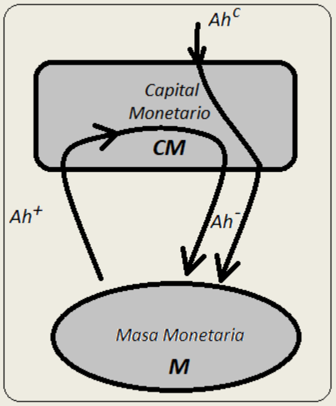
<u>COLORARY</u>: In a pure credit monetary economy, credit money is backed by a portion of the value of the capital it supports, so that, in aggregate terms, credit money cannot be repaid without also destroying the capital backing it.

The Law of Accumulation is much more profound than its short statement appears and shows in a very sophisticated way that capital is the inevitable consequence of the use we make of money to organize our economy. We, the people, are not the ones who use money as a tool put at our service, but, on the contrary, it is money that imposes its own logic on us and forces us to relate to each other in a very specific way. Money is structuring our society, even though there is no imposition from it that forces us to do so.

In aggregate terms, the amount of capital created by the monetary injection is more than enough for the entrepreneur to be able to support the bank credit with which he creates the new capital, provided he is able to capture as a rent, part of the increase in income produced by the monetary injection he makes with the investment. Evidently, a part of the growth of capital, or perhaps all of it, will be inflationary, but now we are only interested in showing that the paradox about the origin of profit in an investment, is resolved when it is understood that the capital created is a flow of income that pays without problems the flow of interest generated by the debt from which it was born. Therefore, credit debt is never repaid, in aggregate terms.

The analysis we have made runs through a sequence of statements that we can call the Financial Theory of Economic Growth, which we summarize below:

<u>Financial Theory of Economic Growth</u>



FIRST: Entrepreneurs, either with money previously saved or with credit money created out of thin air by banks, invest by buying goods in the Consumer Market. This is the flow Ah^- of the figure.

The flow Ah^C is the annual amount of credit money (bank money) that is created by banks from nothing, while Ah^S is the flow of hoarding that increases the amount of money saved. The difference $(Ah^C - Ah^S)$ is the annual amount of money that is injected into the money supply, and it holds that:

$$-(Ah^+ + Ah^-) = (Ah^C - Ah^S)$$

SECOND, when the monetary injection $(Ah^C - Ah^S)$ is positive, nominal GDP grows, partly causing inflation and partly causing an increase in production, at the same time that the value of capital goods increases by 10 to 12 times the annual amount of the monetary injection. Specifically, according to the Law of Growth, the increase in the value of capital is:

$$\Delta K = \frac{\langle\alpha\rangle}{\bar{\aleph} \cdot i} k_F \cdot (Ah^C - Ah^S) \cdot \Delta t \qquad \text{Growth Eq.}$$

How much real GDP grows and how much real capital grows is uncertain, but it is true that both the rate of inflation and the rate of growth of real capital grow. π and the growth rate g is the same for GDP and for capital K:

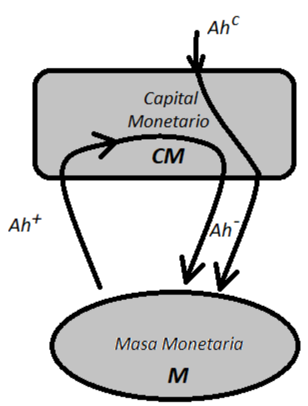
$$\boxed{\pi + g = k_F \cdot \tau = \beta \cdot k_F \cdot \tau_k} \qquad \begin{cases} \tau = \dfrac{(Ah^C - Ah^S)}{PIB} \to \begin{array}{l} tasa\ de\ inyección \\ respecto\ al\ PIB \end{array} \\ \tau_k = \dfrac{(Ah^C - Ah^S)}{K} \to \begin{array}{l} tasa\ de\ inyeccion \\ respecto\ al\ capital \end{array} \end{cases}$$

<u>THIRD</u>: In aggregate terms and in order for the nominal economy to grow, all the money extracted from the economy through savings has to be lent and returned to the economy in the form of expenditure, but this is only possible when the money given on credit is not returned in turn through savings. Otherwise, when the credit money is returned, there will be no change in the money supply at best, and at worst there will be net extraction and, as a consequence, there will be a recession, as stated in the Growth Equation:

$$\frac{d}{dt} PIB(t) = -k_F \cdot [Ah^C - Ah^S] \xrightarrow{Ah^C - Ah^S > 0} recesión$$

5. GROWTH WITHOUT MONEY CREATION AND GROWTH WITHOUT SAVINGS

To understand a little better the role that the Financial Theory of Growth reserves for savings, let's analyze the growth of the economy in two not entirely unrealistic cases.



A first case will be that of an economy where there is no significant monetary growth, which we think is the situation that has been occurring for the last 10,000 years because of the widespread use of gold as money.

The second case will be that of an economy in which there is no significant net saving (hoarding), which is the situation a monetary economy tends to reach when it has at least discrete inflation. This is the normal situation of an economy, where credit is granted with money coming partly from savings and partly from bank creation.

Let us observe in the attached figure that the loan for investment or for consumption, the flow Ah^{-}can come either from previous savings or from the creation of bank money. Ah^{+}as well as from the creation of bank money, being impossible to distinguish one from the other, in aggregate terms. Ah^{C}It is impossible to distinguish one from the other, in aggregate terms. We will now study how the economy changes according to the origin of the money lent:

a) **Economy without monetary creation**

A very interesting situation is the case of an economy where the quantity of money does not change because banks only grant credit with money previously saved. In such an economy, as is logical, there can be no growth of *GDP* or capital, according to the Growth Equation, but nothing prevents, thanks to the advance of technology, the emergence of new companies that are more productive than the existing ones and eliminate them.

SCHUMPETER'S ECONOMY: "We call Shumpeter's economy, an economy where there is no monetary creation and necessarily any loan is made with saved money":

$$\frac{d}{dt}PIB(t) = k_F \cdot [Ah^C - Ah^S] = 0 \qquad \textit{Shumpeter Economics}$$

In a Shumpeter economy, both GDP and the value of aggregate capital remain unchanged.

Let us note that a Schumpeterian economy has several characteristics that can be quite confusing:

1) It is a zero-sum economy. Although there may be an increase in productivity, *GDP* does not grow and neither does the aggregate value of capital, so that any new capital created must be at the cost of the destruction of existing capital. New companies, probably much more productive, replace old companies, which are much less productive, but without increasing the aggregate value of capital.

2) There can be hoarding. Savings need not necessarily flow back into the economy as credit spending. When there is no borrowing because the technological momentum has been exhausted or there is no population growth, the economy will go into recession if the flow of savings (hoarding) exceeds the flow of credit.

In practice, this is an impossible situation, since any increase in production will force prices down, which we have already mentioned is not possible in aggregate terms. However, a very similar situation can occur when an economy grows much more slowly than it could grow because of insufficient monetary creation, for example, because of the gold standard and the slow physical growth of the quantity of gold.

Joseph Alois Schumpeter was an Austrian-American economist who lived in the first half of the 20th century. With a very conservative mentality, he stood out more for his capacity for observation than for his ability to interpret the economic reality around him. His is the idea of "the creative destruction of capital" which unashamedly extols the central role of the entrepreneur in economic growth, and which is the reason why he is remembered.

SCHUMPETER'S CREATIVE DESTRUCTION

There is nothing to prevent an economy from having strong productivity growth and yet weak growth in GDP and aggregate capital appreciation because the money supply is growing very slowly.

Such a situation, with a slow nominal growth of the economy together with a strong increase in productivity, was the situation throughout the eighteenth and nineteenth centuries in Europe. Most especially, during the period of time from 1820 to 1870, the so-called Engels Pause. This was a very strange time, in which an extraordinary development of technology coexisted with the most absolute working-class misery, without ever understanding how both facts, which in themselves seem contradictory, could occur. We think it is very important to understand what was the cause of this apparent contradiction of capitalism and thus prevent it from happening again in the future.

In an economy, nothing prevents people from saving and banks from channeling that saving into investment, granting credit to create new productive capital. In fact, until the advent of bank money and because of the monetary rigidity required by the gold standard, all new investment depended on previous savings, since the growth of gold stocks was limited to very specific moments such as the discovery of gold in California.

Evidently, the Growth Equation does not prevent that in a gold-based economy with very slow monetary growth, there is a large creation of new companies thanks to investment spending *financed with money from savings, but it does force the disappearance of existing companies so that in aggregate terms there is no net increase in capital.*

The new companies created with the loan of money previously saved, will only break through if they manage to capture a part of the expenses captured by the already existing companies, since in the absence of an increase in the money supply there will be no increase in expenditure. But this is guaranteed in an environment of strong technological innovation and great scientific discoveries such as that which accompanied the first industrial revolution. When the introduction of a new technology reduces the number of workers needed to produce the same amount of goods as before, there is a strong increase in corporate profit for the new firms thanks to the reduction in wage expenditure. This causes the new, more productive firms to take the place of the existing, less productive firms.

Everything seems a perfect world to a great observer like Joseph Schumpeter, who is ecstatic at the destruction of the old industrial fabric that makes way for a new industrial fabric with much less need for work. Extraordinary increases in productivity appear before his eyes without perceiving the tremendous incoherence of the slow nominal GDP growth that accompanies it:

Investors' savings provide the necessary funds for investment in new companies.
- The creation of new, more and more productive companies replaces the old ones almost continuously, but there is not an even growth in production.
- Near-zero inflation rounds out the extraordinary landscape.

Of course, Schumpeter is enthusiastic about the economy he sees at the end of the 19th century, which shows a business fabric that renews itself without discontinuity, becoming more and more productive thanks to strong investment. But when we take a closer look at this "brave new world" that shows us a boiling economy, but with slow growth, we see that the economic situation in which workers are left is inhuman and terrible, and misery reaches unthinkable heights only a few decades before, when the economy was still based on agriculture and there was hardly any technology. Schumpeter does not see the poverty in which the working population moves because of structural unemployment and low wages, something that Engels sees a few years earlier, and that is the reason why he writes the Communist Manifesto together with Marx:

1) Thanks to the spectacular increase in productivity, goods are produced with less and less labor, which creates a strong structural unemployment that could easily absorb a rapid growth of the economy. But the expected growth is not happening because the slow growth of money is limiting it. Unemployment will be everywhere because the economy continues to produce almost the same, but with a much smaller number of workers.

(Especially when structural unemployment is coupled with rural migration, as in fact occurred throughout the industrial revolution, but especially during Engels' Pause).

2) Although the economy is not growing fast enough to absorb the growing surplus of the working population, there is enough savings to invest in new and increasingly productive technologies which replace the old ones with almost no discontinuity, and which need less and less labor. A process of "creative destruction" that will cause more and more unemployment and more and more workers' misery in the midst of a binge of technological progress without precedent in the history of mankind.

That was the epoch in which Engels lived. It was the epoch that saw the birth of The Communist Manifesto. It was the epoch that saw the growth of the "reserve army" so magnificently narrated by Karl Marx in Capital. It was also the epoch in which the gold standard and the absence of a Central Bank turned any expansion of bank credit into a credit crisis that spread misery everywhere:

"...a ghost haunts Europe, the ghost of communism..."

(Banking crises occurred without apparent discontinuity throughout the 19th century, in cycles lasting between 7 and 11 years. So much so, that the French physician and economist Joseph Clément Juglar, identified them without difficulty in his book "The commercial crises and their periodic reappearance in France, England and the United States" published in 1862 and for this reason they are known as Juglar cycles).

Perhaps at this point it would be good to quote Karl Max when he wrongly attributes the structural unemployment of his time to the capitalist form of production:

*"...if the existence of a workers' overpopulation is a necessary product of the accumulation or development of wealth on a capitalist basis, this overpopulation becomes in its turn a lever of capitalist accumulation, indeed, one of the conditions of life of the capitalist mode of production. It constitutes an **industrial reserve army**, an available contingent, which belongs to capital in as absolute a manner as if it were bred and maintained at its expense..."*

b) **Economy with monetary creation, but without net savings.**

It is normal in an economy for loan money to come both from previous savings and from bank money that is created out of thin air. In fact, there is no way of distinguishing one money from the other, and it can be seen that most large companies do not resort to credit from banks, but use the issue of debt securities, or the issue of shares to raise money from savings, while bank credit, and the monetary creation it implies, generally serves to finance small and medium-sized companies, mortgage lending and consumption, and also, although less so, to finance the public deficit.

This combination of savings and credit creation allows growth rates as high as China's, which in some years has been well over 10% of *GDP*, with hardly any inflation. It is also what produced the productive miracle of the USA during the Second World War and the 30 glorious years that followed, also with hardly any inflation.

But this does not prevent us from analyzing what happens in an economy where there is no savings and where banks can create all the bank money needed for investment by granting credit. According to the Growth Equation, it will be the flow of bank credit $Ah^C$when it is spent on consumption or investment and becomes part of the money supply, which determines the nominal growth of the economy, whether it is inflationary or not:

$$\frac{d}{dt}PIB(t) = k_F \cdot [Ah^C - Ah^S] \quad \xrightarrow{Ah^S=0} \quad PIB(t) = k_F \cdot \int Ah^C(t) \cdot dt > 0$$

We see that there is no need for prior savings for the economy to invest, take advantage of technological innovations and grow, since the origin of the money necessary for the nominal growth of the economy always comes from monetary creation through bank credit:

$$\pi + g = k_F \cdot \frac{Ah^C}{PIB} \;\rightarrow\; \boxed{\pi + g = k_F \cdot \tau} \quad \begin{cases} \tau = \dfrac{Ah}{PIB} \rightarrow \begin{matrix} tasa\ de\ creacion\ del\ dinero \\ respecto\ al\ PIB \end{matrix} \\ \pi \rightarrow \begin{matrix} tasa\ de\ creacion\ del\ inflación \\ respecto\ al\ PIB \end{matrix} \\ g \rightarrow \begin{matrix} tasa\ de\ crecimiento \\ respecto\ al\ PIB \end{matrix} \end{cases}$$

The inflation that may appear in the economy will depend on whether or not the increase in income caused by the monetary injection from bank credit is captured by the sale of new products or, on the contrary, is limited to raising the prices of existing products.

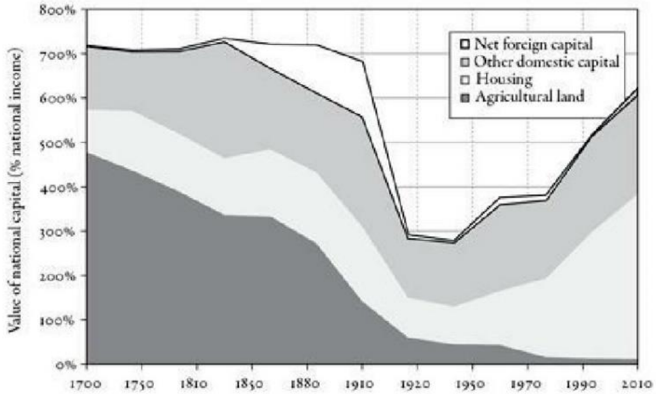
At this point, we could ask ourselves the question: what is the purpose of savings? If only with the growth of bank money is it possible to satisfy investment needs, then what is the function of savings in the economy? It is not easy to answer this question, because the only reasonable answer is probably: "because people like to save".

However, this way of looking at things can lead to the misconception that companies only invest because they expect to raise more capital, which is almost never true. Remember, there is a fixed amount of capital within an economy that forces entrepreneurs to fight for it. Entrepreneurs do not only invest to raise new capital, but most of the time they invest to conserve the capital they already have, precisely because capital is limited and is not produced by savings but by monetary injection:

$$K = \frac{\langle \alpha \rangle}{\bar{\bar{\aleph}} \cdot i} k_F \cdot M$$

Therefore, a very significant amount of the investment made by companies is made in order to maintain their market share intact, that is, to maintain their income, which can be interpreted as a creative self-destruction to which companies are forced and which results in an increase in the general productivity of the economy, even though this does not increase the value of the company.

Let's look at the graph presented by Thomas Piketty in his book, "Capital in the 21st Century" to understand this:



Capital en Francia, 1700-2010

Although it is not visible in the graph because it is normalized to *GDP*, from 1700 to 1900, for almost two hundred years, the economy grew very slowly mainly because of the impossibility of creating money out of nothing. However, despite the slow nominal growth of the economy, it is very clear from the graph that there was a very strong redistribution of existing income. Agriculture, for example, went from accounting for 2/3 of the income to only 1/7 of it at the beginning of the 20th century. This significant loss of relative income in some sectors in favor of others was a consequence of the increase in productivity in agriculture, which strongly reduced the expenses necessary to produce the same amount. This is precisely what can be seen in Piketty's graph.

For example, food needs grow as the population grows, but technological innovation can reduce the cost of producing food very quickly, which frees up resources from agriculture that are used in other sectors and causes the share of food in *GDP* to fall sharply (even though agricultural prices do not fall in nominal terms).

Obviously, this does not mean that farmers saw their nominal income decrease, quite the contrary, but it does indicate that the increase in profits in agriculture was not matched by an increase in its productivity, and this is so because the increase in productivity is a global phenomenon that almost never benefits those who carry it out, because the increase in productivity in one sector is distributed in productivity increases in all sectors.

WHO PAYS FOR INFLATION? In an economy where there is no prior saving and all newly created bank money goes into the money supply through credit for consumption or investment, we can expect inflation without having a clear idea of what value it may reach. But, as long as *entrepreneurs make good investments and manage to increase their incomes by increasing output rather than prices, inflation will be limited.*

Of course, this will depend a lot on the technological momentum. If there is an increase in productivity or if there is a vegetative increase in the population, we can expect that the increase in inflation will be moderate.

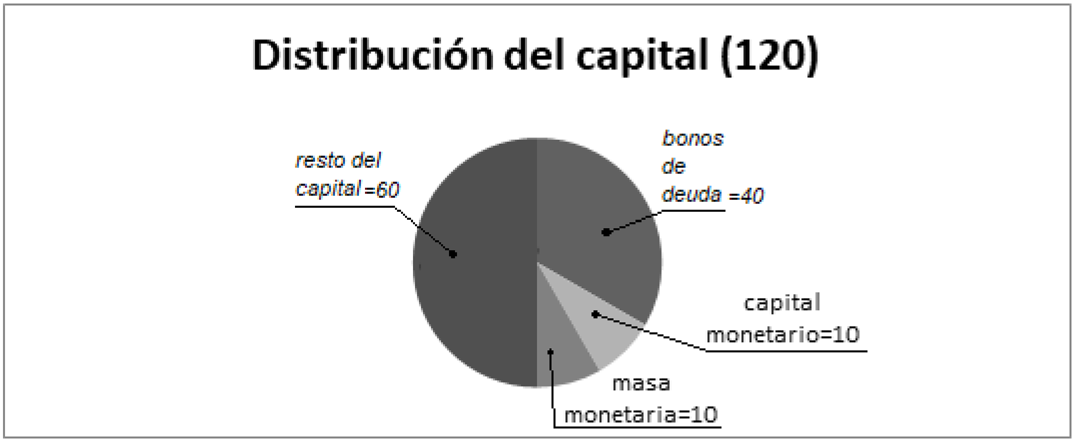
Who pays for the money that banks create when credit spending ends up producing inflation? It is paid by those who use the money. We will all need more money to carry out the same exchanges when prices are higher, while those who borrowed the money will have to pay back an amount of money with less purchasing power than they spent. Both items compensate each other.

6. CAPITAL, DEBT AND MONEY

The Financial Theory of Capital shows us a vision of the economy that surrounds us that is very different from the mechanistic vision of the physical nature of capital. When we stop seeing the growth of capital as the accumulation of productive goods thanks to the investment of savings and accept that capital is the valuation made by the Capital Market of the future income obtained from the possession of a productive good, then savings show their true nature, independent and completely unrelated to the productive process. This is very important, because saving is now only possible to the extent that the quantity of capital grows endogenously, and it proves impossible when the growth of capital is not capable of absorbing the savings that are made.

The idea is not difficult to understand. People save money and then use their savings to purchase capital assets in the logical belief that they will be safer from the vagaries of inflation. It is of no interest to hold wealth as money in a typically inflationary economy when the assets that can be bought on the stock market yield an income of at least 4% of their value.

Let us note that, the distribution of wealth among the various capital assets that might be expected from the financial nature of capital is what is actually observed:



The accompanying chart shows what proportion of wealth is held in each of the four forms of capital within the U.S. in the year of 2019:

$$\textit{bienes de capital} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 120\ MM$$
$$\textit{deuda agregada}\begin{cases} \textit{bonos} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 40\ MM \\ \textit{capital monetario} \ldots\ldots\ldots\ldots\ldots\ldots\ldots 10\ MM \\ \textit{masa monetaria} \ldots\ldots\ldots\ldots\ldots\ldots\ldots..10\ MM \end{cases}$$

Thus, the total value of capital assets in the U.S. (land, housing, offices, businesses, etc., etc.) is the total value of capital goods in the U.S. (land, housing, offices, businesses, etc.). That is, wealth, according to Piketty.), amounts to about 120 trillion dollars at the beginning of 2019, of which about 60MM. Of these, 50% are held through direct ownership of capital assets, while about 40MM, 33 percent of the total, are debt securities on capital assets (corporate bonds, mortgage debt, treasury bonds, student debt, etc.). Recall that debt is an indirect way of owning capital assets because the income it pays comes from the income of the capital backing it. About 10MM, 8 percent of savings, is the money held in the Capital Market (although later we will show that this is the money with which international trade is carried out, since the amount of money held as money capital is very small and falls far short of that figure), while the remaining 8 percent, another 10MM, is the money supply used in the Consumer Market to support purchases.

We have derived the money supply of $10MM from the capital equation, which states that the value of aggregate capital is about 12 times the money supply:

$$K = \frac{\langle\alpha\rangle}{\aleph \cdot i} k_F \cdot M \qquad \begin{cases} K = 120MM \\ M = 10MM \\ \frac{\langle\alpha\rangle}{\aleph \cdot i} k_F = 12 \end{cases}$$

Given that the US GDP is about $120MM, then the money supply supporting the US economy is about $10MM. From this, we have deduced that the savings held in monetary capital are the remainder of the $20MM in bank money, another $10MM, although later we will see that, most likely, most of this money is being used to maintain international trade between countries, so the actual amount held as monetary capital is very small or almost nil.

Let us look very briefly at the difference between capital, debt and money, as well as the relationship between them.

We know that the arbitrage of the Capital Market converts all capital goods into equivalents and that the reason why people or institutions keep savings in one or another form of capital depends only on their expectations about the evolution of its price in the future. We also know that the Financial Theory of Capital states that the aggregate value of all capital is inexorably related to the money supply of the economy:

$$K = \frac{\langle\alpha\rangle}{\aleph \cdot i} k_F \cdot M$$

Therefore, everything would be much simpler if there were only capital goods and money, but this is not the case. The economic reality around us is not so simple, and the simplicity of the expression linking the value of aggregate capital and the quantity of money in the economy is only apparent.

What is debt, is it a capital asset, is bank money a debt that is created when a bank loan is taken out?

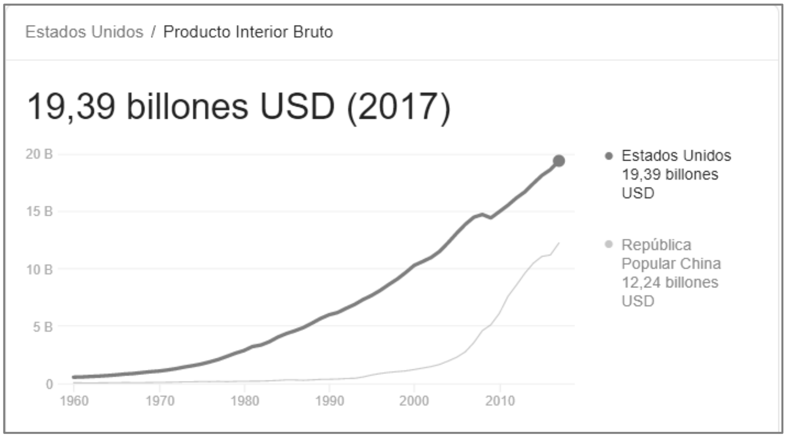
Let's take a closer look at where the different forms of capital come from:

a) The money supply.

If we look closely at the attached graph showing the evolution of the *GDP* of the USA and China in recent decades, we can see very well that the USA has gone from having a *GDP of* around 500 billion dollars at the beginning of the 1960s to having a *GDP of* close to 20 trillion dollars at the end of the 2010s. In other words, in an evolution that can be identified very well with an exponential nominal growth, the nominal *GDP* of the USA has multiplied almost 40 times in the last 60 years. Even more impressive has been the evolution of China's *GDP*, where nominal growth has been clearly exponential and in a much shorter period of time, only 20 years.

Let us note that, *"to increase the nominal flow of spending by more than 40 times, US banks have necessarily had to increase the money supply by more than 40 times during this half century, according to the monetary equation."*

$$. k_F \cdot M = PIB$$



Specifically, by resorting to the Aggregate Conservation Equation it is possible to calculate exactly, the average annual flow of money that banks have been making in the US during the last half century, assuming that the flow of credit has remained proportional to GDP all this time:

$$\frac{dPIB(t)}{dt} = -k_F \cdot Ah(t) \xrightarrow{Ah(t)=a\cdot PIB(t)} PIB(t) = PIB_o \cdot e^{k_F \cdot a \cdot t} \rightarrow a \approx 2\%$$

The result we get from applying the equation is very close to the actual result. Bear in mind that a nominal growth of 4 percent per year, half real growth and half inflationary growth, such as the US economy has experienced in the last half century, requires an annual flow of money creation equal to 2% of *GDP,* which accumulated over the last 60 years is about 35 trillion dollars at current prices, that is, 1.7 times the current *GDP* corrected for inflation (just to create the money supply, and not counting the other 10MM dollars that we assume are used to maintain international trade. If we also count that money, the monetary creation has been double).

Of course, that money does not belong to the banks, but they charge an interest rate for it as if it belonged to them. Although economists working for private universities in the U.S. always blame the government for manufacturing money and causing inflation with their deficit budgets, the truth is that the only ones who manufacture money are the commercial and investment banks when they grant a bank loan. Therefore, they have had to be the ones who have manufactured the immense amount of money that the Consumer Market needs to function.

Seigniorage", which is the term used in economics to refer to the privilege of those who manufacture money, and which is currently held by commercial and investment banks, is the main source of profits of the banking system and we wonder what economic argument can justify an accumulated gift to private banks of 35 trillion dollars (an amount that will rise to almost 70 trillion dollars when the money held as monetary capital is included).

THE LORD IN SPANISH TERMS. *Let's look for a moment at the following figures of the Spanish economy corresponding to the year 2019:*

$$\left.\begin{array}{l} PIB\ en\ 2019 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1.244.757\ M.€ \\ Crecimiento\ nominal\ 3\% \ldots\ldots\ldots 37.342\ M.€ \\ Crecimiento\ real\ 2\% \ldots\ldots\ldots\ldots\ldots 24.895\ M.€ \\ Déficit\ público\ \ 3\% \ldots\ldots\ldots\ldots\ldots 37.342\ M.€ \end{array}\right\} \rightarrow\ \Delta M = 1.5\%\ del\ PIB$$

The data tell us that, during 2019, the money supply has increased in Spain by 1.5 percent of GDP (although the amount may have nothing to do with domestic bank creation, as the money may have come from outside, either thanks to super commercial skill or either thanks to foreign investment, as Spain belongs to Europe and its currency is the euro).

Who has manufactured this money? It is not at all clear, since any bank in the European Union can have manufactured it when it grants credits, but what we do have clear are two things, that the Spanish government would have been able to pay half of the public deficit of 2019 if it had been able to issue the necessary money to allow the nominal growth of the economy. But is it desirable for it to do so?

THE BANKING SYSTEM. Money is a good that acquires its value because it is the universal element of exchange, that is, because it allows us to buy whatever we have put on sale. For this reason, *and in spite of the fact that today's fiat money costs nothing to produce, we know that it has value and is part of our wealth.*

Money has to be manufactured and someone has to manufacture it, and although throughout history there have been many goods that have been used as money (wheat, salt, copper, iron, silver, gold, tobacco), at present it is the banks that manufacture it when they grant credit. Therefore, money is wealth for those who own it and a debt for those who back it, and runs the risk of being counted twice, once as money, and once as an interest-bearing asset: the credit with which bank money was created.

If we ask the director of a bank what is the book value (its capitalization) of his bank, he will most likely add its assets with its liabilities to calculate it and tell us that its equity is zero, which is very clearly false. The banking system is charging interest on all the bank money it has created by granting credit and which does not belong to it, so its book value is, in the case of the US, over $20MM (accepting that all money pays the average interest rate of money).

Monetary seigniorage is taught in private universities in the USA always associated with the privilege that the Central Bank (the government) has to manufacture money from nothing, which, although it may be true because the Fed can force banks to manufacture money for it in any amount, a simple look at its accounts shows that the statement is false (the Federal Reserve has only manufactured money during the 2008 crisis when it had to bail out banks, publicly traded companies and the government itself).

Evidently, no matter how much they lie or try to hide the truth, it has not been the Federal Reserve that has manufactured the 10 MM dollars that maintain the exchanges in the USA (to which we will have to add another 10 MM dollars more to sustain world trade). On the contrary, it was the banking system that manufactured this money and it would be good if it continued to do so, but under greater public control.

But... is it desirable that the money needed to sustain growth be created by the government and used, in part or in whole, to finance public services? This is a more interesting question than it seems at first glance because it tells us that credit money or bank money can be viewed from two different points of view, creating two possible Banking Systems depending on what backing is required to grant credit.

<u>BANKS CRY, TOO</u>. The first thing to understand is that there are two ways to ensure that the borrower repays the loan:

- *Income-backed credit.*
- *Equity-backed credit.*

In fact, the banking system mostly backs up credits with capital goods, without seeming to realize that the price of any capital good comes from the profit it produces (the income it produces). However, what is true for the private sector is no longer true for the public sector, whose only possible collateral is revenue from tax collection and not its assets (we assume that the government does not own capital goods).

When we look at what backs the bank money created through credit by the Banking System, we can find three different types of debtors, depending on the way in which the credit debt is backed:

- *The Central Bank: Without any backing (deciding the interest rate).*
- *Private sector. Supports with capital goods (with the market interest rate).*
- *Consumers: Backed by their income (with the higher interest rate).*

During the last 200 years the Central Bank has intervened very little and the debt it has incurred with the Banking System has been very modest, but the situation has changed dramatically with the 2008 recession. Today, an increasingly significant part of bank money is being backed by the Central Bank. Specifically, the amount of money owed by the Federal Reserve to the Banking System has gone from almost zero to about $5 billion, which is about half of the money the US economy needs to function.

Evidently, this money created for the Federal Reserve has not gone to pay for government spending, but to replace the money in bank loans that have not been renewed by the private sector. That is, before 2008 bank money was backed entirely by credits granted to the private sector, while after 2008 a quarter of bank money is credits granted to the Federal Reserve (the Federal Reserve does not create money by itself) and is being backed by it:

- Before 2008 → 100% of bank money is private credit.
- After 2020 → 25% of bank money is credit owed by the Central Bank.

In 2020, of the $20MM of existing bank money in the US, about $5MM is owed by the Federal Reserve (note that half of that money, about $10MM, is used to conduct trade).

In the other countries of the world the situation is worse. Since it is not the reserve currency, the amount of bank money in the economy of these other countries is approximately the amount of money that makes up the money supply. At present and in these countries, half of the bank money is owed by the Central Bank.

Why are the banks crying?

It is not very difficult to understand. The Banking System has gone from charging interest on 100% of the money that makes up the money supply, to charging interest on only half of that amount, since the Central Bank does not pay interest at present. In addition, the interest rate charged by the Banking System for loans has been greatly reduced, which is a direct torpedo to its source of income. If we add to this the non-payment of many loans due to the strong economic crisis in some of these countries (e.g. Spain), it is rare that all of them are not bankrupt. It is also not uncommon to observe that they charge commissions for almost anything.

Banks have many good reasons to weep.

b) Monetary capital.

Within a monetary economy there is not only the money used to buy in the Consumer Market, there is also the money hoarded in the Capital Market, which we have called "**monetary capital**" and which is often used to buy different capital goods. All the money that exists in the economy is, as the case may be, either money that is used for purchase in the Consumer Market, or money hoarded in the Capital Market, even though the two are not distinguishable in any way because both types of money are only an accounting record within a commercial or investment bank.

As already mentioned, the Capital Market functions as a "barter market" in which there is no money, or, rather, in which money is only one more good that in no way differs from other capital goods. This is the reason why both forms of money do not easily convert into each other, so that a sudden change in the amount of bank money held in the Capital Market does not affect the amount of money in the money supply.

The latter has been seen very clearly after the huge monetary injection carried out by the Federal Reserve with the purchase of more than 4 trillion dollars in assets of all types in the Capital Market, and which has not affected prices in the Consumer Market at all.

It is logical. Saving is that which is done with the intention of having consumption capacity in the future, and the fact that the manner in which it is held changes, whether it is an asset, a house or money, does not change the reason why it is held. When the Federal Reserve bought all those assets in the Capital Market what it did was to satisfy the desire of savers to exchange the financial assets in which they held their savings for money, but at no time did the saver have any intention of spending his savings, whether or not he held them in money.

<u>MONETARY CAPITAL</u>. We call "monetary capital" the savings kept in the Capital Market, that is, the amount of savings kept as money, which is usually used to carry out the purchase of capital goods. Unlike what happens with the money used in the Consumer Market, there does not seem to be any relationship between the flow of purchases of capital goods and the amount of money needed to carry them out, as it does in the Consumer Market, so that the amount of monetary capital can go from being zero to containing millions of millions in a short period of time, as it happened in the years following 2008.

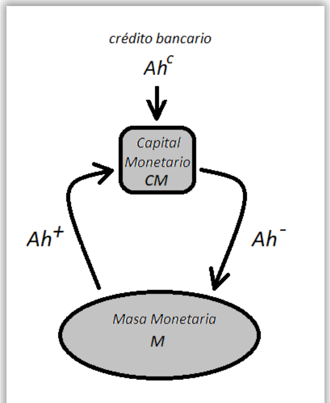
In the Capital Market very little money can create an immense flow of exchanges of capital goods, and a large amount of money can generate very little flow of exchanges when it remains idle. To put it in a more technical way, the flow of purchase in the Capital Market is not limited by the amount of existing monetary capital, and there is no monetary equation in the Capital Market that links the flow of exchange to the amount of monetary capital, as there is in the Consumption Market.

The great difficulty of any monetary analysis has to do with the great difficulty in differentiating both forms of money, since both monetary capital and money supply are only a bank notation that can only be distinguished by the use that is made of them within the economy.

There are, in general, two distinct ways in the economy of creating monetary capital. One is through savings, and the other is through the creation of bank money.

1. <u>Through savings</u>

Monetary capital is created when someone extracts money from the money supply and saves it. And vice versa, it is destroyed when someone injects money into the money supply, spending money capital. Both are flows Ah^{+} y Ah^{-} as shown in the attached figure. It is very clear that in the process of saving and dissaving the total amount of bank money in the economy does not change, although its nature does change, from being money supply to being money capital, or vice versa.



Creación de Capital Monetario

Let us recall that it was following this idea about the flow of money that is extracted or injected into the Consumer Market that the savings vector was introduced into the accounting equation that describes any economic agent:

$$y_j = x_j + ah_j + \frac{1}{k_F}\frac{dx_j}{dt}$$

$$\begin{cases} ahorro & \equiv ah_j > 0 \rightarrow extracción\; monetaria \\ \left.\begin{matrix} crédito \\ desahorro \end{matrix}\right\} & \equiv ah_j < 0 \rightarrow inyección\; monetaria \end{cases}$$

Where the negative components do not always come from previous savings, as they can also come from bank creation.

2. <u>Through the creation of a bank</u>

When banks lend money, they not only use the already existing money previously extracted from the money supply by savings (the mechanism we have just seen), but they can also lend it by creating it out of nothing. This is the flow Ah^{C} which appears in the figure coming from nothing, and represents the capacity of banks to increase the total money in the economy by granting credits. The money that is created to grant credit is monetary capital, and it is only when it is spent in the Consumer Market on the purchase of consumer goods that it becomes part of the money supply. Although it does not always have to end up this way, and it can also be spent on the purchase of capital goods and remain in the Capital Market, as happened with the purchase of more than 4MM dollars that the Federal Reserve spent on goods of all kinds.

(For example, when a mortgage loan is taken out for the purchase of a house, the loan money remains in the Capital Market, since a residential house is a capital good. But whoever sells the house can spend the money later on consumer goods, for example, when the builder pays with the money from the sale the expenses of the construction and spends his profits).

<u>HOW MUCH MONEY IS RETAINED IN THE FORM OF MONETARY CAPITAL?</u> The answer is very little (we will see why later).

*If we accept as valid the data we have shown on the US economy, then the debts contracted with the banks by public and private institutions in the US amount to about 20 trillion dollars. This is what we have called the **Bank Credit** or **Bank Mass** and corresponds to all the credit money manufactured by the banks:*

$$Masa\ Bancaria \approx 20\ millones\ de\ millones$$

If the amount of money used in the Consumer Market is about 10MM, then the rest of the money, the other 10MM, must be monetary capital:

$$Capital\ Monetario = Masa\ Bancaria - Masa\ Monetaria \approx 10\ millones\ de\ milllones$$

That is, the total money made by banks in the US until 2020 is about $20 trillion, roughly equal to the value of GDP, of which half is being used to run the productive economy and the other half seems to be kept "liquid" in the Capital Markets.

But our calculation is false.

A little further on we will see that the amount of savings kept hoarded as money is very small. The remaining 10MM dollars are mostly being used to maintain trade exchanges between the different countries and are not monetary capital (it is money of the monetary mass necessary to maintain purchases between countries).

<u>CREDIT MONEY</u>. Banks always create money in the form of monetary capital, and it is those who receive the loan who convert it into money supply when they spend it in the consumer market. Therefore, the $20 trillion that is deposited in banks around the world is two things at once. It is

money held by the owners of bank deposits, but it is also money that someone owes the banks and for which the banks charge interest:

"bank money is owned by someone, but there is also someone who owes it."

The real magic of credit money is that there is a non-consensual debtor/creditor relationship between those who own the money and those who owe it, in which banks appear as mere intermediaries. The beauty of credit money lies not so much in the fact that interest payments are demanded from the one who made it by borrowing it, which gives him a strong incentive to pay it back, but in the fact that the repayment of the loan causes the money to be destroyed in a process inverse to that which was used to create it. Thus, keeping the money supply unchanged requires either that credits be held in perpetuity, or that any credit that is repaid be taken over by some other debtor.

A perverse beauty, because as we shall see, the quantity of credit money cannot decrease without the economy going into deflation.

The obligation to pay interest as long as the credit is not repaid prevents banks from creating too much credit, since it is the absence of solvent debtors that limits credit expansion, but it is clear that it is not the banks that create the need for indebtedness, but the technological moment through which the economy passes.

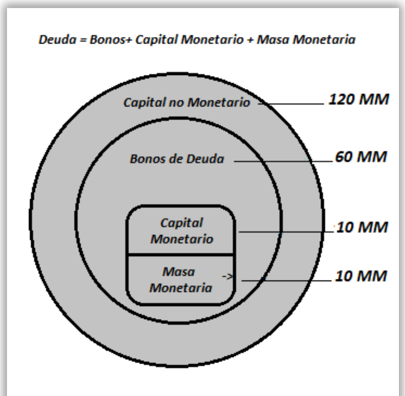
On the contrary, a very serious problem will arise when businessmen no longer wish to take out loans or wish to reduce those they have already granted because they no longer wish to pay interest, since in that case bank money will begin to be destroyed, with disastrous results for the economy, which will enter a recession if the Central Bank does not prevent it, as we shall soon see.

Credit money is one of the greatest intellectual achievements of mankind and should be placed on an equal footing, and without any demerit, with the invention of fire or the wheel.

c) The debt

In general, what is meant by "debt" is the sum of all commitments that exist in the economy to repay an amount of money within a given period of time. A debt is basically a commitment to make a transfer of money in the future without the purchase of any service. It is not, therefore, an exchange of purchase and sale.

Debt includes private debt securities, public debt securities, and bank credit (the mechanism by which monetary capital and money supply, i.e. what we call money, are created). Debt securities are called in colloquial language "bonds" and include both public debt and private debt. The figure shows the distribution of debt in the US.



Distribucion de la deuda

All debt is backed in one way or another by capital assets. Thus, in 2019, the $60MM owed by Americans, which includes the $20MM in bank debt, is backed by the $120MM held by Americans in capital assets.

But this way of looking at things is very misleading because a debt is a future obligation to repay an amount of money and, although Americans have more than enough wealth to back up the debt, the truth is that there is nowhere near the $60 trillion owed by Americans in the economy.

If the creditors decide not to roll over the debt securities, and this may happen, the debt could never be satisfied because there is not enough money in the economy to satisfy it. That tells us that debt securities are only an indirect way of owning capital assets and can never be converted into money, even though they are issued with that intention.

All this was demonstrated for bank debt when the Financial Theory of Growth was explained and it was concluded that "*the credit debt with which new capital is created can never be repaid in aggregate terms",* but it is also true for debt securities issued by companies and government. Also debt securities collect the money that saving takes out of the economy and puts it back into the economy, but once the money becomes part of the money supply, in aggregate terms, it can no longer be repaid: *"Debt can never be repaid in aggregate terms without the economy going into recession"*.

DEBT SECURITIES. It is necessary to understand that debt securities are a way of capturing the income produced by a capital asset without actually owning it, therefore, they should not be thought of as money, because in aggregate terms they are not money, nor can they ever become *money. The only difference between a debt security and the direct possession of the capital asset backing it is that, apparently, the debt security becomes money at maturity, which may be true in individual terms, but cannot be true in aggregate terms.*

Debt securities also do not avoid any problem that the direct ownership of the capital asset already has. In this sense, the value of the debt security will be maintained as long as the income produced by the capital asset backing it is maintained (which is the same thing that happens to the capital asset).

When there is a general flight of savers to liquidity, the problem caused by debt securities is the same in aggregate terms, no matter how much of the savings is held in the form of debt securities and how much is held in the form of capital assets, since it is the lack of liquidity that creates the problem and not whether the savings are held in one form of capital or the other.

There is no problem with debt securities that capital goods do not already have, although both forms of savings can create a very serious liquidity problem when trying to convert them into money, as we will see below.

PART V

MONETARY THEORY OF THE CREDIT CRISIS

CHAPTER 12

THE CREDIT CRISIS

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09 March of the year 2021

1. THE INEVITABLE CRISIS

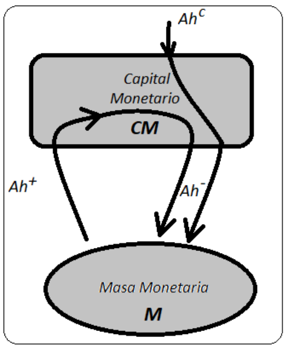
When we analyze the changes in production that the world economy has undergone in the last 300 years, it is very surprising to see that it is full of strong and abrupt periodic declines, which are called with the very appropriate name of "economic crisis". The frequency and periodicity of the economic crises suffered by capitalism is so constant that theories have even been formulated that relate it to the periodic appearance of sunspots.

For this reason, since ancient times, economic crises have been part of the mythology that surrounds and accompanies the scientific development of economics, and there is no economist who does not have a more or less elaborate explanation of the reason why they appear. As it could not be less, we will also elaborate a theory to explain it, but in our case, based on the joint deduction of the consequences of the Growth Equation, the inflationary Principle and the creation and destruction of credit money, or bank money. We will see that these three specific aspects of the economy are sufficient to explain together the periodic drops in production suffered by monetary economies.

2. THE CREDIT CRITERION

From the moment the Aggregate Conservation Equation was derived we know that the extraction of money from the money supply automatically causes a decrease in the economy's PIA (or GDP):

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = -Ah(t) = -[Ah^+(t) + Ah^-(t)] \xrightarrow{Ah(t)>0} \frac{d}{dt}PIB(t) < 0$$



The expression says that when the amount of money needed to carry out exchanges decreases, the nominal *GDP* of the economy must also decrease, which would not be a problem if it were not for the Buyer-Seller Asymmetry Principle, which tells us that the decrease in *GDP* is realized by decreasing production and not by decreasing prices. In other words, any nominal decrease in the money supply causes the economy to go into recession where real production decreases, which allows us to explain the deflationary crises that periodically plague monetary economies, explaining the reason that leads the economy to decrease the money supply.

The practical problem posed by the use of the Growth Equation, as it stands now, lies in the difficulty of measuring the two monetary flows that appear in the expression. Even in the past, when one only has to go and look at the accounting records and check what has happened, it will not be easy to measure the evolution of the flow of savings and the flow of credit. $Ah^+(t)$ and the flow of credit $Ah^-(t)$So there is not much hope that the conservation equation, as it stands now, can be used to predict the evolution of the economy and future credit crises. In fact, the reason for introducing the flow of bank money creation and the flow of hoarding is that the conservation equation, as it stands now, cannot be used to predict the evolution of the economy and future credit crises. $Ah^C(t)$ and the flow of hoarding $Ah^S(t)$ into the expression is because they are variables that are closely related to bank records and are easily measurable, and can be incorporated into economic models without much complication:

$$-[Ah^+(t) - Ah^-(t)] = Ah^C(t) - Ah^S(t)$$

With the expression of the Growth Equation as a function of the flow of credit and hoarding, it is very straightforward to find the condition that the economy must meet to avoid ending up in a serious recession, which is none other than to prevent the flow of credit from falling below the flow of hoarding:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = [Ah^C(t) - Ah^S(t)] \xrightarrow{\frac{d}{dt}PIB(t)<0} \boxed{\begin{array}{c} \underline{Crisis\ Crediticia} \\ \downarrow \\ Ah^S(t) > Ah^C(t) \end{array}}$$

To put it another way, when the increase in the amount of bank money (bank debt) is less than the increase in hoarded money, the economy will be extracting money from the money supply and will inevitably enter a recession:

<u>The credit criterion</u>. The necessary and sufficient condition for a monetary economy not to go into recession is that the growth of the flow of bank credit $Ah^C(t)$ be greater than the flow of hoarding $Ah^S(t)$:

$$\textit{Recession} \leftrightarrow Ah^C(t) < Ah^S(t) \qquad \textit{Credit Criteria}$$

When the flow of hoarding is zero, it will be only the flow of money creation that governs the Growth Equation and the credit criterion is reduced to:

$$\textit{Recession} \leftrightarrow Ah^C(t) < 0 \qquad \textit{Credit Criteria}$$

Almost always, it is going to happen that the flow of hoarding is null or almost null, at least until the economic crisis does not show itself in all its rawness Ah^S is null or almost null, at least until the economic crisis does not show itself in all its rawness or until the Central Bank intervenes and starts buying debt securities to prevent the Capital Market from collapsing. In that case, the economy is driven by the flow of bank credit:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = Ah^C(t) \rightarrow \begin{cases} Ah^C(t) < 0 \rightarrow espiral\ del\ ahorro \\ Ah^C(t) > 0 \rightarrow espiral\ del\ crédito \end{cases}$$

From this slightly more simplified view, economic growth and economic recession are the two sides of the same coin, depending on whether the flow of credit is positive and increases the amount of money in the economy or, on the contrary, is negative and decreases it. That is, depending on whether money is being created or destroyed from the money supply. In this sense, the flow of hoarding refers to the amount of money that is extracted from the money supply without being destroyed (it is not a credit that is cancelled), although for practical purposes this does not matter.

Both the credit spiral, growth, and the savings spiral, recession, have been well documented in the science of economics since the mid-19th century. In 1863, the Frenchman Clement Juglar demonstrated with statistical evidence that the dramatic drops in economic activity at intervals of 7 to 10 years were not isolated phenomena, but part of a cyclical fluctuation of commercial, stock market and industrial activity. Today, although every university professor explains the causes of crises according to their religious beliefs in the afterlife, none of them denies the existence of the boom and bust cycles that have characterized monetary economies since ancient times. Even economists working for private universities in the United States do not dare to deny them, although they always blame them on unpredictable and inexplicable exogenous causes, which is not very different from denying them.

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = Ah^C(t) - Ah^S(t) \ \rightarrow \begin{cases} Ah^C(t) < Ah^S(t) \rightarrow espiral\ del\ ahorro \\ Ah^C(t) > Ah^S(t) \rightarrow espiral\ del\ crédito \end{cases}$$

But, although the growth equation allows us to know the exact condition that makes an economy go from the credit spiral to the savings spiral, it does not allow us to know the exact condition that makes an economy go from the credit spiral to the savings spiral. $Ah^C(t) > Ah^S(t)$to the savings spiral $Ah^C(t) < Ah^S(t)$but nothing tells us what specific aspects of economic activity converge to cause hoarding and credit to change and a credit crunch to occur.

Let us note that the growth equation does not even tell us what causes the credit crunch, nor whether it can be avoided. Nor does it say anything about how to get out of a recession once the economy has entered it, so, first of all, we must clarify the nature of the flow of savings and the nature of the flow of credit that appear in the expression in order to analyze what relationship there is between the two flows and what other variables of the economy they depend on.

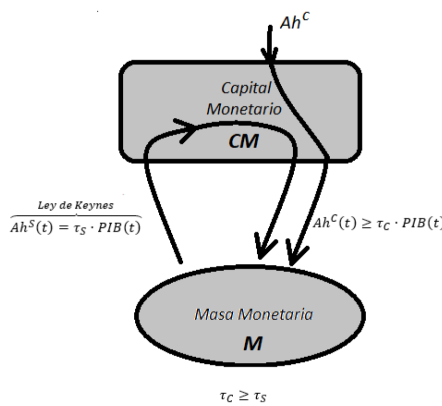
3. THE SAVINGS CYCLE AND THE CREDIT CYCLE

The problem of credit and the consequences it has on the evolution of the economy are much more serious than a quick reading of the Growth Equation would appear at first sight, because if growth is endogenous and the need to invest on credit depends on it, there does not seem to be any obvious way to prevent the economy from going into recession when growth stops and with it also stops investment on credit. It is very clear that the economy will enter a recession when credit ceases to be demanded and those already granted are repaid, which causes the flow of credit to become negative and bank money begins to be destroyed; or when, although the flow of credit does not stop, the flow of hoarding cannot be prevented from exceeding it.

If we assume that the flow of savings Ah^+ is endogenous and maintains a stable relationship with *GDP,* which is almost always the case, we can explain the boom and bust cycle of the economy without difficulty by resorting only to changes in credit spending. In particular, when we assume that savings are proportional to spending (Keynes' Law of Thrift) and there is no hoarding, i.e., that all savings are returned to the economy in one way or another, either through the purchase of assets or the purchase of debt securities, we can forget about hoarding and pay attention only to changes in the flow of credit to explain the business cycle:

$$\overbrace{Ah^+(t) = \tau_S \cdot PIB(t)}^{Ley\ de\ Keynes} \quad \rightarrow \qquad \frac{d}{dt}PIB(t) + k_F \cdot \tau_S \cdot PIB(t) = k_F \cdot Ah^-(t) \qquad \textit{Keynes Eq.}$$

(The parameter τ_S is the savings rate in relation to *GDP* and we assume it to be constant). The equation continues to tell us the same as it did before, that for there to be growth the flow of credit expenditure must be greater than the flow of hoarding, but now that savings appear in the expression, dissaving also appears. $Ah^-$of which only a part is a consequence of the flow of credit:



$$Ah^-(t) = -Ah^+(t) + Ah^C(t)$$

Now, the condition for the economy not to go into recession is that the flow of dissaving grows at least as fast as savings grows, which forces the flow of credit to also grow proportionally to *GDP (*at least):

$$Ah^-(t) = \tau_S \cdot PIB(t) \quad \rightarrow \; Ah^C(t) = -Ah^+(t) + Ah^-(t) = (\tau_C - \tau_S) \cdot PIB(t)$$

This is entirely logical, since the money supply grows proportionally with *GDP*. Let us note that the solution of the equation will be of the exponential type and nominal *GDP* will grow or shrink depending on whether credit manages to remain positive or not:

$$\frac{d}{dt}PIB(t) - k_F \cdot (\tau_C - \tau_S) \cdot PIB(t) = 0 \qquad \rightarrow \qquad PIB(t) = const.\ e^{k_F \cdot (\tau_C - \tau_S)t}$$

This condition will be easily met in an environment of technological change, when the economy requires a strong investment to meet the expected increase in productivity, but it may be a difficult condition to meet in an environment of technological stagnation where there is no clear way to increase productivity and, therefore, no good reason to invest. In the latter situation it will be difficult to avoid recession because it will be difficult for the flow of credit to repay the money that pulls savings out of the economy.

We see that, depending on the credit situation, we can clearly distinguish two economic cycles, one of boom and one of bust, with an intermediate phase passing from one to the other:

a) <u>The boom cycle or credit cycle</u>.

The credit cycle can be described as having three phases that feed back on each other:

1) When, thanks to technological change, there are expectations of an increase in production, and thus in capital income, entrepreneurs borrow money to invest. We know that the economic incentive to invest is very high, since, in aggregate terms and when we assume that hoarding is negligible, the growth of capital is about 12 times the flow of bank creation:

$$dK = \frac{\langle\alpha\rangle}{\overline{\aleph} \cdot i} k_F \cdot dM = \frac{\langle\alpha\rangle}{\overline{\aleph} \cdot i} k_F \cdot Ah^C \cdot dt \approx 12 \cdot Ah^C$$

In aggregate terms, capital growth is more than sufficient to more than support the money borrowed for investment, which can come from both prior savings and bank creation. The reward for capturing as income a portion of the increase in income is very large, and it is easy to make large fortunes in a very short time. There is thus a strong incentive to invest.

2) In such an environment, the money from savings will be insufficient to satisfy the desire to invest, and the banks will have little trouble finding solvent people willing to take on debt, and complete with bank credit the money necessary to cover investment needs. It is very clear that the economy will start a generalized process of economic growth, sustainable as long as the monetary injection coming from credit investment is maintained.

3) The origin of the money for loans is twofold. One part comes from the savings of individuals who see their incomes increase and another part comes from the creation of bank money. The part coming from savings we know does not increase in aggregate terms the quantity of capital goods, but it does allow the renewal of existing capital in a process of creative destruction of the type described by Schumpeter. The other part of the loan, that which comes from monetary creation through credit, is that which increases the money supply and nominal *GDP* of the economy, which will allow not only to renew and modernize existing enterprises by making them more productive, but will also increase the existing aggregate capital that is backing bank credits. The result is an economy of full employment with relatively low inflation, which absorbs without problems the work left free by the implementation of the new technology:

$$\begin{matrix} inyecci\acute{o}n \\ monetaria \end{matrix} \quad [Ah^C(t) > 0] \quad \rightarrow \quad \begin{matrix} crecimiento \\ con \\ pleno\ empleo \end{matrix}$$

The injection of new credit money increases the disposable income that sustains the increase in aggregate spending, both in consumption and investment, i.e., it increases *GDP*. This maintains entrepreneurs' expectations of capturing part of the increase in *GDP* in the form of income, thus initiating a self-sustaining process that lasts as long as investment produces increases in production and productivity.

We see that, in aggregate terms, the need for loans to invest over and above savings is what allows the money supply to grow, which increases income, which increases consumption, which will generate the growth of capital income, which will support the new bank money.

b) <u>The transition between boom and bust</u>.

The three phases we have described for the credit cycle run continuously until the technological impulse is exhausted. It is easy to see that the credit cycle can run in the opposite direction without any problem and with dire consequences because prices cannot fall, as the Buyer-Seller Asymmetry Principle states, but before that, there is a "transition" stage:

1) When there is little expectation of growth because the technological momentum that drives productivity growth has dried up, entrepreneurs stop borrowing money to invest. But the economy continues to function normally and the flow of savings, like the economy's income, remains unchanged.

2) Now, banks are beginning to have problems finding investors to whom to grant new loans as old loans are being paid off. The flow of credit declines while the flow of savings, which we assume to be proportional to *GDP*, remains flat and threatens to find nowhere to be invested to be returned to the economy. The creation of bank money begins to stop as the decreasing need for credit is met first with money from savings.

3) The granting of loans for investment is ceasing to be the mechanism by which bank money is created, and now banks are beginning to replace it with credit aimed at maintaining the consumption of those agents and companies that, although solvent, have seen their income decrease due to the halt in the monetary injection.
But unlike credit for investment, which is not repaid in aggregate terms because it is backed by the income from the capital goods it creates, credit to cover deficit spending is only backed by existing income, and sooner or later it will cease to be granted.

4) The creation of new bank money is slowly coming to a halt as lending to cover deficit spending stops, but saving is still not stopping or is stopping much more slowly than credit is stopping. It is only a matter of time before savings do not find their way back into the money supply and the economy enters a savings spiral in which banks barely extend credit and agents desperately try to pay off their debts by drastically reducing their deficit spending. When that happens and bank credit ceases to be renewed, then not only will money no longer be created, but the bank or credit money that forms the money supply and keeps the economy on its feet will have begun to be destroyed.

Declining spending, both in investment and consumption, lowers expectations for economic growth and further decreases credit spending, which initiates the "savings cycle" that will rapidly destroy the entire industrial fabric of the economy.

c) <u>The down cycle or savings cycle</u>.

Once the flow of credit decreases until it becomes negative, a process begins that leads to the physical destruction of the entire business fabric.

1) When credit becomes negative, what we have is the physical destruction of the money that has been created by credit. That is equivalent to the net extraction of money from the money supply, or in other words, what we have is a constant decrease in disposable income, i.e., in the GDP of the economy:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = [Ah^C(t) - Ah^S(t)] < 0 \quad \rightarrow \quad \Delta PIB < 0$$

2) Consumer spending, which is nothing other than *GDP*, is declining and with it, so is corporate income. There is too much production for the expenditure that is being made, and this expenditure continues to decrease. Many companies will have to close. Which ones? Most probably those that are more indebted and can no longer maintain a deficit expenditure.

3) Now everyone is trying to reduce expenses in the face of declining income, starting with the liquidation of loans. Companies in difficulty are asking banks to renew loans, but the banks understand that in a deflationary environment and without any expectation of growth, it will be very difficult for them to pay them back without resorting to liquidation of the company. The banks are unknowingly exacerbating the problem by forcing companies to repay loans. The repayment of loans is causing the physical destruction of the money that forms the money supply, making the environment even more deflationary.

> To aggravate the situation, the decrease in the income of the companies implies a decrease in the income they produce and, therefore, a decrease in the value of the capital that is backing the credits. Banks will find their very existence threatened, since part of the debt will be irrecoverable when the capital backing it is liquidated.

Little more can be added to the desolate panorama presented by an economy in the midst of deflation. It only remains to add that the destruction of the business fabric stops when the repayment of credit stops and saving becomes impossible. When this happens, the flow of savings becomes very small and the scarce credit that is being granted restarts the growth process, but this can take a long time to happen spontaneously and it is important, as Keynes stated, that the government starts injecting money into the money supply as soon as possible through public spending.

The first cycle, the credit cycle, is initiated and maintained by the desire of businessmen to invest in new capital goods, which increases credit spending that increases the money supply and with it, the economy. The second cycle, the savings cycle, is initiated and maintained by the decrease in credit spending due to poor expectations about future income. To describe both cycles we have assumed that the flow of savings remains relatively stable with respect to *GDP*, while the weight of changes in the money supply is attributed to the flow of credit, which decreases or increases according to the technological moment and expectations. Of course, neither the theory nor the conclusion changes if this assumption on savings is not met.

The following diagram shows the two cycles:

THE CREDIT CYCLE

$$\uparrow \underleftarrow{\rightarrow crecimiento\ del\ credito \rightarrow aumento\ de\ M \rightarrow crecimiento\ del\ PIB \rightarrow} \downarrow$$

THE SAVINGS CYCLE

$$\uparrow \xleftarrow{\rightarrow\, devolucion\ del\ credito\ \rightarrow\ disminucion\ de\ M\ \rightarrow\ decrecimiento\ del\ PIB\ \rightarrow} \downarrow$$

These are the two sides of the growth equation, and they soar as credit spending exceeds hoarding (the latter flow, which we assume to be almost always zero):

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = Ah^C(t) - Ah^S(t) \ \rightarrow \begin{cases} Ah^C(t) < Ah^S(t) \rightarrow espiral\ del\ ahorro \\ Ah^C(t) > Ah^S(t) \rightarrow espiral\ del\ crédito \end{cases}$$

As we have already mentioned, economists teaching in private universities in the United States do not deny the existence of booms and busts in the economy, but they do deny the role of private banks in the creation of the money that produces them and, of course, the role of savings. For them, the crisis is explained by exogenous shocks, which is like blaming aliens.

THE SAVINGS PROBLEM. But what does the credit crunch really create? The Growth Equation states that you cannot decrease the money supply without the economy going into recession, which forces money from savings back into the economy. But savings is not what is creating the new capital, but the increase in bank money created by the granting of bank credit (the flow of credit, when we assume it is hoarding). Ah^C *when we assume zero hoarding):*

$$\Delta K = \frac{\langle\alpha\rangle}{\bar{\bar{\aleph}} \cdot i} k_F \cdot \Delta M = \frac{\langle\alpha\rangle}{\bar{\bar{\aleph}} \cdot i} k_F \cdot Ah^C \cdot \Delta t \sim 12 \cdot Ah^C \cdot \Delta t$$

The problem arises because the increase in capital does not go hand in hand with the accumulation of savings and, in aggregate terms, the money in savings may be greater than the amount of new capital created, which as we know depends on monetary creation.

Let us note that entrepreneurs create new capital by borrowing money coming from savings and money creation, so that a part of the new capital they manage to create does not belong to them, but belongs to those who have lent them the money. A part belongs to the loan coming from savings and another part belongs to the bank credit. The rest of the capital is the real profit that the entrepreneur obtains from his investment:

$$\Delta K = \Delta K_{ahorro} + \Delta K_{crédito} + \Delta K_{empresario} \sim 12 \cdot Ah^C \cdot \Delta t$$

Let us note that it is only possible for the equation to be fulfilled when the growth of new capital is sufficient to absorb the savings made within the economy. Otherwise, the growth of bank credit will be insufficient and part of the savings cannot be lent. In reality, the problem is more serious than it seems because first the money from savings is lent and then money is created with credit, so savings will begin to be hoarded long before credit becomes negative and the economy will go into recession before bank money begins to be destroyed:

$$\frac{\Delta K}{\Delta t} = \frac{\Delta K_{ahorro}}{\Delta t} + \frac{\Delta K_{crédito}}{\Delta t} + \frac{\Delta K_{empresario}}{\Delta t} \sim 12 \cdot Ah^C$$

But, $\frac{\Delta K_{crédito}}{\Delta t} = Ah^C$ *so:*

$$\frac{\Delta K}{\Delta t} = \frac{\Delta K_{ahorro}}{\Delta t} + \frac{\Delta K_{empresario}}{\Delta t} \sim 11 \cdot Ah^C$$

The new capital created by the monetary injection will be distributed, almost entirely, between the entrepreneurs who create it and the investors (lenders) who finance them, which seems logical and coherent until we realize that the above relationship forces that:

$$\frac{\Delta K_{ahorro}}{\Delta t} \ll 11 \cdot Ah^C$$

Or, in other words, in aggregate terms, it is not guaranteed that all the savings made in the economy will end up returning to the economy as investment. In fact, some simple numbers tell us that this is not always going to be easy to achieve when the economy is growing slowly. For example, when the real growth of an economy is 1%, the real creation of new capital is around 12% of GDP, so annual savings must remain well below that figure, since part of the new capital is kept by entrepreneurs as profits (part of the new capital must be kept by entrepreneurs, or else they would not start any new business).

The problem with saving is that it forces the economy to maintain a minimum growth rate in order to absorb it, which is not always possible in an environment of little or no growth. In fact, what we have just shown is that in a monetary economy it is true that GDP growth has to be at least one-sixth of the money that is saved:

$$\Delta K_{ahorro} \ll \frac{\langle\alpha\rangle}{\overline{\aleph} \cdot i} \cdot \Delta PIB \quad \rightarrow \quad ahorro \ll 6 \cdot \Delta PIB$$

Which is a remarkable result. Although the expression is not a very accurate criterion for determining when savings will become a problem, it does at least indicate that savings is the problem behind credit crises:

$$\tau_S \ll 6 \cdot \tau$$

In other words, the savings rate τ_S has to be less than about six times the growth rate of the economy. τ. The expression shows in all its crudeness, what causes the credit crisis, since the problem is not that economic growth is insufficient, but that savings are excessive.

4. CAPITAL MARKET LIQUIDITY

The credit criterion and the Growth Equation from which it derives, speak exclusively of the dependence of GDP on money, or in other words, it tells us about the deflationary crisis created in the real economy by the destruction of the credit money that forms money supply, but at no time does it tell us what role the value of capital goods plays in the booms and busts of production.

Although we know that the capital market and the consumer market are decoupled and only exchange money slowly through credit and hoarding, we also know that the price of each capital good is a consequence of the income it produces within the Consumer Market, so it would be logical to expect that any decline in *GDP*, or even the mere threat of a decline in *GDP, would* affect the price of capital goods and cause their valuation within the Capital Market to fall.

Moreover, the influence between capital goods and consumer spending is reciprocal. Since, in aggregate terms, a good part of capital goods are held indirectly through debt securities, any threat of a decline in the income produced by a capital good will cause the holder of the security to try to liquidate it and not renew it at maturity. Not only that, but the direct holders of capital assets will also try to sell them because of the threat that the income they produce now will not be maintained in the future. The expectation, or belief, that in the near future there will be a decrease in income, whether or not this is true, causes a generalized fall in the price of capital assets, to the point where their price may fall below the debt they support, which is clearly an unsustainable situation from the accounting point of view, forcing creditors to request that the credits be repaid.

The dependence of the value of capital goods on the income they produce, together with the backing that capital goods offer to the bank money with which they were created, creates a circular dependence between the price of capital goods, the flow of expenditure (*GDP*) and bank money that is crucial to understand the dynamics of the capitalist economy, being perhaps this particular aspect where the chronic myopia suffered by economists engaged in research within public universities around the world can be best appreciated. By failing to differentiate in their analysis between the Consumer Market and the Capital Market, economists are unable to understand how the interdependence between the two affects the growth or decline of the economy and, therefore, are unable to understand the dire consequences of the lack of liquidity in the Capital Market for the entire productive economy.

To understand the terrible consequences for the entire economy of the lack of liquidity within the Capital Market, let's start by recalling how people and institutions allocate their wealth among the various capital assets that exist. For example, in the US and in the year 2019, the distribution is as follows:

Capital assets...120MM (100%)
Bonds..40MM (30%)
Capital stock...10MM (8%)
Monetary mass..10MM (8%)

We see that the U.S. saver keeps most of his savings in capital goods, either directly, $60MM, or indirectly through debt securities, $40MM, and that is why they are always afraid of losing their savings because of a sudden drop in their price. Not because the expectations they have formed about the income of the capital goods in which they keep their savings are not fulfilled, which is a risk that the saver assumes when he invests his savings in the purchase of a capital good, but because the price of all capital goods collapses. The fear that any saver has is that there will come a day when everyone will want to sell their assets because any saver foresees that everyone will want to sell their assets, which turns the fall in prices into a self-fulfilling prophecy.

This is the great contradiction and the great danger implicit in the valuation of assets within the Capital Market, and understanding the reason why something like this cannot be prevented from happening is not very difficult: where are the $120MM worth of assets held by Americans going to come from when they all decide at the same time to sell them to keep their savings in money? Nowhere, obviously. Therefore, let us define "liquidity" in the Capital Market in a way that will allow us to have, if not a quantitative idea of what liquidity is, at least a very precise idea of the great problem that causes its absence:

> *DEFINITION OF LIQUIDITY. We say that the Capital Market is "liquid" when it is possible to sell any amount of capital goods without affecting their price. We say that the Capital Market is "illiquid" when this is not possible, which is always.*

It is obvious that this definition of "liquidity" is very vague, although it has nothing to do with the usual idea in economics, associated with the amount of money held for different reasons and introduced by Keynes for the first time in 1936. The definition of liquidity informs us that capital goods have an intrinsic price which, when the market is "liquid", should not be affected by the quantity of goods being bought and sold. Which does not tell us much.

Moreover, it easily follows from the definition that the Capital Market is necessarily "illiquid", since the small amount of money that may be being hoarded as monetary capital is totally insufficient to guarantee that a capital good will be paid for what it is worth, regardless of the amount of capital goods offered for sale. It is very clear that nowhere are there the $120MM that would be necessary to provide liquidity to the huge US Capital Market.

If the Capital Market is, by definition, illiquid, where can the money necessary to satisfy the desire to make $120MM in assets of all classes liquid come from? We have already said, nowhere. But in thinking this way, we are little different from those who search from tree to tree trying to find the forest and conclude, in despair, that it is because of so many trees that it is impossible to find it:

> *THE LIQUIDITY OF THE CAPITAL MARKET. If we remember that the Capital Market is very decoupled from the Consumer Market because the flow of savings and dissaving is very stable, then it is easy to understand that the Central Bank can buy, with money made out of thin air, all the assets that are put on sale without there being any risk that the money will end up creating inflation because it is spent in the Consumer Market.*

For example, if necessary, the Federal Reserve can manufacture out of thin air the $120MM that the capital of Americans was valued at in 2019 and buy it, having the complete assurance that this immense amount of money is not going to produce any inflation because it will not be spent in the Consumer Market, precisely, because the $120MM are the savings that Americans want to continue to keep as savings.

In fact, that is what the Federal Reserve did in 2008 to prevent the US stock market from collapsing and repeating the disaster of 1928. In a period of time of only a few months, more than 4MM dollars were created out of thin air and all kinds of financial assets were bought in the Capital Markets, thus preventing their price from collapsing, and with it, the entire US economy. The result was that the Federal Reserve took over $4MM in assets (and started collecting rents from them), while savers took over $4MM in money, which was what they wanted, even though they did not collect any rents from them.

But, is it ethical and moral for the Central Bank to intervene in the Capital Market by buying all kinds of assets to prevent their price from sinking? Why should the Central Bank intervene and save the wealth of those who speculate on stock prices? Why should the Central Bank save the wealth of the rich? There are two good reasons. The first is because wealth is not only for the rich, even the poor save, and the second is because the collapse of the economy does not benefit anyone, but hurts, above all, the poor:

> *In a monetary economy, it is the capital goods that are backing all existing debt securities, including a good part of the credit money that drives the entire real economy, and which, as we know, was created as someone's credit debt. This was demonstrated very clearly in the development of the Financial Theory of Growth, and it became very clear that the money borrowed, whether to create new capital goods or to maintain deficit spending, could never be paid back in aggregate terms because it had become part of the money supply that maintains the buying and selling exchanges in the Consumer Market.*
>
> *When someone owes a debt and wishes to pay it off, it is normal for him to sell a part of the capital goods to be able to repay it, but this money can only come from previous savings, which implies monetary extraction if whoever receives the money that pays off the debt keeps it as part of his wealth. In aggregate terms, the money*

that is returned when the debt is repaid is part of the creditor's wealth and is not destined to be spent except in the purchase of other capital goods, so the money does not return to the money supply.

When someone pays off a bank credit the situation is even worse, because as before the origin of the money is monetary extraction, with the difference that now the money is not even kept as money in the Capital Market because what the bank does is to destroy the money it created when granting the credit.

It is very clear that the Central Bank has to intervene in the face of falling asset values, which is only the first symptom that things are not going well and that the economy will collapse.

QUANTITATIVE EASING: Where did the more than $4MM that the Federal Reserve used for asset purchases end up?

The essential characteristic *of credit money is that it is a debt that has to be repaid, or that has to pay interest as long as it is not repaid. Therefore, it is well understood that there is a strong incentive to repay credit, especially when it is being backed by someone's income and not by the rents produced by some capital good.*

Therefore, a part of the *4MM went to replace the money destroyed with the repayment, and the non-renewal, of a good part of the bank credits and another part, perhaps the most insignificant, ended up hoarded as monetary capital. The result, in aggregate terms, was that the Central Bank became indebted to the Banking System for 4 billion dollars, being the Central Bank the one backing 4 billion dollars of the more than 10 billion dollars needed by the US economy to function (if we do not count the other 10 billion dollars used in international trade).*

It is important to remember that the amount of bank money in the US would have been close to $15MM at that time, so the decrease of $4MM in bank money would have destroyed the US economy almost instantly if the Federal Reserve had not created the money.

In individual terms, any debt can be repaid without creating any solvency problem, since the liquidation of a capital asset either covers the amount of money it backs or the lender assumes the losses. But, the situation is completely different in aggregate terms, and the payment of the debt, whether or not it is satisfied with the liquidation of the capital good, implies the destruction of bank money when the debt is credit, which causes the decrease of money in the money supply and the collapse of the economy.

<u>A HISTORICAL VIEW OF THE CREDIT CRISIS</u>. There is clear evidence that credit crises occurred periodically throughout the 19th century, despite the fact that money was being backed by metallic gold and the use of fiat money was very marginal.

The paradox of why credit crises are inevitable with the gold standard is well understood when it is understood that the increase in the money supply needed by the economy to grow is carried out thanks to the issuance of paper money and without gold backing. Since growth is endogenous and the amount of gold in circulation is fixed, the amount of gold may not grow sufficiently to allow for economic growth. In such a case it will be inevitable that unbacked paper money will be issued to increase the money in circulation and allow for growth.

(In fact, there is no way of knowing whether a particular banknote is, or is not, backed by gold, since the backing of banknotes is always done in aggregate terms and never in individual terms).

As is logical, when economic growth stops, lenders begin to claim their debts, and then it becomes evident that a large part of the banknotes cannot be exchanged for gold, which leads to the liquidation of all paper money. But it has been the paper money which has been sustaining the growth of the economy, so the liquidation of paper money due to the impossibility of exchanging it for gold, will liquidate the monetary mass and with it the whole productive fabric. In such a situation, the economy will inevitably collapse because the existing gold will not be enough to sustain the GDP achieved thanks to the issuance of paper money.

Credit crises followed one after the other throughout the 19th century, until, at the beginning of the 20th century, the American banker J. Morgan united all the banks in the USA and managed to avoid the banking crisis that threatened to devastate the country in 1905. From that moment on, at least in the US, paper money issued by any of the US banks was backed by the gold of all US banks. Evidently, this allowed the issuance of paper money to increase and with it, the growth of the US economy to levels that could hardly have sustained the real growth of the amount of gold in the country.

The problem, as we know, is that it was only a matter of time before the increasing amount of paper money was claimed in gold: "Only the belief that the gold of all the banks together was sufficient to satisfy the change of paper money, kept the paper money in circulation".

Disaster struck in 1929. The price of the assets listed on the stock market began to sink, and the banks began to reclaim the credits they had granted. The problem was no longer that people went to the banks to exchange their bills for gold (the US had already gone beyond that level and bills had not been exchanged for gold for a long time) since practically all the money in existence were bills backed by the Federal Reserve. The problem was that the bills in circulation in the US were being destroyed, not because they could not be exchanged for gold, but because the debts that had created them were liquidating them!

Of course, at that time this was too big for those who ran the Federal Reserve and they were unable to understand that what was sinking the US economy, and with it, the world economy, was the lack of bank bills, not the lack of gold. The U.S. authorities clung to gold in a posthumous attempt not to sink, without understanding that gold is the worst lifeline for someone who is drowning. International trade virtually disappeared because no one wanted to use scarce gold to back purchases. The world economy simply...collapsed, and only began to recover after 5 years had passed, when World War II was already inevitable.

Since the Second World War, credit crises have continued to occur without interruption and with disastrous consequences for developing countries, but in the form of currency crises. The cause of this change was the acceptance of the dollar as the reserve currency in world trade. Logically, the only countries that have never suffered any exchange rate crisis have been the USA (it only suffered a slight stagflation in the seventies) and those countries with a trade surplus such as Australia or Germany, but we must not let the change of name deceive us, because what causes an exchange rate crisis is the same phenomenon that causes a credit crisis, as we shall see a little later on.

What was different, however, was the 2008 U.S. stock market crisis, which became a global crisis as the dollar was the international reserve currency. Like all credit crises, the 2008 crisis began with a generalized credit crunch that affected disposable income and caused GDP to fall. This fall in GDP drives down the prices of capital goods (either before or after) and feeds back into GDP when banks start to default on loans across the board. It is the repayment of debts that causes money to be withdrawn from the money supply and GDP to fall, which in turn causes asset prices to fall, which then feeds back into the repayment of debts, creating a credit crunch.

Evidently, swift action by the Federal Reserve prevented the disaster of 1929 from repeating itself a century later.

A situation of lack of liquidity in the Capital Market, as defined here, is what is currently occurring in all countries of the world due to the pandemic at the beginning of 2020. Specifically, in Spain, the stock market price reflected by the IBEX35 has fallen more than 30% of its value without the European Central Bank having done anything to prevent it.

The pandemic in Spain. In the first months of 2020, the Spanish government decreed the total confinement of the entire non-essential population. From that moment on and in only two weeks the IBEX35, the Spanish stock market index, fell almost 30% of its value.

Is the drop in asset valuations justifiable based on expectations of future returns? No, clearly not. The possible one-off loss of 20% or 30% of the companies' annual profits cannot justify a fall in their price by 20 times that value. It is very clear that a drop as large as the one observed is only possible due to the lack of liquidity in the market.

What happens in these cases in which a generalized fall in the valuation of the assets listed on the stock exchange is expected, even if it is slight, is that nobody wants to be the one to pay for that small fall in the price. Everyone wants to be the first to sell the assets before they fall, trying to make others bear the expected loss, even if it is small and very bearable in average terms for the saver. But once the race to sell the assets has begun, the lack of liquidity makes its appearance and prices plummet to levels that do not justify the expected loss of income.

The cause is, evidently, that there is not enough money in the Capital Market to buy all the assets that are put up for sale, which makes their price fall far below the price that reflects the real situation of the economy:

"the market has stopped arbitraging prices because it lacks the money to do so."

A small economic standstill, which will obviously mean an economic loss for someone, becomes, due to the lack of liquidity in the market, a generalized fall in asset prices of nearly 30% that not even a war disaster could justify.

Why didn't the European Central Bank intervene in the same way as the Federal Reserve did in the U.S. Perhaps because the U.S. authorities know what they are doing and the European authorities don't?

The problem of "liquidity" is a real problem facing any monetary economy, and it shows very clearly the immense sword of Damocles hanging over the heads of the more than 8 billion people living on this planet. The sad part of all this is that the political authorities are doing nothing to avoid it even though the solution offered by the Central Bank is so simple.

It is very clear that the liquidity of the Capital Market cannot be left to the free will of economic agents, not only because they do not have enough money to provide liquidity to the market, but also because it is the companies that make up the industrial fabric of an entire country that are at stake when the problem arises. What is threatened when there is a credit crisis is the real economy, the companies that people on this planet live from, and if those companies fall, the economy that sustains the welfare of more than 8 billion people will also fall. We believe that both the European Central Bank and the central banks of other countries have a responsibility to intervene to prevent the fall in the price of national stock markets from sinking the real economy.

5. THE FOREIGN EXCHANGE CRISIS

Perhaps the most important event of the entire twentieth century, even more important than either of the two world wars that ravaged the century, was the abandonment of gold as a currency of exchange and the introduction in all countries of bank money created by credit. From the moment each of the world's economies agreed to issue their own currencies and set an exchange rate between them, it was inevitable that the currency considered to be the safest would become the reserve currency with which to conduct trade between countries. The implicit consensus with which all economies had adopted the dollar backed by gold as the reserve currency after World War II, became an explicit consensus in the 1970s when gold ceased to back the dollar, and exchange crises, which until then had been resolved by raising tariffs to prevent gold from leaving the country, became savage devaluations of the currency that devastated the country's economy with equally savage domestic price inflation.

The count of the succession of exchange rate crises that have occurred since then is innumerable, and the poverty and desolation they have left in the countries that have suffered them, unspeakable, even though almost all of them were easily avoidable. Perhaps for this reason, because they are easily avoidable when the cause is understood, is where the dire consequences for millions of people of the liberal propaganda of the economists working for the private universities of the USA can be seen most clearly. We are now going to develop a theory about their formation and dynamics so that the monetary authorities of any country, whether or not it has its own currency, can predict and avoid them without any difficulty, since we will demonstrate that an exchange rate crisis (or a debt crisis) is no different from a credit crisis within an isolated economy.

We will begin by recalling that the Growth Equation is a macroeconomic equation that treats the whole economy as a single isolated country, while the economic reality we wish to describe, on the contrary, groups together a large number of countries, each operating with a different currency and producing different goods. But, in spite of the obvious difference between an isolated economy and a group of countries trading with each other with different currencies, we shall see that the view of the credit crunch as caused by the extraction of money from the money supply when the flow of savings is greater than the flow of evictions is greater than the flow of evictions, and that the credit crunch is caused by the extraction of money from the money supply when the flow of savings is greater than the flow of evictions. Ah^{+} is greater than the flow of dissaving Ah^{-}will remain valid:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = -[Ah^{+}(t) + Ah^{-}(t)] \sim Ah^{C}(t) \xrightarrow{Ah^{C}(t)<0} \textit{Crisis of Change}$$

although the Credit Criterion should be supplemented with an additional condition that accounts for the monetary flow created by trade.

In this new reality formed by many trading countries, it makes sense to describe the economy with only two sectors, the country with its own currency under study and the rest of the world that trades with the reserve currency. For this purpose, we will use the system of two equations which describes an economy divided into two sectors, or two countries, using a single currency, and which we deduced in the second topic of the exposition when we talked about Empty Spain:

$$\begin{aligned}\frac{1}{k_F}\frac{dx_1}{dt} &= -a\cdot x_1 + b\cdot x_2 - ah_1 \\ \frac{1}{k_F}\frac{dx_2}{dt} &= \ \ a\cdot x_1 - b\cdot x_2 - ah_2\end{aligned} \tag{1}$$

Now, the coefficients "a" and "b" in the expression indicate the percentage of *GDP* that each country spends in the other country and are, by definition, positive ("1" is the country under study and "2" is the rest of the world). The savings flows, ah_1y $ah_2$are still the financial transfers between the Consumption Market and the Capital Market within each of the countries, i.e. the aggregate savings flow of each country, which is equal to the flow of savings minus the flow of dissaving $(Ah^{+} - Ah^{-})$ in each of the countries:

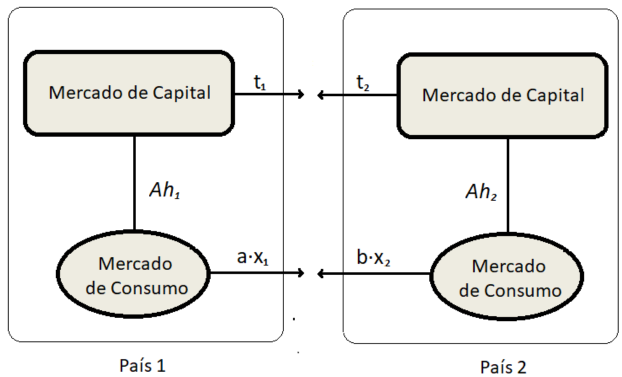
$$ah_i = ah_i^{+} - ah_i^{-}$$

In addition, the flows shown in each equation are expressed in the currency of each country, so the equations should be written differently when expressed in a single currency:

$$\begin{aligned}\frac{1}{k_F}\frac{dx_1}{dt} &= -a\cdot x_1 + b\cdot x_2 - ah_1 \\ e_{12}\left(\frac{1}{k_F}\frac{dx_2}{dt}\right) &= e_{12}\cdot(a\cdot x_1 - b\cdot x_2 - ah_2)\end{aligned}$$

where is the exchange rate between currencies and where the flows in the second equation are written in the currency of the second. e_{12}_the exchange rate between currencies and where the flows of the second equation are written in the currency of the second. <u>But to avoid the hassle of dragging the exchange coefficient in all the expressions we will use the convention that the flows appearing in each of the accounting equations are expressed in the country's own currency, so that the term $(a\cdot x_1 - b\cdot x_2)$ indicating the trade flow between the two countries or regions will have different values depending on whether the term appears in one equation or the other, because it will be expressed in a different currency</u>.

The attached figure helps to clarify the situation a little. The flow t_1 y t_2 are the investment flows that each country makes to the other, and the flow $(a\cdot x_1)$ y $(b\cdot x_2)$ are the expenditure flows that each country makes in the other expressed in the same currency, and have a different value according to the equation in which they appear.



Thus, the two equations describing the economy of the two countries are left in the original form, but with the understanding that each of them is expressed in a different currency:

$$\begin{aligned} \frac{1}{k_F}\frac{dx_1}{dt} &= -a \cdot x_1 + b \cdot x_2 - ah_1 \\ \frac{1}{k_F}\frac{dx_2}{dt} &= \ \ a \cdot x_1 - b \cdot x_2 - ah_2 \end{aligned} \tag{1}$$

Let us note that the expressions reveal the important role played by the trade deficit in the credit crisis, since the term $(a \cdot x_1 - b \cdot x_2)$ acts, depending on its sign, as a flow of extraction of money from the money supply, or as a flow of monetary injection, which is added to the extraction already made by savings itself, so that the amount of money that must be injected by spending on credit to avoid the credit crunch is greater for the deficit country and less for the surplus country. The criterion for the economy not to go into recession changes, and it is now necessary that the sum of the aggregate flow of savings and the trade deficit be less than zero:

$$\frac{1}{k_F}\frac{dx_1}{dt} = -a \cdot x_1 + b \cdot x_2 - ah_1 \xrightarrow{\Delta x_1 > 0} -a \cdot x_1 + b \cdot x_2 - ah_1 > 0$$

The expression indicates that the trade surplus helps the country to grow by allowing savings to exceed savings without the economy going into recession. Conversely, a country with a trade deficit can go into recession even when the dissaving exceeds the saving, because of the extraction of money implied by the trade deficit. Or in other words, the net monetary injection that must be created by deficit spending, whether public or private, to prevent the economy from going into recession is greater in a trade deficit economy than in a trade surplus economy.

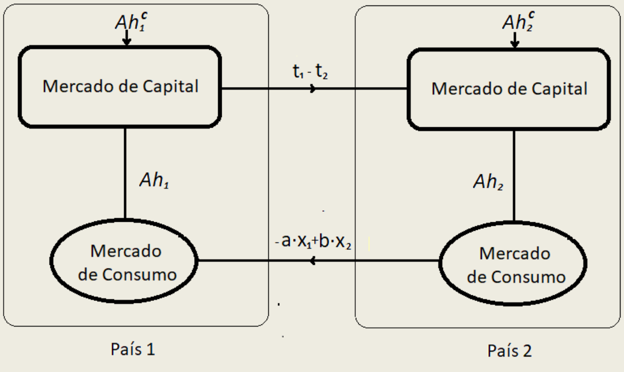
Although it is not explicitly shown in the figure, we are assuming that neither country can manufacture the currency of the other country nor accumulate it, so the balance of payments between the two countries must be zero (in reality the Central Bank can accumulate any amount of currency of the country with which it trades, which is called the "foreign exchange reserve", but this does not invalidate the analysis). This forces each country's currency flows to be zero, in its own currency:

$$(-a \cdot x_1 + b \cdot x_2) - (t_1 - t_2) = 0 \qquad (2)$$

Or in other words, the flow of trade expenditure from one country to the other country has to be balanced by the financial transfer of credit from the latter country to the former, since we have assumed that there is no accumulation of foreign currency. The accompanying figure clarifies what happens, and shows that the monetary flow between countries is equivalent to a circular flow that forces the balance of payments to balance, or, in other words, forces the financial transfers between capital markets to equal the trade transfers between consumption markets. It is when this condition threatens not to be fulfilled that the Exchange Rate Crisis occurs and the currency is devalued until it is fulfilled.

Let's take a closer look at this last statement.

__THE CRISIS OF CHANGE:__



The two conservation equations that describe the evolution of the consumption of a country with its own currency that trades with the rest of the world as if it were a single country is:

$$\frac{1}{k_F}\frac{dx_1}{dt} = -a\cdot x_1 + b\cdot x_2 - ah_1$$
$$\frac{1}{k_F}\frac{dx_2}{dt} = \ a\cdot x_1 - b\cdot x_2 - ah_2 \tag{1}$$

Where, ($-a\cdot x_1$) is the country's spending in the rest of the world, ($b\cdot x_2$) is the expenditure of the rest of the world in the country, ah_1 is the country's aggregate savings flow and ah_2 the aggregate savings flow of the rest of the world. The accompanying figure clarifies the situation somewhat and also shows the capital flows between the two countries. From the figure it is easy to deduce that when there is no currency accumulation, the trade deficit must be equal to foreign borrowing (foreign investment):

$$-a\cdot x_1 + b\cdot x_2 = -t_1 + t_2 \quad \rightarrow \quad D(t) = T(t)$$

Where we have called D(t) the trade deficit of the country and $T(t)$ the country's trade deficit and foreign transfers:

$$D(t) = a\cdot x_1 - b\cdot x_2 \qquad and \qquad T(t) = t_1 - t_2$$

Flows and t_1 y t_2 are respectively the financial transfers between the Capital Market of the country and the Capital Market of the rest of the world. The condition for a credit crunch to occur within the country remains the same, but adding now the monetary flow created by trade:

$$-a\cdot x_1 + b\cdot x_2 - ah_1 < 0$$

It is interesting to put the expression in terms of credit and hoarding flows, as we have been doing. After some simple algebraic manipulations we conclude that the credit criterion, which gives the condition for a credit crunch to occur, remains unchanged:

$$\begin{matrix} Ah^S = Ah^C - T + Ah \\ Ah^S = Ah^C - D + Ah \end{matrix} \qquad \rightarrow \qquad Ah^C(t) - Ah^S(t) < 0 \qquad \textit{Crisis of Change}$$

However, in order to obtain the expression we have imposed the condition that the entire trade deficit be returned to the economy as foreign borrowing, so this condition will be the actual criterion that must be met to avoid the exchange rate crisis:

$$-a\cdot x_1 + b\cdot x_2 = -t_1 + t_2 \quad \rightarrow \quad D(t) = T(t) \quad \rightarrow \quad D(t) \geq T(t) \quad \textit{Crisis of Change}$$

What the condition says is not very difficult to understand. To do so, let us look at the attached figure, where the different monetary flows that leave or arrive to the Capital Market appear. We can see that, together with the loan from previous savings and bank credit, now appears the loan from foreign investment, which has to be equal to the trade deficit when there is no accumulation of the reserve currency. The exchange crisis occurs when the loan from foreign investment is insufficient to cover the trade deficit. When this happens, the currency has to be devalued to restore equality between the deficit and foreign investment.

But the interesting thing comes from the distribution of the new capital being created within the economy, which is now divided between savings, credit, foreign investment and corporate profit. The emergence of the new eater who claims a share of the new capital, the foreign investor, is a consequence of the deficit and makes it more difficult for monetary creation to create the capital necessary to absorb the savings:

$$\Delta K = \Delta K_{ahorro} + \Delta K_{crédito} + \Delta K_{extrangero} + \Delta K_{empresario} \sim 12 \cdot Ah^{C} \cdot \Delta t$$

Or another way:

$$\Delta K_{ahorro} + \Delta K_{extrangero} \ll \frac{\langle \alpha \rangle}{\bar{\bar{\aleph}} \cdot i} \cdot \Delta PIB \quad \rightarrow \quad ahorro + inv. extrang. \ll 6 \cdot \Delta PIB$$

This shows very clearly that what causes the credit crisis is the same thing that causes the exchange rate crisis and the problem is still that savings may be excessive and not that economic growth is insufficient.

In general, to avoid an exchange rate crisis it is necessary that the trade deficit be returned to the economy as a loan, but with the big difference that the loan comes from foreign investment, from foreign money. In other words, the main problem facing a country with a trade deficit that wishes to avoid a credit crisis is not only the difficulty of finding people or institutions within the country itself that want to spend on credit, which as we know can be a difficult problem to solve, but also finding people or institutions within foreign countries that want to lend (or invest) within the deficit country, since the balance of payments of each of the countries must be zero:

$$-a \cdot x_1 - t_1 + e_{12} \cdot (b \cdot x_2 + t_2) = 0 \quad \rightarrow \quad D(t) = T(t)$$

This is the opposite of what happens with countries that have trade surpluses, which find it easier to avoid a credit crunch because they can maintain savings in excess of the borrowing that can be absorbed by the economy without entering a credit crunch, although, as already discussed, the trade surplus has to be invested in capital goods within the foreign country.

An exchange rate crisis is no different from a credit crisis and its origin is the same: "the extraction of money from the country's money supply", but this time the monetary extraction is caused by the trade deficit and must be returned as foreign investment.

<u>THE PROBLEM OF THE TRADE DEFICIT</u>. A country with a currency other than the reserve currency (other than the dollar) and a continued trade deficit will necessarily go into recession in a period of time not much longer than about 15 years, depending on the specific situation of each country and the interest rate paid on the foreign currency. Let us see why.

Suppose the following three statements are true:

1) We assume that a country cannot manufacture money of another country, nor can it accumulate it. Both conditions force the balance of payments of each of the two trading countries to be zero in its own currency:

$$-a \cdot x_1 + b \cdot x_2 - t_1 + t_2 = 0$$

2) We will also assume that all the income obtained from foreign investment is withdrawn and not reinvested in the country. If we call "i" the average return on foreign investment and call Q(t) the amount of foreign investment accumulated in the country, then the annual flow of rents that is repatriated is:

$$i \cdot Q(t)$$

3) We assume a constant trade deficit. That is:

$$-a \cdot x_1 + b \cdot x_2 = const. = -d$$

With these assumptions we can calculate without difficulty what is the flow of foreign investment $t_1(t)$ *necessary to keep the balance of payments balanced, since this has to cover not only the trade deficit of country "d", but also the outflow of profits obtained from the investment that has* *been made up to that point, the term $i \cdot Q(t)$. To do this, the first thing we need to calculate is the amount of foreign money that has been invested in the country from the beginning of the trade deficit up to time "t":*

$$\textit{Amount invested} = Q(t) = \int_0^t t_1(s) \cdot ds$$

This amount, when multiplied by the interest rate, gives us the annual flow that the country pays in interest on the foreign money that remains invested in the country (and which we assume is repatriated):

$$\textit{Repatriated interest} = i_1 \cdot Q(t) = i_1 \cdot \int_0^t t_1(s) \cdot ds$$

Finally, the expression we are looking for is:

$$t_1(t) = d + i_1 \cdot \int_0^t t_1(s) \cdot ds$$

The expression tells us that the annual flow of foreign investment is equal to the sum of the current trade deficit, which we have assumed constant, plus the interest payment on the accumulated investment, and which we have assumed to be repatriated in foreign currency (the integral term). The solution of the integral equation above, which is what we are interested in, is:

$$t_1(t) = d \cdot e^{i_1 \cdot t}$$

Evidently, the mere presence of the exponential in the solution informs us that the trade deficit can only be maintained for a very limited time, since it requires foreign investment to grow exponentially. We see that it is the trade deficit that is creating the problem, although it has relatively little influence on the final outcome, since the real cause of the disaster is the repatriation of income paid on accumulated foreign investment, which causes the amount of foreign currency being repatriated to grow exponentially.

The analysis shows that the higher the interest rate, the sooner disaster will strike, so a lower interest rate on foreign currency loans may delay the problem for some time, just as a rise in the interest rate will accelerate it.

That is what happened with the debt crisis of the 1970s, when the US raised the interest rate of the dollar without thinking of the consequences. All the economies of the world collapsed in unison, and only the surplus countries were spared from burning.

For example, if we assume that the situation becomes unsustainable when interest payments on foreign investment exceed 10% of GDP (because it is accepted that beyond that amount it will be difficult to avoid widespread investor flight and exchange rate crisis), then if the economy has a continued trade deficit of 5% of GDP and a debt interest rate of 5%, the situation will become unsustainable when it does:

$$t_1(t) = d \cdot e^{i_1 \cdot t} \qquad \rightarrow \qquad 10\% \cdot PIB = 5\% \cdot PIB \cdot e^{5\% \cdot t}$$

$$t \sim \frac{0{,}7}{5} 100 = 14 \; años$$

In other words, a deficit country will have an exchange rate crisis before 15 years have passed. Of course, each country's situation will be different and a small trade deficit helps to delay the exchange rate crisis, as does a low interest rate, but the bad thing about an exponential function is that, sooner or later, it ends up being intractable. Moreover, the exchange rate crisis is likely to occur long before that time when interest on debt exceeds 10% of GDP, when domestic and international savers realize that the foreign currency debt situation is unsustainable.

From the analysis it is easy to see that countries with trade deficits are condemned, at best, to stagnation and, at worst, to a systemic succession of exchange rate crises. A country wishing to grow must necessarily be a country in surplus with respect to the rest of the world.

6. LIQUIDITY AND THE EXCHANGE RATE CRISIS.

Where the magnitude of the problem created by the lack of liquidity in the Capital Market can be seen most clearly is in today's world, made up of many small countries that use their own currency internally, but trade among themselves with the reserve currency (currently the dollar).

It is often thought, and this is what economists working for private universities in the United States affirm, that a country with its own currency has more tools at its disposal to defend itself from the ravages of foreign competition within the country, or to avoid exchange rate crises, but this statement should be very nuanced as we shall see, because it can be shown that it is very far from reality, especially with respect to the possibility of avoiding exchange rate crises.

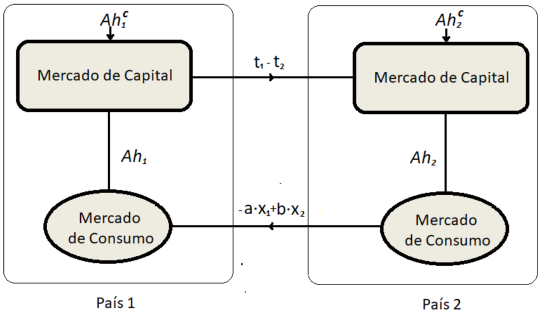
A simple glance at the reality around us shows that no country, regardless of its size, has escaped an exchange rate crisis in the last 50 years, and only countries with a trade surplus, such as Germany, Australia, China or Japan, have managed to keep themselves safe. We have already explained why this happens, and why the country is forced to resort to unsustainable borrowing in the reserve currency to replenish the money extracted from the money supply by the deficit trade flow. As long as the trade deficit persists, it is inevitable that borrowing in foreign currency will lead the economy into an exchange rate crisis.

But the analysis, as it has been carried out, seems to indicate that it is possible to escape exchange rate crises when there is a balanced trade flow, or surplus. However, when the above statement is analyzed more slowly, the answer is that no, neither can a surplus country guarantee that exchange crises will not appear when trade with other countries is done in a foreign currency, although it is also true that when the country's economy is very large it is possible to avoid them without too many problems.

The attached figure explains graphically where the problem lies.

There are two markets and there are two flows in local currency to be exchanged for foreign currency. One of the flows comes from the Capital Market and has its origin in the desire to have savings in foreign assets and the other flow comes from the Consumer Market and has its origin in the desire to buy foreign goods. Both flows are in local currency and have their counter flows in foreign currency that must cancel them, because, as we have already commented, when we assume that there is no accumulation of reserves, it must be fulfilled that:

$$-a \cdot x_1 + b \cdot x_2 - t_1 + t_2 = 0$$



But this situation, as we have already seen, is unsustainable when there is a trade deficit, and an exchange rate crisis cannot be avoided in a short period of time.

However, let us note that it is possible to avoid the exchange rate crisis if the balance of payments equilibrium is fulfilled independently in each of the two markets:

$$-a \cdot x_1 + b \cdot x_2 = 0 \qquad \textit{trade balance}$$

$$-t_1 + t_2 = 0 \qquad \textit{capital balance}$$

When both conditions are met, the country does not need to borrow in foreign currency and there will be no unsustainable accumulation of foreign currency debt. But this is no problem, and the monetary authorities of the country that trades in a currency that is not its own have sufficient tools to ensure that both equations are fulfilled and monetary flows balance independently in each of the two markets. They can achieve this by manipulating two internal variables at their disposal: *"the interest rate and the exchange rate"*.

THE EXCHANGE RATE. Lowering or raising the exchange rate between currencies changes the amount of goods that can be bought or sold between countries, and as a result, it is easy to ensure that the balance of trade remains balanced, especially because both prices and quantities purchased in international trade vary little over time and are very stable (of course, lowering the purchasing power of your currency improves sales abroad, but at the cost of selling your labor more cheaply).

THE INTEREST RATE. On the other hand, and although capital flows are very fast and unpredictable, by acting on the interest rate of money it is possible to keep the capital flow balanced independently of what is happening in the trade deficit.

By making use of both mechanisms, the manipulation of the interest rate of money and the exchange rate of money, current economic theory claims that it is possible to keep the trade exchange and the investment exchange independently balanced, and thus avoid any exchange crisis. However, there are very serious doubts as to whether this way of looking at things is correct, because, although it achieves without any difficulty the independent equilibrium in the two markets, it is very clear that society pays a high cost for it:

1) The exchange rate between currencies fixes the relative price at which labor is sold inside and outside the country, so that any rise in the exchange rate of the currency also implies the loss of purchasing power of wages. Therefore, it is hard to understand how many progressive economists, who call themselves leftists, are intransigent in the face of any loss of purchasing power of wages due to inflation, and yet seem indifferent to the loss of purchasing power due to devaluation of their own currency with respect to the reserve currency.
2) The interest rate of money is what the market uses to determine the value of capital goods and should be set by the authorities so that it changes as little as possible. It does not seem to be a good idea for the interest rate to be set by foreign savers in the international capital markets.

Let us note that the usual manipulation by the authorities of the two variables when there are economic difficulties, raising the exchange rate and raising the interest rate, clearly harms workers and local entrepreneurs, so it is not at all clear that alternative policies, such as tariff protection or the prohibition of the free circulation of money, are not a much better policy to avoid the exchange rate crisis.

But, despite the clear damage that the usual policies aimed at avoiding exchange rate crises cause to the standard of living of the inhabitants of a country, our interest is now focused on analyzing whether such monetary policy really manages to keep the feared exchange rate crises away from the country, and the answer is that no, that even this belief is a mirage that can be very dangerous because only by preventing the free circulation of capital together with tariffs on the movement of goods is it possible to avoid an exchange rate crisis.

LOCAL MONEY AS A FOREIGN ASSET. We know that when capital markets are liberalized, any person or institution can borrow in local currency at the market interest rate and exchange it for the reserve currency with the intention of investing the money in another country, or with the intention of hoarding it.

Evidently, no one will do such a thing if the interest rate demanded for local money is higher than the income expected to be obtained when the money is exchanged for the reserve currency and invested in foreign assets. Therefore, when the monetary authorities want the exchange flows between the Capital Market and the rest of the world to be balanced:

$$-t_1 + t_2 = 0 \qquad \textit{capital balance}$$

can vary the interest rate at which local money is lent, until savers' expectations of finding higher returns on foreign currency assets are zero. This fixes the interest rate, and prevents the monetary authorities from being free to decide the interest rate, since it will be determined by the fulfillment of the equilibrium condition.

The government is obliged to raise the interest rate of its currency to prevent the flight of savers to the reserve currency, raising or lowering the interest rate of local money to lower and raise the price of local assets so that they give at least the same income as foreign currency assets give. Such an equilibrium prevents the sale of assets in the local currency with the intention of exchanging them for the reserve currency to buy assets abroad.

We see clearly that the World Capital Market treats the local currency as a capital good from which an income is obtained and which can be valued, just as other capital goods are valued, assigning it a price and an uncertainty:

$$dinero_{local} = \frac{renta_{local}}{i \cdot \aleph_{local}}$$

Where the interest rate is the rate demanded by the markets for the reserve currency, since it is the valuation of local money from the rest of the world. Uncertainty $\aleph_{local}$ is that which is "appreciated" from the rest of the world, while "income" is none other than the average income produced by an amount of reserve money when it is exchanged for local currency and invested in local capital goods, measured in the reserve currency. Therefore, the same expression must also be true in the local currency, i.e., the rent that a quantity of local money produces when it is lent, and which we assume without uncertainty, is worth:

$$K = \frac{renta}{i_{local}}$$

Equating both expressions, we obtain a remarkable result:

$$\aleph_{local} = \frac{i_{local}}{i}$$

The uncertainty with which investment in local money is viewed from abroad is equal to the quotient of the respective money interest rates (note that the money interest rate is set by the monetary authorities so that the inflow and outflow of capital is mule, which is the condition under which we have assumed that no exchange crises occur. Or in other words, it is the international currency market that sets the interest rate of local money, and with it the price of capital goods in the local market.

Let us remember that the flows of monetary transfers between the country's Capital Market and the rest of the world change very rapidly because they do not correspond to the real physical investments but to the valuation of the future rents of these real investments, so that the purchase of capital goods is very dependent on the expectations, real or not, that savers have about the future price of the assets. The possible flight of savers towards liquidity, which in an isolated economy automatically causes a credit crisis unless the Central Bank acts, now becomes a flight towards reserve currency, which the Central Bank will not be able to satisfy because it lacks the possibility of creating reserve currency.

We saw, when we analyzed Capital Market liquidity, that in an isolated economy it was always possible that a flight of savers to liquidity would cause asset prices to fall, leading the economy to an inevitable credit crunch when banks and lenders, as a precaution, would stop rolling over loans. It was then demonstrated that only the intervention of the Central Bank, by buying massively all the capital goods put on sale, could prevent the fall in the price of assets while allowing the repayment of debts in a liquid environment, avoiding the credit crunch. And this is where the problem appears, because it is very likely that the generalized flight to liquidity is made in the reserve currency and not in the local currency, so that first the assets are made liquid in the local currency, but not to keep it, but to exchange it for the reserve currency, which is the only one that cannot be created by the Central Bank of the country.

In such a situation disaster is inevitable, because even though the Central Bank can buy with the local currency all the assets for sale and thus avoid the fall in the price of assets, it will not be able to prevent its own currency from being exchanged for the reserve currency and end up creating an exchange crisis, since it does not have the reserve currency in sufficient quantities to monetize all the capital goods.

The problem is very clear: *"the country's Central Bank can create any amount of money in its own currency, but it cannot manufacture the reserve currency, so it has only two alternatives, either it sinks the exchange rate to be able to exchange the local currency for the reserve currency or it prevents the free movement of capital, which is the same thing".*

Of course, before that, governments often resort to raising the interest rate to make their own currency attractive and prevent a flight to the reserve currency, but that is like trying to put out a fire by pouring gasoline on it. The higher the interest rate at which the Central Bank pays its own currency, the greater the amount of money it will have to exchange for the reserve currency, and the greater the exchange rate crisis when it comes. The only thing the Central Bank achieves with this policy is to delay the problem in exchange for aggravating it.

We see that the Central Bank of a country with its own currency, although it can avoid a credit crisis, cannot avoid an exchange crisis when there is free circulation of capital, so it is not at all clear what real advantages are offered by having its own currency for a small country as opposed to the advantages of belonging to a larger economic area that can compete on equal terms with the reserve currency, as is the case of Europe, China or India. The only solution is not to allow the free circulation of money, or, in other words, to confiscate the reverse currency obtained by the country from foreign sales in order to distribute it among all the agents according to their participation in the economy.

CHAPTER 13

SOLUTIONS TO THE CREDIT CRISIS

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10 March of the year 2021

1. INTRODUCTION

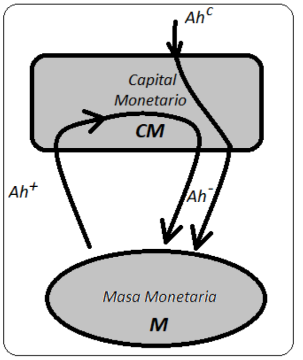
Since economic growth is driven by scientific discovery and technology, and since investment is exogenous and depends heavily on the expectations of entrepreneurs about future growth, it seems very clear that, if the economy is to avoid going into recession, it must be savings that must adjust to changes in investment spending, not the other way around.

However, savings, the "propensity to save", is an endogenous variable that depends on people's income and increases when this increases, what Keynes called, the most important psychological law of economics, it does not seem very clear how monetary authorities can make savings change to match both variables and avoid credit crises.

It is very important to understand this last point, because nobody seems to realize that, in aggregate terms, the imbalance caused by people who save is avoided by the deficit spending of people who do not save. This is a very serious and transcendental fact because it increases income inequality as long as savings are not limited by tax collection.

Let's move the question to the growth equation by trying to understand the consequences of saving in aggregate terms.

If we look at the attached figure, we see that the credit flow is not the only monetary flow coming from the Capital Market which is spent and becomes part of the money supply. Ah^C is not the only monetary flow coming from the Capital Market that is spent and becomes part of the money supply, but there is another flow coming from previous savings that can be much more important in magnitude than that one. The sum of both, the credit flow and the flow coming from previous savings, form the flow Ah^- which must be greater than the flow of savings Ah^+in order for the economy to grow:



$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = -[Ah^-(t) + Ah^+(t)] \xrightarrow{Ah^- + Ah^+ > 0} \Delta PIB > 0$$

We know, from the way the growth equation was derived, that the need for dissaving to remain greater than saving Ah^- to remain greater than savings Ah^+The reason for this is the need for the money supply not to decrease because of the money extracted by savings, because that is what causes the economy's *GDP* to decrease. Therefore, the question that arises from the perspective offered by the growth equation is:

How can we ensure that the money extracted by savings is returned to the economy?

<u>THE FAILURE OF THE STANDARD THEORY</u>. At a time when technological change requires a lot of money to introduce new technologies, investment is sufficient to repay the money saved by the economy without any problem, not only that, part of the investment is covered by bank credit, which allows economic growth. But in an environment of low technological growth, when companies have few investment needs, the return of the money that extracts savings becomes a serious problem that is difficult to solve, and it is not at all clear what should be done to return it to the economy.

The answer to the question becomes even more complicated when we realize that the answer will depend on our view of the relationship between capital goods and savings.

Let us observe that when we see capital as an accumulation of physical goods, then savings, however large they may be, can always be spent on the purchase of the physical goods that make *up capital and return to the economy without causing any problems. It is then logical to act on credit and remedy the incomprehensible lack of investment by lowering the interest rate until all savings are lent and spent.*

But when we see capital as the valuation of an income, the situation is completely different. Now capital (wealth) does not grow when savings are spent on the purchase of physical goods, but, on the contrary, it is the growth of the quantity of capital goods that makes it possible to absorb savings by selling them. The flow of savings is spent on the purchase of new capital, and if this does not grow sufficiently, because the technological moment is not propitious or for some other reason, the savings will not find anything to spend and will not return to the economy.

The calculation is very easy to do. Suppose an economy that saves 10% of GDP, but only has a real growth of 2% of GDP. In such a case, the real growth of capital is about 10 to 12 times GDP, which is too little to absorb all the savings being made in the economy, since part of the new capital must be kept by entrepreneurs, or else they will not borrow to invest.

The whole problem of economics, as we already know, is that capital is not a physical but a financial reality.

According to this analysis, it is very clear that the lack of control over savings, and our inability to increase or decrease it by adjusting it to changes in the economy's need for investment, is what causes bank credit to decrease until it becomes negative and the economy goes into recession:

$$-(Ah^{+} - Ah^{-}) = Ah^{C} - Ah^{S} \quad \xrightarrow{Ah^{C}<0} \textit{recession}$$

In spite of this, all the solutions currently being used to avoid recession involve acting on credit and not on savings, which is really absurd, since savings is an endogenous variable that depends on other variables that can be controlled, while credit is an exogenous variable that depends on the financing needs brought about by technological change and cannot be controlled.

With the passage of time, and thanks to the evolution of the Banking System, the appearance of the Central Bank and, above all, the generalized use of bank money in the economy, we have a clearer vision of the paradigm used by the monetary authorities in the USA to avoid the credit crisis. If we had to summarize the economic paradigm that the Federal Reserve seems to follow at present, it would be more or less this:

1) Raise the interest rate to decrease bank money and avoid inflation.

2) Lower the interest rate to increase bank money and avoid deflation.
3) Increase deficit public spending to compensate for the credit crunch.
4) Decrease deficit public spending to compensate for credit expansion.
5) Provide liquidity in the Capital Market by purchasing assets to prevent their price from falling.

To this should be added the systematic lowering of taxes, although this cannot be considered strictly part of the Federal Reserve's monetary policy. In other words, the Federal Reserve's current policy is the same policy it has been following for 40 years, and is based on acting on investment, encouraging it to be able to absorb savings.

For example, it is also the policy that Japan has followed for the last 20 years and with which it does not seem to have done badly in the last decade, if we ignore, of course, that the public debt has reached levels close to 3 times Japan's GDP and that the slightest rise in the interest rate will clearly make it unsustainable. But why would public debt have to pay interest and be unsustainable, or why would it even have to be repaid, instead of being monetized outright? In fact, that is exactly what every economy in the world is doing today.

To summarize, we can say that there are two basic mechanisms used by the Federal Reserve to prevent the US economy from entering a credit crisis, and both try to influence the amount of money that is invested in the economy and not the amount of money that is saved, as would be logical:

a) Deficit public spending or "Keynesian policy".
b) Lowering the interest rate on loans.

We will analyze in some detail each of these two mechanisms acting on the Consumer Market, and we will deal separately with the issue of financial instability, or the "*black swan theory*", which is the cause of the fall of prices in the Capital Market. Then, finally, we will analyze how it is possible to avoid credit crises by acting on the flow of savings.

2. KEYNESIAN POLICY

Since to avoid a credit crunch it is necessary to return to the money supply all the money extracted by savings, Keynes proposes that deficit public spending should be responsible for this, by directly borrowing the money saved by the private sector (and not spent) and spending it on public services or public investment. Although Keynes put forward the proposal in 1936, in a very different context from the one we have put forward here in formulating the Financial Theory of Growth, his proposal is very coherent and easy to understand, as well as being a good solution.

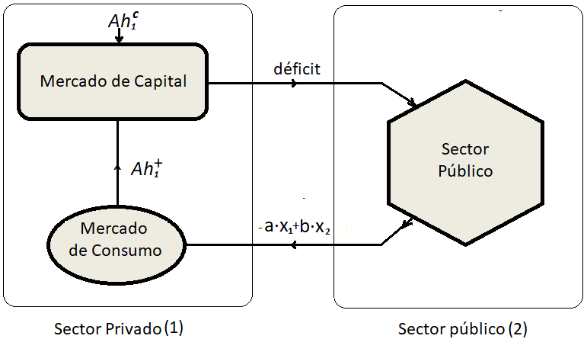
The only problem with Keynes' proposal, which is also very easy to understand, lies in the possibility of deficit public spending becoming unsustainable over time, if the debt-financed public deficit policy is maintained indefinitely. Even Keynes did not believe that this was possible. His proposal was limited to a one-off action in a situation of clear economic depression, such as existed in the 1930s, and not a policy action continued over time indefinitely. To see this, let us imagine an economy divided into two sectors, the public sector and the private sector:

$$\begin{aligned} \frac{1}{k_F}\frac{dx_1}{dt} &= -a\cdot x_1 + b\cdot x_2 - ah_1 \\ \frac{1}{k_F}\frac{dx_2}{dt} &= a\cdot x_1 - b\cdot x_2 - ah_2 \end{aligned} \qquad (1)$$

Where the private sector is the first sector and the public sector is the second sector. Now the term $(a\cdot x_1 - b\cdot x_2)$ is the public deficit, the difference between the money the government collects in the private sector $(a\cdot x_1)$ and the money spent by the government in the private sector $(b\cdot x_2)$. Let us also assume, for simplicity, that there is no growth in the money supply, which implies that the aggregate expenditure of both sectors does not change and that the net saving of the economy is zero:

$$ah_1 + ah_2 = 0 \quad \leftrightarrow \quad ah_1 = -ah_2$$

This simply means that *"the savings being made by the private sector is equal to the deficit being made by the public sector, or vice versa"*. The attached figure shows the circuit.



Now it is very easy to understand the proposal made by John Keynes in 1936 to avoid the deflationary crisis: *"the government must spend on credit, either in investment or consumption, all the surplus savings not spent by private investment".*

$$\textit{Public Deficit} = a \cdot x_1 - b \cdot x_2 = ah_1$$

The private sector has decreased spending without changing its income, and its net savings are positive. Ah^+ is positive. The consequence is that the other sector, the public sector, enters into a dilemma, either it increases public spending, making it a deficit by borrowing what the private sector saves, or it maintains the budget balance and lets the economy go into recession because the savings do not return to the economy.

Keynes was the first economist to become aware of the consequences of the mismatch between people who save and people who invest on credit. According to the opinion of the dominant theory of his time (and which is the theory still defended today by economists working for private universities in the USA), saving is balanced by investment thanks to the interest rate. This is the so-called Loanable Funds Theory. But for Keynes it was very clear that this was only a mirage, since when businessmen's expectations ceased to be flattering, private savings stopped returning to the economy through investment on credit and the economy went into recession due to insufficient spending.

Keynes thought that, in such a situation, any attempt to stimulate investment by lowering the interest rate would be futile:

"*you can take the horse to the river, but you can't force him to drink.*"

Keynes,1936

And the only sensible thing to do is for the government to act and borrow the savings that the private sector does not spend in order to spend them, compensating for the insufficient investment spending with public investment. In this sense, the theory put forward by Keynes in 1936 is very similar in many respects to the Financial Theory of Growth that we have presented here, and the solution proposed by Keynes actually succeeds in avoiding the mismatch between savings and credit.

KEYNESIAN POLICY. The economic policy proposed by Keynes, which uses deficit public spending to return to the economy the money extracted from excess savings, was not used in the United States until the 1980s, for the simple reason that it was not sufficiently established in economic thought. It was thanks to the economic policy carried out by President D. Roosevelt in the 1930s to bring the US out of the economic crisis that established the Keynesian policy.

After the war, private investment financed by bank credit grew steadily, more than injecting into the economy the money needed for growth, while the growing public expenditure was financed without resorting to the deficit, thanks to the progressive tax rate left by the Roosevelt presidency after the war. These were the so-called "thirty glorious years" of the post-war period, which many limit to the end of the sixties and the beginning of the seventies, when the oil crisis appeared, although from the fiscal point of view we are now analyzing, the truth is that the economic policy remained unchanged until the arrival of Reagan's presidency in the eighties of the century.

It is very curious, but the narrative of events propagated by economists working for private universities in the United States has nothing to do with what actually happened.

The decrease in taxes on the highest income earners, which had been constant since the end of the war, suffered a sharp reduction with the arrival of Reagan as president, well into the 1980s, at the same time as the public deficit became chronic and the public debt rose to levels unseen since World War II (much higher than those reached with the alleged public deficit that financed the Vietnam War). It was then that what can be called without exaggeration the "Golden Age of Keynesian Politics" began, with three decades of Republican presidencies with a high public deficit along with a sharp reduction in the progressivity of taxation.

It is curious, but the long period of Keynesian policy only suffered a slight blackout under President Clinton, who increased taxes on the richest and progressively reduced the public deficit until it *reached a surplus at the end of his eight years in office. Seeing is believing. All Republican presidents applied Keynesian policies while Clinton, the only Democratic president in thirty years of presidency, reduced the fiscal deficit until it was eliminated by raising taxes. Although, of course, the story told by economists working for private universities in the United States is very different.*

<u>THE DEBT CRISIS</u>. The explanation given by these same economists for the exchange rate crisis suffered by most of the world's countries in the late 1970s and early 1980s is also very different.

Until the 1970s, most countries, particularly the Spanish American countries, had maintained a low foreign debt thanks to an active "import substitution" policy, but the rise in oil prices in the early 1970s, and the widespread corruption inherent in the externally imposed dictatorships of the time, increased the public debt unsustainably because of the need for dollars that could only be obtained through borrowing.

The subsequent increase in interest rates by the Federal Reserve, already in the 80's, put the final nail in the coffin of what was already a foretold exchange rate crisis in the Hispanic American countries, which in any case would not have taken long to occur. The generalized default, together with the subsequent opening up of domestic markets and the abandonment of the "substitution policy" imposed by the International Monetary Fund, left the domestic production of these countries unprotected and turned their own industry into a wasteland that pushed the countries to specialize in the production of those products that the creditor countries lacked: raw materials, food or manufacturing, which absorbed too much unskilled labor from the industrialized countries.

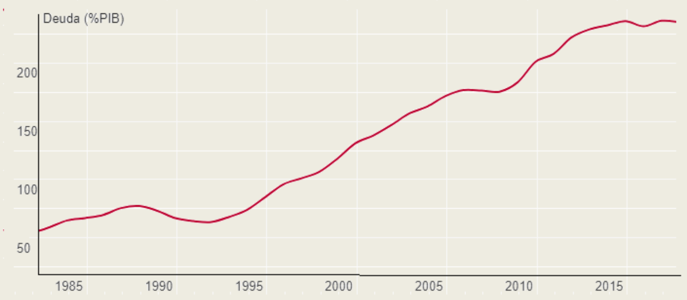
Once domestic production has changed, the countries will not be able to raise their heads again because local industry has specialized in creating products for foreign industry, which is much more specialized in value-added products and much more economically powerful than it. Industrial dependence on the industrialized countries is established and becomes chronic, an unequal relationship that we analyze with the Theory of Unequal Exchange, from which it will be very difficult to escape, and in which the so-called developing countries are trapped indefinitely.

The sad part of this whole story is that economists working for private universities in the U.S. blame local governments and public deficits for the foreign debt, which is completely false, since local governments borrow in dollars to meet the currency needs of local industry and to maintain the free movement of capital required by the IMF and international relations. So, although it is *true that the debt in dollars is public debt acquired by the government, it is the private sector that really spends the dollars, and not precisely on investments.*

As we have already mentioned when analyzing trade between countries, Keynesian policy is unsustainable over time because public debt is constantly increasing until it becomes unpayable.

<u>THE PROHIBITIVE LEVEL OF PUBLIC DEBT</u>. The consequences of thrift are frightening. Not only is it the source of the economic instability suffered by all current economies, but it is also the source of the prohibitive level of public debt.

At present, the dimensions that public deficits can reach when they are used to avoid a credit crunch are in some cases truly scandalous. The accompanying figure shows the evolution of Japan's public debt, which is the country usually used as an example in this case.



The steady increase in Japan's public debt since the 1990s can be seen, reaching a cumulative value of about 2.5 times the country's GDP in 2019. The evolution is very well in line with a Keynesian policy aimed at satisfying an annual saving by the private sector of about 10% of GDP, which after 30 long years accumulates a net saving of about 2.5 times the current GDP.

It is difficult to justify such nonsense, the origin of which is the bursting of a real estate bubble in the early 1990s, which lasted for almost three decades.

It is very clear to the authors that if Japan had assumed the inevitable loss of value of housing, either because the public sector assumed it, buying with credit money the homes of the Japanese above their real value, or because the private sector assumed it by selling the homes for their real value (perhaps it would have been better if both sectors had assumed part of the loss of value of the homes), the situation would have been resolved in a few years without too many problems. But the Japanese monetary authorities, on the contrary, decided to lower taxes and to satisfy with *the public deficit the forced savings that a part of the private sector was forced to make in order to acquire the houses that they had bought well above their value. In other words, instead of forcing the liquidation of the debts within the private sector, assuming the loss of value of the housing (with public money), the debts were kept to be paid with little private savings, at the expense of the public deficit.*

The end result can only be the same, whether you take one path or the other. The difference between the two paths is in the time it takes to travel them. If the Central Bank had taken over the price of housing, buying it from the Japanese at the inflated prices of the bubble, it would hardly have spent the "two GDPs" it spent when it decided to take the longer path and let the Japanese pay off their debts with their savings bit by bit, causing a deflationary environment that has lasted for more than two decades.

Many times it is not understood that a liquidation of debts should never be prevented because the only thing that is achieved by doing so is that the debts are liquidated by a much longer way. That is why it is so important for the Central Bank to assume the responsibility of providing liquidity in the Capital Market, which means, whether we like it or not, that it has to assume the cost of any bubble that is generated within the Capital Market, because the alternative is none other than to allow the economy to enter a recession.

It is very important for the Central Bank to take responsibility for providing liquidity in the Capital Market to help the debt to be paid off as quickly as possible, no matter how high the price it has to pay for it.

3. INTEREST RATE MANIPULATION

As we already know, in the present monetary economies what makes money is bank credit, so when the interest rate of money rises, credits are more expensive to maintain and are renewed in a smaller quantity, and the quantity of bank money grows more slowly than when the interest rate was lower. The opposite happens when the interest rate falls, and the quantity of bank money grows because the amount of credit granted increases as it is cheaper to pay interest.

The dynamics is very similar to that described by the Lendable Funds Theory, with the notable difference that the money affected by the interest rate is the money created out of nothing by the Banking System when it grants bank loans, and does not affect savings money. According to Keynes, and surely he is not far wrong, savings is a function more or less proportional to income and its amount depends little or not at all on the interest rate.

Be that as it may, the manipulation of the interest rate proves to be a very powerful tool for controlling the quantity of bank money, thanks to the direct effect it has on the level of credit flow. So much is the co-financing that the mechanism awakens in the monetary authorities, that they entrust all their hopes to the control exercised by the interest rate on the quantity of money in the economy, to avoid that the quantity of bank money decreases excessively, producing a recession, or that it increases excessively, producing inflation. However, it is very clear that such an idea is a mirage that leads the economy towards inevitable disaster.

PAUL VOLCKER. The use of the public deficit and the interest rate as basic tools to control the flow of credit began to be used by the Federal Reserve in the early 1980s. It was right at the beginning of the Reagan presidency when Paul Volcker made the three major changes in Federal Reserve policy that were to shape monetary policy for the next 30 years:

1) A strong tax cut was made on the highest incomes, which increased income inequality, and with it savings, is very significant.
2) The public deficit increased significantly.
3) The interest rate was significantly increased.

The economic consequences of such a course of action are not difficult to predict. Public services continued virtually unchanged and the middle class did not protest. Bank money declined rapidly, producing a slight recession, but inflation declined as well, and that benefited everyone, including the banks. The tax cut mainly benefited people with higher incomes, but it also increased the incomes of the middle class. Is it any wonder that Reagan is one of the most popular presidents of the second half of the 20th century?

ALAN GREENSPAN. Paul Volcker was replaced, still at the beginning of Reagan's presidency, by Alan Greenspan, who raised to the level of "art" the manipulation of the interest rate to regulate *the amount of bank money and the increase of the public deficit to absolve savings, all this to prevent the decrease in taxes on the richest from ending in a credit crisis.*

If there is one thing that can be said about Greenspan, and no one doubts it, it is that he is the person who has shaped the last 40 years of capitalism with his hands. Of course, it would be foolish for us to attribute such merit to a single person, but it is true that Greenspan is the visible head of the oligarchy that has used the Federal Reserve to return the government of the world to the rich, with the explicit consent of the political class.

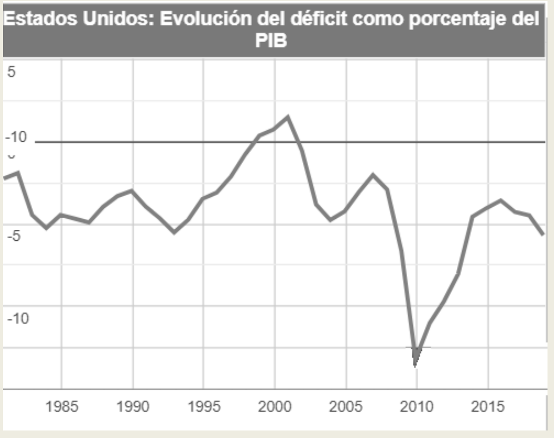
Greenspan is, first and foremost, an economic fundamentalist who identifies his political beliefs with the scientific knowledge that should emanate from economics. He believes in the goodness of the "free market", and uses all the resources made available to him by the Federal Reserve to let the markets in the U.S. and the rest of the world do as they please. In this sense, it is undeniable that he is the most influential person who has done the most for liberalism in the USA, and it is for this reason that he has held the presidency of the Federal Reserve for almost 30 years, undoubtedly the most important position on this planet.

To understand Greenspan, and to understand how the Federal Reserve shapes the entire world economy, let's look at the attached figure for changes in the interbank interest rate made to stabilize the money supply since the beginning of the 21st century.

We can see very well how the interest rate decreases very quickly from a level of 6% in 2001, at the beginning of Bush's presidency, to almost 1% in 2004, almost at the end of his presidency. The *cause, although it does not appear in the graph, is to come out of a small recession that began in the U.S. just at the turn of the century.*

Then, for some inexplicable reason, a rapid rise in the interest rate to 5% is initiated, which could only end in a recession, as in fact it does (Bush reproaches Greenspan that this rise cost him his reelection). Why does Greenspan "lower and raise" the interest rate in such a short period of time? What can justify such abrupt changes in the interest rate?

Let's look now at the public deficit in the same period.



It is easy to see that the public deficit, non-existent at the beginning of the century, increases sharply from 2001 to reach 5% of GDP, and begins to fall again in 2004, coinciding with the rise in the interest rate. We see that both policies are closely coordinated, so that interest rate increases are associated with increases in the public deficit, and vice versa.

Although we do not show it with a graph, taxes on the richest are also greatly reduced during the entire Republican Bush presidency. It seems that the Federal Reserve follows a policy during the period very similar to the one followed during the Reagan presidency, lowering the interest rate and increasing the public deficit to avoid the 2001 recession, and raising the interest rate and lowering the public deficit to avoid inflation in 2005.

But, is that the reason the Fed lowers rates and then raises them?

In the late 20th and early 21st centuries, near the end of the Clinton presidency, Greenspan had raised the interest rate sharply while Clinton's fiscal policy reduced the government deficit to *surplus, which was bound to push the economy into a recession before the turn of the century, shortly after the start of the Bush presidency. In fact, the rise in the interest rate of the dollar was so high that it produced an exchange rate crisis in Southeast Asia and Russia, which brought down their economies (was it on purpose?). It became necessary, therefore, to increase credit spending by lowering the interest rate to 1%, helping the US economy to recover, while at the same time increasing the public deficit, all until the situation seemed to reverse in 2004.*

(The public deficit financing of the Invasion of Iraq in 2003 was very good for the US economy at that time, helping a lot with the necessary monetary injection and GDP growth, but that was not the purpose pursued by the Federal Reserve).

Beginning in 2004, the Federal Reserve decided that it was time to return to a more "normal" interest rate, around 3% or more, and began to raise it. At the same time, public spending was reduced in coordination with the political authority to reduce the quantity of money. Not only because Greenspan thought that the economy was overheating, but also because there was a possibility that a housing bubble was developing within the country and Greenspan decided that it should be deflated.

Said and done, the Federal Reserve began to raise the money rate again, at the same time that the Bush administration cut the public deficit, halting in its tracks the two sources of credit money injection into the economy: deficit public spending and private spending financed by bank credit, and pushing the US economy into recession.

A recession was inevitable, and indeed it was expected, but Greenspan expected it to be brief and transitory, as it had been on previous occasions. For example, as had happened at the beginning of the Reagan presidency, as had happened at the end of Bush Sr.'s presidency, or as had happened at the beginning of Bush Jr.'s presidency, just four years earlier. But what happened was not that.

Everything seemed to be going well at first. From 2005 onwards, the US economy slowly came to a halt at the same time that the interest rate was rising and the public deficit was decreasing. Alan Greenspan, the father of interest rate manipulation, was euphoric and rightly so: he had been chairman of the Federal Reserve for almost 20 years, raising and lowering the interest rate of money, without the US economy having had a serious setback in all that time. From the year 1987, when he took office, until the year 2006, when he left it, the US GDP had multiplied by 3 in real terms, with no shadow on the near horizon.

Alan Greenspan left office with glory.

In 2006, Ben Bernanke, perhaps the best person in the world for the job, replaced him without knowing that, just one year later, he would have to deal with the most serious crisis of capitalism since 1929. But what made the interest rate hike different this time?

4. WHY 2008 WAS DIFFERENT (THE BLACK SWAN)

Logically, Keynesian policy can only be maintained until the country's capacity to pay the interest on the growing public debt is reached. From that moment on, the annual public deficit will be very limited and becomes insufficient to continue returning excess savings to the economy, even when the interest rate is lowered to zero.

Lowering the interest rate always gives the economy some breathing space by relieving interest payments on both public and private debt and allowing the economy to continue to maintain deficit spending, but it clashes with the increasingly close-to-zero interest rates that seem to offer money at no cost. Both alternatives, maintaining the public deficit and maintaining private credit so that people with higher incomes have someone to lend their savings to, keep the economy away from a recession, but cause a discomfort without a definite origin that warns us that something must be wrong with the simplicity of the reasoning that justifies lowering the interest rate.

The real problem of the economy, once it has reached a situation in which a very low interest rate and a large credit debt come together, is not only that nothing has been solved and savings must continue to be drained because they have not diminished, but also that a new actor appears on the scene, this unsuspected one, which dashes all the hopes that the Central Bank has placed in an interest rate close to zero to avoid a credit crisis:

"*financial instability or the black swan*".

Why was it different in 2008? Why didn't the US economy, after slowing to a complete halt because of the interest rate hike, return to growth in 2008 when the government deficit began to increase and the interest rate began to be lowered to zero?

Although it is easy to see that after doing all that, the US economy finally recovered, this time the fall in stock prices that accompanied the small recession that always caused the interest rate to rise was of such magnitude that the monetary injection that had to be made to maintain prices was immense when compared to the small injections of previous recessions. Despite this, it took almost three years before the economy began to show the first signs of growth. Why the change?

THE RELATIONSHIP BETWEEN THE TWO MARKETS. The Madrid Theory that we have developed revolves around the existence of two markets, the Consumption Market and the Capital Market, highly decoupled one from the other thanks to the stability of the monetary flows of savings and non-savings, but both highly correlated by the value of the interest rate of money. It is precisely the ability of the interest rate to influence both markets when it changes that characterizes a monetary economy and that makes monetary policy terribly dangerous and unstable when the interest rate approaches zero.

Let us observe that raising or lowering the interest rate not only makes credit debt more or less expensive, and therefore makes the price of maintaining the amount of bank money that forms the money supply more or less expensive, but also makes capital goods more or less expensive, since the interest rate is the reference used to determine their price.

So when the interest rate is lowered to prevent the flow of credit from falling and going negative, we are also increasing the value of all capital goods, which is not a bad thing in itself when the interest rate is high, but it is a disaster when the interest rate approaches zero.

Let's see why.

The equation relating the change in the aggregate value of capital to the money supply is given by:

$$K = \frac{\langle \alpha \rangle}{\bar{\aleph} \cdot i} k_F \cdot M$$

In which we assume that all the parameters that appear in it do not change, or change much more slowly than the money supply changes, which as we know is equal to bank money. But let us note *that the expression states that when monetary policy decreases the interest rate, the value of capital goods increases and, conversely, when the interest rate increases, the value of capital goods decreases.*

Any change in the interest rate will not only change the amount of bank money in the economy, but will also change the value of capital goods. The problem arises when the interest rate approaches zero, because then the valuation of capital goods tends towards infinity:

$$K = \frac{\langle\alpha\rangle}{\overline{\overline{\aleph}} \cdot i} k_F \cdot M \qquad \rightarrow \left[\frac{\langle\alpha\rangle}{\overline{\overline{\aleph}} \cdot i}\right]_{i \to 0} \approx \infty \qquad \rightarrow \underset{i \to 0}{K} \approx \infty$$

The expression tells us that the decrease in the interest rate decouples the value of capital from the income flows that sustain it, by making the relation between capital and income tend towards infinity. As the interest rate approaches zero, the valuation carried out in the Capital Market on the present value of any future income becomes more and more uncertain, because of its high value. Its value fluctuates greatly in the face of future changes in income.

Thus, for example, if the interest rate is 5%, then, in an environment without uncertainty ($\overline{\overline{\aleph}} = 1$) and with an income share of 30% of GDP, the ratio of aggregate capital to income is 6. $\langle\alpha\rangle$ of 30% of GDP, the ratio of aggregate capital to income is 6, while in the same environment, but with an interest rate of 1%, the ratio is 30:

$$\left[\frac{\langle\alpha\rangle}{\overline{\overline{\aleph}} \cdot i}\right]_{i=5\%} \sim 6 \qquad \left[\frac{\langle\alpha\rangle}{\overline{\overline{\aleph}} \cdot i}\right]_{i=1\%} \sim 30$$

Any small inaccuracy about the future income of a capital asset is transmitted to the calculation of its present value multiplied by a factor of 30 when the interest rate is 1%, which makes any valuation of capital very inaccurate as the interest rate approaches zero.

When we remember that what the capital market is arbitrating is the relation between the value of a capital good and the income it produces, what we have called uncertainty. $\overline{\aleph}_j$ then it is well understood that a flight to liquidity in the market will be much more likely the closer the interest rate is to zero, because the greater the losses that the saver will suffer if he does not flee to liquidity in time.

$$dK = \frac{\langle\alpha\rangle}{\overline{\overline{\aleph}} \cdot i}\ dPIB \quad \rightarrow \left| \begin{array}{l} \xrightarrow{i=5\%} \quad dK = 6 \cdot\ dPIB \\ \xrightarrow{i=1\%} \quad dK = 30 \cdot\ dPIB \end{array} \right.$$

We see, that the interest rate close to zero makes the valuation of capital goods very imprecise, making the flight to liquidity become much more frequent, as well as much more costly in the case it occurs, because the fall in valuation is made from a higher value. Or in another more graphic way, it is more likely to appear:

"the black swan"

The disaster that the world economy would have ended up in would have been enormous, if the Federal Reserve had not acted quickly to inject liquidity into the Capital Markets, saving the banks and many other companies that needed money to pay off their debts. But let's remember that the problem is being created by the savings money that needs to be returned to the economy in one way or another, and none of the mechanisms being used by the Fed to avoid a credit crunch is reducing income inequality, which is what keeps savings very high. Those who save are those who have surplus income that they don't know where to keep.

5. THE PROBLEM OF EXCESS SAVINGS

If we had to point out one of the most important consequences of the financial nature of capital, it is the statement that capital goods are not the product of savings, but that savings are possible because capital goods are created. It is this statement that identifies excess savings as the cause behind all the problems of a monetary economy.

The growth equation shows us that *GDP* growth depends on the difference between the flow of savings and the flow of dissaving, but it does not make clear what we should do, or how we should manipulate both flows, to prevent the economy from going into recession. However, the situation changes completely when we study, not the growth equation, but the conservation of money flow equation from which it comes.

When we divide the economy into two large sectors, the agents (or persons) who save and the agents (or persons) who do not save, and we assume that both are two distinct groups of agents, it is possible to use for their description the system of two equations that describes an economy divided into two sectors:

$$\begin{aligned} \frac{1}{k_F}\frac{dx_1}{dt} &= -a \cdot x_1 + b \cdot x_2 - ah_1 \\ \frac{1}{k_F}\frac{dx_2}{dt} &= \ \ a \cdot x_1 - b \cdot x_2 - ah_2 \end{aligned} \tag{1}$$

Where now:

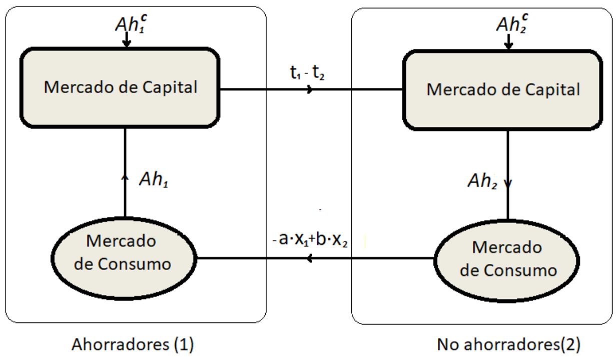
$a \cdot x_1 \rightarrow$ the fraction of savers' spending that ends up as income for non-savers.
$b \cdot x_2 \rightarrow$ the fraction of non-savers' spending that ends up as savers' income.
$ah_1 \rightarrow$ the net savings of savers.
$ah_2 \rightarrow$ the net savings of non-savers.

The system of equations is very general, and although it is normal that each equation represents a different sector of the productive system, or even represents different countries, the truth is that it can also be applied to any division of the economy into two parts, with the only condition that each sector is a different sector that can be associated with an accounting equation, and that it also fulfills Fischer's equation, that is, that in each sector it makes sense to define a monetary mass:

$$k_F \cdot m_i = x_i \qquad \textit{(Fischer Equation)}$$

If we assume that the division between savers and non-savers makes sense because each sector is made up of different agents and because it is possible to associate to each of them a money supply that satisfies the Fisher equation, then it is possible to understand what the real problem that originates savings is by analyzing the system of equations (1).

To do this, let us separate the Consumption Market and the Capital Market of each of the two sectors, the one belonging to savers and the one belonging to non-savers. Now, the exchange flows appearing in each of the two equations of the system (1) represent outflows or inflows between the respective consumption or capital markets of each of the sectors, as shown in the accompanying figure.



Let us recall that the solution of the system of equations (1) was studied in a very general way in the second chapter, where it was used to explain the phenomenon of Empty Spain and trade between countries taking into account the Capital Market. According to that analysis and when we assume, as was assumed there, that there is no monetary creation and, therefore, when we assume that the saving made by savers must be equal to the dissaving made by non-savers, a quite logical conclusion is reached for large times:

$$ah_1 = -ah_2 \xrightarrow{t \to \infty} \begin{cases} x_1 = const. \\ x_2 = const. \\ a \cdot x_1 = b \cdot x_2 - ah_1 \end{cases}$$

The expression tells us that non-savers are able to maintain deficit spending (i.e., deficit spending $(-a \cdot x_1 + b \cdot x_2)$ above income, thanks to the money they borrow from savers. $(-ah_1)$. But it escapes no one's notice that this flow of dissaving can only be financed, in aggregate terms, by the sale of the capital goods of the non-savers. There is a money circuit, which has to be closed when we assume that there is no credit creation, in which the deficit flow between the Consumer Markets has to be being fed as a loan flow between the Capital Markets, but it is evident that this circular flow of money has to be compensated in the Capital Market by a flow of capital goods from the non-savers to the savers. Or to put it another way, the excess consumption of the non-savers must necessarily be financed by the sale of capital goods, and the savers must be increasing their wealth at the expense of the loss of wealth of the non-savers.

To see this more clearly, let us calculate the amount of money owed at each moment by non-savers if they do not repay the debts they are incurring. When we assume that the flow of loans is constant, the accumulated debt must increase linearly over time. $Q(t)$ should increase linearly over time. However, in the money owed we must also include the interest payments on the debt already accumulated, so that the increase in accumulated debt $\frac{dQ(t)}{dt}$ is given by the differential expression:

$$\frac{dQ(t)}{dt} = ah_1 + i \cdot Q(t) \qquad Q(0) = 0$$

Where "i" is the interest rate of the debt. The solution of the equation is an exponential function that grows without limit:

$$Q(t) = \frac{ah_1}{i}(e^{it} - 1)$$

Evidently, debt cannot grow without limits and must eventually be paid off. The figure shows that the monetary flow between the capital markets closes the monetary circuit and compensates the deficit spending that exists between the consumption markets between savers and non-savers, therefore, there must be a flow of capital goods from non-savers to savers that liquidates with their sale the debt that is accumulating. Or, in other words, it is the sale of their capital goods that is allowing non-savers to maintain deficit spending (in aggregate terms).

The result is truly remarkable, as well as very problematic, because it says very clearly that the flow of credit between savers and non-savers cannot be maintained indefinitely, and will stop when the non-savers have no capital goods left to sell. But what really makes the analysis hair stand on end is to see that the reason why the non-savers are indebted, has its origin in money extracted from the economy by the savers, who are inducing a monetary deflation that reduces income and forces the non-savers into indebtedness.

THE WEALTH OF THE RICH IS THE POVERTY OF THE POOR. The relationship between savers and non-savers can be written with the same system of equations used to describe an economy divided between two sectors. When we further assume for simplicity that there is no monetary creation, which implies that the saving made by some is the non-saving made by others, we have:

$$
\begin{aligned}
\frac{1}{k_F}\frac{dx_1}{dt} &= -a \cdot x_1 + b \cdot x_2 - ah \\
\frac{1}{k_F}\frac{dx_2}{dt} &= \ \ a \cdot x_1 - b \cdot x_2 + ah
\end{aligned}
\tag{1}
$$

And it can be shown that, in stationary regime, the relation between the income of savers and non-savers is given by the expression:

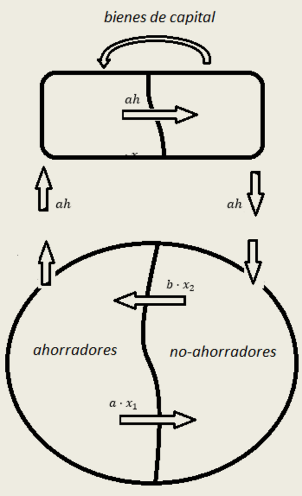
$$a \cdot x_1 = b \cdot x_2 - ah$$

In addition, the debt accumulated by non-savers is given by the expression:

$$Q(t) = \frac{ah}{i}(e^{it} - 1)$$

Where "i" is the interest rate paid on the debt. Of course, the debt is unsustainable and in practice, inter-sectoral borrowing is maintained as long as the debt is repaid by the sale of the capital goods held by the savers.

That is, when we consider non-savers as a statistically separate group from the group of savers, in aggregate terms, non-savers have to part with capital goods to maintain indebtedness. The figure explains this process a little.



It is now possible to understand without much difficulty why for the last 30 years or so, the rich have been getting richer and the poor have been getting poorer.

Of course, not all the savings of savers have been spent by non-savers. The public deficit also absorbs part of the savings. For example, Japan's public debt is now about 2.5 times GDP, with treasury securities being a part of the savings that Japanese savers have been making. Moreover, another part of the savings will have been used to buy new capital goods or to finance their creation, which is the same because they will now belong to the savers. In spite of all this, it is clear that when savings are not absorbed by the public deficit or by the purchase of new capital goods, it will be the indebtedness to which a large part of the middle class has had to resort to maintain its expenses in a slightly deflationary environment due to savings, which will be returned to the economy in exchange for its wealth, which will now belong to savers.

Evidently, the analysis we have made indicates that in an economy without growth, aggregate savings are not possible for long periods of time.

We have also seen that Keynesian spending policy cannot be the permanent solution to the savings problem either.

6. THE FISCAL SOLUTION TO THE SAVINGS PROBLEM

Once it is understood what creates the credit crunch, then it is not difficult to find a solution to the problem. Let's look once again at the growth equation that shows the evolution of spending as a function of savings and dissaving flows:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = -[Ah^{-}(t) + Ah^{+}(t)] \xrightarrow{Ah^{-}(t)+Ah^{+}(t)>0} \Delta PIB < 0$$

We know that the flow of money withdrawn through savings must never exceed the flow of money injected through credit and the purchase of debt securities. The problem is, as Keynes already said a century ago, that those who save are different from those who spend on credit and invest, and there is no reason why the two flows should remain balanced.

We also know that the fiscal and monetary policy that has been used for the last 40 years is wrong because it is aimed at maintaining the flow of credit above the flow of savings, when the logical thing to do would be to act on the flow of savings. What is done, as we know, is to lower the interest rate of money and maintain indefinitely a deficit public expenditure, but, as has been shown, neither policy can be maintained indefinitely in time, because the interest rate is dangerously close to zero and public debt increases to the point of endangering the financing of public services, so that, in the best of cases, both policies can only be punctual, without ever being a definitive solution.

This is logical. Investment spending through credit depends on the technological moment and, although it can be stimulated by deficit public spending or by lowering the interest rate, it is an exogenous variable over which there is no control. Savings, on the other hand, is an endogenous variable that depends primarily on the income of each of the agents, and can therefore be manipulated very easily by changing the amount and progressivity of the income tax. In other words, it is to be expected that by increasing and decreasing the income tax it will be possible to reduce savings so that they always remain below credit spending.

What we are proposing here is to impose a progressive income tax in order to limit savings, but clearly separating the financing needs of public spending from the fiscal policy aimed at avoiding the credit crisis, in such a way that the rate used to finance public spending is clearly differentiated from the rate used to limit savings through fiscal policy. We think that public spending should be financed with the money collected from the income tax and without having to resort to the deficit, while, to solve the problem of savings, what we propose here is that the Central Bank, based on the analysis of the economic situation, should separately indicate the extra annual amount to be collected to reduce the excess savings that threatens to sink the economy.

Concretely, and since saving depends progressively on income (Keynes' Law of Saving), the rate must be progressive with income. There is, therefore, no reason why it should be different from the rate used to finance public spending, and what we propose, in fact, is that it should be the same.

The attached table shows the proposal:

Capital tax	**Income tax**	**Savings tax**

Multiple of average net worth	Annual property tax
0,5	0%
	0%
5	
1.000	
10.000	

Income multiple medium	Effective tax rate
0,5	10%
5	50%
1.000	
10.000	

Multiple of average income	Effective tax rate ε *
0,5	ε·10%
	ε·40%
5	ε·50%
	ε·60%
	ε·70%
1.000	ε·80%
10.000	ε·90%

- The tax is on income, and the parameter ε is a positive number decided by the Central Bank according to the economic situation.

The parameter ε is a positive factor decided by the Central Bank sufficiently in advance and according to the economic situation. The first table is the proposal for a capital tax, which is discussed later, but has nothing to do with what we are dealing with now. The second table shows the usual rate levied on income, regardless of its source, whether it comes from labor or income; it is the revenue used to pay for the cost of public services. The third table shows the tax that we propose to reduce savings; it is a tax that is just as progressive as the usual tax on income but which is made to depend on a parameter ε that changes as the general economic situation changes, so that the tax ensures that no savings are left uninvested.

Let us note that now, it is not necessary to manipulate the interest rate to increase the flow of credit, nor is any deficit public spending necessary. Moreover, the money collected with this last savings tax should never be directed to finance public spending, but should be devoted to facilitating investment by lower income people, since the function of the tax is to reduce the amount of savings of those with higher incomes.

<u>THE ORIGIN OF THE INCREASE IN INEQUALITY</u>. The savings problem is not trivial, and can be aggravated for many reasons. Although we do not wish to go into detail here, we will point out two of them because they are a deliberate consequence of certain fiscal policies propagated as desirable by economists working for private universities in the United States:

1) *<u>The decrease in the progressivity of taxes</u>. The continuous decrease in the progressivity of taxes, which has been occurring since the second half of the 20th*

century, redistributes the tax burden and causes a relative increase in the tax burden of those with higher incomes compared to those with lower incomes. This, in addition to causing an increase in inequality, increases the savings rate, given that the propensity to save is greater the higher people's income (Keynes' Law of Saving).

2) *Increased indebtedness. The increased savings of one part of society induces a decrease in the income of the other part of society, which forces the latter to support its expenses with borrowed money. Let us remember that the saving of some is the dissaving of others, and that only the creation of bank money tips the balance towards credit. Therefore, and although it is only true when there is no money creation, we can say that it is true:*

$$\sum ah_i^+ + \sum ah_i^- = 0$$

In other words, those who save are forcing the rest of the population into debt. It is very clear that aggregate consumption can only be maintained thanks to the deficit spending of those who do not save, those who redistribute income through interest payments or the loss of capital goods. In aggregate terms, it is clear that the process will aggravate the inequality of wealth and, therefore, of income.

Both causes feed back on each other and pull in the same direction, increasing savings and making it more difficult for credit to keep up with savings: "The loss of tax progressivity increases income inequality, and the increase in income inequality induces the increase in aggregate savings". The conclusion is very clear, the lack of tax progressivity aggravates inequality.

PART VI

FISCAL POLICY

CHAPTER 14

FISCAL POLICY

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March 4, 2021

1. THE MADRID THEORY.

We have used the previous chapters to answer very concisely several of the many basic questions that monetary economics has raised since its origin:

- The nature of money
- The basic equations that govern within a monetary economy.
- Price formation within the Consumer Market.
- The financial nature of capital.
- Price formation within the Capital Market.
- The Financial Theory of Growth.
- Causes of the credit and exchange rate crisis.

All this is implicitly based on three very simple principles or postulates about the nature of money:

1st Postulate. The quantity of money is conserved in buying and selling exchanges.
2nd postulate. The quantity of money satisfies the monetary equation, where k_F is Fisher's constant:

$$k_F \cdot M = PIA$$

3rd Postulate. All money in the economy is bank money, created when credit is granted.

Although we are not unaware that we have left unstudied aspects of vital importance such as the influence of public expenditure, we believe we have developed a theory that is sufficiently complete and exact, and with sufficient predictive capacity, to analyze with great precision the consequences of the decisions that are taken every day in the field of political economy. In this sense, we believe we have successfully completed the main objective that has moved us to write this treatise on monetary economics, which has been none other than to point out the mathematical structure underlying what is called free market economics and the limitations it imposes on our social way of organizing ourselves.

Specifically, we think that we have demonstrated, beyond any reasonable doubt, that within a monetary economy there coexist two markets of a very different nature, where two types of goods of a very different nature are bought and sold: *consumer goods and capital goods*. We believe that we have also demonstrated, beyond any reasonable doubt, how the Principle of Asymmetry, the Financial Theory of Capital and the Theory of Bank Money come together to explain one of the most remarkable equations of economics, the Growth Equation:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = Ah^C(t) - Ah^S(t) \qquad \textit{(Growth Eq.)}$$

Equation, with which we can obtain a very global and exact vision of the cause that originates the credit crisis and the exchange rate crisis, at the same time that it shows us the best way to avoid them.

Having reached this point, it is now time to summarize, by way of a brief compilation, the set of statements that we have been stating little by little throughout the chapters of this treatise and which we have named The Madrid Theory. The intention of the summary is to present the new economic paradigm and the set of general lines of monetary and fiscal policy that we advise the monetary authorities to follow in order to get out of the impasse to which we have been dragged by the loss of progressivity of the tax rate on income, the absurd and growing public debt and the absurd interest rate close to zero at which money is lent.

The purpose that has guided the elaboration of this treatise has been none other than to denounce the ridiculous and dangerous economic paradigm propagated by economists working for private universities in the USA, who advise public indebtedness without justification, who advise reducing tax progressivity that increase income inequality, who advise lowering the interest rate to zero, who raise the valuation of capital goods to the point of bringing the world's stock markets to an announced disaster, but above all, our guiding purpose has been to denounce the dangerous silence they have about those who manufacture money in the shadows, who are none other than the investment banks. It is these U.S. investment banks that unbalance with their loans in dollars the real economy of the rest of the countries of the world, which do not have, nor can they have, a currency strong enough to face them. It was the US investment banks that were responsible for the Asian crisis or the Russian crisis, or the 2008 crisis, even if they needed the necessary collaboration of the Federal Reserve to do so.

2. THE NEW PARADIGM OF THE MADRID THEORY.

On the nature of money.

The usual economics definition of money is quite imprecise and inaccurate. For example, the world's most widely distributed macroeconomics textbook, "Samuelson", defines money as... *"anything that serves as a commonly accepted medium of exchange".* Another very common definition, no clearer, but perhaps a little more redundant would be:

> "*Money is any asset or good universally accepted as a means of payment for exchanges and which also fulfills the functions of being a unit of account and store of value."*

It is redundant because "being a unit of account" and "store of value" is the direct consequence of "*being universally accepted as a means of payment*" and yet the definition remains imprecise because "*being accepted as a means of payment"* lets us know what is being used as money in an economy, but does not tell us if we are really in a monetary economy, i.e. if it is really money. For example, there is evidence that, during World War II and in the concentration camps, prisoners used cigarettes as a universal means of exchange, but it is not at all clear that we can really say that there was a monetary economy inside the camps. Another example that shows us that such a vague definition of money is insufficient to characterize it is shown by some present-day countries such as the Cuban Republic, where it is very clear that money exists and it is very easy to identify it, but where it is not at all clear that there is a monetary economy.

Therefore, in the Madrid Theory we define what a monetary economy is by defining at the same time what money is, so that both concepts always go together:

<u>DEFINITION OF MONETARY ECONOMY.</u> An economy is said to be a monetary economy when there is a good with which it can buy any other good or service offered for sale and whose total quantity M satisfies the monetary equation:

$$k_F \cdot M = \sum q_i \cdot p_i = PIA$$

The monetary equation tells us that the value of money does not come from the material it is made of, but from the relationship that exists between the quantity of money that exists and the monetary flow of buying and selling, or PIA.

In other words, what characterizes a monetary economy is the existence of money, which, as defined, implies the fulfillment of a quantitative, measurable relationship of an aggregate or statistical nature:

1) That there be a universal good, money, with which any good or service offered for sale can be purchased.
2) That the quantity of money M satisfies the Monetary Equation, in which k_F is the Fisher constant:

$$k_F \cdot M = \sum q_i \cdot p_i$$

The definition characterizes what money is, as well as the monetary economy in which it exists.

In summary: Money is not only "that" which allows us to buy any good or service that is for sale in the economy, but it is also the character it imprints on the economy in which it is used. We say that an economy is a monetary economy when money exists and is used in it. Throughout history, and since the most remote antiquity, innumerable things have been used as money. From gold, the best known commodity that has been used as currency, to tobacco or salt, being the essential characteristic of all of them, the certain fact that their value does not come from the value of the commodity itself that is used as money, but from the fact that the flow of purchases fulfills the monetary equation. In fact, it is the monetary equation which indicates the social origin of the value of money, by relating the quantity of existing money to the maintenance of exchange flows within the economy. At present, what is mostly used as money is "bank money" which is created when a loan is granted (and destroyed when it is repaid), and its value comes from the fact that it verifies the monetary equation:

$$k_F \cdot M = \sum q_i \cdot p_i = PIA$$

On credit money.

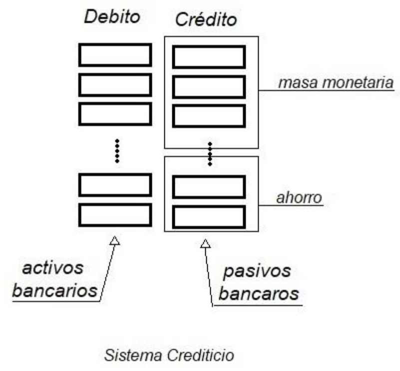
What makes money in today's monetary economies is the bank money created by banks when they grant a loan. The public authorities - and, therefore, the citizenry - have granted commercial and investment banks the privilege of creating the necessary money, subject to certain concessions.

It is not difficult to demonstrate that money is created when a credit is granted, that is why we call it credit money or bank money, and in this sense, who is really creating the money is the one who receives the credit, since it is he who backs it, by committing himself to return it or pay interest as long as he does not return it. The bank only acts as a subsidiary responsible, and that is why it can go bankrupt, because its assets are insufficient to support all the money created. For example, the money created by banks in the U.S. is more than 20 trillion dollars, clearly much higher than the equity backing of the banks.

The attached figure shows the result of the process of creation and destruction of bank money through the granting and repayment of credit.

When a loan is granted, the bank creates two entries or registers, one reflecting the amount of money that the bank lends (and which is thereafter used as money), and another reflecting the money owed to the bank (it is an asset of the bank, but it is not money and cannot be used as money). Evidently the sum of all the records of all the banks must always give zero, indicating that all the bank money being used in the economy is someone's debt (even the bank money used by the central bank).

When a loan is repaid, the opposite happens, and the money is destroyed. The bank liquidates the record where the contracted debt is recorded (the record on the left in the figure) and deletes the record containing the money that has been repaid (the record on the right in the figure).



Calculating the amount of money that needs to be created for an economy to function is not difficult. Using the monetary equation and giving it Fischer's constant of a value of 2, we have for 2019 and for the US:

$$k_F \cdot M = PIB \xrightarrow{PIB=20MM \quad and \quad k_F=2} M = 10MM$$

In updated terms, the 10MM manufactured over the last 50 years are worth about $35MM, to which must be added the other 10MM plus dollars that have also been manufactured and are used to maintain international trade, bringing the updated value of the money manufactured by US banks alone to about $70MM at current prices.

The problem, or the great advantage, of bank money is that it is created as a debt that has to pay interest as long as it is not paid back, so there is a strong incentive to pay it back and destroy the money created. It is a great advantage because the flow of interest that has to be paid for maintaining a credit prevents banks from being able to create too much money and cause an inflationary process. And, it is a great disadvantage because there is a strong incentive to repay bank loans, destroying the money and causing price deflation which, in times of recession, will end in a credit crunch or an exchange rate crisis.

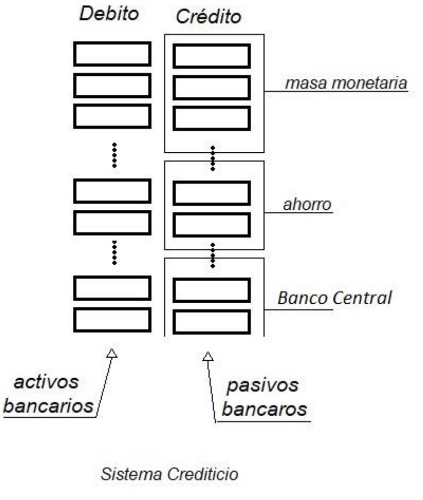
Sustaining the equilibrium of the quantity of credit money is the magic that sustains the monetary economy on which more than 8 billion of us are born, live and die. Credit money is perhaps our society's greatest display of genius, or perhaps its greatest display of recklessness, and it is not at all easy for the authors to take a position on it. However, we are inclined to think that credit money, which we know represents a debt that must be repaid, has many more advantages than disadvantages, despite the fact that it is very easy to demonstrate, as we believe we have done in the Madrid Theory, that it is its existence that condemns the economy to suffer periodic credit crises.

In short: What is currently used as money is bank money, which is created when banks grant credit and destroyed when the credit is repaid. The essential nature of bank money is to be a debt that supports who takes on the credit, while the bank that granted the credit is only secondarily liable. The great advantage of credit money is that it can grow and adapt to the growth needs of the economy, in addition to being backed by society as a whole, but it has the great disadvantage that it can be destroyed when no one wants to assume the credit and interest payments involved.

About the money created by the Central Bank

It is important to understand that the Central Bank cannot create bank money by itself, and that only commercial and investment banks have the privilege of creating money when they lend.

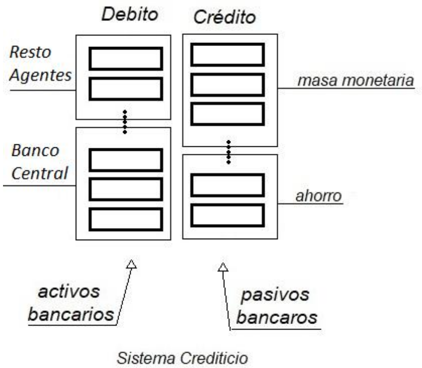
The attached figure shows again the process of bank money creation, which is the same process that the Central Bank must follow in order to obtain money:



1) The Central Bank requests a loan from the banking system, and the banking system creates the money as just another loan, which is no different from the loan granted to a private individual.
2) The Central Bank has, from that moment on, two records in the Banking System, one that indicates the amount of money that the Central Bank owes to the Banking System, and another where the money that the Central Bank can spend is shown.
3) Once the Central Bank has been granted credit (which no commercial or investment bank can refuse), it can spend it on the purchase of assets (capital goods), it can lend it to commercial or investment banks that request it, or it can do nothing with it, which is unusual (the Central Bank is usually prohibited from buying consumer goods such as, for example, a red porch).

It is observed that the Central Bank is like any other user of the Banking System, with the only difference that the Banking System never rejects its requests for credit, and it is the Central Bank and not the Banking System that decides what interest it pays for the borrowed money (this is how it regulates the market interest rate, lending to others the money it borrows at the interest rate it pays itself).

The overall result of the Central Bank's performance is shown in the attached figure:



1) The Banking System keeps as an asset the amount of credit money that it has created for the Central Bank and that the Central Bank owes it (these are the bank reserves that are sometimes used by the banking authorities to limit the amount of bank money that can be granted by each bank).

2) The Central Bank can buy capital goods with the money it orders to be created for it, or it can lend it to banks to liquidate bad loans that are not repaid, in exchange for the same interest it pays for the money. In both cases, the money becomes part of the mass economy like the rest of the money, while the Central Bank remains a debtor of the banking system (reserves).

The money spent by the Central Bank is credit money that does not differ in any way from other credit money. What it makes money is unique (there cannot be two currencies).

In short: The Central Bank is just another user of the banking system and any amount of money manufactured by the banks for it appears in the banking records as just another loan. The Central Bank is not the one who really creates the money, but it is the one who sets the interest rate when it says what interest rate it pays for the money lent to it by the banks, although in the textbooks written by the private universities that study economics all over the world they say that they are the ones who make the money.

About the Banking System.

The Central Bank does not manufacture any money, but it does have the function of regulating the amount of money that commercial and investment banks can manufacture. Throughout the evolutionary process that has led the economy to move from the use of metallic gold as money to the use of bank money (bank registers and bank bills), governments have gradually changed the mechanism to limit or enable the creation of bank money by private banks. At present, almost all central banks use the interest rate to ensure that bank money is created in the amount necessary to sustain the growth of the economy, although historically, it has been through the use of bank reserves (the debt contracted by the Central Bank) that the amount of bank money that can be manufactured within the economy through credit has been limited.

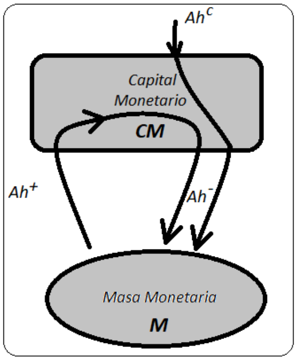
It is not very difficult to understand that there is a terrible confusion among economists as to what makes money today, since we have gone from gold and metallic silver to the present bank money without it being at all easy to establish a dividing line marking the change from one system to another. If it is necessary to draw a dividing line in the last 500 years, it is certain that it will have to be drawn at the creation of the Central Bank, because it is at this moment that bank money (the bank bill convertible into gold) becomes the official currency which makes it possible to buy anything offered for sale within a country.

Therefore, when we hear economists working for private universities in the USA claiming that money is made by the Central Bank, we can easily understand that it is the banks and the banking system that they are trying to protect by keeping their work in the dark. It is also easy to understand why it is a private bank in Sweden that has the privilege of awarding the Nobel Prize. Both are only trying to prevent the economy from progressing and discovering that it is the investment banks that cause the credit and currency crises.

In short. It is the commercial and investment banks that manufacture bank money and not the Central Bank. That is very dangerous for the whole economy, especially the investment banks that create credit money for the leveraged buyout of financial assets. Of course, the Central Bank sets the interest rate on loans, but it does not control the amount of bank money in the economy, especially that which is manufactured for asset purchases in a process very similar to the *Quantitative Easing* we have seen the Federal Reserve do, with the difference that the Federal Reserve intervened by providing liquidity to prevent asset prices from sinking, while the investment banks wait for asset prices to sink before buying them with money created out of thin air and without any risk.

About the Consumer Market and the Capital Market.

One of the most important consequences of the use of money within society is that it divides all goods that can be purchased into two distinct categories, goods that are consumed, called consumer goods, and goods that generate income, called capital goods.



Specifically, consumer goods are easily identified with those goods or services that are manufactured by companies with the intention of being consumed, which are almost all of them, and which also include the physical goods with which the companies are manufactured. While capital goods are identified with those goods that have the essential characteristic of producing income, such as the companies that produce consumer goods. For example, capital goods are companies listed on the stock exchange, housing, or natural resources, ... i.e., those goods whose main function is to produce other goods.

Capital goods are bought in the Capital Market, while consumer goods are bought in the Consumer Market, being one of the most essential characteristics of a monetary economy that both markets set prices very differently and are, therefore, very uncoupled.

The attached figure shows the two markets and the monetary flows that move between them, with the savings flow coming from the Consumer Market and the savings flow coming from the Consumer Market. Ah^+ the flow of savings coming from the Consumer Market and the flow of dissaving being spent in the Ah^- the flow of dissaving being spent in the Consumer Market. While Ah^C is the flow of money creation, which in the present banking system is done by granting credits. That is the reason why, in the figure, Ah^C comes from nothing. The two flows that relate the Consumption Market and the Capital Market, that of savings and dissaving are usually very stable over time, so it can be said that the amount of money in one and the other market is relatively constant. Very different is the situation created by the flow of credit, which the intervention of the Central Bank or the intervention of commercial and investment banks can make it change very quickly.

The money that is used to buy in the Consumer Market is the money that forms the money supply *M* that appears in the Monetary Equation. While the money that is hoarded in the Capital Market we have called the "money capital". It can be said that the two forms of money, mass money and hoarded money, are very different one from the other, even though both types of money are indistinguishable one from the other, both being bank money.

In short: The use of money divides the goods that exist within a monetary economy into two distinct types, consumer goods, which are those goods that are produced with the intention of being consumed, and capital goods, which are those goods that produce income. Both goods are bought in different markets, are priced differently and are highly decoupled (in the sense that monetary flows between them are very stable because they come only from savings and dissaving).

<u>About the Consumer Market.</u>

The question that economists have been asking for at least 2,000 years, without receiving a coherent answer, is how prices of consumer goods are set. In part, the lack of a scientific theory explaining how prices are set in a monetary economy has its origin in the fact that economists do not even agree on what is meant by a Theory of Prices and is completed by the confusion that exists about the variables on which the economy depends.

Therefore, in the Madrid Theory we begin by affirming that giving an explanation of prices is equivalent to showing on what other economic variables prices and the quantity of goods depend, which we understand to be the two basic variables that must be explained in a Theory of Prices. It can be shown, and this is done under very general conditions, that prices are fixed when sellers fix the profits they obtain from the goods they produce. It can also be shown, and this is done under very general conditions, that the quantity of each commodity purchased is decided by the buyers when they allocate their incomes according to their consumption preferences. This link between prices and profits, on the one hand, and between the quantity of goods and consumption preferences, on the other, is what we call in the Madrid Theory, the Principle of Buyer and Seller Asymmetry, completed by a set of statements of great importance, such as the Inflationary Principle and the Principle of Closure.

In that sense, the Madrid Theory follows the ideas of the Italian economist, Piero Sraffa, supporting all the conclusions he reaches in his book "Production of goods by other goods", in particular the one that states that prices are fixed within a monetary economy for structural reasons, but filling in the gaps he leaves unexplained in his exposition. However, the official theory propagated by private universities in the USA in textbooks states that the price and the quantity produced of each good or commodity are decided by the interaction between supply and demand, because among other things, supply and demand are the same thing and only in the universe created by the imagination of economists, they can be separated and can be defined separately. In the reality around us this is not possible, and everything that is bought is also sold.

In short: The price and quantity sold of each good is fixed by the "Buyer-Seller Asymmetry Principle", which states that *"prices are fixed when sellers decide how much profit they make from the sale of what they sell, while the quantity produced of each good is fixed when buyers decide how much of each good they buy*". The principle has profound consequences for the productive economy and shapes the entire social structure in which we live.

On the Inflationary Principle.

One of the most important consequences that can be deduced from the difference between the decision to buy and the decision to sell, we named it in the third chapter of this treatise as the Inflationary Principle. The inflationary principle states that, "*in aggregate terms, the prices of goods or services can only go up in price and can never go down"*, because when we try to lower prices, what happens is that the number of goods sold decreases, but not the prices, i.e., before the economy enters deflation what happens is that the productive fabric is destroyed.

Let us note that the monetary equation states that a specific amount of money is needed to maintain a specific flow of exchanges:

$$k_F \cdot M = \sum p_i \, q_i$$

It is very evident then that a decrease in the quantity of money present in the economy will cause, according to the monetary equation, either a decrease in prices or a decrease in production, or both at the same time. But it is not difficult to demonstrate that in the case of a decrease in the quantity of money, it will be production that decreases and not prices. This is what the Inflationary Principle affirms, that the price of goods cannot fall in aggregate terms, so it is inevitable that it will be output that falls in the case where the money supply falls.

This last statement is truly remarkable, because the Financial Theory of Growth is going to explain the crises that periodically plague the economy as the consequence of the destruction of bank money due to the non-renewal of credits.

In summary: One of the most important consequences of the asymmetry that exists between buyer and seller in monetary economies is the inflationary principle, which states that, in aggregate terms, the average price of products cannot go down and can only go up. This in turn implies that, in the event that the quantity of money in the economy decreases, the quantity of real output will decrease and prices will fall. Or in other words, what creates economic crises is the destruction of money.

About the Capital Market.

An essential characteristic of the monetary economy is the appearance of goods producing rents, whose nature is completely different from the nature of consumer goods. Rent-producing goods are called capital goods, and their differentiated existence also explains why their price is fixed in a differentiated market, the Capital Market, and with a different mechanism from that used in the Consumer Market.

The Madrid Theory uses three laws of capital, Robinson's First Law, Robinson's Second Law and Piketty's Law, to explain how the price of capital goods is determined:

- Robinson's First Law: "The value of a capital good is equal to the rent it produces, divided by the interest rate of money and by the uncertainty that the market assigns:

$$k_i = \frac{r_i}{\aleph_j \cdot i} \qquad \textit{(Robinson's 1st Law)}$$

- Robinson's Second Law: "The aggregate value of capital goods is equal to the income they produce after taxes, divided by the interest rate of money and by the uncertainty factor:

$$K = \frac{\langle \alpha \rangle \cdot PIB}{\bar{\aleph} \cdot i} \qquad \textit{(Robinson's 2nd Law)}$$

- Piketty's Law: "In a stable economy, the uncertainty factor $\bar{\aleph}$ is "1", or in other words, the aggregate value of capital goods is equal to the after-tax income they produce, divided by the interest rate of money:

$$K = \frac{\langle \alpha \rangle \cdot PIB}{i} \qquad \textit{(Piketty's Law)}$$

The three laws of capital reflect the financial nature of capital, and uncover the most remarkable consequence of a monetary economy:

"the aggregate value of capital goods does not depend on the amount of savings made, without the amount of existing rents within the economy."

Piketty's Law tells us what that dependence is.

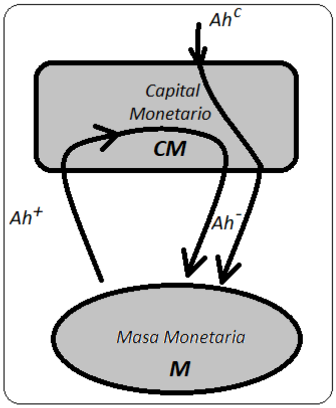
In short: It can be proved beyond any reasonable doubt that the nature of capital is financial and its valuation is equal to the present value of the future income it is expected to produce. Specifically, in a stable economy, the aggregate value of all capital goods is equal to the average rent they produce after taxes, divided by the interest rate of money: $K = \frac{\langle\alpha\rangle \cdot PIB}{i}$, an equation we have named Piketty's Law.

On economic growth.

Explicitly, the Financial Theory of Growth that we have developed within the Madrid Theory, identifies the growth of expenditure, the PIA, with the growth of the money supply with which the real economy operates, or almost equivalently, the growth of *GDP* with the growth of the money supply. M:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = -[Ah^+(t) + Ah^-(t)] \qquad \textit{Savings Eq.}$$

In which Ah^+ y Ah^- are the savings and dissaving flows that communicate the Consumer Market with the Capital Market. According to the expression, the economy can only grow when the money supply increases, which requires that the money injecting savings flow Ah^- in the Consumption Market must be greater than the money that extracts savings flow. Ah^+. The attached figure shows the monetary flows involved in the process.



It is possible to express changes in the money supply as a function of changes in the quantity of bank money and the money hoarded. For this purpose, knowing that the flow of credit is equal to the change in bank money and the flow of hoarding is equal to the change in bank money. Ah^C is equal to the change in bank money and the hoarding flow is equal to the change in hoarded money. Ah^S is equal to the change in hoarded money, it can be shown that:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = Ah^C(t) - Ah^S(t) \qquad \textit{Growth Eq.}$$

Thus, the Financial Theory of Growth assumes that when the technological moment is propitious, new investment projects will appear and new products will appear that will require credit financing for their development, so that it is the increase in bank money that originates investment and consumption on credit, the flow of credit, which increases the disposable income of the economy and, therefore, makes it grow in nominal expenditure or PIA (or, equivalently, GDP). Ah^CThe increase in bank money, which increases the disposable income of the economy and, therefore, increases the nominal expenditure or *PIA* (or its equivalent, the *GDP*).

The condition for the economy to grow is now that the increase in bank money is greater than the increase in money hoarded Ah^C is greater than the increase in money hoarded, which is always the case when bank money grows, since very little money is hoarded. Ah^SThis is usually the case whenever bank money grows, since very little money is hoarded. As long as there is no major flight to liquidity, which only happens when there is already a credit crisis, the flow of hoarding is very small or almost nil. Ah^S is very small or almost nil, and it is the changes in the quantity of bank money (the flow of bank credit) that governs the economic cycle (it must be kept in mind that when the Central Bank intervenes by creating bank money to buy assets and give liquidity to the market, the quantity of hoarded money changes notably, but a credit crisis is already underway):

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) \cong Ah^C(t) \qquad \textit{(Growth Eq.)}$$

Therefore, when the flow of credit grows, the economy grows smoothly. However, once the flow of credit stops and credit begins to be repaid, it becomes negative indicating that the destruction of bank money begins. When this happens, then the flow of hoarding can become important and must be factored into the equation because it contributes to the extraction of money from the money supply with which the economy operates.

The growth equation speaks of two opposing forces, the flow of credit and the flow of savings which, in an environment of strong technological change, work together to achieve remarkable growth rates that can exceed 10% of *GDP, with* hardly any inflation (for example, the Chinese economy has grown in the last decades of the 20th century with rates of around 10% and an inflation rate that has rarely been above 3 or 4%). But in an environment of weak technological growth, savings turn against the economy and conspire behind the back of credit to produce a credit crisis.

The Growth Equation allows us to formulate without too many problems the criteria that must be met to prevent a credit crunch from occurring:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = -[Ah^{+}(t) + Ah^{-}(t)] \xrightarrow{\frac{d}{dt}PIB(t)<0} \boxed{\begin{array}{c}\underline{Crisis\ Crediticia}\\ \downarrow \\ Ah^{+}(t) > Ah^{-}(t)\end{array}}$$

The criterion tells us that, when money from savings is not returned to the economy through dissaving, the economy inevitably enters a recession that will be more or less severe to the extent that savings are realimented and the money that forms part of the money supply decreases.

An equivalent expression is obtained when credit and hoarding flows appear in the growth equation. If we assume that there is hardly any hoarding, then the decline in the flow of bank money creation, until it becomes negative, is what initiates the credit crunch:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = [Ah^{C}(t) - Ah^{S}(t)] \approx Ah^{C} \xrightarrow{\frac{d}{dt}PIB(t)<0} \boxed{\begin{array}{c}\underline{Crisis\ Crediticia}\\ \downarrow \\ Ah^{C}(t) < Ah^{S}(t)\end{array}}$$

The criterion allows us to explain economic cycles without many problems, since it tells us that cycles are basically driven by the rise and fall of bank money, i.e., by the flow of credit.

<u>EXPANSION CYCLE</u>. When the vegetative population increases, either by migration or by internal growth, there is an endogenous impulse to increase production with loan financing. The increase in borrowing is met, primarily, by bank credit, which increases the economy's disposable income and with it, the economy's expenditure (or *GDP*) and output.

The same happens when there are expectations of increasing productivity with technological change. An endogenous impulse to increase production then appears and must be fed by lending, which increases bank credit. The increase in bank credit increases disposable income, which increases spending and production.

In both cases, money must be injected into the money supply through bank credit if growth is not to be impeded.

<u>RECESSION CYCLE</u>. Problems arise when either technological momentum declines and the need to invest in credit diminishes, or when vegetative growth is small, or when there are structural imitations, because savings can then choke the flow of credit, since they cannot find anything to invest in. In such a situation, the creation of bank money can be reversed, because of the credits that are cancelled without being renewed and because new credits are not granted either. Everything seems to be conspiring, since now the money that is being saved cannot find anyone to borrow it and return it to the economy as deficit spending.

Once the destruction of bank money begins, the deflationary environment feeds back and makes any reversal of the economic situation very difficult. The economy inevitably deepens the recession because savings not only does not stop, but increases. This is what we in the Financial Theory of Growth have called "the savings problem", because the credit crunch is not created by the credit crunch, but by excess savings, which cannot be invested.

Savings and credit compete for scarce investment, with the former literally choking the latter and causing a credit crunch.

In summary: The Growth Equation provides a very good explanation of the economic cycles to which monetary economies are subjected:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = -[Ah^{+}(t) + Ah^{-}(t)] \qquad \begin{cases} Ah^{+}(t) > Ah^{-}(t) \rightarrow & \Delta PIB(t) < 0 \\ Ah^{+}(t) < Ah^{-}(t) \rightarrow & \Delta PIB(t) > 0 \end{cases}$$

In particular, it is possible to establish a criterion (*the credit criterion*) to know when an economy is in recession:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = Ah^{C}(t) - Ah^{S}(t) \xrightarrow{\frac{d}{dt}PIB(t)<0} \boxed{\begin{array}{c} \underline{Crisis\ Crediticia} \\ \downarrow \\ Ah^{C}(t) < Ah^{S}(t) \end{array}}$$

Or to put it in words, when the flow of credit becomes negative (it is less than the flow of hoarding), the destruction of bank money begins and the economy inevitably enters a recession. The time from when the criterion is met until *GDP* starts to notice the decline is about 6 months (the inverse of Fisher's constant).

On the crisis of change.

One of the truisms that economists working for private universities in the US have managed to overlook is the large number of credit crises that have been occurring over the last 50 years. As is often the case in economics, anything that does not appear in the textbooks and journals published by private universities in the US does not exist, and apparently, a crisis that does not affect the US is not a crisis worth explaining, and therefore does not exist.

In spite of this, the truth is that there has been an endless succession of exchange rate crises from which very few countries have escaped without being affected by a strong and traumatic devaluation of the currency and which need to be explained. The Madrid Theory explains the exchange rate crisis with exactly the same mechanism used to explain the credit crisis, with the aggravating factor that in this case the Central Bank cannot resort to asset purchases to avoid it, since almost all countries have committed themselves to maintaining the free circulation of capital without understanding that this is impossible to do in a monetary economy in which you cannot manufacture the reserve currency.

As its name suggests, the dollar is called the reserve currency because when there are problems savers keep their liquidity in the reserve currency. Therefore, when a Central Bank manufactures money with the intention of buying assets to avoid a credit crisis, it is inevitable that the liquidity in its own currency will in turn be exchanged for the reserve currency, which the Central Bank will obviously never be able to satisfy, unless it prevents the free movement of capital.

To sum up. For any country, it is suicide to maintain the free circulation of capital, because it will inevitably enter into an exchange rate crisis. When we look at the world economy, we can see very well that most countries have gone through frequent exchange rate crises, with the only exception of some large countries with a very favorable foreign trade balance, such as Germany. Basically, when there is a flight to liquidity and the Central Bank creates money to buy assets of all kinds, it cannot avoid that all the manufactured money is exchanged for the reserve currency, creating an exchange rate crisis. Or in other words, when there is free circulation of capital, it is inevitable that a flight to liquidity will end in an exchange rate crisis.

3. RECOMMENDATIONS DERIVED FROM THE MADRID THEORY.

The above brief summary of the most important statements that have been made throughout the treatise, and which we have named as the Madrid Theory, show us in a very clear way a vision of economics very different from the paradigm propagated in their textbooks by economists working for private universities in the USA. We believe, therefore, that it is very important to expand separately on some aspects that are deduced from the Madrid Theory, but which are outside the conclusions that are strictly derived from the mathematical structure of the theory and which, therefore, enter the thorny field of political economy and opinion. Or in other words, we will list a set of recommendations that, although they are very clearly deduced from the Madrid Theory, are not inevitable conclusions and fall into the field of political opinion.

On public spending.

If we understand that public spending is done because the citizenry has decided that certain goods and services should be paid for jointly and provided in a public manner, as is done with health care, sewage or roads, then it is difficult to understand why the amount of money collected through taxes does not cover the expenses necessary to satisfy the proposed public services.

It is incredible to hear economists working for private universities in the United States reasoning that tax revenues should be reduced because they consider them to be excessive, while at the same time complaining that public services are not being provided properly. These are the same economists who claim that the public deficit should be reduced, at the same time that they claim that tax collection should be reduced, without ever saying which public services should be stopped because of the reduction in tax collection.

You don't need to be an economist or have a PhD in economics to understand that you must first decide what services are publicly provided (in a common way) and then, logically, you must calculate what level of taxes should be set to raise the money needed to pay for them.

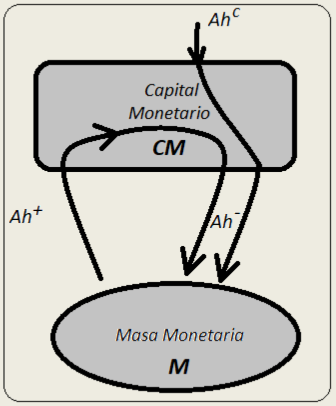
WHO BENEFITS FROM THE PUBLIC DEFICIT? It is not very difficult to know. Let's take as an example a hypothetical society in which the following two statements are true:

a) Taxes are levied in proportion to the income of each citizen. Specifically, let us assume that the total cost of providing public services requires a one-time tax equal to 50% of each person's income.

b) Society is divided into two parts, those who earn on average 200,000 euros per year (the rich) and those who earn on average 20,000 euros per year (the poor).

In such circumstances, and although we do not know the number of rich citizens or the number of poor citizens, we do know that in the event that public spending is financed in its entirety without resorting to borrowing, the former pay 100,000 euros each in taxes and the latter 10,000 euros.

Let us suppose now that the economists of the private universities of that society convince the citizens that the best thing for everyone is not to collect so many taxes and to borrow the money that is not collected, but which is high enough to satisfy the public services. Specifically, let us suppose that we move from the single rate of 50% of income to a rate of 25%, borrowing the rest, but from whom, within society, from whom can we borrow the money needed to meet public spending?



Let's look once again at the attached figure where the flows of savings and dissaving between the Consumer Market and the Capital Market are shown.

It is easy to conclude that the government can only finance the deficit in two ways, with money that comes from savings or with money that comes from bank credit, although in aggregate terms it is impossible to know from which of the two items the government is borrowing money. Nevertheless, it is very clear that, in aggregate terms, the government is borrowing from citizens the money they have saved thanks to the tax cut.

In the economics of the example, rich citizens will be able to lend the government the 50,000 euros they save from the tax cut, while poor citizens will be able to lend the government only 5,000 euros. When only a part of the money from the tax cut is saved, then the savings made by citizens Ah^{+} *does not cover the public deficit and the banking system will create new money and lend it to the government.* Ah^{C} *and lend it to the government.*

The important thing to understand is that, in aggregate terms, wealthy citizens gain when public spending is covered by borrowing rather than by tax revenues, since it is the citizens who pay the most taxes who save the most. In the example, the rich citizens are not only saving 50,000 euros a year in taxes, but the government will be giving them interest on them from then on. Or in other words, the government is creating debt securities whose income it pays with tax revenues.

When we look at the amount of public debt reached by the different countries of the world, the nonsense acquires Dantesque dyes. In 2019, the public debt of the USA reaches 20MM dollars, the debt of the European Union is higher than 10MM and the debt of Japan reaches 10MM euros.

The direct consequence of increasing public debt is to create a government-backed income supported by public revenues, which, unsurprisingly, is usually part of the savings of the wealthiest citizens.

It is a truly burlesque situation in aggregate terms, since citizens are being asked to borrow the money they save thanks to the tax cut. This can only benefit people with higher incomes, who see the money they would otherwise have had to pay in taxes converted into savings.

For example, the US has a public debt of around 100% of *GDP*, which indicates that the federal government has forgiven in taxes to its richest citizens approximately 20MM million dollars, which, when updated, reaches the sum of 35MM dollars. But the most serious thing is not only that, the most serious thing is that it pays interest on them, which is the last straw. What can economists working for private universities in the U.S. claim to justify such nonsense? Even worse is the situation in Japan, whose government has an accumulated public debt that reaches 250% of its *GDP,* what can justify such a public debt?

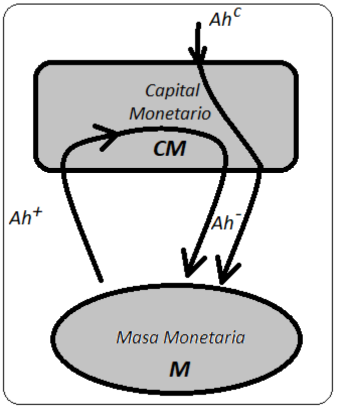
When we understand that all that public debt is money that should have been raised through taxes and when we hear economists who call themselves progressives say that they are in favor of increasing the public deficit even more, then it is easy to understand the state of total insanity that the economy has entered.

In short: It cannot be justified in any rational way that the public expenditure that the citizens have decided to assume jointly is not covered with money collected from taxes and that one has to resort systematically to indebtedness to finance it. Therefore, it is desirable that public expenditure should always be made with money collected from taxes. On the other hand, any occasional imbalance that the government is forced to assume by resorting to borrowing must always be done with specific objectives and separately from the collection of taxes to finance public spending. Therefore, the fact that it appears in the European Constitution that national governments cannot have a deficit of more than 3% of GDP and must keep public debt under control is always good news.

<u>On Keynesian fiscal policy</u>.

In economics, the term "Keynesian fiscal policy" is usually used to refer to the increase in the public deficit with the intention of avoiding the savings spiral into which the private sector enters when there is a threat of a credit crisis, which has its logic. Let us note that, in aggregate terms, Keynesian policy achieves two very important objectives:

1) It returns private savings to the economy by borrowing and spending them.
2) It restores the growth of bank money that the private sector has stopped making, by maintaining part of the deficit spending with bank credit.



This is shown very clearly in the attached figure. There we see that the flow of savings can be returned to the economy when the government borrows and spends it Ah^+ can be returned to the economy when the government borrows and spends it in deficit. Not only that, the government deficit spending must be large enough so that, in aggregate terms, a part of it has to be met with bank credit. Only in this way, it can be guaranteed that the flow of dissaving Ah^-covers the savings and bank credit necessary for the growth of the economy. When we assume that there is no hoarding and $Ah^S = 0$we have:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = -[Ah^{+}(t) + Ah^{-}(t)] \; = Ah^{C} > 0$$

In this sense, Keynesian policy is ideal, since deficit public spending takes care of repaying the part of private savings not borrowed by the private sector itself, as well as ensuring that bank credit is sufficient to guarantee the growth of the money supply.

But it is important to be very clear that the public deficit is unsustainable over time, at least in the amounts currently being assumed (Japan already has a public debt close to 2.5 times the GDP), due to the generalized reduction of the tax rate on the income of the richest people, which aggravates the savings problem instead of solving it and forces, what is called Keynesian policy, to maintain unsustainable levels of public debt.

In short: Keynesian fiscal policy is the policy that uses deficit public spending to return money from private savings to the economy. Which would be an excellent idea but for the fact that the increase in public debt becomes unsustainable over time. Moreover, the problem that saving creates is compounded when the public deficit is made because of a tax cut, as it contributes to the amount of money being saved being greater than it would be without the implementation of the policy. We think, and this is confirmed by the Financial Theory of Growth, that there is no reason to think that an absurd tax reduction will prevent deflation due to excess savings.

About the interest rate.

As stated in the Financial Theory of Capital, the interest rate is the reference used by the Capital Market to determine the price of capital goods, so it would be highly desirable that its value remains unchanged, and if possible above 3 percent.

However, at present, central banks use the interest rate as the basic variable to control the amount of money created in the economy and thus avoid both inflation and deflation. This is logical, since the interest rate makes it more expensive or cheaper to maintain bank credit, which is where all the bank money in the economy comes from. Therefore, the higher the interest rate, the greater the incentive to repay the bank credit and destroy the money that was created with the credit. And the same will happen when the interest rate on credit falls, it will be cheaper to maintain the credit with which the bank money was created.

However, manipulating the interest rate to control the amount of bank money in the economy is not a good idea because the value of capital goods depends inversely on the interest rate, as stated in the three laws of capital. For example, according to Piketty's Law, the value to which aggregate capital tends within an economy is:

$$K = \frac{\langle\alpha\rangle \cdot PIB}{i} \qquad \textit{Piketty's Law}$$

We see that when the interest rate is close to zero, the imprecision with which the price of capital goods is determined is very high. This can be easily checked by deriving Piketty's law with respect to rent:

$$\Delta K = \frac{\langle\alpha\rangle}{i}\Delta PIB \rightarrow \begin{cases} i = 5\% \;\rightarrow\; \Delta K = 20 \cdot \langle\alpha\rangle \cdot \Delta PIB \\ i = 1\% \;\rightarrow\; \Delta K = 100 \cdot \langle\alpha\rangle \cdot \Delta PIB \end{cases}$$

The expression tells us how much the added value of capital goods increases when the income they produce increases, for a given interest rate. It can be seen very clearly that when the interest rate is 1% the changes in the valuation of capital are 5 times greater than when the interest rate is 5%. In other words, the lower the interest rate, the more uncertain the calculation of the capital value and the more unstable the Capital Market will be.

In summary: The function of the interest rate is to serve as a reference for valuing capital goods (goods that produce income) and it should remain unchanged and above 3 percent. Therefore, its use for monetary policy should be avoided.

About taxes.

Here we will distinguish between two types of taxes, those that are intended to pay for public services and those that are intended to develop fiscal policy.

TAXES TO PAY FOR PUBLIC SERVICES. The basic function of taxes is that citizens contribute, jointly and according to their income, the money necessary to pay for the services they have decided to provide in common. We understand that the decision of which are these services of public character, the citizens decide it, because here we start from the base that the political system with which the society is organized is the democracy. Universal and free education, universal and free medical care, universal and free access to justice, are an example of the many services that citizens can access free of charge and that can be managed publicly and financed through taxes. For all these reasons, there is no economic or political justification for resorting to indebtedness because revenue is insufficient to meet public spending, thus violating the citizens' mandate. When a government allows deficit spending, it is because it is using taxes for a function different from that of financing common expenses, and, therefore, it is disobeying the citizens.

In this sense, it seems a good idea that the income tax rate be progressive, so that those who obtain more benefits from the economic system, are also those who contribute more to maintain it, as it is stated in the articles of the Constitution. Nor can it be understood why exemptions that alter the progressiveness of taxes are proposed.

<u>TAXES TO AVOID THE CREDIT CRUNCH</u>. Although taxes should only be levied for the purpose of financing public services, and no exemptions should be allowed, they are ideal for avoiding excess savings. The growth equation makes it very clear that savings Ah^{+} must be returned to the economy as expenditure $Ah^{-}$to the economy if the economy is to avoid going into recession:

$$\frac{1}{k_F}\frac{d}{dt}PIB(t) = -[Ah^{+}(t) + Ah^{-}(t)] \approx Ah^{C}(t) \xrightarrow{\frac{d}{dt}PIB(t)<0} \boxed{\begin{array}{c} \underline{Crisis\ Crediticia} \\ \downarrow \\ Ah^{C}(t) < 0 \end{array}}$$

So a very obvious way to solve the problem that is created when people save too much without sufficient investments on credit to absorb it, is to penalize income.

It must be understood that it is not possible to penalize savings directly because it is not possible to distinguish savings from investment, since both are the same thing. The only thing that can be done is to penalize income in a very progressive way because, in aggregate terms, saving is greater the higher the income (Keynes' Law of Saving). Nor does it make much sense to favor investment for the same reason, because it is not possible to distinguish investment from savings.

The question that may arise if an extra, very progressive, income tax is imposed is what to do with the money collected. Of course, it should not be used to pay for public services, since that is not the purpose for which it was collected. We think that the best thing to do is to use them to grant credits at a negative interest rate so that investments are made in sectors of interest, such as, for example, for ecological reconversion.

In summary: It would be desirable to separate the need to finance public services from the need to limit savings in order to avoid a credit crunch. We believe that "extra" money raised through fiscal policy should never be used to maintain or increase public spending, because that is not the reason for which the money is raised.

On the 2 percent inflation rule.

One of the most important statements made by the Madrid Theory is that it refers to the existence within a monetary economy of two different types of goods, consumer goods and capital goods, which are purchased in different markets. Therefore, it is important to point out that when we talk about inflation in economics we only refer to the rise in the price of consumer goods, without taking into account anything that may be happening with the price of capital goods.

Although there is much evidence that inflation is an autonomous process, which has little or nothing to do with the increase in the money supply, it is also true that an increase in the quantity of money which forms the money supply produces price inflation when it is not accompanied by a rise in output. The latter is what follows very clearly from the growth equation:

$$\frac{1}{k_F}\frac{dPIB}{dt} = Ah$$

The equation predicts that when a quantity of money is injected into the money supply, the nominal consumption of the economy increases. Part of the increase in consumption will be real and will be a consequence of the increase in the quantity of products purchased, but it is certain that another part will be solely inflationary and will be a consequence of the rise in prices. Therefore, when inflation is to be avoided, what is done is to limit the growth of the money supply by limiting the flow of credit, which is achieved by increasing the interest rate of money.

But what is the level of inflation that should set off the alarm bells that would make it advisable to increase or decrease the amount of bank money created with credit?

It is not easy to set a concrete level, but one idea that does not seem far-fetched is to increase bank money when the amount of credit when the inflation rate threatens to fall below the real growth rate of the economy (at least, as long as the inflation rate does not exceed 3 or 4 percent):

$$\pi \geq g \qquad\qquad \textit{monetary target}$$

However, in Europe, the Central Bank sets an absolute level for inflation of 2% without taking into account the value of the other variables, which makes no sense at all. We believe that being guided exclusively by the country's inflation rate can easily lead to the wrong conclusions, and is a folly that can cost the country dearly.

A BAD EXAMPLE. Let's analyze the Spanish economy during 2019.

$$\left.\begin{array}{l} PIB\ en\ 2019 \ldots\ldots\ldots\ldots\ldots\ldots\ldots 1.244.757\ M.€ \\ Crecimiento\ nominal\ 3\% \ldots\ldots\ldots 37.342\ M.€ \\ Crecimiento\ real\ 2\% \ldots\ldots\ldots\ldots\ldots 24.895\ M.€ \\ Déficit\ público\ \ 3\% \ldots\ldots\ldots\ldots\ldots 37.342\ M.€ \end{array}\right\}$$

It is very clear that this is a near deflationary economy, where inflation is falling below growth, indicating that not enough money is being injected into the economy.

Spain's situation is complicated. On the one hand, Spain is obliged to limit deficit public spending to 3% of GDP by the EEC Stability Treaty, and, on the other hand, private credit is still scarce, probably due to the accumulation of debt that has been dragging on since 2008. Be that as it may, the monetary injection from public spending and private credit seems to be insufficient to cover the growth needs of the Spanish economy, which is a crime against humanity when we observe that the country has a youth unemployment rate of almost 30 percent.

If we now look at Spain's trade balance, we see that Spain has a surplus, which indicates that Spain does not currently have structural problems limiting its growth. It is very clear that there is an unjustifiable shortage of money that is hampering the growth of the Spanish economy because money must be leaving, surely to meet the payment of private debt, even more so when we see that unemployment in Spain is around 13 per cent.

There is no possible justification for leaving the monetary injection in the hands of private Spanish banks which, as is logical, have their own accounting difficulties which force them to put their personal interest above the general interest. In this sense, the responsibility of the European Central Bank to guarantee that money is injected into the economy of European countries in the *necessary amount is very clear, without delegating this function to a banking system that may be "touched" and unable to carry out this function.*

If Europe wants to one day become Europe, then the European Central Bank will have to be the European Central Bank.

In summary: One of the priority functions of the Central Bank's monetary policy is to ensure that the necessary amount of money is being created to maintain economic growth. To this end, the most important criterion used by the Central Bank to know if enough bank money is being created to allow growth is to look at the value reached by the local inflation rate of money. If one had to give a blind rule to follow, one that cannot hurt the economy as long as economic growth is not too great (< 4%), it would be the following:

$$\pi \geq g \qquad\qquad Objetivo\ Monetario$$

In other words, *"the central bank must ensure that enough money is injected into the economy to keep the rate of inflation above the economy's real growth rate.* π *above the real growth rate of the economy, when growth is not very large (* g *when growth is not very large (*$g < 4\%$*)".* The rule can only give problems when the real growth rate is very high, so it is interesting that the inflation rate does not exceed 4% or 5%, although the figures are far from precise.

On the problem of Capital Market liquidity.

The Capital Market is very different from the Consumer Market. While the flow of exchanges within the Consumer Market fulfills the monetary equation and needs a specific amount of money to function, the Capital Market functions as a barter market where money is just another asset and where no specific amount of money is needed to function. In this sense, arbitrage within the market makes a debt security equivalent to any other asset in the market, so that the amount of money within the Capital Market depends only on the desire of savers to have more or less money hoarded as an asset, without that amount having any relation to a concrete flow of exchanges within the market. Therefore, any liquidity problem that arises within the Capital Market does not have its origin in the lack of money to carry out exchanges, but in the desire to keep a part of the savings in the form of money.

When we look at the US and the year of 2019, the distribution of savings among the different capital assets, we can realize that the liquidity needs in the Capital Market can become immense:

$$\begin{array}{l} \textit{bienes de capital} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 120\ MM \\ \textit{deuda agregada} \begin{cases} \textit{bonos} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 40\ MM \\ \textit{capital monetario} \ldots\ldots\ldots\ldots\ldots\ldots\ldots 10\ MM \\ \textit{masa monetaria} \ldots\ldots\ldots\ldots\ldots\ldots\ldots..10\ MM \end{cases} \end{array}$$

IF all savers, in a panic, decided not to roll over debt securities and keep their savings liquid, there would not be nearly enough money in the economy to satisfy the \$40MM+ owed. Worse, since all capital assets are equivalent, savers may also wish to liquidate the remaining capital assets and the over \$120MM held by Americans would have to be exchanged for money, which would clearly be a problem with no solution, unless the Central Bank acts.

Unfortunately, "flight to liquidity", which is the name given to the situation that occurs when all savers sell their assets because they believe that their price will fall in the future, is a "self-fulfilling prophecy" that can occur at any time, for no other reason than the widespread belief that such an event will occur. In fact, it is a phenomenon that has occurred on countless occasions, in all countries of the world and at all times, and it is inevitable that it will happen again, unless it is remedied.

Regardless of whether the stock market panic is more or less justified by the economic situation, the only certainty is that a flight to liquidity can only be stopped if the Central Bank acts as buyer of last resort, in a very energetic manner and as long as the panic lasts. Only by agreeing to buy all the securities that savers have put up for sale can the price collapse be prevented.

Very recently, in March 2020, the problem of liquidity in the Capital Market was once again very clearly demonstrated when, in just one week, the IBEX35 fell nearly 40% without the European Central Bank doing anything to prevent it.

Does it make sense for something like this to happen? Does it make sense for a country's economy to collapse because the European Central Bank does nothing? Does it make sense for people's savings (even if they are the savings of the rich) to vaporize because of a clear panic situation that is no different from the banking panics that plagued economies throughout the 19th century? Why hasn't the European Central Bank acted, as the Federal Reserve has done in the US?

Liquidity within the Capital Market is a very serious matter that can ruin a country much more quickly and violently than a conventional war or a few atomic bombs. If Europeans want Europe to persist over time, the European Central Bank needs to intervene forcefully and take care of providing liquidity to all markets in Europe, without exception.

All this leads us to ask why the Central Bank does not take charge of providing liquidity to the Capital Market, not only in exceptional situations, when it is very clear that no one else can do it, but also in normal situations when commercial and investment banks do not seem to have any problem in providing liquidity to the market by granting credit.

Here we are going to propose the procedure to be followed by the Central Bank to provide liquidity to the capital market all the time, preventing it from sinking and speculation.

<u>The "guaranteed purchase" of assets</u>.

The Central Bank is to provide liquidity to the Capital Market through "guaranteed purchase of securities". The basic idea is that any holder of a listed asset can sell it to the Central Bank at a given price related to its price at the time of sale. Specifically, and as an example, the rule to be followed by the Central Bank could be the following:

> *"The Central Bank buys any amount of the publicly traded securities at 3% below the price the securities were trading at one week prior to their sale."*

Or in other words, the Central Bank intervenes and buys any asset whose price falls 3% below the price at which it was trading a week earlier. This simple rule will forever prevent any stock market panic and give stability to the Capital Market in the same way that the bank deposit guarantee eradicated bank panics many decades ago. The rule is complemented by another rule to guide the sale of securities by the Central Bank:

> *"The Central Bank will put any security it holds up for sale when its price is 2% higher than the price at which it was purchased."*

This makes it a business to give stability to the capital market. In fact, this is what large institutional investors normally do, and they only stop acting this way, in the face of a generalized flight to liquidity, when the money they manage is already insufficient. Let us note that the Central Bank has losses with those securities that never recover the price at which they were bought plus 2%, because they are never sold, but we think that the losses will be more than compensated with the 2% profit that it obtains from those securities that have recovered the price and are sold. A rounded business.

The advantages of the existence of the "guaranteed purchase" are very clear:

1) Financial panic is avoided immediately, since the sale of securities for fear that their price will fall at a rate of more than 3% per week cannot occur. This is the same thing that happens when the Central Bank guarantees the money in the bank deposits of savers, and bank panic ceases to occur because savers can withdraw the money deposited without loss (although this does not prevent banks from continuing to fail).
2) There is no danger of moral hazard because no specific assets are chosen, only those whose price falls too fast and meet minimum transparency requirements in their management, something that the Central Bank can always enforce through regulation.

Note that the only danger faced by the Central Bank is that the securities are bought above their real price, so the difficulty of "guaranteeing the assets" is to be found in the difficulty the Central Bank has in determining the Uncertainty of each of the assets it buys. $\aleph_j$ of each of the assets it buys. But that is precisely what Piketty's Law tells us, at least in aggregate terms. According to Robinson's 1st Law:

$$k_j = \frac{\langle r_j \rangle}{\aleph_j \cdot i} \qquad \rightarrow \begin{cases} \langle r_j \rangle \rightarrow renta\_capital \\ \aleph_j \rightarrow Incertidumbre \\ i \rightarrow tasa\ de\ interes \\ k_j \rightarrow precio\_capital \end{cases}$$

Where $\langle r_j \rangle$ is the after-tax income of the capital asset. For a particular asset, If the market has accurately valued any capital good, the sharp fall in its price will most likely be attributable to the lack of liquidity in the market, so the Central Bank's purchase of the capital good will be correct. Moreover, in aggregate terms, the Uncertainty Factor is worth "1", so the Central Bank can stop applying the rule when it deems that it is in a bubble because $\overline{\aleph}$ is less than "1".

In summary: The Central Bank must be the one to provide liquidity to the Capital Market in a transparent manner and declaring when, how and where it will intervene by buying securities. Except in very exceptional situations, the amount of money held as money (monetary capital) is very small, so that the liquidity of the Capital Market cannot be satisfied unless the Central Bank acts as a buyer of last resort, especially in panic situations. Here we propose that the Central Bank should permanently use a concrete mechanism, "the guaranteed purchase of securities", to prevent any rapid collapse of the stock market (although in order to be able to do so, it is necessary to prevent the free movement of capital).

On the creation of credit money.

When analyzing the privilege of bank money creation that the Central Bank has granted to commercial and investment banks, it becomes very difficult to justify two things, the immense amount of money that the banks earn thanks to seigniorage and the immense profits they obtain from providing liquidity to the Capital Market.

Furthermore, it is clear to no one that, together with these benefits, there are two other no less important ones. The first is the ability of banks to decide which sectors of the economy to invest in, by deciding which sectors to lend to and which not to lend to, which implies a high "moral hazard" that is also very difficult to justify. Second, the ability to manipulate asset prices by having the ability to grant loans for leverage in certain assets and not in others.

No one doubts that lending money, especially when it is money created out of nothing, implies a cost that must be assumed by the one who receives the money and backs it, and that can very well be charged through the interest rate of money. But to think of credit in this way, as if it were only a service that has to be paid for, is a major mistake that forgets the important function that credit has in today's economies, since it is credit that directs growth and its control makes it possible to control which sectors grow and which sectors do not grow. Credit is like water in a desert region, and whoever manipulates it is the one who really runs the region's economy. Therefore, it is necessary to separate the banking business from monetary creation, since both can have different interests without reproaching anyone.

Specifically, what we propose here is that the Banking System should be limited in the total amount of bank money it can create to 25% of the value of *GDP*, which is approximately half of the money the economy needs to function. Leaving to the Central Bank the responsibility of granting the rest of the credit, the other half of the money needed to maintain the Consumer Market, following political and environmental reasons.

In summary: It would be desirable to separate the "management" of money from the "creation" of money, which is currently done by commercial and investment banks without it being possible to separate one function from the other. We propose to limit the amount of credit that can be granted by the banking system to no more than 25% of *GDP*, which is about half the amount of money needed for the Consumer Market to function, and let the rest of the credit be granted by the Central Bank on a policy basis.

The above collection of statements is a fairly coherent summary of the consequences that follow from the financial theory of capital and the set of basic equations with which the monetary economy is described, and which we think reflect quite accurately the problems and contradictions created by savings and credit. It should also be clear that, although we have not constructed a theory of trade, all the statements that have been made remain valid, both for an open economy and for an isolated economy.

4. PIKETTY'S PROGRESSIVE TAX ON CAPITAL

At present, the fiscal policy used in almost all the countries of the world to avoid credit crises resorts to monetary injection from deficit public spending, which is usually called "Keynesian policy", but with the added absurdity of lowering progressivity and the amount of income tax with the idea of activating the economy, which aggravates the problem created by savings instead of solving it. This policy, although it is true that it avoids recession because it manages to return the money extracted by savings with deficit public spending, has the serious disadvantage of increasing without limit the accumulated public debt, and with it, the cost of debt service (Japan has been using this fiscal policy for more than two decades and its public debt has already reached more than 2 times the value of its *GDP*).

Fiscal policy is always accompanied by monetary policy, especially when the public debt burden is so high that it prevents the government from continuing to use deficit public spending to absorb savings. The Central Bank then resorts to lowering the interest rate on money, which lightens the amount and payment of interest, not only on public debt, but also on private debt. For example, for almost a decade now, the income paid on public debt in the richest countries (Europe and the USA) has been almost zero or even negative.

This monetary policy is also exhausted when the interest rate reaches zero, and despite the low cost of maintaining credit, the private sector does not ask for credit to make investments. It is then that the Central Bank resorts to monetary creation to buy public debt, but even this mechanism runs up against the limit of the amount of debt that can be monetized and is exhausted.

These three policies complement each other sequentially. First the public deficit is run up, then, when it is exhausted, the interest rate is lowered and, finally, the debt, both public and private, is monetized, bringing the economy to the edge of the precipice, where "film noir" will soon make its appearance. The Madrid Theory that we have developed in these pages demonstrates, beyond any reasonable doubt, that these three policies are not sustainable over time, and sooner or later they will be insufficient to stop the credit crisis.

The basic problem of the rich countries' economies today is their desire for wealth, i.e., the existence of an excess flow of savings that has nowhere to accumulate because capital goods grow very slowly. According to the Financial Theory of Capital, capital goods are not created by the accumulation of savings, so savings may very well exceed the growth of capital, which automatically creates a credit crisis:

$$\Delta\textit{(Savings Flow)} > \Delta\textit{(Capital)} \quad \rightarrow \quad \textit{Credit Crisis}$$

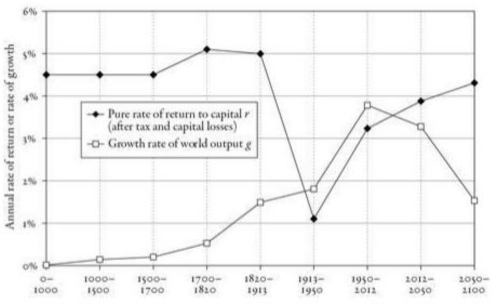
Precisely, the expression used as a criterion to determine when the economy enters a recession is the *"Credit Criterion*":

$$Ah^C(t) - Ah^S(t) < 0$$

Which says almost the same thing, because the difference between the flow of credit and the flow of savings is proportional to the new capital created by investment. Therefore, the only coherent fiscal policy is to make the tax rate on income, both from labor and income, more progressive, while raising its amount to attack that which is producing the problem, which is none other than savings:

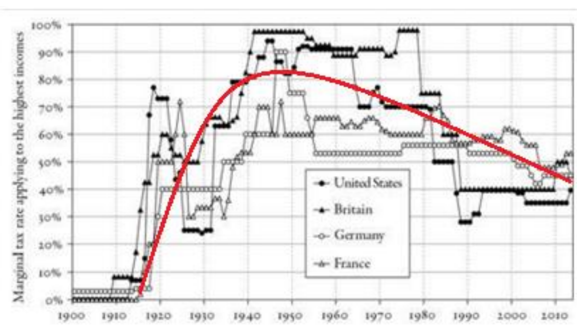
"By increasing the marginal rate on income, both from labor and capital income, you limit disposable income and limit the amount of money that can be saved, attacking the heart of the problem, without undermining growth."

In Piketty's book there are two graphs that clarify very well why raising the marginal rate on income really solves the problem created by the excess of income that is not spent. They show the evolution of the marginal rate on income from capital, not including those on income from labor, but the consequences derived from them are generalizable:



Tasa de retorno del capital y tasa de crecimiento

(Piketty, El capital en el siglo XXI)



Evolucion del impuesto marginal sobre el capital
(El capital del siglo XXI)

The graph on the left shows the sharp decline in the average after-tax rate of return on capital at the beginning of the twentieth century, from 5 percent to 1 percent after the end of the Second Great War in the middle of the twentieth century, due to the increase in the tax rate on capital. Thereafter, the curve shows very well how the rate of return on capital gradually increases, reaching levels close to those reached during the eighteenth and nineteenth centuries, due to the gradual decrease in the tax rate on capital.

Together with the rate of return on capital, Piketty also shows the changes in the tax rate on capital, which allows us to corroborate the Financial Theory of Capital beyond any reasonable doubt. The graph on the right shows the curve with the changes of the marginal rate on capital income and inheritance taxes and the inverse correlation that it has with the valuation of capital goods made by the markup is quite clearly seen. It can be seen how the progressive increase in taxes on the highest income earners, which began at the beginning of the 20th century, reaches its climax at the end of the Second World War, and how, from then on, the constant decrease in taxes on the highest income earners increases the value of capital goods in aggregate terms (we have over-drawn the tax rate evolutions of the different countries in red for clarity).

The increase in tax revenues in the first decades of the twentieth century served to finance the increase in social services, and also to finance the preparations for the coming war, but the increase in tax rates on capital income and on capital itself did not prevent the impressive economic growth of the twenties, nor did they prevent the economic recovery of the United States during the mandate of Franklin D. Roosevelt well into the thirties. The graph also shows "The glorious thirty years" after the end of the war, which correspond to the top of the mountain of the tax rate curve, confirming that high rates on income, far from bringing down capitalism, make it flourish.

THE TEACHING OF ECONOMICS. We cannot fail to point out that the loss of progressivity of the income tax coincides with the commendable propagandistic work carried out by economists working for private universities in the United States since the 1970s, which not only made governments lower tax rates on capital income, but also left captive and disarmed the unions and workers' associations that defended and defend workers' wages. Both facts together raise the incomes of the richest people to the detriment of the less wealthy, since it is the people with less income who contribute more and more to pay them with their salaries, and it is the salaries that are gradually decreasing with respect to the income from rents.

The direct consequence is the increase in savings and the growing difficulty to return it to the economy when it does not grow fast enough. But it was not only taxes, it was the ideology that was to be transmitted from then on in education as an economic science.

Gradually the unions, which Franklin D. Roosevelt's policies strengthened in the 1930s, became irrelevant in the US, accused by economists working for private universities in the US of favoring unionized workers over non-unionized workers through coercion and violence:

"How can unions raise wages and improve working conditions for their members? Unions achieve their market power by gaining a legal monopoly on the provision of labor services to a given company or industry. Based on this monopoly, they force companies to offer wages, benefits and working conditions above the competitive level. For example, if non-union plumbers earn $20 per hour in Alabama, a union can negotiate with a large construction company for a $30 per hour wage for its plumbers. However, such an agreement is valuable to the union only if it can limit the company's access to alternative bids for work. Hence, under a typical collective bargaining

agreement, companies agree not to hire non-union plumbers, not to contract out plumbing services, and not to subcontract with non-union firms. Each of these measures helps prevent the erosion of the union's monopoly control over the plumbers who will work for the company. In some industries, such as steel and automobiles, unions have attempted to unionize the entire industry so that unionized workers in company A do not have to compete with non-union workers in company B. All of these steps are necessary to protect high wage rates from unions."

Samuelson, 2002

Well into the 21st century, Samuelson, the most prestigious economist ever to work for private universities in the U.S., was still teaching such patently false views about unions in the world's most widely distributed college textbook.

However, unlike the justification based on the need to limit savings that we have presented here, Thomas Piketty justifies on the grounds of "common utility" the convenience of returning to the progressive income tax that also worked during the war and the post-war period. Nor does it escape anyone's notice that the motive underlying our tax proposal is based above all on practical motives based on the convenience of avoiding the different savings that cause income inequality, while the underlying motive behind Piketty's proposal is fundamentally ethical, resorting in his argument to the spirit in which the Declaration of Human Rights was drafted in an attempt to justify it:

> *Men are born and remain free and equal in rights. Social distinctions can only be based on common utility.*
>
> *Universal Declaration of Human Rights*

Without wishing to downplay the importance of the ethical motivation behind Piketty's proposal, which we think is sufficient in itself to consider it completely valid, we make the observation here that the imperative need to return to the tax rate of the immediate post-war period is more than justified by the unquestionable decrease it will cause in private savings, which will prevent the need to resort to deficit public spending and to lower the interest rate of money to zero in order to prevent the economy from going into recession. Even more so, when we already know that both policies, deficit public spending and lowering the interest rate, cannot be sustained indefinitely.

We believe we have demonstrated the undoubted "common utility" of recovering the progressivity of the tax rate on income, regardless of whether it comes from work or income. Not only because those who benefit the most from society should also be those who help the most to maintain it, but also because they prevent savings, which, as we know, are very progressive with income:

1) It limits and decreases savings, preventing the credit crunch caused by excessive savings.
2) It makes society a little less unequal and a little fairer, since it decreases the income of the richest with respect to the less rich, by making them contribute more to the maintenance of public spending.

What remains to be analyzed now are the concrete consequences of Piketty's proposal:

Progressive tax on the property			**Progressive tax on the income**	
Multiple of average net worth	Annual property tax	Inheritance tax	Multiple of average income	Effective tax rate
0,5	0,1%	5%	0,5	10%
		20%		
5		50%	5	50%
	5%			
	10%			
1.000			1.000	
10.000			10.000	

The attached table shows the tax rate proposed by Piketty on income, the sum of income from capital and labor income, and on capital and inheritance:

- On income, sum of income from labor and capital.
- On the value of capital.
- On the inheritance of capital.

Let us analyze them briefly:

Progressive income tax. *Piketty proposes a tax on the sum of income from labor and income, very progressive and similar to that which existed in the immediate post-war period. What Piketty seems to be seeking with this tax is to limit the accumulation of capital by using the income that comes from capital income, but without preventing the already accumulated capital from being maintained.*

The rates shown in the table are very similar to those in force during World War II and 10 years later, and there is strong empirical evidence that such a tax poses no threat to the growth of the economy and, therefore, of capital. There are currently many countries, such as the Nordic countries or France, where taxes on income are very progressive and have a public expenditure that exceeds 50% of GDP, and this has not prevented them from being among the countries with the highest income in the world, neither then nor now.

Progressive tax on the inheritance of capital. *Piketty proposes a strong progressive tax on the inheritance of capital assets, which ties in very well with the idea of eliminating inequalities that have their origin in inheritance. That we should all have the same opportunities regardless of the wealth of our parents, leaving only our work and effort to be rewarded with a different income, is a very republican idea that goes very badly with the family nature of the human being.*

The logic used by Piketty is impeccable and difficult to refute when what is sought with such a strongly progressive inheritance tax is to equalize opportunities for all. But, a tax that can eat up 90% of the value of what we inherit makes no sense when we realize that the death of our parents alone can plunge us into poverty (in relation to the disposable income we had before their death). It is not logical for parents to spend all their income on the education and welfare of their children without any limitation, only to deprive them of that education and welfare when they die. The equality of opportunity that we should all enjoy cannot depend on our parents dying prematurely, before they can spend their wealth on us.

It makes neither sense nor logic. *A just society does not necessarily have to be an equitable society, and the rationality that is sometimes alleged to pursue equity is, many times, the place where our deepest prejudices and our deepest irrationality hide.*

The progressive property tax*. The value of the tax proposed by Piketty to record the accumulation of capital is so high that it eliminates any real possibility of accumulating capital above about 100 times the average capital, i.e., any accumulation above 20 million euros will be impossible.*

We believe that such a tax is out of place and will be interpreted by the citizens as a senseless spoliation. We think that such a tax is a mistake, and the citizens will never allow such tax rates to be imposed, regardless of whether they are poor or rich.

Piketty comments in "Capital and Ideology" that the property tax has had a long historical journey characterized by the strong controversies that preceded its introduction, because of the diversity of interests at stake. He quite rightly comments that the disparate outcome of that struggle of interests, is what explains why different capital assets are taxed so differently, even though they all yield the same income, and makes the keen observation that real estate always has a much higher tax rate than publicly traded assets, surely because the economic elite do not usually keep their wealth in real estate or real estate assets. It is usually the most economically disadvantaged class who have their meager wealth saved in a home, but that observation, while very accurate, is hardly sufficient to justify the high and progressive rate he proposes on capital assets.

What we are interested in pointing out with this discussion, prior to the exposition of an alternative proposal on a tax rate in line with the Financial Theory of Growth, is that:

The soul of capital is the rent it produces. "Capital is the price that the goods that produce an income have, and its value will be negative when the income it produces is negative."

We believe that the tax rates proposed by Thomas Piketty reflect his misconception about the nature of capital, which he considers to be the result of the physical accumulation of savings, something that is completely false. Piketty taxes capital as if it were something physical that has been accumulating, without realizing that large estates, such as the one held by Bill Gates, are the consequence of technological change and not of any physical accumulation of capital that Bill Gates has been doing with his savings. Bill Gates has not saved anything in his entire life, and people like him live on the income produced by the capital they own, but never saved that capital (no one can save the fortune that Bill Gates has).

Trying to prevent very talented entrepreneurs (and much luckier ones, as Gates was), from accumulating wealth whose origin lies in economic growth and in the financial nature of capital, and not in savings or in the investment they may have made as entrepreneurs, is a collective suicide that cannot be justified in rational terms. If capital is prevented from being created, it will not be created. When you prevent capital from being inherited, or when you want to prevent the formation of hereditary dynasties, you have to be careful not to kill capital assets in the process, because they are the prize that makes the economy grow.

5. INCOME TAX AS A SOLUTION TO THE SAVINGS PROBLEM

We can distinguish three good reasons why it is desirable for citizens, companies and institutions to pay taxes. First, because citizens want many services to be paid for with money contributed by all. Second, because they can be used in part to correct the inequality of wealth generated by the economy when left to its own devices. Third, because the credit crunch caused by savings can be prevented by making taxes very progressive.

Precisely because all these good reasons are mixed without discontinuity and without it being easy to separate one from the other, is why Piketty states, in "Capital and Ideology", that the reasons that justify what to tax and how to tax it is something that will always be subject to a strong social discussion. In this sense, and without wishing to close the subject, we are going to present three ideas that emerge from the financial theory of capital and that we consider to be true:

1) The value of all capital goods in an economy is given by the expression:

$$K = \beta \cdot k_F \cdot M \qquad\qquad \beta = \frac{\langle \alpha \rangle}{\overline{\aleph} \cdot i}$$

Where $\langle \alpha \rangle$ is the share of income in *GDP* after tax, and $\overline{\aleph}$ is "1" when the economy is growing steadily, which is most of the time.

2) The net annual tax rate on a given amount of capital goods, the sum of the tax on the income they produce and the tax on the fact of owning them, must not exceed the value of the annual income they produce, because if that happens, the capital would have no value for those who own it. The equation that marks the limit in aggregate terms, is:

$$A \cdot C_{medio} \cdot \gamma \geq A \cdot C_{medio} \cdot tasa_{capital} + A \cdot C_{medio} \cdot \gamma \cdot tasa_{renta}$$

   Where γ is the rate of return on capital, C_{medio} is the average capital per person and the product $A \cdot C_{medio}$ is the amount of capital that is taxed. The expression marks the amount of capital $A \cdot C_{medio}$ above which, with specific tax rates, the income it produces after taxes is negative and the capital will disappear in more or less time:

$$\gamma \geq tasa_{capital} + \gamma \cdot tasa_{renta}$$

3) Capital acquired by inheritance should be considered as legitimate as that acquired by saving, or that acquired by the revaluation of existing capital. Therefore, the rate to be applied to the increase of the patrimony should not depend on the concrete way in which the capital has been acquired.

Since we assume that any inheritance tax should also be levied on the savings made or on the increase in the market valuation of capital, our proposal does not contemplate any tax that depends on the different origin of the increase in assets, so that to avoid the inequality of income from the different inheritance, what we propose is an annual tax on the price of capital, so that for practical purposes it is equivalent to an inheritance tax.

Therefore, if we accept, as Piketty points out, that the only purpose of imposing a tax on the amount of capital is not to raise revenue to pay for public services, but to prevent the formation of dynasties that can sustain themselves indefinitely in the inheritance of capital, then the only source for financing public spending is a tax on income.

The accompanying table shows what we think would be a reasonable tax rate:

Progressive tax on the property			**Progressive tax on the income**	
Multiple of average net worth	Annual property tax	Tax on the increase*.	Multiple of average income	Effective tax rate

0,5	0%	0%
	0%	0%
5		50%
		50%
		50%
1.000		50%
10.000		50%

0,5	10%
5	50%
1.000	
10.000	

Includes savings, donation, inheritance and revaluation.

TAXES ON INCOME TO DEFRAY PUBLIC EXPENDITURE .

We start from the opinion that all public spending should be paid only by a very progressive tax on income, whatever its origin. The table on the right shows the different rates according to the total income of each citizen, the sum of wages and capital income. It is identical to the one proposed by Thomas Piketty, and we assume that it is sufficient to collect approximately 50% of *GDP*, which is the public expenditure of a country like France (the various subtleties that are always involved in the practical implementation of any tax system, such as VAT or corporate income tax, do not appear, because our intention is to give a general idea of the need to separate the tax to cover public expenditure from those other taxes that are imposed to prevent savings and which we think should be used for different purposes).

TAX ON THE AMOUNT OF CAPITAL TO PREVENT THE ACCUMULATION OF WEALTH.

The left-hand column shows the annual tax on the value of the accumulated capital. It shows a single rate of 2% which is not at all progressive and which only exempts from its payment those who have a capital of less than 2 times the average capital, which in France is currently 400,000 euros (average capital in France is 200,000E).

The function of this tax is to prevent the accumulation of wealth. That is why in the rightmost column, in gray, appears the equivalent rate of a one-off inheritance tax that would raise the same amount. In other words, we can choose between a 50% one-off inheritance tax or a 2% annual tax on the amount of capital owned, with the exemption indicated. In both cases, approximately the same amount would be collected (the calculation is not precise at all), but both rates would have approximately the same effect on the accumulation of the capital coming from the inheritance.

To see that the two rates are more or less equivalent, let us assume that all capital changes hands every 30 years (people do not yet live forever and we assume that all capital is inherited or donated every 30 years on average). If we want to collect the same, with an annual rate on the price of capital, as what is collected thanks to a 50% rate for donation or inheritance every 30 years (to prevent dynasties, as Piketty proposes), then the annual rate on capital will be approximately the same:

$$(1-x)^{30} = 0.5 \quad \rightarrow x \sim 2\%$$

That is to say, a 50% tax on the increase of capital by inheritance is equivalent to what is collected during 30 years by imposing an annual rate of 2% on the capital (30 years is the time we assume it takes for all the capital to change ownership). In the table it appears in the gray column.

Evidently, it is more practical to impose an annual tax of 2% on all existing capital (from 2 times the average capital), than to keep track of who inherits what and to tax punctually any inheritance or donation with a single rate of 50% that will not be understood by the citizens.

INHERITANCE TAX. An average tax of 50% on the value of any gift or inheritance will be very difficult to be accepted and understood by the citizenry (even by those who own less capital and are exempted from the tax), so we suggest that the levy be replaced by an equivalent annual tax of 2% on all existing capital. This will produce the same effect over time and will be much more understandable and much easier to pay as it will be spread over a period of time of about 30 years.

People are born with a strong sense of protection for their children, and we tend to go to great lengths to accumulate wealth with the sole intention of passing it on as an inheritance upon our death. People will not understand a heavy inheritance tax, and will look for any trick to avoid it, something that is relatively easy for those who have a lot of money but difficult to avoid for those who do not have so much. It is easier to avoid a one-time tax in time that occurs in the donation or inheritance, than a tax that extends over 30 years.

We believe that the discussion has no color.

Keep in mind that the 2% annual tax rate we are proposing guarantees that any estate above 2 times the estate will have paid the treasury its own value in about 50 years, provided that the collection of the tax does not decrease the value of the property on which it is imposed (and half its value in about thirty years when it does decrease it):

$$50 \text{ años} \cdot \frac{2\%}{anual} \cong 100\%$$

In other words, capital will be annihilated, in aggregate terms, in about a century when the rents produced by capital goods are not taken into account. But given that income taxes also include income and are strongly progressive, it will be very difficult for the great fortunes to perpetuate themselves thanks to the saving of the income they obtain from their wealth, so that the previous figure of 100 years will be considerably reduced. It will only be possible to benefit from the inheritance by spending it on consumer goods, which annihilates the capital and will prevent dynasties.

To see this, it is only necessary to calculate the effective income that an amount of capital produces to its owner after deducting the tax. The expression:

$$A \cdot C_{medio} \cdot \gamma \geq A \cdot C_{medio} \cdot tasa_{capital} + A \cdot C_{medio} \cdot \gamma \cdot tasa_{renta}$$

It marks the limit from which the rent will be negative for its owner because he will have to pay more money in taxes than he collects in rents. This is approximately between 2 and 5 times the current average capital of a country like France, as shown in the table below:

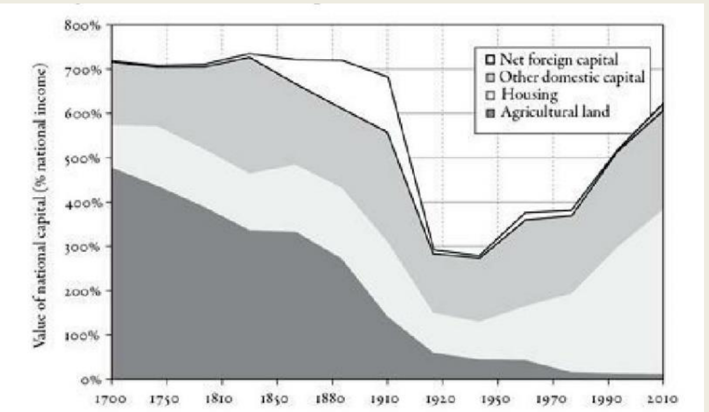
Effective income of capital			
Multiple of average net worth	Annual property tax	Effective income of capital $\langle\gamma\rangle$	Capital annihilation time (years)
0,5	0%	2,7%	-
	0%	1,8%	-
5		0,5%	-
		-0,8%	
		-1,1%	
1.000		-1,2%	
10.000		-1,7%	

To obtain it, we have assumed an average rate of return on capital goods of 3% (a figure very much in line with a slow-growth economy such as the current ones), and used the following expression:

$$A \cdot C_{medio} \cdot \langle \gamma \rangle = A \cdot C_{medio} \cdot (\gamma - \gamma \cdot tasa_{renta} - tasa_{capital})$$

Obviously, it is possible to raise the annual tax rate on capital above 2% without any problem, but it is not a good idea to make it progressive because the tax on income produced by capital is already progressive enough.

__The Piketty Curve.__ *We have already commented that there are many reasons to give Thomas Piketty the Nobel Prize. Without being the most important of them all, we like to point to the curve showing the evolution of the aggregate value of capital in relation to GDP as one of those reasons.*



Capital en Francia, 1700-2010

In fact, as we have already shown using the Financial Theory of Capital, the "hole" observed in the curve is a direct consequence of the increase in taxes on capital income, so that simply returning to the rate on income that existed in the post-war period would immediately return to the capital valuations observed in Piketty's graph, which are around 4 times GDP. Obviously, well below the valuation of capital today.

If, in addition, the increase in the progressivity of the income tax is completed with a tax on the possession of any type of capital of 2% per year, the value of capital would fall even further and the existence of hereditary dynasties would be almost completely avoided.

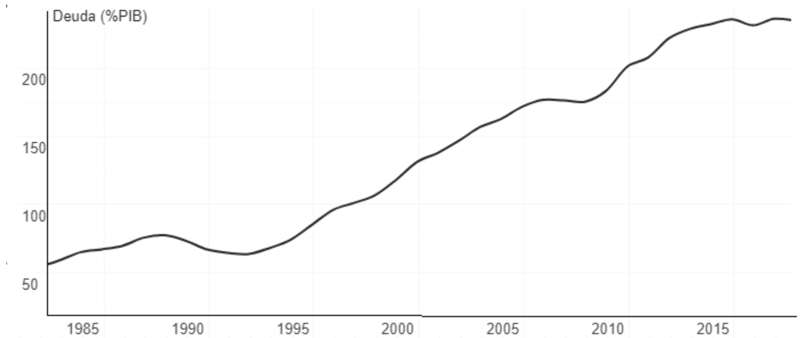
Thomas Piketty proposes to allocate the proceeds of the latter tax (2% per year on the value of the capital assets owned), to provide a minimum wealth to all young people when they reach the *age of 25, regardless of their income or the wealth they already have, something with which it is very difficult to disagree completely.*

TAXES ON INCOME TO LIMIT SAVINGS

It has already been shown that the reason why the economy goes into recession is because the flow of credit becomes negative and money starts to be destroyed from the economy, or if you prefer, because saving extracts more money from the money supply than is returned through dissaving. When technological momentum stops, credit investment stops as well, and it is then inevitable that savings become hoarded and end up causing a decline in *GDP* that feeds back into a credit crunch.

The fiscal policy currently being followed to solve the problem, which uses deficit government spending to absorb savings and return them to the economy as spending, is a solution that can be maintained as long as the amount of debt and interest payments do not become prohibitive, which will happen sooner or later, even when the interest rate is lowered. But, although lowering the money interest rate relieves interest payments and makes it possible to continue maintaining government deficit spending, it makes the valuation of capital goods unstable, so it cannot be kept low for long. Keynesian policy, at best, is a one-time solution that is not sustainable over time.

Consider, for example, what has happened in Japan. There, the interest rate has been close to zero for decades, and it is deficit public spending that is returning the savings made by the private sector. In 2020, Japan's public debt reached 250% of *GDP*, surely the highest in the world, and sooner or later it will be unsustainable even for Japan. In addition, an interest rate close to zero drives up asset prices to stratospheric heights, producing instability in the Capital Market valuation. Both situations will sooner or later make disaster inevitable and the Japanese economy will sink.



The attached figure shows the almost constant increase in Japanese public debt since the 1990s, while showing very conclusively that private saving is proportional to *GDP,* as Keynes suspected. We know that, within an isolated economy, the sum of public debt and private savings is zero in aggregate terms when there is no bank creation, and the evolution of Japan is very well approximated by an isolated economy that is not growing or growing very slowly. If we assume that the public debt comes from Japanese savings and very little from monetary creation, then:

$$deuda\ pública = \int_0^t Ah(s)\cdot ds \xrightarrow{Ah=\tau_s\cdot PIB} = \tau_s \cdot \int_0^t PIB\cdot ds \xrightarrow{PIB(t)\sim constante}$$
$$\approx \tau_s \cdot PIB\cdot\ t \rightarrow \frac{deuda\ publica(t)}{PIB(t)} = \tau_s \cdot t$$

That responds very well to what is observed in the graph, suggesting that savings have remained proportional to *GDP as* we have assumed. This allows us to easily calculate the annual savings rate of the Japanese that has been absorbing the government deficit on average. Assuming that the Japanese economy has been growing very slowly, as indeed it has been doing in recent decades:

$$\frac{ahorro}{PIB} = \tau_s \sim 10\%$$

It is very clear that Japan's situation is absurd and unsustainable. Japan's public spending has been absorbing the private savings that the Japanese have been making (surely to pay off mortgage debt) and has been returning it to the economy avoiding deflation. The net result of the process has not been the transfer of private debt to public debt as is often thought, but the senseless maintenance of a flow of savings of 10% of GDP at the expense of public debt, with no certainty as to what the nearly 10MM euros owed by the public sector have been spent on.

<u>PUBLIC SPENDING</u>. It is very clear that the function of public spending is to pay for the public services that the citizens have decided to assume in a common way, and it makes no sense to use it to absorb private savings by doing what is known as Keynesian fiscal policy, even when deficit public spending can be paid for with money made out of nothing (which does not change the problem created by excess savings).

What we propose here is to introduce a progressive income tax in order to limit savings, but clearly separating the financing of public spending from the fiscal policy aimed at avoiding the credit crisis, so that the rate used to finance public spending is clearly differentiated from the rate used to carry out fiscal policy. We think that public spending should be financed with the money collected from the income tax and without having to resort to the deficit, while, to solve the savings problem, what we propose here is that the Central Bank, based on the analysis of the economic situation, should separately indicate the extra annual amount that should be collected to reduce the excess savings that threatens to sink the economy.

Concretely, and since savings depend on income and we assume it to be proportional to it (Keynes' Law of Saving), the rate should be progressive with income. There is, therefore, no reason why it should be different from the rate already used to finance public spending, and what we propose, in fact, is that it should be the same.

The attached table shows the proposal:

Capital tax		**Income tax**		**Savings tax**	
Multiple of average net worth	Annual property tax	Income multiple medium	Effective tax rate	Multiple of average income	Effective tax rate ε *
0,5	0%	0,5	10%	0,5	ε·10%
	0%				ε·40%
5		5	50%	5	ε·50%
					ε·60%
					ε·70%
1.000		1.000		1.000	ε·80%
10.000		10.000		10.000	ε·90%

- The parameter *ε* is a positive number decided by the Central Bank depending on the situation.

The parameter ε is a positive factor decided by the Central Bank sufficiently in advance and according to the economic situation. The first table is the proposal for a capital tax, which is discussed later, but has nothing to do with what we are dealing with now. The second table shows the usual rate levied on income, regardless of its source; it is the revenue used to pay for the cost of public services. The third table shows the tax that we propose to reduce savings; it is a tax that is just as progressive as the usual tax on income but which is made to depend on a parameter ε that changes as the general economic situation changes.

We believe that the money collected with this last tax should never be used to finance public spending, since the function of the tax is to reduce the amount of savings of those who have more income. Therefore, it should only be used to encourage private investment and private spending by those who do not have sufficient income to do so themselves.

EPILOG

How can we finish a treatise of almost 300 pages, pretending to summarize everything that is told in it in just a couple of paragraphs? Perhaps it is pretentious on our part, but in this case, it is not as difficult to achieve as it seems if we formulate a question in the first paragraph and dedicate the second paragraph to answer it.

Where does the money from our savings go?

A very simple question, which has a very short answer: "nowhere". In aggregate terms, money is hardly hoarded and people save by buying something whose value increases over time or, at least, remains unchanged. But what is there for sale in a monetary economy whose value does not decrease over time? Obviously, capital goods, because their value depends on the income they produce, which is stable in aggregate terms. If we want to save, money will have to be spent on the purchase of capital goods, so there must be at the same time someone who wants to sell the capital goods he has. But who would want to sell his capital goods? Ah, that question is very easy to answer and the answer is known by everybody!!! People who have saved by buying capital goods and want to save now by selling them!!!

So where's the problem?

If you have followed the line of reasoning, you will then understand that saving, in itself, does not create any new capital good, so saving will either cause no problem or will cause many problems, depending on whether or not you find capital to buy. But in an economy without real growth real capital does not increase:

$$\Delta K = \frac{\langle \alpha \rangle}{\bar{\bar{\aleph}} \cdot i} \ \Delta PIB$$

According to the most important equation in economics. Saving will not be a problem in a no-growth economy as long as the amount of money you want to save now is equal to the amount of money you want to save now.

Do we now see where the problem lies?

The problem is that we are not heading for a slow-growth economy in which aggregate savings will have to be zero or close to zero, i.e., what someone saves will be the same as what someone saves. This is a problem, because an economy in which this condition is met is an economy that has already given in the past and that the majority of the population will find undesirable to return to in the near future.

Let us imagine a society like the present one, with hardly any growth and with capital assets distributed very unequally. A society with 1% of the population owning 50% of the wealth and no growth: why would the richest 1% have to save, when the wealth they own brings them considerable income? But then, where will the capital goods that savings will buy come from? Clearly, nowhere. It is very clear to the authors that the current instability of our economies is transitory and that society will inevitably head, after the occasional credit crisis, towards an economy with hardly any growth and hardly any savings, with great inequality and very similar to that predicted by Thomas Piketty in Capital in the 21st Century. In such an economy, the rich will stop saving and with their immense consumption will direct a good part of the world economy to satisfy their whims and excesses, as happened with the court of Louis XVI before his head was cut off, and as is happening now. The middle class will barely be able to save and will get their wealth from their parents' inheritance. The underprivileged class will hardly be able to save and will not inherit anything from their parents, they too will live exclusively on their income. Everyone, rich, middle class and poor, will live off their income, none of them saving hardly at all.

The future that the Madrid Theory clearly draws, unless it is remedied, could be called "Piketty's future" because it is the same as the one warned by the French economist, but we do not wish to make Piketty bear such a karma.

Nor is it the authors' job to lecture anyone, but to show the future that monetary economics leads to when society is left to its own free will, building a solid crystal ball, the Madrid Theory, to see it. We have done our job building the ball, but avoiding the future that the ball shows is not our job, but yours.

Clara Rojas García, Julia Rojas García, Pedro Rojas Sola
March 4, 2021

ANNEX 1

WE ACCUSE STEVE KEEN OF PLAGIARIZING MADRID THEORY

Pedro Rojas Sola
June 1, 2021

The explanation of Steve Keen's crisis

In April 2017, Steve Keen published his latest book to date, "*Can We Avoid Another Financial Crisis? (The Future of Capitalism)*", where he announces for the end of 2019, the arrival of an economic crisis in a number of countries due to the high level of private debt they maintain. From reading this book, we can conclude that Steve Keen continued to explain the economic crises in 2017 with the same argument he used in 2010, when he based his explanation of the cause of the economic crises on the changes in the amount of private debt.

Specifically, in an article published in 2010, with the title "*The problem is private debt and the future of the US is deleveraging*", Steve Keen defines aggregate demand... "*as the sum of GDP plus the change in debt (where that demand is spread across goods, services and asset markets)*." In other words:

Aggregate demand = GDP+ change in debt

Based on the expression, he deduces that any change in private debt will affect aggregate demand. Thus, Steve Keen reasons that any decrease in the amount of private debt will cause a reduction in aggregate demand that will eventually affect GDP and cause a recession, although his reasoning is rather obscure and difficult to follow.

We see that the basis of Steve Keen's explanation of economic crises is thus quite simple and has not undergone any change during the entire second decade of this century. In it, he attributes to high private debt the origin of the decline in GDP, although the reason why the high amount of private debt has to decline at some point in the future and cause a decline in demand is never made clear in Steve Keen's explanation of the economic crisis.

However, it escapes no one's attention that the reasoning of Steve Keen in his 2010 article, which he repeats in the book he published in 2017, leaves much to be desired in terms of the explanatory capacity of economic crises, since, from his definition of aggregate demand, it does not necessarily follow that the economy's GDP has to decrease when the change in private debt becomes negative (GDP has to decrease for an economy to enter a recession). Let us note that from Steve Keen's 2010 definition of aggregate demand:

$$\text{Aggregate demand} = \text{GDP} + \text{change in debt}$$

... the causal line between the variables used by Steve Keen to justify the economic crisis, ranging from the change in debt to the economy's GDP, does not emerge. In fact, and according to the expression, a negative change in the amount of private debt forces GDP to increase when aggregate demand does not change, which is just the opposite of what Steve Keen concludes to justify the crisis. Why can this not happen? Why can't the change in debt be negative, at the same time as the economy's GDP increases?

Let us note that, from the definition of aggregate demand, it is not concluded what is the causal relationship that exists between the three variables that appear in it and, therefore, all the argumentation that Steve Keen makes about the effect that the change in debt has on the economy's GDP, is left floating in the air. Not only that. Steve Keen does not know it, but the causal line implicit in his definition of aggregate demand is the opposite of the one he uses in his reasoning:

$$\text{Aggregate demand} = \text{GDP} + d/dt\ (\text{private debt})$$

According to the expression, it is the difference between aggregate demand and GDP that drives the change in private debt and not the other way around (only those who have studied physics know this).

We see, when we analyze in depth the basis of Steve Keen's explanation, that it is not possible to construct a coherent explanation of economic crises using only the definition of aggregate demand given in 2010. For this reason, Steve Keen is forced to make several had oc reasonings about the concrete causal linearity that exists between the variables, which, moreover, turns out to be the opposite of the one implicit in the expression that serves as a basis for explaining the economic crises. Perhaps for this reason, and not for anything else, is why nobody takes Steve Keen seriously when he states that he did see the 2008 crisis coming, and he did so after observing the high levels of private debt held by many countries in those years.

We see that, in order to explain the economic crises, Steve Keen needs to make several had oc reasonings about the concrete causal linearity that exists between the variables, which is the opposite of the one implicit in the expression that serves as a basis for explaining the crises.

The article in Braveneweuropa magazine under the title "Money Matter" in 2020.

However, at the end of 2020, Steve Keen's interpretation of the economic crisis changed radically after we sent him the Madrid Theory at the end of 2019 through Michel Robert, an English Marxist economist who offered to evaluate the equations that appear in the Madrid Theory.

In December 2020, Steve Keen published in Braveneweuropa magazine, under the title "Money Matter", the draft of the second chapter of a new book that he will publish at the end of 2021. The book will be entitled *The New Economics: A Manifesto*, and we fear that Steve Keen will present in his new book as his own, many of the ideas that we began to develop in 2015, more than 5 years ago, and that we sent him at the end of 2019 through Michel Robert. In other words, Steve Keen is going to plagiarize all our work.

Although it does not make much sense for someone to bring forward a chapter of his next book by a few months, in the case of Steve Keen we can find a good reason to do so. In the second chapter of the book Steve Keen formulates a very precise criterion for detecting economic crises, which had never been formulated before, neither by him nor by any other economist that we know of (although this is always difficult to know), and whose discovery Steve Keen attributes to himself when he states that he had already discovered it in 2010:

> *The correct Bank Originated Money and Debt model shows that crises are caused by credit turning negative (Vague 2019)*
>
> *Steve Keen, 2021*

It is very clear that, Steve Keen, had never claimed such a thing in any of the many articles he has published before 2021. Furthermore, and perhaps most important of all, in the second chapter of his future book, Steve Keen shows a graph with the three great economic crises suffered by the USA in the last 300 years. The graph fully confirms the Credit Criterion that we formulated in the Madrid Theory, which attributes the cause of economic crises to the decline in bank credit:

> *Credit Criterion: The economy will go into recession when the difference between the flow of credit and the flow of hoarding becomes negative.*

Nor had Steve Keen presented this graph and the corresponding explanation in any article published prior to 2021. One may wonder, therefore, why Steve Keen does not state in the draft of the second chapter that we are facing a new discovery, when he attributes the economic crisis to the decrease in the amount of credit money.

Indeed, the graph shown by Steve Keen shows a very clear correlation between the flow of negative credit and the three great economic recessions in the US, but such correlation is not new and even Karl Marx had already pointed out this fact.

It should be noted that the explanation economists have been giving for the correlation observed between GDP and the change in the amount of bank credit is exactly the opposite of the one stated in the Credit Criterion: "the fall in GDP causes the withdrawal of bank loans, because banks are afraid of not being able to collect them and because users are afraid of not being able to repay them". In other words, economists assume that, as a consequence of the collapse of the economy, people liquidate their credits and banks stop granting them, which aggravates the liquidity problem, but they never assume that the fall of credit is the cause of the crisis, but its consequence. One only has to read Milton Friedman to see that this view of bank credit is the one that underlies all his reasoning on the 1929 crisis, but it can also be read in the writings of Irving Fisher or in the writings of Karl Marx. It can be seen that all of them basically affirm the same thing, despite the fact that they live in very separate eras in time.

Steve Keen's view on bank credit has never been different from that of other economists. His position on bank credit only changes when he receives the paper we sent him, which derives the expression that relates changes in GDP to the flow of bank credit and which we name here as the Growth Equation:

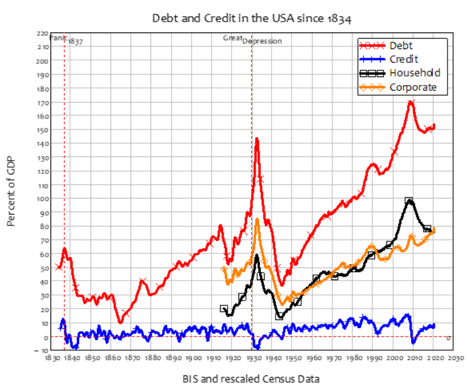
$$\frac{1}{k_F}\frac{dPIB}{dt} = (Ah^C - Ah^S)$$

Analyzing the consequences of the expression, we can easily formulate the "Credit Criterion", which states that the economy will go into recession when the difference between the flow of credit and the flow of hoarding becomes negative. The Growth Equation also contains explicitly, without possible discussion, the causal line between the variables: the change in GDP depends on the difference between the flow of credit and the flow of hoarding. (Note that the flow of a variable is equal to the annual amount that the variable grows or decreases).

The plagiarism attempted by Steve Keen is clearly shown when we remove from the second chapter everything that is genuinely Steve Keen's, and leave only what is new and original. What remains, then, is a small piece of text taken from the section **Negative credit, economic crises, and economic policy,** where Steve Keen verbally formulates the Growth Equation:

"Similarly, the "unpredictability" of crises like the Great Recession is a product of the Neoclassical **paradigm's** *false Loanable Funds model of money. The correct Bank Originated Money and Debt model shows that crises are caused by credit turning negative (Vague 2019) , and that most recessions are caused by credit declining, but not quite going negative. This causal relationship between credit (which is identical in magnitude to the annual change in private debt) and economic performance endows capitalist economies with a tendency to accumulate higher and higher levels of private debt. This phenomenon is most evident in that most capitalist of economies, the United States of America-see Figure 6.*

Figure 6: Private Debt and Credit in the USA since 1834



This chart identifies America's three great economic crises: the Great Recession, the Great Depression, and the "Panic of 1837". What, you haven't heard of the "Panic of 1837"? Neither had I, until I produced this chart (Census 1949, Census 1975), but after doing so, I found it was described at the time as "an economic crisis so extreme as to erase all memories of previous financial disorders" (Roberts 2012, p. 24). In each of these crises, credit plunged from a historically high level, turned negative, and remained negative for a substantial period-see Table 4.

Table 4: Magnitude of Credit and duration of negative credit in the USA's major economic crises

	Credit			
	% GDP			Years
Crisis	Maximum	Minimum	Change	Negative Duration[18]
Panic of 1837	12.2	-8.9	21.1	6.2
Great Depression	9.1	-9.1	18.2	8.2
Great Recession	15.4	-5.3	20.7	2.6

But the renewed growth engendered by rising credit came at the expense of a rising private debt to GDP ratio, with this rise terminated either by another crisis, or by wars that drove the private debt ratio down dramatically because of the "War Economy" boost to GDP: nominal GDP growth reached 32% p. a. during the US Civil War in (1861-65, 29% during WWI (1914-1918, and 29% again during WWII (1939-45), far exceeding the maximum growth rate of credit during those periods.a. during the US Civil War in (1861-65), 29% during WWI (1914-1918), and 29% again during WWII (1939-45), far exceeding the maximum growth rate of credit during those periods (0.2% of GDP p.a., 8.6% and 4.5% respectively).

This is no way to run an economy, but it is what we are stuck with while economic policy is dominated by a theory of economics that ignores banks, private debt, money, and credit. However, with a new, monetary paradigm, several things become evident: we should stop the level of private debt from getting too high, and credit-based demand should not be allowed to become too large a component of aggregate demand. But how could we do that?

It's time to take a monetary look at the other type of debt: government debt.

Steve Keen, 2019

In the rest of the second chapter, Steve Keen does not add anything new to what he has been saying since 2010, but it is very evident that the piece we have reproduced here is completely new, even if Steve Keen does not want to admit it. In the text, Steve Keen no longer makes a vague statement of the style, *"The smoking gun: credit".* Now we have the explicit formulation of a causal relationship between GDP and the flow of bank credit, which Steve Keen uses as the basis for his new explanation of the economic crisis:

> *The correct Bank Originated Money and Debt model shows that crises are caused by credit turning negative (Vague 2019), and that most recessions are caused by credit declining, but not quite going negative. This causal relationship between credit (which is identical in magnitude to the annual change in private debt) and economic performance endows capitalist economies with a tendency to accumulate higher and higher levels of private debt.*

Let us note that, in such a short text, Steve Keen repeats up to six times the causal dependence that exists between changes in GDP and the change in the amount of bank credit, and which formulates the Growth Equation:

<u>First: </u>"*The correct Bank Originated Money and Debt model shows that crises are caused by credit turning negative".*

<u>Second: </u>"*and that* most *recessions are caused by credit declining, but not quite going negative".*

<u>Third: </u>*"This causal relationship between credit (which is identical in magnitude to the annual change in private debt) and* economic *performance endows capitalist economies with a tendency to accumulate higher and higher levels of private debt".*

<u>Fourth: </u>"*Neither had I, until I produced this chart (Census 1949, Census 1975), but after doing so, I found it was* described *at the time as "an economic crisis so extreme as to erase all memories of previous financial disorders" (Roberts 2012, p. 24). In each of these crises, credit plunged from a historically high level, turned negative, and remained negative for a substantial period-see Table 4."*

<u>Fifth: </u>*"Each crisis* turned *around only when the decline of credit stopped".*

<u>Sixth: </u>*"nominal GDP growth reached 32% p.a. during the US Civil War in (1861-65), 29% during WWI (1914-1918), and 29% again during WWII (1939-45), far exceeding the maximum growth rate of credit during those periods (0.2% of GDP p.a., 8.6% and 4.5% respectively)."*

How can Steve Keen justify the drastic change of opinion on the cause of the economic crises? Prior to this draft written in 2021, he attributed the decline in the amount of private debt as the cause of the economic crisis, however, in this article written in 2021 he attributes the annual change in the amount of credit as the cause of the crisis.

It is not just that. Steve Keen needs to lie to make the reader believe that he has not changed his explanation about the cause of the crisis, and he lies when he states that "the change in aggregate debt is the same as the "change in the amount of credit" (banking, right?), because it is very clear that both things are not the same. The reason for the lie is because only if both things are the same (or have the same value), will Steve Keen be able to argue that already in the distant year of 2010 he had discovered the causal dependence that the change in GDP has with the annual change in the amount of credit (dependence that allowed him to predict the 2008 crisis).

The Spanish prologue to "*Can we avoid another financial crisis? (ESSAYO)*"

We have already commented that it does not make much sense to advance the chapter of a book that is to be published only a few months later, but it makes even less sense to publish the Spanish edition of a book that was published in 2017 and that the pandemic of 2020 has made completely obsolete. Unless, of course, the reason for publishing it has nothing to do with what the published work says, and has to do with the change of opinion that you want to add in the book.

In April 2021, just a few months before the forthcoming publication of "The *New Economics: A Manifesto*", Keen publishes the Spanish edition of his book, "*Can We Avoid Another Financial Crisis? (ESSAYO)*" The prologue of this book shows how Steve Keen has changed the way in which he explains the economic crisis. We do not know what the English version that was published at the end of 2017 says, because we have not read it, but we have no problem in showing the paradigm shift that Steve Keen's thinking undergoes in 2021, extracting some quotes from the prologue of the Spanish edition (which certainly does not appear in the prologue of the English edition written in 2017):

1) *...As I explain in this book, private debt drives economic unemployment, because the change in private debt - which I call credit, following the accounting terminology - is a significant, and by far the most volatile, source of aggregate demand....*

The quote is from the prologue to the Spanish edition of Steve Keen's book, and it shows very well the change that his old definition of aggregate demand undergoes when he states that *"the change in private debt"* is the same as *"credit"*. Clearly, Steve Keen's claim is absurd and the change in debt is not the same as the change in the amount of bank credit in any accounting terminology, nor is even their value the same. Only debt is equal to bank credit when debt is acquired by the granting of bank credit, but then Steve Keen's clarification would be a truism and in the 2010 definition he would have mentioned bank credit and not debt. Debt and credit are different things, as everyone knows, and what Steve Keen claims is a lie that he needs to pass off as a truth if he wants to attribute to himself the discovery that it is the decline in bank credit that causes economic crises.

It is very clear that there is intentionality in Steve Keen's lie, that he does not want to acknowledge that he has completely changed his explanation of the cause of the economic crises so that he does not have to give any explanation as to why he has changed his mind, well into 2021. There is a lot of pettiness in this.

2) *...This triggered a credit-based aggregate demand boom....*

   ...but the real culprit of the Spanish boom was the growth of credit, from zero in 1995 to 10% of GDP in 2008...

   ...the crisis began when credit began to fall - a pattern that would be repeated all over the world, but which was extremely obvious in the case of Spain....

All quotations are taken from the prologue of the Spanish edition. In fact, the prologue of the Spanish edition is the description of a credit bubble followed by a very sharp decline in bank lending which, as explained in the Madrid Theory, causes the economic crisis. His description of the Spanish economic crisis, which he generalizes to the rest of the world's economies, has nothing to do with Steve Keen's pre-2020 interpretation. It is remarkable to note that Steve Keen says textually: ... "*the crisis began when credit began to fall" ...* explicitly discarding the inverse causality that attributes the decline in bank credit to the decline in GDP, i.e., Steve Keen is quoting the Growth Equation and making it his own.

What Steve Keen is formulating in the foreword is the Growth Equation and the Credit Criterion that follows from it. The Credit Criterion states verbatim: recession begins when the difference between the flow of credit and the flow of hoarding becomes negative.

3) *...My working hypothesis was that aggregate spending in the economy was roughly the sum of GDP and credit, and that this sum generated both income (through purchases of goods and services) and capital gains (through net purchases of assets-predominantly property and stocks). Since credit was much more volatile than GDP and could potentially turn negative and reduce demand, the crisis would begin when the growth rate of private debt slowed.*

Here it is very clear that Steve Keen reiterates his deception by referring to the definition of aggregate demand that he formulated in 2010. He insists on arguing that *"the change in private debt"* is the same as *"the change in bank credit"*, something that any economist knows to be false.

As we have already mentioned, the working hypothesis referred to by Steve Keen appears in an article published in 2010, entitled *"The problem is private debt and the future of the US is deleveraging*". There it can be read:

> *"... This becomes obvious when you view aggregate demand according to my definition: as the sum of GDP plus the change in debt (where that demand is diffused by goods, services and asset markets) ..."*
>
> *Steve Keen, 2010*

From the comparison of both quotes, it is very obvious that Steve Keen does not want to acknowledge that he has changed his interpretation of the economic crisis, and lies to the reader to make him believe that already in 2010, he defended that "the variation of GDP depends on the flow of credit" (in reality, the variation of GDP is proportional to the difference between the flow of credit and the flow of hoarding"), something that is completely false.

The Madrid theory

The Madrid Theory is a very complete scientific theory in which the physical laws that govern a monetary economy are deduced and its most immediate consequences are studied. For example:

- We enunciate the Asymmetry Principle (microeconomic linkage) and analyze the macroeconomic consequences derived from it.
- We deduce an alternative meaning to the "standard commodity" introduced by the Italian economist, Piero Sraffa in "Production of Commodities by other Commodities".
- We formulate the first two laws of capital according to their financial nature and name them Robinson's First Law and Robinson's Second Law.
- We formulated the third law of capital, and named it Piketty's Law. With it we demonstrate the financial nature of capital, beyond any reasonable doubt.
- We derive the Growth Equation that relates changes in GDP to the difference between the annual flow of credit and the annual flow of hoarding.
- We formulated the Credit Criterion that allows us to predict the credit crisis.

We, the authors, are very proud of all the equations and principles we have formulated. From the Growth Equation, through the Credit Criterion, the Inflationary Principle, the Closure Principle, the three laws of capital, to the most important equation of all monetary economics:

$$K = \frac{\langle \alpha \rangle \cdot k_F}{i} \cdot M$$

All these equations and all these very important principles, and they have never been formulated before. In particular, the above equation, which we consider the most important equation in economics, is equivalent to E=MC2 and we think that in the course of time, it will be as famous as it is. Therefore, because of the importance of the equations and principles that we have formulated in the Madrid Theory, we are fully convinced that, in a more blatant or less blatant way, they will appear as our own discoveries in the new book that Steve Keen will publish at the end of 2021.

For this reason, we are not at all pleased when someone with more prestige and more media coverage tries to appropriate them, either in part or in whole.

The accusation I make about Steve Keen's inappropriate behavior is very serious. The floor is now Steve Keen's to say what he has to say. We are done.

June 1, 2021
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