Again on Piketty's *Capital in the Twenty-First Century*

or Why National Accounts and Three Simple Laws Should not be a Substitute for Economic Theory

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Abstract

This paper reviews Piketty's book *Capital in the 21st Century*. Although the facts described by Piketty are widely indisputable, the paper criticizes the actual economic theory underlying the central thesis of the book, and this on two main points: first the nature and thus the consistency of capital, and second the direction of causality. The paper discusses first the confusion made by Piketty between "capital" and "wealth" which for him cover the same economic reality, and shows that productive capital, real estate capital and net financial assets cannot be put on the same conceptual level. Secondly, it shows that the rate of return on capital as the ultimate explanatory factor for the growth in inequalities does not hold, because Piketty's three laws are not acceptable as such: the first one is a mere tautology, the second implies the identity of the long-term growth rates of income and capital, and for the third law the fact that r is greater than g is not in itself a sufficient condition for β and therefore α to increase. Even in Piketty's analysis it is not really r but s, the owners of capital's consumption choices, which drive capital accumulation. The paper finally proposes an alternative explanation for the evolution of developed economies over the last 35 years.

Key Words: Piketty, capital, rate of return, inequality, income sharing

Above all, we should acknowledge the enormous amount of work accomplished by Thomas Piketty in his book, *Capital in the twenty-first century*[2], in reconstituting data on capital, its rate of return and its distribution, for the major developed economies and over two centuries. If the starting point of all science is firstly to describe facts and measure variables that express them, it is indeed in this case an inescapable scientific approach, and one which had never been carried out so far with this depth and width. We can therefore only express admiration for the importance of the task so performed.

But Thomas Piketty does not limit himself to the mere description of facts. After bringing them to light, he also attempts to give an explanation based in theory, and intended to be very simple, since it is essentially based on three formulas, or "laws", quite basic and therefore easy to understand. This is part of what makes the deserved success of this book. But as we will attempt to show, it is also at this level that a number of reservations can be expressed as to the status and therefore the relevance of this underlying theory.

Let us begin by saying that the distribution of wealth is at the heart of economic theory because it is the central question of the organization and functioning of any human society. And this is so whether we consider wealth as incomes, which are flows, or as assets, which are stock variables.

Let us recall the outline of Thomas Piketty's approach. It is based on national accounts, which deliver annual accounts for different categories of economic agents, considered as "institutional sectors". These accounts provide annual data on the formation, decomposition and use of incomes from their creation as primary incomes in the production process. For quite a number of years now these national accounts also provide data on assets. The annual series from these accounts finally tell us about the evolution of the variables involved. For earlier periods prior to the creation of national accounts, Piketty has reconstructed

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[2] *Capital in the twenty-first century*, Cambridge, MA: Belknap Press, March 2014 (English translation). However the page numbers for the quotes refer to the French edition.

data relevant to its analysis using all conceivable historical sources.

Our author is primarily interested in inequalities in household incomes and wealth, and ultimately it is households that are directly or indirectly - through stock ownership - the owners of the other economic agents, with the exception of the government or more exactly public administrations. These other agents are (to make it short) firms and banks and financial institutions. As Piketty's approach is a macroeconomic one, he is led to aggregate or consolidate in household accounts the accounts of these other agents. Once the statistical data are compiled and presented through numerous tables and graphs, and knowing moreover that, adopting the point of view of households, Piketty explicitly equates wealth and capital, his thesis can be summarized as follows:

- he notes that the capital has a rate of return "r", which he considers as an essentially technical data, and as such a largely uncontrollable one, since it is external to the economic system. This rate of return seems to him to be linked primarily to the productivity of capital. This rate of return varies little in the long run, and stays around 5%, in real terms, with perhaps a small downward trend in recent years, which would bring it closer to 4 or 4.5%.

- however, this rate of return is higher than the rate of GDP-growth "g" which has declined for some time and seems more likely to settle at around 1.5 or 1 % in real terms over the coming decades. Thus capital will grow faster than income (capital intensity, i.e. the β ratio between capital and income, will increase), which will mechanically increase the share α of capital income in aggregate income. Inequalities in wealth as well as in incomes will thus increase in proportions that will soon become unbearable. To avoid this predicament Piketty, as the good tax expert he is, calls therefore for the implementation of a progressive tax on capital.

Although the facts described by Piketty are largely indisputable, apart from minor methodological points regarding the reconstitution of time series, the economic theory underlying the central thesis of the book needs to be criticized on two main points: the first concerns the nature and thus the consistency of capital, and the second concerns the explaining factors highlighted by Piketty, because of the contradictions that his own approach brings about. These two points will be discussed in turn in the first two sections, before we provide some elements of an alternative explanation in a third section.

1. The nature and consistency of capital

For Piketty the words capital and wealth cover the same economic reality, since as he himself points out (page 84 of the book): "We will use the words 'capital' and 'wealth' interchangeably, as perfect synonymous".

This confusion between capital and wealth does not affect the validity of Piketty's figures concerning inequalities, but it is a source of problems for the interpretation and comprehension of the mechanisms behind the rise in inequalities. To be sure, this conflation between capital and wealth has been mentioned by a number of authors, and in particular by VAROUFAKIS[3]. But they generally fail to underline that this position of Piketty exactly reflects the rules of national accounting. These conventions correspond to the methodologies, definitions, accounting rules and classifications that can be found for instance at the international level in the European System of Accounts, and in the present context in balance sheet accounts[4]. On this basis the right translation for the French word "patrimoine", might have been "net worth", rather than "wealth", since the balancing item of a balance sheet is called net worth, but this is not such an important problem. It is on this same basis that Piketty indicates therefore that capital consists of non-financial assets (consisting in the sub-categories of produced and non-produced non-financial assets, such

[3] Varoufakis, Y. (2014). Egalitarianism's latest foe: a critical review of Thomas Piketty's *Capital in the Twenty-First Century*, *Real-World Economics Review*, 69, Section 2, 19-21.
[4] The conventions regarding balance sheets can be found in chapter 7, Balance sheets, 169-192, of the European manual published by the European Commission for the European System of Accounts – ESA 2010.

as land and natural resources), and net financial assets. Apart from inventories, produced non-financial assets consist of productive capital and real estate capital.

VAROUFAKIS rightly points out that this definition of aggregate capital is creating various problems at the conceptual level, and therefore at the level of economic theory itself, in particular as regards the definition of rates of return, or as he puts it "the link between capital and GDP". But he does not expand on real estate capital, despite the fact that it plays a very important role in Piketty's analysis, since it makes up at times close to 50% of overall wealth. He does not expand either on net financial assets. This is the reason why both these items are discussed below.

1.1 Real estate capital

Firstly, as regards the real estate part of capital, housing is considered as such primarily because of its span of life, and because it is supposed to "produce" housing services, which can be sold on payment of a rent. Thus national accounts assume that households produce and consume housing services. For occupant households owning their own homes this leads even to the complex calculation of a fictional production of imputed housing services, which necessarily implies also fictitious rents.

This is questionable for several reasons. First this leads to overlook the fact that the economic definition (and not the accounting one) most commonly accepted for capital is that it is made of means of production which in the capitalist system are combined by entrepreneurs with wage labor to produce goods or services. But this is usually not the case for housing rented by households, except perhaps for owners of very large real estate portfolios for which housing then takes on the nature of a productive capital.

Second, what also shows the purely conventional nature of the treatment of housing in the national accounts, and thus by Piketty, is that the same reasoning could be applied to almost all consumer durables, which by definition are not immediately destroyed at the time of consumption. Thus, any vehicle can be considered during its entire life (which can be quite long: up to a dozen years or more) as producing transport services. So there is a difference of degree (of lifetime), but no difference in nature, and thus no difference conceptually between housing and other consumer durables.

A final argument, and not the least, deserves to be taken into account: it is that at the macro level national accounts are supposed to only record net flows, and this is indeed what Piketty does when it comes to financial assets, from which liabilities are deduced (we shall come back to that). But the rent paid by a household to rent a home is the rent received by another household, which means that when the global household account is established by aggregating the individual accounts, then paid rent and rent revenue compensate exactly, with a resultant which is zero: it results that rental housing does not create any net income for all households. Thus if there is no income globally, for reasons of pure logic, there can be no corresponding production.

Even though there is indeed the consumption of a "housing service" when a household occupies a home rented from another household owning this same home, this last household is at the same time obviously deprived of the possibility of consuming this same service, which corresponds to a negative consumption. In other words, at macroeconomic level, the global output of an economy remains unchanged when the owner of a house stops using it himself to rent it to a tenant. The variation in the net amount of consumption for both households is therefore zero, which shows that we are here in presence of a notable fallacy of composition, something that is central to Keynesian economics. This corresponds also to the fact that this housing service has not been produced in the period by the combination of labor and productive capital: it has been produced potentially at the very time of production of the house (which is anyway the convention of national accounts for consumer durables).

Let us conclude that at macroeconomic level and from an economic point of view, not an accounting one, revenues corresponding to housing are created on the occasion of the production of new housing. The buyer of a new home buys on this occasion the possibility of consuming the corresponding housing services during the whole lifetime of this home. All subsequent transactions involving this home must be considered as a sale of existing assets or used goods, which add nothing to the production of the period and therefore the value of the corresponding product. And this whether these are definitive sales or

rentals, since the last one should be viewed from a macroeconomic point of view as a sale for a temporary period equivalent to the duration of the lease. Therefore rents corresponds only to a remuneration of property, and not to a "rate of return on a capital".

For the three reasons that were just explained and that reinforce each other, let us conclude that housing should be considered not as productive capital (in the economic sense) but as consumer durables. Moreover, it is like this that it seems to be considered in most countries by tax administration (although not in the US), by not allowing the owners (except in certain cases) to deduct any depreciation from their income. But this does not prevent us in any way from viewing housing as a part of wealth. We must realize, however, that this discrepancy is one of substance, which does not relate only to words or simple definition. It follows that rents should not be treated in the same way as profits made by firms through the utilization of productive capital. They cannot be aggregated in a way that conflates both of them under the same concept of rate of return on capital. This explains why, as Piketty recognizes, the "rate of return" on real estate is different from, and in fact lower, than the rate of return on productive capital.

1.2 Financial capital

The criticisms that can be made on the treatment of financial capital are for the main part of a different nature. Financial capital is indeed a significant part of the overall wealth in the richest countries, and even more so of the global wealth of the richest people. Its role has become all the more important in the last forty years, with the financialization of capitalist economies. Furthermore the recent world financial crisis has showed that it can be very disruptive. Obviously Piketty knows that and he also devotes a few pages to the remuneration of financial capital and the evolution of the interest rate, which for him does not seem to be by nature very different from the rate of return on productive capital, which he thinks is why its level is close to this rate of return. But financial capital is almost nonexistent in the statistics and figures provided by Piketty, where wealth is essentially made of real estate and productive capital. Financial capital is therefore ultimately a very small part of global wealth, and this can be related to the absence in Piketty's book of a true theory of the interest rate. As we will now show this derives from the fact that Piketty's approach is a statistical, and not a theoretical one, since it is based on the treatment of financial capital in the System of National Accounts, combined with the fact that he employs too high a level of consolidation of these accounts.

The first point to emphasize is that, in the work of Piketty, financial assets and therefore their income, cover a wide range of elements, since in the national accounts they comprise all financial claims, meaning currency and other deposits, debt securities (short term and long term), loans (short term and long term), equity and investment funds shares or units (not to speak of the gold bullion component of monetary gold). All those assets can be classified into two broad categories: assets that earn interest, on the one hand, and those that pay dividends or income deriving in one way or another from the ownership of productive capital, on the other hand. The latter are linked obviously to capital as it is considered in this article, (fixed or productive capital) and therefore do not deserve particular attention. On the contrary, the first ones correspond to what can be considered as "pure" monetary or financial assets.

With respect to these assets the treatment adopted by Piketty is consistent with national accounts, which consider that "all financial assets have a counterpart liability". This amounts to saying that any financial claim of an institutional sector is a debt of another one. For instance deposits are a claim of households on the banking system (i.e. the Financial Corporations), and simultaneously a liability of the banking system to these same households. Therefore, when as does Piketty we consolidate the assets and liabilities of the different sectors, claims and liabilities are netted off. Net financial assets might not have been excluded from the analysis if this consolidation had concerned only firms (Non-Financial Corporations) and households. However the balance sheet of the sector of Financial Corporations (the banks) is also subject to this consolidation with the balance sheet of the household sector and of non-financial corporations, whereas - in contrast, the government sector (General Government) is excluded from it. Therefore the resulting aggregate is what Piketty names the private sector, as opposed to the public sector at large (the government sector in question). Within such a framework all claims and liabilities between all the economic agents belonging to

the three sectors of households, financial corporations and non-financial corporations compensate in the resulting consolidated balance sheet. As a balancing item of this overall balance sheet of the private sector, there cannot be any other net financial assets than the private sector claims on the public sector, which correspond to the financial net worth of the private sector, equal to the debt of the public sector to the private sector (leaving aside the rest of the world).

Such a high degree of balance sheet consolidation is to some extent inherent in Piketty's analysis, which concerns ultimately the wealth of individuals, which is in national accounts terms reflected in the consolidated balance sheet of the sole institutional sector of households. Indeed since all the banks and financial institutions (the institutional sector of Financial Corporations) are ultimately owned by the households who own their shares, their net worth is ultimately a part of household wealth. Let us note in passing that this (correct) treatment of financial assets leads Piketty to treat interest differently from rents on real estate, since he considers interests - rightly, as an income transfer, which therefore does not correspond to any production, and adds nothing to the overall income or GDP of the economy. This is quite in line with the fact that for national accounts "financial assets are rooted, not in production but in a commitment, that is, they are the counterpart of a liability". Let us just mention in passing that for national accounts banks nevertheless produce financial intermediation services indirectly measured (FISIM).

This high degree of consolidation of household accounts, however normal it may be in a wealth analysis, introduces a theoretical impossibility to understand monetary and financial phenomena. Indeed, and despite the fact that banks produce the means of payment, the banking system disappears from the statistics and the broad picture through the consolidation of its balance sheet (together with the balance sheet of financial corporations) within the balance sheet of the household sector. In any model of a monetary economy, households, firms and banks cannot be consolidated into a single sector. Since on the contrary this is the case here, it is normal that Piketty's theory of capital is incapable of analyzing a financial crisis such as the one which began in 2008.

This brings us to another criticism regarding Piketty's analysis of financial capital, which comes from the fact that, as part of the conventions of the System of National Accounts, the Central Bank is treated as a financial institution, with its balance sheet consolidated within the balance sheet of the institutional sector of Financial Corporations, itself ultimately consolidated within the household balance sheet. Doing so, however, introduces an inconsistency with the way Piketty builds the private sector, with its net financial worth expected to correspond to global household wealth. As it is defined by Piketty, the balance sheet of this private sector includes the balance sheet of the Central Bank, although in most countries it is 100% owned by the government.

This should have implied to depart from the conventions of the system of national accounts by consolidating the Central Bank's balance sheet with that of the General Government. It is true that the assets and liabilities of the Central Bank are always broadly equivalent, with therefore a net worth of its balance sheet close to almost zero. But the consolidation of the household balance sheet with that of the banks makes M3 – M1 disappear from the statistics, and the indirect consolidation of the household balance sheet with the Central Bank balance sheet, through the consolidation of this last one with the bank balance sheet, makes M1 disappear. It follows that the monetary wealth of households corresponding to M3 (currency, deposits, etc.), which should obviously be a part of their net worth, disappears in the meantime. Ultimately, the monetary claims of the households, once their accounts are consolidated with the banks ones, are compensated as a liability of the Central Bank to the economy, and are therefore not a part of the household net worth.

Knowing for instance that the amount of the M3 money supply is in most rich countries not too far from 100% of GDP, which is a significant amount, this inevitably introduces a bias in the numbers, by lowering the overall amount of recorded wealth. This is the explanation of this strange phenomenon, the absence of monetary wealth, which is easy to spot in Piketty's statistics, but which no commentator seems to have noted!

We must therefore acknowledge that money remains ultimately external to Piketty's statistics and analysis in terms of wealth. To be sure, this is consistent with the neo-classical approach to monetary phenomena, for which money is a mere veil, but it prevents Piketty from having any theory of the interest

rate, other than linking it to the rate of return on the other types of capital. This has the inconvenience of disposing of the Keynesian and post-Keynesian monetary theory, but also to ignore some hard facts that are particularly obvious today: in most of the developed world, interest rates have fallen to levels so low that it should be obvious for any honest observer that the nature of interest rate is conceptually very different from the rate of return on capital, to which it can be only loosely related.

Regarding the nature of wealth thus assimilated to capital, let us conclude that things are much less simple than it appears in Piketty's book. As long as wealth means all the property rights of economic agents on a number of assets, both real and monetary or financial, both produced and not produced (land and natural resources), and this regardless of the nature of incomes that their detention can bring, it is a concept that does not in itself suffer criticism. However, when one tries to understand the role of these different types of wealth in the production and distribution of income, as part of an economic theory, to conflate under one unique concept of capital all these elements with so many differences in nature and properties – and to let financial wealth largely disappear from the analysis - appears extremely simplistic and confusing.

As we will now try to show, this initial blur cannot but have an impact on the nature and validity of the explanations given and theories developed in "*Capital in the 21st century*."

2. The need to inverse the order of the determining factors

2.1 The rate of return on capital and the first law of Piketty: α = r x β

In Piketty's book, it is the rate of return r which is the first and fundamental variable, from which the others derive. With regard to its definition, he states that "in all cases, the rate of return on capital measures what capital provides in a year, regardless of the legal form of this income (profits, rents, dividends, interest, royalties, capital gains, etc.), expressed as a percentage of invested capital."

With regard to the determination of this rate of return, Piketty begins by noting that "the rate of return on capital is determined in particular by the following two forces: first technology (what is the capital), and secondly by the abundance of capital stock (too much capital kills the capital)". However, after having conflated them at the beginning of his analysis, he continues by distinguishing capital in the form of real estate and the rest of the capital, as noted: "In all civilizations, the capital serves two major economic functions: firstly to house (that is to say, to produce "housing services" ...), and also as an input to produce other goods and services". This seems indeed justified, but all the more so on the basis of the explanations that we have provided above, which means in another theoretical framework where capital is not defined by its ability to "produce" goods and services. In Piketty's theoretical framework, it is not clear why real estate capital should rely on a different logic: what would in other words differentiate housing services from other services, produced by capital as an input? *Capital in the 21st Century* does not tell us.

Piketty then tells us that in the simplest economic models, "the rate of return should be exactly equal to the marginal productivity of capital" (page 336) even though other influences may come to be added, so that depending on the sectors this rate may be higher or lower. But he specifies that "the concept of marginal productivity of capital is defined independently of the institutions and rules - or the absence of rules – which characterize the sharing between capital and labor in a given society" (page 339). For Piketty, it is therefore clear that the return on capital does not depend on that sharing, while the inverse is true.

Again, it is a regrettable confusion. These explanations fit into the framework of neoclassical theory. But they overlook the fact that even in this context, the theory of marginal productivity explains the rate of return only at the micro level, either for one firm or one commodity, and in the very short term, with the price system (and therefore the rate of return) being given. Moreover the equalization of the rates of return among all branches would require conditions of pure and perfect competition that are never met in the real world.

However Piketty is clearly at the macroeconomic level, and focuses on the long term. This is one reason, among others, why the rate of return is obviously an average, which corresponds to the average productivity, and not to the marginal productivity of capital. It is true that the marginal rate may be equal to the average rate, but that is true only at the maximum level reached by the curve of average productivity. It is unclear how the production of all goods and services produced in an economy where markets are imperfect could be situated simultaneously at a level that corresponds exactly to this point of the curves. Finally, it is

interesting to recall that even for the neo-classical theory, but in one of its most sophisticated versions: the theory of inter-temporal general equilibrium developed in particular by MALINVAUD[5], the model leads to a multiplicity of profit rates.

Piketty's model starts from his first law, which is that the share of capital in total income, i.e. α, is equal to the rate of return r multiplied by the intensity of capital i.e. β (α = r x β). As Piketty himself recognizes, it is in fact a tautology, since it is obvious that the ratio of the share of income from capital to total income α can at all times only be equal to the share of income from capital divided by this capital (i.e. r), multiplied by the ratio of total capital over total income (β), since when we realize the multiplication, capital disappears from the fraction. The transformation of that identity into a law boils down to regard it as a function, where α is a function of r and β, which implies first to determine r elsewhere in the system. But if, as we have shown above, we cannot do it by making r a function of the marginal productivity of capital, because there is no such thing at the macroeconomic level, then we cannot explain α.

The only way out of this indeterminacy is to reverse the problem, taking as its starting point the fact that the rate of return is not a kind of technical or technological element, given as such from outside of the economic system. If it were of a technical nature, it would be difficult to understand how - as Piketty indicates, it was able to change so little over centuries, fluctuating around 5%, while the evolution of technical progress has been at the same time so uneven. On the contrary, if r is an economic (as opposed to technical) variable, it has to be determined within the system, which means that Piketty's first law has to be rewritten such as r = α / β. The only way to calculate r is by knowing the share of capital income in total income α and the intensity of capital β, which implies to know the amount of capital, and thus the price system, as soon as we consider that this capital is made of heterogeneous commodities. But here, as is well recalled again by VAROUFAKIS[6], we know since the Capital Controversies of the 1960s that r must be known in order to determine the price system, which itself must be known to determine r: this is a logical fallacy.

We have therefore three variables, r, α and β, each of them being linked to the two others. We know that r cannot be the determining variable and that r and β are codetermined. This leaves us with α, the income-share of capital, or γ = 1 – α, defined as the income-share of labor, as the only variable that can logically be determining the two other ones. We thus come back to Sraffa's well-known demonstration[7] that in a system with k goods (and k prices), plus the wage w and the rate of profits r, we have k+1 equations (with an additional equation to define the standard) as compared with k+2 variables. Therefore "the number of these exceeds the number of equations by one and the system can move with one degree of freedom; and if one of the variables is fixed the others will be fixed too".

However, and unlike Sraffa, it seems quite impossible to consider, as he does, that the rate of profits "can well be 'given' before the prices are fixed" and "is susceptible of being determined from outside the system of production, in particular by the level of the money rates of interest"[8]. Indeed it has already been mentioned that such a supposed link with the interest rate is more than dubious.

This means that what we are left to choose as the independent variable is w, the level of the money wages, which will give us the price system, and then γ, as the income-share of labor (from which α is the complement to one). This seems all the more justified that the level of monetary wages is indeed determined at a different logical level. It would indeed be hard to deny that the distribution of income and wealth is at the heart of the conflicts which characterize any human society, and corresponds in a capitalist society to the sharing between capital and labor. As such this sharing cannot be the result either of a technological phenomenon that, like the productivity of capital, could be put into equations, or of a monetary phenomenon, like the interest rate. It is rather the outcome of multiple economic, social, cultural, institutional, political and ideological factors.

One can now understand why this sharing is the primary phenomenon: it is because its modalities depend on factors mostly external to the economic theory itself. This sharing results indeed from the balance

[5] See in particular Malinvaud's book: *Lectures on Microeconomic Theory*.
[6] See page 27 in his article mentioned above : "Egalitarianism 's latest foe: a critical review of Thomas Piketty's *Capital in the Twenty-First Century*, *Real-World Economics Review*, 69, Section 2, 19-21.
[7] In *Production of Commodities by Means of Commodities*, page 12.
[8] At the end of Chapter 5 "Uniqueness of the Standard System", page 39 of *Production of commodities by means of Commodities*.

of power which in any society and at any time exists between workers and firms, locally, in the various branches and at national level. It is this phenomenon that is the primary engine of the functioning of any economy.

Finally, let us observe that in the theoretical framework which we have developed here, where houses are – rightly – considered as consumption goods, this conflicts is a conflict over the sharing of consumption goods alone. It is true that labor income can also be saved, lent to capitalists and be invested, but ultimately, at the macroeconomic level, the ownership of the capital goods resulting from the corresponding investments will not belong to those who have saved, but to the capitalists who have borrowed and transformed these savings into investment. Conversely, if a worker decides to invest by himself directly and buy shares or capital goods, he logically becomes an owner of capital, i.e. a capitalist, at least for this part of his activities corresponding to this property.

2.2 The second law of Piketty, β = s / g

VAROUFAKIS discusses Piketty's laws, and in particular his second law β = s / g, exposing the assumptions behind it[9]. He relates these to five different axioms that he criticizes then on various grounds, theoretical as well as empirical. I will not question here Piketty's assumptions, but discuss rather the internal validity and necessary implications of this second law, β = s / g, and the coherence between these implications and the rest of Piketty's analyses.

This formula means that the ratio of capital over income β (the intensity of capital) is equal to the ratio of the net saving rate "s" (itself equal to the ratio of net savings S over income) over the growth rate of output "g". Piketty states that in the long run this equality is always true, making it a law. He further considers that this ratio tends to rise because of the decrease in the growth rate g, which makes β increase. As the rate of return on capital r is postulated to remain constant around 5%, and since α = r x β, then the share of income from capital over total income α should increase to a level that can become socially unbearable.

To check the validity of this law, let us remember that by definition saving is the share of income that is not consumed, and simultaneously the part of the output which is not consumed but invested. As output is equal to income (other things being equal), there is an identity between saving S and investment I, and the net saving rate s (S/Y) is by definition identical to the net investment rate (I/Y). To check the validity of the law, we call K the capital stock, Y the income, and I = dK the net investment, with I equal to the increase ΔK in the capital stock (gross investment) less capital depreciation. Knowing that Piketty calls *∂* this depreciation rate, then we have I = dK = ΔK - *∂*K. Furthermore, the growth rate of the product g is by definition equal to dY/Y. With this notation, Piketty's formula can be rewritten as:

$$\beta = \frac{K}{Y} = \frac{s}{g} = \frac{dK/Y}{dY/Y} \Rightarrow \frac{K}{Y} = \frac{dK}{Y} \times \frac{Y}{dY} \Rightarrow \frac{K}{Y} = \frac{dK}{dY}$$

From which it results necessarily that:

$\frac{dY}{Y} = \frac{dK}{K}$, i.e. g = $\frac{dK}{K} = \frac{I}{K}$ (which is the growth rate of the stock of capital).

This formula implies that the growth rate g of output and income is identical to the growth rate of the capital stock, which means that returns to scale are constant: regardless of the scale of production and income, the ratio β is constant! The law can be reformulated as meaning that in the long-term the growth rate of output is identical to the growth rate of the capital stock, and that the ratio β between capital and income, i.e. the intensity of capital, is therefore constant (as is the average life span of capital if *∂* is constant)!

[9] See pages 22-28 in Varoufakis's article as mentioned above.

In passing it should also be remembered that income and investment are flow variables, since they are defined as monetary values (a priori scalar) distributed or invested during a period. If this period is taken as a unit, ΔK is therefore a scalar per unit of time. However, capital is a stock variable: it is the monetary value of the capital stock measured at time t, so it is a dimensionless variable (a pure scalar). Therefore the $K/\Delta K$ ratio between the capital stock and gross investment during a period is simply the average life of this capital. If the capital stock is constant, implying that net investment is zero ($I = dK = 0$), then the rate of depreciation ∂ is the inverse of the average lifetime.

The law put forward by Piketty is an odd one, since it is based on the identity of the long-term growth rates of income and capital, and thus the long-term stability of the ratio β of capital to income, although it is supposed to lead to a thesis according to which this ratio is due to increase systematically, which is completely contradictory! For the β ratio to rise it is essential that the growth rate of capital (I/K) be greater, and not identical, to the growth rate of income g! This can be demonstrated more concretely using figures provided by Piketty, and from his own findings.

Consider a β ratio equal to 6, and a net rate of return on capital r equal to 5%. This gives us a capital K equal to 600 for an income of 100, with a resulting net capital income amounting to 30 (of which rents amount to 10). If the rate of growth of output and income g is given and equal to 2 % per year, then the saving rate s is given by the formula: $s = \beta \times g$. Hence s is necessarily equal to 12%: net savings S and net investment $I = dK$ are equal to 12. The depreciation rate ∂ being 2%, according to Piketty, the depreciation of capital ∂K is also equal to 12 and therefore the gross investment ΔK (i.e. $I + \partial K$) is 24.

A first apparent paradox can be highlighted: if the rate of depreciation of capital is 2%, the average life of capital should be close to 50 years, whereas with a gross investment of 24 and a capital stock of 600, the average life of capital seems to be 25, but this is related to the fact that the capital stock is not constant, but increases by 2% a year: with such a depreciation rate the capital which has become unproductive or obsolete and as such is removed from the production process is one that has been invested on average 35 years before. We need also to recall that for Piketty capital is divided into two parts, approximately equal: real estate capital and productive capital, that each amount to about 300. However, the average life is not at all the same in both cases: it is surely more than double for real estate capital, implying a depreciation rate of close to 1 % in this case, meaning therefore 3% for productive capital, with an average lifespan of about 50 years in one case and 20 in the other.

With such a model, how do we move to a new ratio β higher than the previous one, for example increased by 50% and equal to 9? Focusing on the output and income structure, and thus putting growth aside, the second law of Piketty shows that with an income of 100, a capital of 900, and still a return on capital of 5%, we get a capital income of 45 (with rents of 15). If the growth rate is still 2%, then the saving rate s is now equal to 18% and net savings and investment $I = dK$ are equal to 18. If the average life of capital and thus the rate of depreciation of capital ∂ have not changed, then the capital depreciation ∂K is 18 and therefore the gross investment ΔK is 36.

One can certainly go from the first situation, where $\beta = 6$, to the next, where $\beta = 9$, but this poses two problems. The first problem is that to go from one to the other requires that the capital stock is growing faster than the income. For example, if the rate of income growth remains at 2 %, and the growth rate of capital rises to 3% per year, it takes a little more than 37 years for the β ratio to rise from 6 to 9. But this assumption of a growth of the capital stock faster by 50% (3% against 2%) contradicts the law itself, which can only be stated if by construction the growth rate of the two variables is the same! If the economy were to stay in this new situation where $\beta = 9$ and for the formula to become valid again, it would be necessary that the rate of capital growth realigns with the growth rate of output, once we have reached this new level where the β coefficient has gone to 9. This could happen either through a decline in the rate of capital growth, which would have to go back to 2%, or through a rise in the rate of output growth, which would have to go up to 3%, or through a combination of both. Thus in the real world the rate of growth of the capital stock can well be lower than g, in which case β would fall, contrary to Piketty's assertion that it cannot but increase.

Another problem is that the law implies constant returns to scale. This is also what is supposed to explain the approximate constancy of the rate of return on capital, by establishing the identity of this rate of return to the "productivity" of capital. However, within the framework of neo-classical theory, the increase in β

should indeed cause a decrease in the rate of return, since in our example we need a capital increased by 50% to get the same income: one goes from K/Y = 6, and therefore Y/K = 16.7 %, to K/Y = 9, or Y/K = 11.1%. In the neo-classical world the reduction in the average productivity of capital is necessarily accompanied by a decrease in its marginal productivity and thus the rate of return on capital. We are therefore in a situation of diminishing returns, which in all neoclassical logic should cause a decrease in the rate of profit, but Piketty himself notes that this is not the case. This is indeed another reason why in the real world the rate of return on capital has actually nothing to do with any marginal productivity.

As a consequence, let us conclude that the formula β = s/g put forward by Piketty is not a law. It is an identity, which is valid only under very special conditions of constant returns and identical and constant growth rates of output and capital. These conditions are similar to what Marx designated in the "Capital" as a situation of simple reproduction. But this formula is by no means a function in the mathematical sense of the term, which could explain the evolution, upwards or downwards, of the intensity of capital, i.e. β. It allows in the long run to compare two situations corresponding to different saving or growth rates, but does not allow to understand why these rates have changed, or how we went from one situation to the other over time. The latter are phenomena that correspond to what Marx called expanded reproduction. They are what Piketty would have to explain in order to provide a theory behind increasing income and wealth inequality.

2.3 The fundamental force of divergence: r > g

Piketty tells us (page 55) that the fundamental inequality r > g, which expresses the fact that the rate of return on capital exceeds the rate of sustainable growth, plays an essential role in the book and summarizes to some extent its overall logic. If growth rates remain low in developed countries, it effectively implies that capital income will rise faster than overall income, so that the share α of capital income in total income will not stop growing, and this would become unsustainable.

Before examining in more detail this argument, however, note that by definition, as α = r x β, there is necessarily an intermediate assumption, which is actually the second fundamental law, already discussed: for α to increase if r remains constant (or even decreases somewhat) it is imperative that β increases. However, and strictly speaking, the increase in β = K/Y does not depend directly on r, but rather on the rate of growth of capital, which must be greater than g, the rate of income growth. In this case the ratio β can only increase, resulting inevitably in an increase of the ratio s/g. And if the growth rate g is constant, for example, around 2 % per year, as a result, it is s that must increase.

The important variable is therefore not r, but s, which is the net saving rate (S/Y), but which is also the net investment rate (I/Y = dK/Y). Piketty is well aware of that, since he writes (page 573): "If g = 1% and r = 5%, then it is sufficient that the owners of important assets choose to reinvest each year more than one fifth of their income from capital for these assets to grow faster than the average income of the society in question."

This example is very interesting because it shows two things. First that it is the dynamics of capital accumulation that are fundamental. Indeed, in a crisis, if the investment rate becomes zero (situation of mere replacement of capital), or negative, then β will stagnate or even decline, and Piketty would deduce that α is expected to stagnate or decline. Secondly, this example shows well that not all capital income is invested: look for example to the case where β = 6 (the capital is equal to 6 times the income). For β to remain constant with a growth rate g equal to 1 %, it is sufficient that dK/K = S/K be equal to 1%, which implies that the rate of net savings S/Y = s be equal to 6 %. Then by definition we have α = r x β = 30 %. The result is that 4/5th of net capital income (30 % - 6 % = 24 % of income Y) are not saved, but consumed! But consumption out of capital income (dividends or direct profits) is largely absent from the book of Piketty. However, regardless of this example, everything shows that in the real world consumption out of capital income takes a higher and higher share of total consumption, with in particular in recent years a phenomenal growth in the consumption of luxury goods.

Let us conclude that the true force of fundamental divergence is not that r is greater than g, but that dK/K is greater than g. Even if r is greater than g, this is not a sufficient condition for β and therefore α to increase. It is not therefore the rate of return on capital, but the rate of capital accumulation I/K, i.e. the

investment behavior of the owners of the capital, which is the determining variable at this level.

Before investing or consuming, you must however have received an income, and since capital income cannot be explained on a theoretical level by capital productivity, it is clear that this income must come before all from the ownership of capital and from the powers attached to it in terms of distribution of income and output. One can thus observe again that it is the variable α, reflecting this distribution or sharing of income, which is logically the first, and which should therefore be the starting point of any analysis. However, it was previously indicated that this distribution cannot be explained in purely economic terms, and at any time depends on the bargaining power of the various actors.

The sharing of income between capital and labor being given, the central value is then the variable s, because it reflects the choice of the owners of capital between consumption and investment. The amount of capital at time t derives from these past choices, throughout the lifetime of accumulated capital. This amount once known, one can finally derive the rate of return on capital $r = \alpha / \beta$. Compared to the analysis of Piketty we can only see that we must reverse the order of explanatory factors[10].

3. Some elements of an alternative explanation

It is out of the question here to embrace two centuries of evolution of capital and revenue sharing, and we will focus on the period following the Second World War. There is a clear break for all variables studied between the so-called "thirty glorious years", going broadly from 1946 to 1974, and the period from the early 1980s to the present. The period 1975-1980 is an intermediate one. If we start from the distribution between capital and labor, and if we try to understand what has changed at this level between the two periods, we are led to highlight the global mode of regulation of the economy of developed countries.

3.1 A brief factual background

For the first period, marked by the post-war reconstruction, we observe that the strong growth (around 5% per year), with a very low unemployment rate, has been accompanied by a roughly equivalent growth of real wages, probably because of the high employee bargaining power associated with low unemployment (around 3%), which led to an approximately constant share of wages in income (around 66% in the Europe of fifteen). This is what has been called the "Fordist" model of regulation[11]. The continuous rise in real wages fed demand, which in turn led to maintaining a high rate of investment, creating a virtuous circle. The investment rate was high enough for the capital stock to increase significantly, particularly as related to the reconstruction. The capital stock increased and the capital/output ratio β stood around 4. The increase of the output corresponded to an increase of about 1% per year of the labor force, and thus to an increase of approximately 4% per year of labor productivity.

In the second period, going roughly from 1980 to the outbreak of the international financial crisis, the unemployment rate was high (around 10%), and the average growth slowed down sharply, to around 2% per year. Real wages stagnated, and the share of wages in income decreased by 7 to 8 percentage points. The growth rate of labor productivity was considerably reduced, and is now around 1%. Growth of the capital stock continued, and the β ratio is approximately 6. Finally, and according to the figures, it is not true that the rate of return remained stable at around 5%. Disregarding the real estate capital, to focus only on productive capital, different studies show that this rate increased from about 13-14% (in terms of gross profit), to about 20-21%.

How did we move from one configuration to the other? To understand this, note that the interim period, which runs from 1974 to 1980, is a transition period that extends between the two oil shocks. After the first shock, since unemployment was very low and the bargaining power of workers was high, firms bore the transfer of income to the oil-producing countries, which resulted in a decline in the share of profits and

[10] This analysis therefore is very different from that of Ann Pettifor and Geoff Tily in their article "Piketty's determinism?" published in *Real-World Economics Review*, no 69, where they emphasize the causal role of the monetary rate of interest, rather than the rate of return on fixed capital, in explaining growth.
[11] On this question, see Aglietta, M. (1976), *Régulation et crises du capitalisme*, Paris, Calmann-Lévy.

the rate of profit. This in turn generated a decline in investment rates, creating the conditions for a rise in unemployment. When the second shock occurred in 1980, increased unemployment and the concomitant decline in the bargaining power of workers were such that real wages started to decelerate, that the wage-share of income declined and that the profit share increased.

Meanwhile, with Thatcherism and Reaganism, the neo-liberal model of regulation was developed. Since 1980, in particular, the world economy has entered a phase of globalization, where foreign direct investment (FDI) has increased enormously. Thus in France, outward FDI has averaged just over 4% of GDP between 1990 and 2011, according to OECD statistics. FDI inflows were far from compensating the phenomenon, representing only 2% of GDP during the same period. The decline in domestic investment rates, already depressed by weak demand, has obviously been aggravated. It is not surprising that the growth of labor productivity has fallen to a very low level.

3.2 A simple model for the two periods

To better understand the nature and consequences of the changes, we can make use of the small model that we used above (pp. 9 and 10) to explain the reasoning of Piketty, but with some recalibration to reflect the criticism made so far. In particular, since Gross Domestic Product (GDP) is the variable most used in national accounts, we will name gross income Y_g and gross investment $I_g = \Delta K$. This model is not intended to represent a particular country for a well specified year, but would rather be representative of an average situation for the main developed countries, for an average year within each of the two major periods discussed above. The United States, however, are supposed to be excluded from the average for the first period, because there was no reconstruction for them. The model is summarized in the table on the next page, which provides all the significant figures for both periods. It will show that, despite using the same assumptions as Piketty's, we do not reach the same conclusions regarding the inevitability of a slow growth leading to a continued rise in inequalities.

To stick to Piketty's approach, we choose to include real estate capital, despite the strong criticism we expressed about that, knowing that it skews the analysis somewhat. Within this framework, the reconstruction period is characterized by data that are fairly close to the example above (page 9). But we assume a β ratio equal to 4, which gives a capital K equal to 400 for a net income Y of 100. If we keep the same rate of depreciation ∂, which is 2% for Piketty, the depreciation of capital equals 8. Therefore with an investment rate of 24% of gross income and Y_g equal to 108, the overall gross investment ΔK amounts to 26, and total net investment I = dK to 18 (26 - 8). We consider that real estate capital is only 150 over 400 and that the net income from rents amounts to 5% of total net income Y, or an absolute amount of 5, which gives us a rate of return on real estate capital of 3.3% (5/150). If the rate of depreciation of real estate capital is 1%, the gross rate of return is 4.3% and its depreciation in absolute value is 1.5. All these figures correspond to Piketty's.

A simple model of both the reconstruction and the post 1980 periods		
	1945-1974	**1980-2008**
Gross income Y_g	108	112
Net income Y	100	100
Net income from total capital	30	37
Net income from real estate capital (rents)	5	8
Net profits on productive capital P	25	29
Gross investment $I_g = \Delta K$	26	22
Gross investment rate $\Delta K/Y_g$	24%	20%
Net investment I = dK (with δ = 2%)	18	10
Capital K	400	600
Real estate capital	150	300
Productive capital	250	300
Global rate of depreciation ∂	2%	2%
Depreciation of capital ∂K	8	12
Rate of depreciation of real estate capital	1%	1%
Depreciation of real estate capital	1.5	3
Depreciation of productive capital	6.5	9
Rate of depreciation of productive capital	2.6%	3%
Gross income from total capital	38	49
Share of gross income from capital in total gross income	35.2%	43.8%
Gross rate of return on total capital	9.5%	8.2%
Net rate of return on total capital	7.5%	6.2%
Gross income from real estate capital = rents	6.5	11
Share of gross income from rents in total gross income	6%	9.8%
Gross rate of return on real estate capital	4.3%	3.7%
Net rate of return on real estate capital	3.3%	2.7%
Gross profits on productive capital P_g	31.5	38
Share of gross profits on productive capital in gross income	29.2%	33.9%
Gross rate of return on productive capital	12.6%	12.7%
Net rate of return on productive capital	10%	9.7%
Net investment in real estate capital (2% of existing capital)	3.0	6.0
Gross investment in real estate capital	4.5	9.0
Gross investment in productive capital	21.5	13
Net investment in productive capital	15.0	4.0
Gross rate of investment in productive capital	19.90%	11.6%
Net rate of investment in productive capital	15.00%	4%
Rate of growth of productive capital	6.00%	1.33%
Total consumption (C = Y – I)	82.0	90.0
Consumption of the owners of total capital	12.0	25.0
Share of consumption from capital income in total consumption	14.6%	27.8%

Isolating now the productive capital, its depreciation in absolute terms is the difference: 8 - 1.5 = 6.5, and the rate of depreciation of productive capital is thus 2.6% (6.5 / 250). If the net capital income amounted to 30, as in the above example, made of 5 for rents plus 25 for profits on productive capital, we deduce that the gross revenues from total capital amount to 38. The ratio between this amount and a gross income Y_g of 108 is 35.2%. The rate of return on total capital is 9.5% for the gross yield (38/400) and 7.5% for the net return (30/400). For productive capital, this corresponds to a gross profit of 25 + 6.5 = 31.5, or 29.2% of gross income. We then obtain the rate of return on productive capital, 31.5/250 = 12.6% for the gross yield, and

25/250 = 10% for the net return. Assuming that net investment in real estate capital is 2% of this capital, it amounts in absolute value to 3 (net), which gives a gross investment of 4.5. We deduce that investment in productive capital is 21.5 gross (26 - 4.5), i.e. 15 net (21.5 - 6.5). The rate of investment for productive capital is 19.9% gross and 15% net.

The period that began in 1980 is characterized by very different data. If we stay rather towards the end of the period, assuming a β ratio equal to 6, this gives a total capital K equal to 600 for a net income of 100, which is again consistent with Piketty's data. Always maintaining the same rate of depreciation ∂, i.e. 2%, capital depreciation ∂K equals 12. But the domestic investment rate has dropped by 4 points, and represents only 20% of gross income Y_g, itself equal to 112, which means an overall gross investment ΔK of 22, and an overall net investment I = dK amounting to 10. We take into account the existence of a housing bubble, which has increased the market price of property much faster than the general price level, which is why it now represents half of total wealth, i.e. 300 out of 600. This has reduced somewhat the performance of real estate capital, which explains that net rents are only 8 or 8% of net income. This gives us a lower rate of return on real estate capital, equal to 2.7%. If the rate of depreciation of real estate capital is still 1%, the gross rate of return is 3.7% and the depreciation in absolute value is 3.

By isolating again the productive capital, its depreciation is by difference: 12 - 3 = 9. The rate of depreciation of productive capital has risen to 9/300, or 3.0%, a slight increase, which is logical in a phase characterized by a slowing rate of accumulation. Let us assume that net capital income is now 37, which reflects the observed increase in the share of capital income. These are divided into 8 of net rents and 29 of net profits from productive capital. We deduce that the gross revenues of capital amount to 49, i.e. 11 of rents (8 + 3) and 38 of gross profits of productive capital (29 + 9). The rates of return on total capital are thus 8.2% for the gross yield (49/600) and 6.2% for the net return (37/600). The ratio between a gross capital income of 49 and a gross income of 112 is 43.8%. This corresponds for productive capital to a ratio of 33.9% (38/112) between gross profits and gross income. For rents the ratio is 9.8%. Finally, we obtain the rate of return on productive capital, or 12.7% for the gross yield (38/300) and 9.7% for the net yield (29/300). If net investment in real estate capital represents 2% of this capital, it amounts to 6 (net), with a gross investment of 9. We deduce that the investment in productive capital amounts to 13 (22 - 9) for gross investment and 4 for net investment I (13 - 9). It has declined by 39.5% for gross investment, passing from 21.5 to 13, and by 73% for net investment, falling from 15 to 4.

To sum up, we note that the leading factors behind the notable changes that have taken place from one period to the other are first a well-documented and sizeable increase in the share of profits, which can be linked to the change in the mode of regulation of the economies of developed countries. However this increase has not translated into a rise, but on the contrary, into a strong fall in the investment rate, although there has not been any reduction in the rate of profit! This fall is the second leading factor, because when it is prolonged over many years, a depressed level of investment is largely sufficient in itself to be the source of and explain the concomitant fall in productivity and the growth rate. But other findings of the model need also to be emphasized.

3.3 The main findings from the model

We can draw several findings from this stylized description, the first one relating to consumption, the second one to the evolution of β, the intensity of capital.

As regards **consumption**, for the first period we observe that the balance between all the profits (gross or net) and investment (gross or net) necessarily represent the share of consumption of the owners of total capital in total income, i.e. a net amount of 30 - 18 = 12, or 12% of net income. This is 14.6% of total consumption, which is equal to 82 (100 - 18). For the second period, in the absence of outward flight, the same balance between total capital income (gross or net) and total investment (gross or net) which represents the share of consumption of the owners of capital in total income, becomes 37 - 10 = 27, or 27% of net income! It is also 30% of total consumption, which is now, at the end of the period, equal to 90 (100 - 10), due to the fall of net investment. As for the consumption of the owners of productive capital in total income, its absolute value is 29 - 4 = 25, or 25% of net income! This is also 27.8% of total consumption. In

both cases this share has approximately doubled, and there is therefore no need to wonder why consumption from the workers stays at depressed levels.

We can also note that in the second period consumption accounts for 66% (or 25/38) of gross profits and that gross investment in productive capital, which is equal to 13 (i.e. 9 + 4) represents therefore only 34%, i.e. a minority share of these profits!

As regards **the intensity of capital**, we observe that the capital stock increases by 4.5% per year (18/400) during the first period, but that this splits into an increase of 2% per year (3/150) for real estate capital and 6% per year (15/250) for productive capital. This thus highlights the true mechanism by which the capital/output ratio β increases: the rate of growth of productive capital stock (6% per year) is higher than the growth rate of the economy, supposed to be 5% for this first period. If population increases by 1% per year, the growth rate of labor productivity is 4% per year. As for the second period, we find that the stock of capital increases only by 1.7% per year (10/600), but this involves an increase of 2% per year (6/300) for real estate capital, partly explained by the rise in real estate prices due to a bubble, and 1.3% per year (4/300) for productive capital. It is thus found that there is no reason for the β ratio to continue to increase: the growth rate of the productive capital stock (1.3% per year) is indeed lower than the growth rate of the economy, supposed to be 2% on average for the second period. If population continues to increase at the same rate of 1% per year, it follows that the growth rate of labor productivity has fallen to 1% per year.

3.4 The impact of globalization must not be overlooked

Both the above findings, about consumption and about capital intensity, have to be put into a wider perspective, because they do not take into account a phenomenon that has become more and more important since 1980, and especially since the 1990s. This phenomenon is globalization and in particular the steep increase of direct investment abroad. For France, outward FDI had shown an annual average of 4% of GDP, or about 4.5% of net income, between 1990 and 2011. But Piketty shows little interest for this phenomenon, as he is focused rather on foreign investments in developed countries, especially those related to the use of oil revenues by sovereign funds.

To be sure, this latter phenomenon is real, but it has not had the same magnitude as outward investment: again for France, inward FDI accounted for only half of outward FDI, averaging 2% of GDP for the period 1990-2011. The result is that part of the investment made in France during the same period was from foreign sources, representing approximately 15% of the average gross investment in productive capital. By contrast, over the past 35 years, French firms, or more precisely, the large internationalized French firms, have accumulated a capital stock abroad (in China and elsewhere) that could now approach 100% of French GDP, nearly a third of the domestic stock of productive capital. The amounts invested have certainly been reduced by the depreciation of capital, but increased by additional investments from locally generated profits. These profits are a priori much higher than in France or in any other developed country, since they are realized on the basis of wage levels that are most often barely one quarter or one fifth, or even less, of the corresponding French wages. It is true that there are other costs involved in investing abroad, but it is most probable that these investments would not have been made, had these profits been lower.

In any case, this implies that the growth of investment abroad is necessarily associated with an increase in the consumption of the owners of capital which is smaller than previously indicated. To take the last example developed above, this consumption is in fact reduced by a similar extent by the foreign investment of profits. If one applies an outward FDI of 4% of GDP to this example, consumption from profits in absolute terms falls from 25 to 20.5, and in percentage from 27.8 to 22.8% of total consumption. But for gross profits on productive capital of 38, consumption still accounts for more than half, or 54% of their amount. This is still good enough to explain the rise over the last thirty years of the consumption of luxury goods. This phenomenon of an increasing consumption, relative to profits, by the owners of capital, must obviously be related to the increasing inequalities, well highlighted by Piketty, but it is unfortunately not the subject of a thorough analysis in his book.

Yet it is a fundamental phenomenon, since it implies that while for firms reproduction and hence investment remain clearly the ultimate goal, things are not at all the same for households who own this

productive capital, and for whom it is indeed consumption, and especially the consumption of luxury goods, which is the main goal. As such, the increasing "financialization" of capitalism and the rise in the share of dividends in total income are going in the direction of this increasing consumption of profits. Although Piketty is not implicated with that, let us observe that this finding is sufficient in itself to invalidate radically the so called "Schmidt theorem", according to which "the profits of today are tomorrow's investments, which are the jobs of after tomorrow."

3.5 The fall in the growth rate g is reversible

Referring to the figures of the model analyzed for the first period (reconstruction), but limiting ourselves to productive capital only, we observe that the average "productivity" of capital (Y/K) is 100/250, i.e. 0.4. For production to increase from 100 to 105 (meaning a 5% rate of growth), with a remaining capital of 243.5 (6.5 corresponding to depreciation are removed from the production process) and an additional investment of 21.5, it is necessary that the new capital, incorporating innovations, has an average productivity equal to [105 - (243.5 x 0.4)] / 21.5 = 0.35. This is 12.5% lower than the productivity of the initial capital stock! This paradox is only an illustration of the law of diminishing returns (since the capital stock is growing faster than output), and shows that this law is not incompatible with the rapid growth of output. With the parameters of this example, we need only a little over 19 years for the β ratio to rise from 2.5 to 3, with an output that stands then at 255 and a stock of capital that goes to 765.

As for the model corresponding to the second period, after 1980, the average "productivity" of productive capital is then 100/300 or 0.33. To get a production of 102 (meaning a 2% growth rate), with a remaining capital of 291 (obsolete capital or capital withdrawn from the production process is 9) and an additional investment of 13 (9 + 4), it is required that the new capital, that incorporates innovations, has an average "productivity" equal to [102 - (291 x 0.33)] / 13 = 0.38. It is thus sufficient that the average "productivity" of the new capital be 15% higher than the average productivity of the capital stock, to compensate for a growth of the capital stock which is lower (1.3%) than that of output (2%). Let us agree that such an increase is quite easy to achieve with a minimum of technical progress!

In reality, there is every reason to believe that newly invested capital has a significantly higher "productivity" than the one which it replaces. The real problem is therefore that of the volume of capital and consequently of investment. What has been missing for 30 years and more in developed economies, is the investments at home, which have instead been made by their own firms in countries with low labor costs. They have concerned first the manufacturing sector, where labor productivity is the highest, leading to the de-industrialization of developed countries, and the accelerating growth of China, where more than half of exports and a significant part of growth are to be recorded on account of foreign investment. Putting Germany aside, these developed economies have been transformed into economies increasingly focused on services, while, as Piketty rightly points out, productivity is lower in services than in manufacturing.

It is however easy to show that not much would be needed for these economies to go back to higher growth rates. Starting from the above figures for the second period, let us suppose indeed that capitalist consumption would decrease by 6 percentage points (from 25 to 19 % of a net income Y of 100), and be replaced by a similar amount of investment in productive capital. This – compared to the figures of this second period, would make gross investment rise from 13 to 19% of net income. If this new investment had a "productivity" of 0.38, then new income would become Y = 291 x 0.33 + 19 x 0.38 = 104.2, meaning that the growth rate would more than double, from 2 to 4.2%, with a growth rate of investment still no more than 3.3% (10/300). With a labor force still growing by 1% and assuming a decrease by 1% in the unemployment rate, labor productivity would raise from 1% to 2.2%, which shows in passing that even the fall in labor productivity is not irreversible: increased investment, to the extent that it incorporates innovation, is indeed the key to increased labor-productivity.

However, for a given share of capital income, a rise in investment at the expense of capitalist consumption would simultaneously depress demand, which shows that such an assumption in the above paragraph was from this point of view incomplete! It would indeed be foolish to imagine that such a rise in investment might ever take place with a constant demand due to an unchanged labor share in global

income. It follows that an increase in workers consumption, and hence in their share of income, is a prerequisite for higher investment levels, and that only such an increase would be able to restart the engine of growth! In the above example, a 2.2% increase in labor share would indeed be enough to achieve an increase from 2 to 4.2% in the growth rate, and to trigger the rise in investment! After more than thirty years of reduction in this share, in accordance with the prescription of the neo-liberal model of regulation, we can thus better understand why this model has failed completely, in terms of its capacity to generate growth and employment, without even referring to the global financial crisis that erupted in 2008.

4. Conclusions

Several conclusions emerge from this analysis.

4.1 **The first conclusion** is that the amalgam made by Piketty between real estate capital and productive capital contributes to obscuring the vision of what has happened since the Second World War in the economies of major developed countries. Our model shows indeed a big difference in yields between the two types of capital, which goes nearly from one to three, from 4.3% to 12.6% during the first period, and from 3.7% to 12.7% in the second one. This reflects the heterogeneity of the mechanisms at work in both cases, which derive from the balance of power amongst households between landlords and tenants in the first case, and the balance of power between firms and workers in the second case. When taking into account total wealth as Piketty does, there is in effect between the two periods a small decrease in net return on capital, as he also indicates. But this decrease is primarily related to the lower performance of real estate capital, and corresponds to a virtually stable performance for productive capital, which shows a very slight increase in gross terms and a slight decrease in net terms.

4.2 **The second conclusion** is that, contrary to the qualms of Piketty, there is no inevitability of the continuation of an increase in capital stock at a faster pace than income, and therefore in the share α of capital income in total income. In contrast, in most developed economies the accumulation of productive capital has seriously slowed. Due to depressed demand, and also in part because of globalization and the rise in investment abroad, it has fallen to levels of investment going just slightly beyond the mere replacement of depreciated capital. In these economies there is even a tendency towards a relative decline in the domestic capital stock and therefore a decline in the β ratio, which, if r were truly constant, would even go in a direction opposite to that of an increase in the share of capital in total income α.

4.3 **The third conclusion** is that there is no inevitability either of stagnation, no offense to Larry Summers and his theory of secular stagnation of capitalism, or of a growth rate durably slowed down, no offense to Piketty. We have shown indeed that the growth rate of GDP can return to higher levels, as long as investment goes back to higher levels. Consequently the decline in labor productivity in the most developed economies, which stems first and foremost from lower volumes of investment, could also be reversed: there is no reason why investment would have lost its ability to increase labor productivity, in favor of which it acts as a powerful catalyst.

4.4 **The fourth conclusion** refers to Piketty's status as an economist. It is clear that he is a brilliant statistician and a great tax expert, and his book is a landmark in the field of wealth distribution, inequalities, and their evolution over time. However all his theory boils down to three simple laws, which transform the rate of return and the capital stock into almost intangible primary data, from which can only arise a decline in the labor share of income and a rise in inequalities. But this paper has shown that such laws have only a very limited explanatory capacity, because one of them is only a tautology (first law), while the validity of the other two is highly questionable. The flaws that we have exposed, and in particular the fact that these three laws do not pass the test of coherence, show that Piketty is not a theorist. In fact there is no proper economic theory in his otherwise excellent book, maybe because he did not want to distance himself from mainstream economic theory, which might have caused outright rejection of his theses. Thus, it turns out that national accounts and three simplistic laws cannot be a

substitute for a coherent economic theory. They cannot overcome the failure of neo-liberal or neo-classical theory, which stays at the basis of Piketty's theory of capital.

Although Piketty clearly does not accept the rise in inequalities, it is unfortunate that he seems nevertheless to accept the situation behind this rise, and the slowdown in growth and mass unemployment which results from it. To reduce inequalities, he only proposes an intervention through the introduction of a progressive tax on capital. It is therefore an ex-post action, once the distribution of wealth between capital and labor has been realized, and therefore without questioning this distribution at the level of the constitution of primary income. This position stems obviously from the simplistic theoretical content of his book.

4.5 **The fifth conclusion** is that there is a way out. To break the vicious circle in which the neo-liberal model of regulation has engulfed most developed economies, particularly in the European Union, and especially in the euro area, it is necessary to reverse the source of the demonstration. We should return to the message of Keynes and remember that the key to output growth and labor productivity is investment, which must increase as a share of global income. This does not require an increase in profits, since it can simply result from a decrease in the consumption of the owners of capital, translating into a higher share of investment in GDP, and deriving from a higher share for labor income and workers consumption.

The restarting of investment can certainly be implemented by governments (this is what Roosevelt did in 1934), but in a market economy to restart investment implies a growth in demand that can only come from increased real wages, and thus a distribution between capital and labor that is significantly rebalanced in favor of workers, after 35 years of an evolution that has been to their detriment. On the contrary an increase in capitalist consumption would not help, since it would at the same time reduce savings and investment, and depress global demand, as observed during this same period with the dismal results that everybody can well note. Furthermore, restarting domestic investment certainly implies also an increased control over investments abroad by firms in the most developed countries, which would of course depart from the neo-liberal dogma.

4.6 Finally, the overall conclusion of this article is that Piketty strives to show in his book that the reduction in the rate of growth of developed economies (the fundamental "force of divergence") has been the main cause of the rise in inequalities. The essential message of this article is that Piketty's demonstration is wrong and that on the contrary it is the rise in inequalities, through the rise in capitalist consumption and the fall in investment it has generated, which has been the main cause of the fall in the rate of growth.

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