CRISES AND MARX'S LAW

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I. Introduction. This work tests empirically the validity of Marx's law of the tendential fall in the average rate of profit (from now on, Marx's Law) as a theory of crises. It also deals with and tests some important theoretical questions and introduces some new concepts fully compatible with Marx. The focus is on the most important economy worldwide, the US.[1] I have subdivided the US economy into productive and unproductive sectors and I have chosen the sectors producing material goods as a proxy for the former.[2] As for the unproductive sectors, the focus is only on finance and speculation. Commerce has been disregarded because it is not central to contemporary debates.

Special attention has been given to the average rate of profit (from now on, ARP) realized in the productive sectors because they produce the vital lymph of capital: value and surplus value. In what follows, ARP refers to the ARP in these sectors, unless otherwise indicated. But as other studies have emphasized, the ARP for the whole economy – or general ARP – is also an important indicator. Another important distinction is between nominal and deflated values. Here the data refer to deflated values. Deflated values have been chosen here because they are better suited to show the evolution of the generation of value. The argument that non deflated values are a better indication of the dynamics of the system because it is on these values that capitalists base their decisions misses the point that the dynamics of the system are explained by the generation of value irrespective of what capitalists perceive or aim at. The paradigmatic example of this is a fall in the ARP as all capitalists try to maximize their own rate of profit.[3]

The focus is on the two fundamental classes, capital and labour. This is not to say that there are no other classes in capitalism. But for present purposes, it is sufficient to focus on the producers of value and surplus value (labour) and on the appropriator of surplus value (capital). The latter shares the booty, directly or indirectly and in a variety of ways, with other classes and social groups.[4]

Further, this work focuses on only the productive sphere of the economy. Some authors object to this procedure. The argument is that large corporations in the productive sectors engage also in finance and speculation. But the statistics do not separate the profits generated in the productive from those in the unproductive sectors. So, it is held, the distinction between productive and unproductive capital cannot be applied for statistical reasons. It follows that the focus should be on the general ARP. This view not only overestimates real profitability. It also overlooks that, as far as the productive sectors are concerned, it is not necessary to distinguish between the profits resulting from operations in the productive sphere from those resulting from operations in the unproductive sphere. The reason is as follows.

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[1] The features highlighted in this work apply also to most other countries. They are broadly relevant also for the world economy. See chapter 2 of this book.

[2] The generation of knowledge too can be productive of surplus value (Carchedi 2011a, chapter 4 and Carchedi, old wine, new bottles and the Internet, *Work organization, labour and organization*, Vol. 7, No.1). However, no estimates can be made of average profitability due to the lack of suitable statistics.

[3] Carchedi 2011b uses nominal values. While the height of the rates of profit varies, the trends don't.

[4] For a theory of old and new middle classes, see Carchedi, 1971.

The capital invested in the financial and speculative sectors does not produce profits, i.e. it is fictitious.[5] So, the profits of fictitious capital are fictitious. They look as if they had been generated in the unproductive sphere, but they are not. A bank, when it charges its clients fees for investing their money in the stock exchange on their behalf, makes a fictitious profit. When, on the basis of that fictitious profit, it claims money from its clients, i.e. when it claims the monetary expression of real surplus value, it makes a real profit but only because it appropriates surplus value it has not produced, which has been produced by the productive sectors. More generally, fictitious capital appropriates surplus value it has not produced. It follows that the profits realized by productive capitals through their operations in finance and speculation *have been previously generated in the productive sectors*, even if not necessarily by the capitals that have produced them. Therefore, it is correct to add those profits to the profits of these capitals. Even if the statistics on the productive sectors separated the profits generated in those sectors from those generated in the unproductive sectors (for example by the financial division of a car factory), in calculating the profits realized by the productive sectors it would be incorrect to deduct the profits made through finance and speculation. As for the financial and speculative firms (not considered in this work), their profits will remain fictitious as long as they remain on their accounting books. They become real if cashed in, i.e. when converted into real money (not credit) profits. But then they become a deduction from the productive firms' profits.

II. A sketch of Marx's Law. Marx's Law, also referred to as the law of the tendential fall in the profit rate, says that tendentially the ARP falls due to the introduction of productivity increasing and labour shedding technologies and that this fall is the cause of crises. Let us elaborate.

For Marx technological innovations increase *efficiency*, i.e. the effect on output of science and technology incorporated in the means of production (or assets).[6] The number of labourers working with a certain quantity of assets measures efficiency. A falling Labour/Assets ratio (or a rising A/L ratio) indicates increased efficiency. This is the (L/A) line in Chart 1. It shows that the number of labourers working with assets worth 1 million dollars (deflated figures) dropped from 75 in 1947 to 6 in 2010.

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[5] For the reason why finance, speculation and commerce do not produce value and surplus value, see Carchedi, 2011.

[6] "The accumulation of knowledge and skill, of the general productive forces of the social brain.. [are] absorbed into capital" Marx, 1973, p. 694.

Chart 1. Capital efficiency (L/A) and actual productivity (output per labourer)
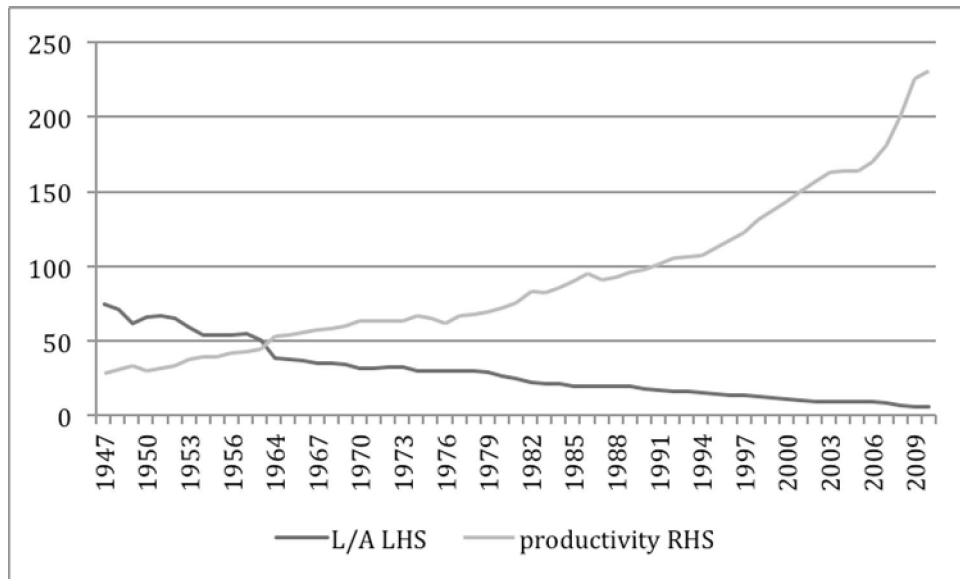

Chart 1 illustrates the basic point that technological innovations are, as a rule, productivity-increasing (productivity rises persistently since the end of WWII, even if in a zigzag way) but labour shedding (the declining L/A ratio). Since only labour produces value and surplus value (a fundamental assumption to be empirically substantiated below), this chart illustrates the basic contradiction of capitalist economy: an increasing mass of output contains a decreasing mass of value. This is not to say that the *mass* of labour keeps decreasing. The mass of labour varies with capital accumulation or dis-accumulation (see below). It is the mass of labour relative to assets that decreases tendentially.

Efficiency as defined is the basic determinant of the *productivity* of labour, i.e. the output per labourer. However, productivity is affected not only by efficiency but also by the rate of exploitation. This is ignored by conventional economics for obvious ideological reasons. Let me exemplify. Suppose an investment in constant capital of 80 units of value (c) and in variable capital of 20 units of value (v). Suppose a rate of exploitation of 100% and thus a surplus value of 20s. Then, 80c+20v+20s=120V, where V is total units of value. If the output is 120P, productivity 120P/20v=6 and efficiency is 80c/20v=4. Next, let efficiency rise to 90c/10v=9. Now 90c plus 10v are invested, a surplus value of 10s is produced (the rate of exploitation is unchanged), and the output rises to, say, 150. Productivity rises from 6 to 150P/10v = 15. *Productivity rises because of higher efficiency.* Finally, suppose that efficiency remains the same, i.e. 80/20=4 but that the rate of exploitation rises from 100% to 200%. Now 80c+20v are invested and surplus value is 40s. Output rises to 150 because labour works longer hours or more intensely. Productivity rises from 6 to 150/20=7.5. *Productivity rises due to higher exploitation rather than to higher efficiency.* To calculate the increase in productivity due only to higher efficiency, or *actual productivity*, I have computed productivity by holding the rate of exploitation constant. This is shown in Chart 1. It shows that output per labourer climbs from deflated $28.9m in 1947 to $231.5m in 2010.

The replacement of labour by means of production, i.e. greater efficiency, causes average profitability (ARP) to fall. This is the basis of Marx's Law.[7] In fact, if only labour produces value, the more efficient capitalists, by replacing labour with more efficient means of production, generate *less* (surplus) value per unit of capital invested. The ARP falls on this account. At the same time, the more efficient capitals' rate of profit rises. The reason is that, due to their higher efficiency, their labourers' productivity rises, i.e. they produce a greater output (use values) per unit of capital invested than the laggards. Since unit prices tend to equalize within sectors, the innovators, by selling to other sectors a higher output at the same price as that of the lower output of the low-productivity capitalists, realize a share of the latter's surplus value.[8] Their rate of profit rises while the laggards' rate of profit and the sector ARP falls. Thus, a falling ARP indicates that, given a lower mass of surplus value produced, the profitability of the innovators rises while that of the technological laggards falls. As more and more capitalists introduce the new technologies, increasingly less labour is employed and less surplus value is generated. Many capitals go bankrupt while a few prosper. Generalized *bankruptcies* and *unemployment*, i.e. *the destruction of capital* and thus the crisis, follow.[9] At a certain point, after sufficient capital has been destroyed, the conditions for rising profitability emerge again, labour power increases relative to the means of production, capital starts generating more value and surplus value, and the rate of profit rises. Downward cycles alternate with upward cycles. This is the essence of Marx's theory of crises.[10]

Consider the assets/labour ratio (A/L). If L is expressed in wages rather than in labour units, we obtain Marx's organic capital composition (from now on OCC). This is the ratio of constant capital (capital invested in assets) to variable capital (capital invested in labour power). In Chart 2, C and V are constant capital and variable capital respectively, and C/V is the OCC.[11] This is how Marx relates rising efficiency (the substitution of labour power by means of production) to profitability. Tendentially (as shown by the long-term linear trend in Chart 2 below) if the OCC rises, the ARP falls.

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[7] Okishio (1961) is the main critic of Marx's Law. Okishio's flaw is that he substitutes Marx's notion of labour as value creating activity with the capitalists' notion of labour as a cost (See Carchedi, 2011a, chapter 2). Many authors follow in the footsteps of Okishio. For example, for David Harvey, the innovators produce more use values, realize higher rates of profit, reduce the *cost* of the wage goods, and raise the material level of living of the labourers even if (monetary) wages can fall (2010, pp. 88-9). Shaikh (1999, pp. 121-2) holds that the innovative capitals reduce their *costs* and thus their prices. A generalized fall in prices follows. Average profitability falls too. Since the innovators' costs are lower than the competitors', the former's rate of profit is higher than the reduced general profit rate. However, if the costs of some capitalist' output fall (e.g. the cost and thus the price of wage goods), so do the costs of the same or of other capitalists' inputs (variable capital). The former fall decreases the ARP, the latter increase it. The ARP is unaffected. It is value that is reduced.

[8] The assumption is that the distribution of purchasing power among sectors is unchanged. But this assumption can be dropped without altering the outcome of the analysis.

[9] For Grossman the falling rate of profit is a threat to capitalism because at the limit "The capitalist class has nothing left for its own personal consumption because all existing means of subsistence have to be devoted to accumulation" (1992, chapter 2). His aim is to dispute, contrary to Bauer and other authors, that capitalism can reproduce itself perpetually and harmoniously. This is correct. But the limit is not the capitalist class' personal consumption: the innovators can increase investments as well as unproductive consumption. One aspect of the crisis is the obscene consumption of the richest layers of the bourgeoisie.

[10] For a detailed explanation of the alternation of upwards and downwards cycles, see sections VI and VII below.

[11] Constant capital is both fixed and circulating. Here, only fixed capital is considered. Carchedi and Roberts, The rate of profit and circulating capital, chapter 6 of this work, deal with the measurement of circulating capital.

Chart 2. ARP and OCC (i.e. C/V)
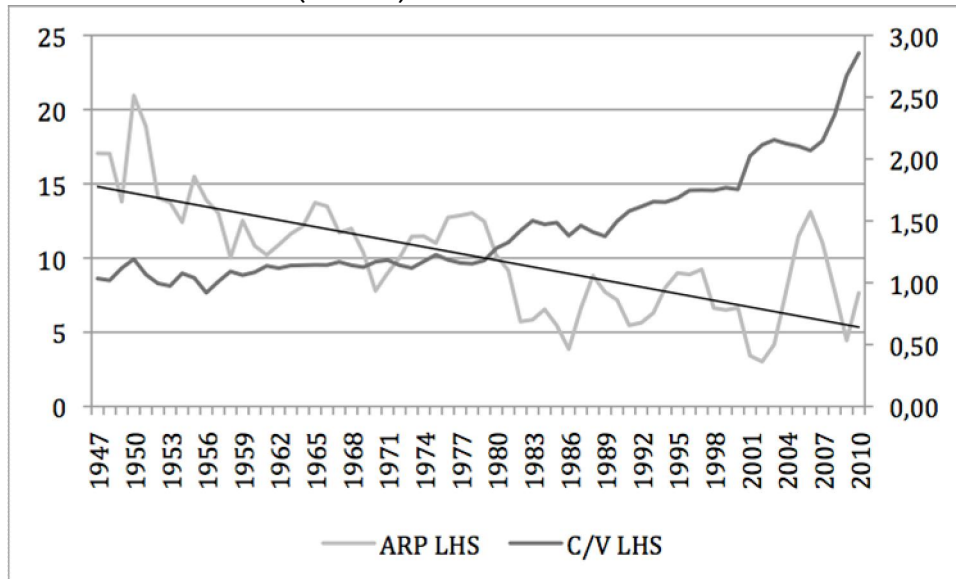
III. Four objections to Marx's Law. Of the several objections that have been raised to Marx's Law, four will be considered here.[12]

First, in Chart 2 the secular trend is downward, but the ARP starts rising from the mid-1980s. This does not contradict Marx's Law, provided it is understood, as in Marx, i.e. as a tendential movement, as the interplay of the tendency and the countertendencies in which the latter can only retard the manifestation of the former while at the same time shaping, together with the tendency, the specific features of each cycle of profitability. At times the tendency predominates; at other times it is overcome by the countertendencies. But the tendency keeps operating even when the countertendencies prevail. In terms of chart 2, the downward (from 1946 to 2010) secular trend in profitability includes a long-term period of rising profitability starting in the mid-1980s. The objection that this period cannot be a tendency because it lasts too long overlooks the fact that a countertendency lasts as long as its cause keeps operating; in this case, as we shall see, the defeat of the world working class and concomitant jump in the rate of exploitation. But, as we shall see, the tendency keeps operating also in this period.

Second, some authors challenge the thesis that falling profitability is caused by rising productivity (as a result of labour-shedding and productivity-increasing new technologies). For them, falling profitability is caused by falling productivity, a view that mirrors the perception and experience of the individual capitalist. To show this, these authors decompose the ARP as follows

(1) ARP = profits/capital stock = (profits/output)*(output/capital stock)

where the first term indicates the pro-capital distribution of the output and the second indicates capital productivity. But this is not the decomposition of the Marxian rate of profit. In formula (1), the output/capital stock ratio measures *use values.* Then, the rate of profit (measured in terms of use values) rises if productivity rises. For Marx, if productivity rises, the

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[12] Heinrich (2013) is a recent example of a rehearsal of old critiques of Marx's Law. For a critique of Heinrich, see Carchedi and Roberts, A critique of Michael Heinrich, chapter 5 of this book.

rate of profits falls because an increase in productivity implies the shedding of labour and thus less value produced. But in formula (1) labour does not appear. Thus, if the production of use values increases, the (surplus) value produced can be constant, greater or smaller. The greater physical output says nothing about the Marxian ARP. Besides, the above formula has an element of fetishism in that it implies that it is constant capital that is productive instead of labour.

The Marxian decomposition is obtained by using wages instead of output

(2) ARP = (profits/wages)*(wages/capital stock)

where the first term is the rate of surplus value and the second is the inverse of the OCC. Then the rate of profit varies proportionally with the rate of surplus value and inversely with the OCC (and thus proportionally to the labour employed relative to the means of production).

The approach in terms of use values explains crises as the result of falling productivity. But since productivity grows as a rule (see chart 1 above), falling productivity (and profitability) is an exception to the rule. So capitalism tends towards growth: crises are only a temporary obstacle to growth. If growth is the rule, the system is rational. This is the exact opposite of Marx's theory and a death blow to labour's struggle because this struggle would be an (irrational) fight against a rational system.

The assumption is that wages and employment move in the same direction. Then a fall in employment more than a fall in assets expresses rising productivity while a fall in variable capital greater than a fall in constant capital causes a rise in the OCC and thus a fall in the ARP. Profitability falls because productivity rises. But it can happen that, for a while, wages keep rising after employment has begun to fall. The fall in employment more than the fall in assets expresses rising productivity while rising wages relative to constant capital cause a fall in the OCC and thus a rise in the ARP. Both productivity and profitability rise. But this outcome is a temporary deviance from the rule. It disappears as soon as wages fall in line with employment.

The *third* objection holds that increased efficiency makes it possible to produce cheaper means of production. So, it is argued, in the next production process, when those cheaper means of production are applied as inputs, the OCC can be lower and the ARP higher. However, the question is not whether the new machines are cheaper or more expensive than the old ones. Even if they are cheaper, they might require less variable capital in such a proportion that the OCC rises and the ARP falls. The question is whether *as a rule* and thus *tendentially*, i.e. irrespective of short-term variations, the new means of production, when applied as inputs, are labour-shedding or not. They are.

The reason is that, if they required a greater share of labour power per unit of capital, the gains deriving from higher efficiency would be reduced or even cancelled out by the greater share of the product (value) going to labour. Moreover, labour's negotiating and political power would increase and thus would further dent profitability. As Marx put it: 'It would be possible to write quite a history of the inventions made since 1830, for the sole purpose of supplying capital with weapons against the revolts of the working class.' (Marx, 1967a, p. 436). Capital needs higher efficiency *and* labour-shedding new means of production. Chart 1 above supports empirically Marx's hypothesis. The falling L/A ratio indicates the shedding of labour due to new

technologies (and thus the increase in the OCC, as in chart 2 above) while the rising productivity line indicates that the new technologies are also productivity increasing.

Given that, as a rule, no capitalist would invest in lower OCC means of production, when and why does the OCC fall instead of rising? As section VI will argue, the OCC falls at specific turning points, at the beginning of short-term upward cycles. First, when recovery starts, i.e. when production picks up (because sufficient capital has been destroyed), capitalists increase the capacity utilization of their assets rather than increase investment. More labourers are employed by the same (previously partly under-utilized) means of production. Second, the number of start-ups increases and their OCC is low. Finally, this greater mass of labour is employed at lower wages as a delayed effect of the previous crisis. The OCC falls on all three accounts. But this fall is only temporary.

The *fourth* objection holds that, supposedly, the equalization of the rates of profits into an average (ARP) requires capital mobility across sectors and (price) competition within sectors. But in a monopolized economy these conditions are lacking so there is no (movement towards an) ARP. Supposedly, Marx's Law does not apply to monopolies and thus to modern economies.

However, modern economies are oligopolistic rather than monopolistic. And oligopolies do penetrate each other's sphere of production and compete technologically. But assume for the sake of argument that each sector of production is a monopoly. Then, each monopoly must sell its output to other monopolies (sectors). This does not imply a lack of technological innovations. If a monopoly innovates, it produces a greater output at lower unit costs while reducing labour power. It produces less value and surplus value but more use values with a lower (surplus) value contained both as a whole and per unit. If the innovator can sell its greater output to the other monopolies at the same unit price as before the innovation, it receives a greater output with a greater value than before the innovation but cedes more output with the same value. It appropriates a part of the surplus value contained in the other monopolies' output. The former increases its profits at the cost of the latter. The latter's profitability falls and they are forced to innovate or perish. The different profit rates tend towards an average even in the absence of capital mobility. This average tends to fall because the innovators, by replacing the labour force with assets, generate less surplus value. The crisis is in the making. So Marx's Law operates in the same way as in non-monopolistic markets.[13]

IV. Money and value ARP. The validity of Marx's Law has been tested by using official US data, which are deflated money prices of *use* values. But Marx's Law must hold also in terms of values (i.e. abstract labour quantities). Chart 3 shows the ARP in money and in value terms.[14]

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[13] For the Monopoly Capital school the *surplus* generated by monopolies rises because of realization difficulties. See Foster, 2012.
[14] See the Appendix for the methodology.

Chart 3. Money ARP and value ARP
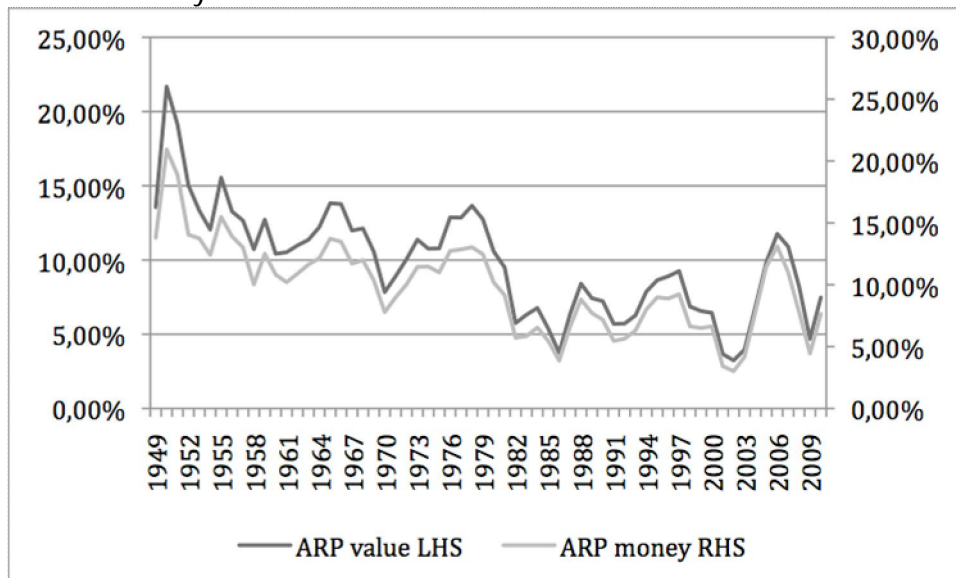
Since money quantities can be converted into value magnitudes, the results of the analysis in money terms apply also to the value dimension. The height of the two ARPs differs but they move in the same direction (tendentially downward) and track each other very closely.[15] If abstract labour can be measured before exchange, value exists before exchange. If it is possible to measure it, it exists before exchange, contrary to the 'value form' approach.[16]

V. The constant exploitation ARP. Charts 2 and 3 above show a rise in the ARP since the mid-1980s. For some authors this is a sign of economic recovery. These authors do not reason in terms of tendency and counter-tendencies, i.e. they do not see this period as a long counter-tendency. Then, for them, the Great Recession has emerged within a long period of sustained rising profitability and falling profitability cannot be the cause of crises (at least not of this crisis). However, *a recovery requires not only a rising ARP* but also an increase of new value generated, i.e. *expanded reproduction*. Chart 4 below shows that, tendentially, the ARP rises within the context of a falling percentage growth of the mass of new value created. It follows that *the ARP increases* because a greater share of that smaller quantity goes to capital *due to a greater rate of exploitation*. This is what happened in the period of the so-called neo-liberalism.

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[15] The correlation coefficient is 0.8935.
[16] See the Appendix. For a critique of the value form approach, see Carchedi 2011a.

Chart 4. New value percentage growth and ARP
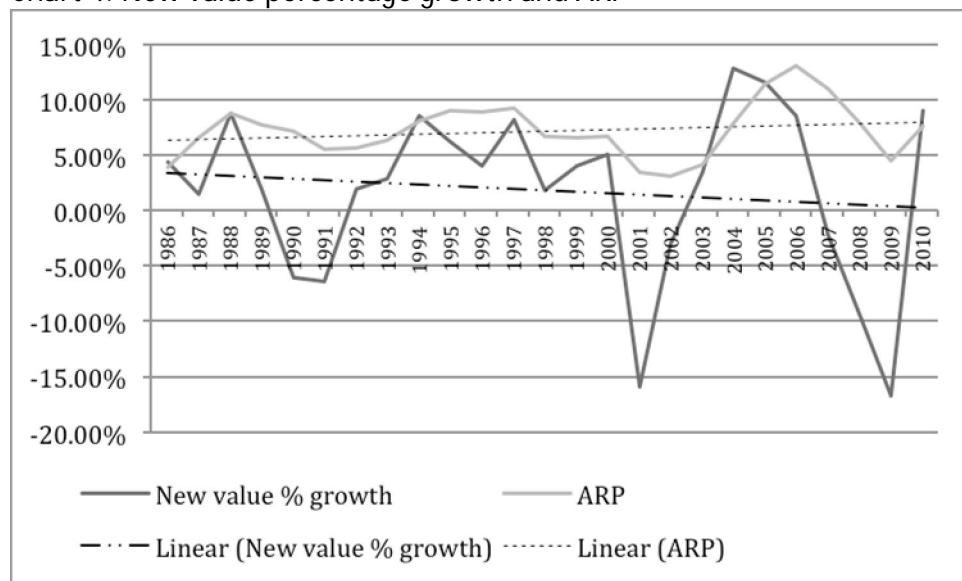
If greater profitability is the result of a greater pro-capital redistribution of a falling mass of new value, the ARP actually falls in terms of surplus value produced, i.e. without the effect of greater exploitation. To see this, we need a measure of profitability whose numerator is independent of the fluctuations in the rate of exploitation. To this end, the ARP has been computed by holding the rate of exploitation constant throughout the secular period. This is the *constant exploitation ARP (CE-ARP)*. Chart 5 below shows that profitability in terms of the surplus value created has been falling dramatically since 1986.

Chart 5. ARP and CE-ARP
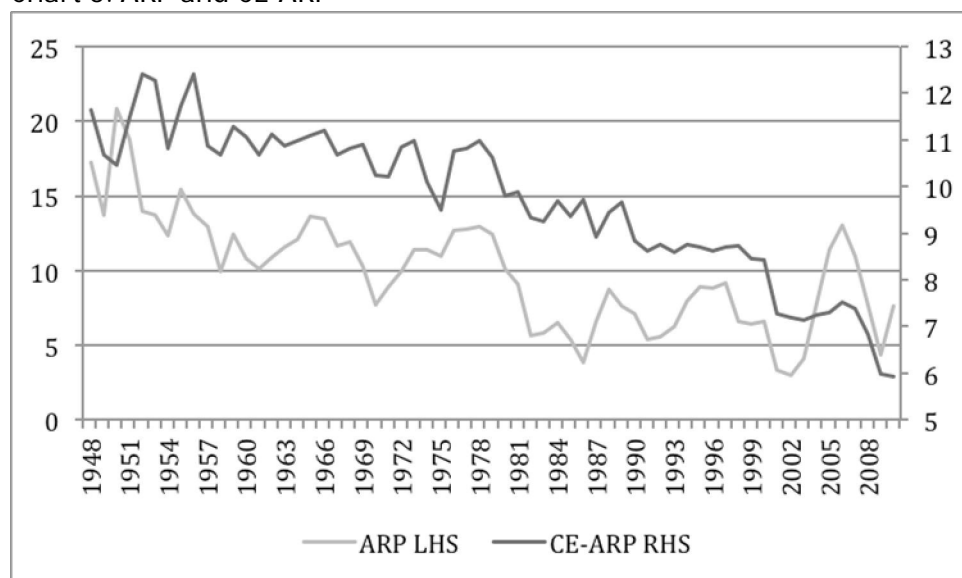
It has been argued that the CE-ARP is not a 'real', but a hypothetical or counterfactual measure because it measures what profitability would have been under the assumption of a constant rate of exploitation, rather than what it has actually been. However, holding an independent variable constant is a standard procedure when the movement of a dependent variable is

influenced by two independent variables and when one wants to determine the effect of one independent variable only. This aside, the ARP can be and is computed in different ways by different authors. Some use current, others deflated prices. Some use in the denominator only fixed constant capital, others also constant circulating capital, and others also variable capital. Some use profits before tax, others after tax. Some use profits before interest payments, others after interest payments. Some deduct the compensation of managers from wages and some don't. Some use historic costs valuation, others replacement costs. Some include profits generated outside the US, other don't.

Besides all these differences, the NIPA data make it impossible to compute 'real' profitability. They do not record tax evasion, nor the profits generated in mental production. They are unsuitable to compute the income of managers. Official statistics make no difference between those who perform the function of capital and those who perform the function of labour (and are thus labourers) even if they perform the work of co-ordination and unity of the labour process. Moreover, the great majority of those who perform the function of capital are not managers but members of the army of agents whose task is that of supervision, like the first line supervisors. They are all grouped under the category of managers. Even more importantly, no matter how the ARP is computed, invariably all commentators use official statistics that are the monetary expression of use values (output). But the Marxian rate of profit should be a monetary expression of value. The 'real' ARP in terms of use values is not the 'real' Marxian ARP. Will the 'real' ARP please stand up?

The CE-ARP is indeed hypothetical. But so are *all* the other measures of profitability. The point is that it reveals that the rate of profit that can explain crises and recoveries, i.e. the rate of profit based on the surplus value actually generated, has been falling.[17] Chart 6 below shows the secular inverse relation between the CE-ARP and the OCC.

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[17] Paitaradis and Tsoulfidis find that their net profit rate starts increasing around the early 1980s but conclude that there is no recovery because the 1997 peak is far below that of the 1960s (2012, p. 224). Nevertheless, their trend *is* rising. The reason why there has not been a recovery is the fall in the CE-ARP.

Chart 6. CE-ARP and OCC
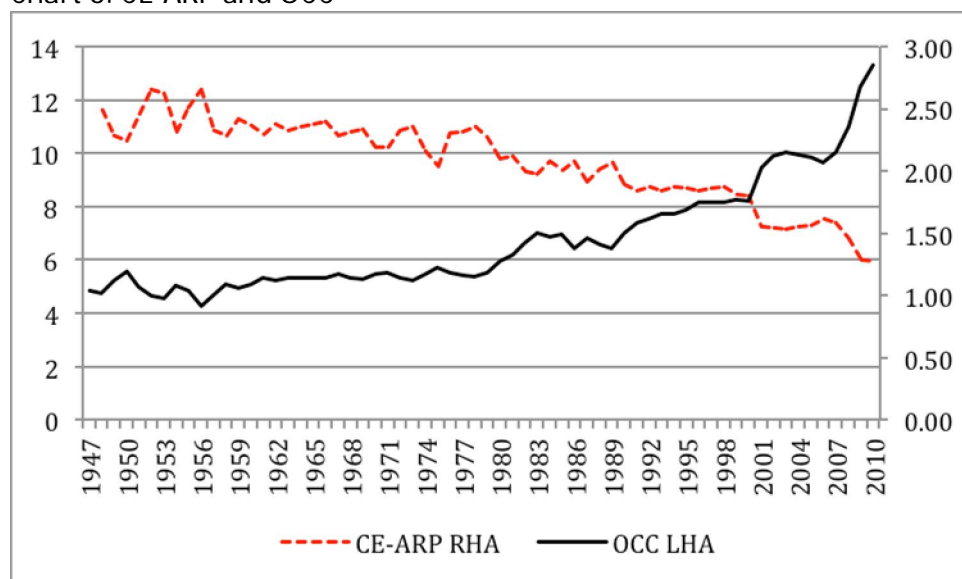
An all-important point emerges from this chart. If the OCC and thus the assets relative to labour rise persistently (even if in a zig-zag way) while the ARP falls persistently (also in a zig-zag way), constant capital cannot produce surplus value and thus value. Given that there are only two factors of production, means of production and labour, it is labour and only labour that produces value and surplus value.[18] Marx's law of value is empirically substantiated.

VI. The short cycles. The CE-ARP falls through a succession of upward and downward cycles. To understand this movement we must consider the interplay of technological competition, the OCC, the ARP, and employment.

A review of the 34 short cycles from 1948 to 2010 shows that in 28 out of the 33 cases, as the CE-ARP climbs to a peak, the OCC falls and vice versa.[19] This is a replica on a micro-scale of the long-term, secular movement. The following example - the 1954-56 upward cycle and the following 1956-58 downward cycle - illustrates the recurrent pattern[20]

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[18] The point is not to show that labour produces value. Marx had already given an answer: "Every child knows that any nation that stopped working, not for a year, but let us say, just for a few weeks, would perish" (Marx, 1969, p.416). The point is to show that *only* human labour, and not the means of production, produces value. Like man-made means of production, animals, the forces of nature, etc. affect efficiency and productivity and thus the quantity of use values produced, but not value. Those who think differently should submit a theory of value and of economic cycles based, say, on horse power. As for those performing what Marx calls the function of capital, from CEOs to first line supervisors, they are needed to enforce exploitation on behalf of the capitalists. But they do not produce value because they, even if at the service of capital, do not transform use values but only supervise that transformation. See Carchedi, 1971.

[19] The five exceptions are: 1980-81 and 1990-92 when both the CE-ARP and the OCC rise; and 1960-63, 1993-94, and 1996-98 when the CE-ARP rises but the OCC remains constant.

[20] The next section will consider the Great Recession and the recovery preceding it.

Table 1.

Upward cycle	CE-ARP	OCC	E	TV%	Wage share	Wages %	New value
1954	10.8%*	1.08	18.5	-0.3	42.8%	-3.92	-5.1%
1955	11.7%	1.04	19.6	+10.4	42.4%	9.11	14.4%
1956	12.4%	0.92	19.9	+5.6	45.7%	13.83	9.5%

Downward cycle	CE-ARP	OCC	TV%	E	Wage share	Wages %	New value
1956	12.4%	0.92	+5.6	19.9	45.7	13.83	9.5%
1957	10.8%*	1.01	-2.5	19.1	44.0	-6.07	-6.6
1958	10.6%*	1.09	-2.3	18.5	43.4	-3.5	-7.5

E = employment in millions. TV% = percentage growth in total value. 1956 is both the culmination of the upward cycle and the starting point of the downward cycle. * are crisis years

Table 3 begins with the 1954-1956 upward cycle. Its starting point is the 1954 trough in profitability (10.8%), which, combined with the fall in total value (-0.3%) and in new value (-5.1%), determines the crisis. In the preceding depression and trough, some capitals have closed down. In 1954 wages have fallen by 3.92%. Other capitalists can now fill the economic space left vacant. Starting from 1955, production, as measured by total value and new value, increases (respectively +10.4 and +14.4%). Initially, net fixed investments do not rise. Rather, capitalists increase their assets' capacity utilization. More labourers are now employed by the same (previously under-utilized) means of production (from 18.5 to 19.6 million). Due to higher capacity utilization, assets are subject to increasing wear and tear, which reduces their value. Also, the capitalists buy the means of production, raw materials, semi-finished products, etc. of the bankrupt capitalists at deflated prices. These means of production do not incorporate new technologies and thus do not shed any labour. Constant fixed capital falls. The numerator of the OCC falls. Start-ups play also a role. Their formation accelerates in times of economic growth and given their lower OCC, they contribute to the increase in the ARP (see below). Due to increased employment, wages rise (+9.11%). The denominator of the OCC rises. The OCC falls on both accounts (from 1.08 to 0.92). The wage share rises with employment (from 42.8% to 45.7%). The CE-ARP rises from 10.8% to 11.7% in 1955 and further to 12.4% in 1956. Rising employment increases labour's purchasing power and rising profitability increases that of capital. Both factors facilitate the realization of greater output. This is a two-year economic recovery.

At this point, the movement changes direction. This is the start of the 1956-58 downward cycle. Spurred by higher profit rates and hindered by high capacity utilization, capitals start investing in higher labour-shedding and productivity-increasing assets. Constant capital rises and employment falls and, with it, the wage share and wages. Some capitals cease operating, i.e. some capital is destroyed. Many start-ups go bankrupt and, given their low OCC, the ARP falls. The OCC rises from 0.92 to 1.09 and the CE-ARP falls from 12.4% in 1956 to 10.6% in 1958 (while the profitability of the more efficient capitals rises). The destruction of capital reaches the point at which the percentage growth of total value falls from +5.6% to -2.3%. New value falls by much more, from 9.5% to -6.6% in 1957 and to -7.5% in 1958. Due to falling

employment and to falling profitability, both labour's and capital's purchasing power fall. Difficulties of realization follow. This is a two-year slump.

The example above highlights three major points. First, the upward profitability cycle generates *from within itself* the downward cycle. This latter, in its turn, generates *from within itself* the next upward profitability cycle. Second, there is an inverse relation between the OCC and thus technological innovations on the one hand and profitability and employment on the other. Third, these fluctuations do not move around an equilibrium average, as it would seem if we focus on short-term cycles (in this example, the ARP starts at 10.8% in 1954 and ends at 10.6% in 1958). Rather, *each cycle is a further station on the path of the long-term secular fall in profitability*. As chart 7 below shows, both the short-term crises and the short-term booms are embedded within a long-term secular fall in the CE-ARP, i.e. short-term recoveries cannot counter the secular fall in the CE-ARP. It also shows that starting in the mid-1980s, crises become deeper each time.[21]

Chart 7. CE-ARP, growth of new value (%), and crises (negative % growth of new value), RHS
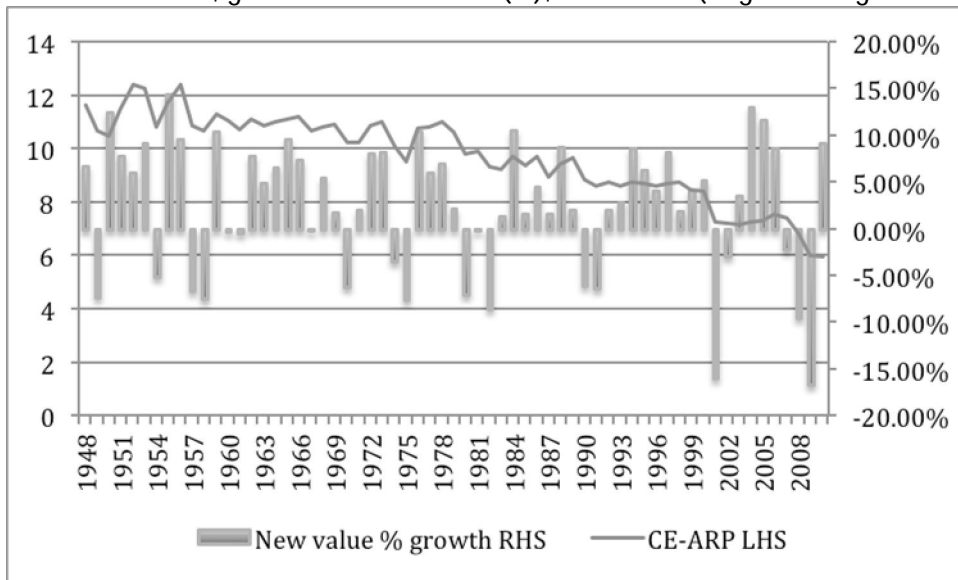
VII. Crises and recoveries. Consider now the genesis of all post-WWII crises and recoveries.

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[21] For Marx, crises "become more frequent and more violent" (2000, p.43). This should be interpreted in terms of the secular trend (which is downward) and not in the sense that each crisis is necessarily more violent than the previous one.

Table 2. Crises

(1) Crisis years [22]	(2) Negative % change in new value in crisis year(s)	(3) % Rise in OCC in crisis years	(4) % Fall in CE-ARP in crisis year	(5) % Fall in employment in crisis year(s)	(6) % Fall in employment before crisis year
1949	-7.24	1948(1.02) 1949(1.12)	1948 (11.6) 1949 (10.6)	1948 (-0.8) 1949 (-6.8)	n.a.[a]
1954	-5.13	1953(0.97) 1954(1.08)	1953 (12.2) 1954 (10.8)	1952 (4.8) 1953(-2.2)	1952(4.8) 1953(-2.2)
1957-58	Cumulative -14.16	1956(0.92) 1957(1.01)	1956 (12.4) 1957 (10.8)	1955(5.9) 1956(1.6)	1955(5.9) 1956(1.6)
1960-61	Cumulative -0.72	1959(1.06) 1960(1.08)	1959 (11.3) 1960 (11.0)	1959 (4.4) 1960 (-4.5)	n.a.[a]
1970	-6.19	1969(1.13) 1970(1.17)	1969 (10.9) 1970 (10.2)	1968(2.6) 1969(1.1)	1968(2.6) 1969(1.1)
1974-75	-11.03	1973(1.12) 1974(1.17)	1973 (11.0) 1974 (10.0)	1972 (4.7) 1973(4.2)	1972(4.7)[b] 1973(4.4)
1980-82	Cumulative -15.79	1979(1.18) 1980(1.28)	1979 (10.6) 1980 (9.8)	1978(5.9) 1979(0.8)	1978(5.9) 1979(0.8)
1990-91	Cumulative -12.36	1989(1.28) 1990(1.50)	1989 (9.6) 1990 (8.8)	1987(2.3) 1989(-0.4)	1987(2.3) 1989(-0.4)
2001-02	Cumulative -18.84	2000(1.75) 2001(2.02)	2000 (8.4) 2001 (7.2)	1997(2.4) 2000(0)	1997(2.4) 2000(0)

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[22] The crisis years so defined coincide with the NBER data. The chronology does not change if crises are defined as negative growth of total value.

| 2007-09 | Cumulative -28.4 | 2006(2.07) 2007(2.15) | 2006(7.5) 2007(7.3) | 2005(1.6) 2006(-1.1) | 2005(1.6) 2006(0.1) |

[a] To observe the fall in new value before the pre-crisis year, at least two years are needed before the crisis. [b] The 1974-75 crisis is the only exception. The new value grows, even if minimally, before this crisis. FP = financial profits as percentage of total profits.

In the crisis years (column 1 in table 2 above) the OCC rises (column 3) and thus the ARP falls (column 4). The fall in the ARP indicates the economic and financial difficulties of the technologically backward capitals and thus bankruptcies and unemployment. Thus the fall in the ARP causes a fall in employment not only relative to the means of production (the fall in the ARP) but also in absolute terms (column 5). Given that only labour creates value, new value stops growing and its rate of growth becomes negative (column 2). The crisis emerges when the fall in profitability causes a negative growth of new value. This is how falling profitability determines crises. In table 2 above, all crises are preceded by falling profitability. For example, the 1949 crisis is preceded by a fall in the CE-ARP from 11.6% in 1948 to 10.6% in 1949. But not all periods of falling profitability result in a crisis. It is only when the new value reaches a negative percentage growth that the crisis ensues. Employment falls too, but it need not grow negatively.

Conversely, recoveries are periods of not only growing profit rates but also of rising percentage of new value

Table 3. Recoveries

Recoveries	CE-ARP (%)	New value growth (%)
1961-62	10.7->11.1	-0.4->7.7
1963-66	10.8->11.2	4.9->7.4
1971-73	10.2->11.0	1.9->8.2
1975-78	9.0->11.0	-7.6->7.0
1987-89	8.9->9.6	1.5->2.0
1991-92	8.6->8.7	-6.3->2.0
1993-94	8.6->8.7	2.8->8.5
2003-2006	7.2->7.5	-3.5->8.6
2009-2010	5.9->5.9	-16.7->9.1

N.B. Negative growth rates of new value indicate crises years. They are also the start of the recovery.

In the recovery period, the CE-ARP rises and production increases. At first, existing capital increases the labour employed but not the assets as capital relies on a greater capacity utilization of existing assets. The higher capacity utilization increases the wear and tear. The stronger capitals can purchase the means of production of the bankrupt capitals at fire prices. Start-ups play also a role. Usually, their OCC is lower than the average. As Laderman and Leduc put it (2014)

Because start-ups generate jobs at a much faster pace than older businesses during recoveries, they account for a significant proportion of job growth in the economy, even though their

share   of   overall   employment   is   quite   small.

In the next phase, when employment and wages rise, capital starts increasing investment in new assets. Labour falls percentagewise and the OCC rises. Since only labour creates value, the rate of growth of new value slows down as well. The bankruptcy of the start-ups raises the average OCC because of their lower OCC. The crisis emerges again when both the CE-ARP falls and new value starts to contract.

Let us now consider the 2007-09 Great Recession. The critics argue that it cannot have been determined by falling profitability because profitability rises in the 2002-2006 recovery preceding it. However, as table 2 shows, it falls from 2006 to 2007, conforming to Marx and contrary to the critics.

Consider now the 2007-2009 crisis and the recovery preceding it. Let us start with the 2003-2006 recovery. As Table 4 shows, the CE-ARP grows by a very modest 0.4 percentage points while the ARP grows much more, by 9 percentage points due to the jump in the rate of exploitation of 27.1 percentage points. But we should distinguish between two phases: 2003-2005 and 2005-2006. From 2003 to 2005, the rate of growth of assets decelerates and that of employment and wages accelerates because the capitalists increase their assets' capacity utilization with greater employment. The OCC falls from 2.15 to 2.10. The CE-ARP rises, from 7.1 to 7.3.

Table 4. The 2003-2006 recovery

Upward cycle	Rate of exploitation	ARP	CE-ARP	Assets % growth	Wages % growth	OCC	Labour % growth	New value % growth	Productivity % growth
2003	13.1	4.1	7.1	1.9	0	2.15	-2.18	3.48	4.7
2004	24.4	7.8	7.2	1.3	2.7	2.12	1.38	12.97	3.7
2005	35.5	11.4	7.3	1.4	2.5	2.10	1.68	11.68[a]	3.6
2006	40.2	13.1	7.5	3.2	5	2.07	0.13	8.67	5.2
Ppt	27.1	9	0.4						

[a] 2005 is the only dissonance: from 2004 to 2005 labour's percentage growth rises while new value falls. However, from 2004 to 2006, the trends of both labour and new value are downward.

From 2005 to 2006, labour's percentage growth slows down, from 1.68 to 0.13, and assets percentage growth rises, from 1.4 to 3.2. Productivity increases from 3.6 to 5.2. This is a clear indication that capital, spurred by rising profitability, starts investing in labour-shedding and productivity-increasing means of production, conforming to Marx. Due to the accumulated strength of labour, in 2006, wages keep rising even if employment has started slowing down. Since wages rise more than assets, the OCC keeps falling and the CE-ARP keeps rising. But the seeds of the crisis have been sown.

In 2006, even if assets grow less (+3.2%) than wages (+5%) so that the OCC falls, the acceleration in the percentage growth in assets has begun: while from 2004 to 2005 the growth is 0.1 percentage points, from 2005 to 2006 it is 1.8 percentage points. At the same time, labour's percentage growth slows down from 1.68% in 2005 to 0.13% in 2006. So the rate

of growth of new value falls from 11.68% to 8.67%. The elements of the coming crisis have come together. Even if the OCC is still falling and the CE-ARP is still rising, the movement that leads to the crisis has been set in motion: an acceleration in the growth of assets and a deceleration in the growth of employment and of new value.

There is an added reason why the OCC falls in the 2002-2006 period. The incentive for capital to invest relatively more in labour power than in assets was the extremely high rates of exploitation that more than compensated the wage rise. From 2002 to 2006, wages rise by 5 percentage points while exploitation rises by 27.1 percentage points. This is a golden opportunity for capital to expand employment and to slow down investment in constant capital.

The crisis emerges in 2007. In that year, assets grow more than wages (+5.7% and 1.8% respectively), so that the OCC rises and the CE-ARP falls. Employment falls to negative values and new value percentage growth becomes negative too. All elements of the crisis have emerged: rising OCC, falling profitability and negative values both of employment and of new value. This is the origin of the Great Recession. It strikes its roots in the 'real', rather than in the financial and speculative economy. The latter detonates the former.

Table 5. The 2007-09 Great Recession

Crisis years	CE-ARP	ARP	OCC	Employment % growth	New Value % growth	Productivity % growth
2006	7.5	13.1	2.07	0.13	8.6	5.2
2007	7.3	11.0	2.15	-1.93	-2.2	4.4
2008	6.8	7.8	2.36	-7.53	-9.5	8.5
2009	5.9	4.4	2.67	-12.54	-16.7	9.3

Here too start-ups play a role

even modest slowdowns in start-up growth could result in significant drops in overall employment growth... Employment at start-ups was particularly hard-hit during the Great Recession, suffering a much steeper decline in growth compared with more mature businesses and compared with start-ups in previous recessions... compared with the recovery from the deep downturn of 1981–82, start-up employment grew significantly less in the year following the Great Recession... between March 2010 and March 2011, lower employment growth at start-ups may have subtracted as much as 0.7 percentage point from total job growth, translating into roughly 760,000 fewer jobs."

Another controversial point is whether the 2007-2009 crisis was a financial crisis that spread to the productive sectors or the other way around. The above has already given a first answer: the downward movement in the CE-ARP started before 2007. Table 6 below provides further evidence.

Table 6.

|	Financial profits ($bn)	Financial profits as % of total profits	New value % growth	OCC	CE-ARP

2003	306.5	38.2	3.4	2.15	7.1
2004	349.4	33.3	12.9	2.12	7.2
2005	409.7	29.0	11.6	2.10	7.3
2006	415.2	26.0	8.6	2.07	7.5
2007	301.5	21.6	-2.2	2.15	7.3

If the focus is on the mass of financial profits, the 2007 financial crisis cannot have been determined by falling financial profitability because financial profits rise up to the burst of the financial crisis, from $306.5bn in 2003 to $415.2bn in 2006. So the financial crisis must have a different cause. It could be submitted that the cause is the fall in financial profits as a percentage of total profits, from 38.2% in 2003 to 26.0% in 2006. But this only tells us that in this period less capital moves out of the productive sectors, where profitability is on the rise, and into the fictitious ones. Then, the genesis of the 2007 crisis must be sought in the productive sectors. From 2003 to 2006, the CE-ARP rises but the new value created slows from a rate of growth of 12.9% in 2004 to 8.6% in 2006, three years before the financial crisis. A fall of -2.2% and a fall in the CE-ARP reveal the crisis in the productive sectors. It determines the financial crisis, which in turn catalyses and reveals the crisis of profitability.

The Great Recession disproves the critics' view that productivity and profitability are positively correlated and confirms Marx's view that they are inversely correlated. As Table 4 above shows, from 2003 to 2005 the CE-ARP rises but productivity falls. And as table 5 shows, from 2007 to 2009, the CE-ARP falls but productivity rises. The above holds also if the ARP is considered instead of the CE-ARP.

VIII. Money, profitability and inflation. It is commonly held that crises can be avoided by manipulating the quantity of money. Chart 8 below shows that monetary measures are ineffective as anti-crises policies.

Chart 8. ARP, CE-ARP, and money quantity
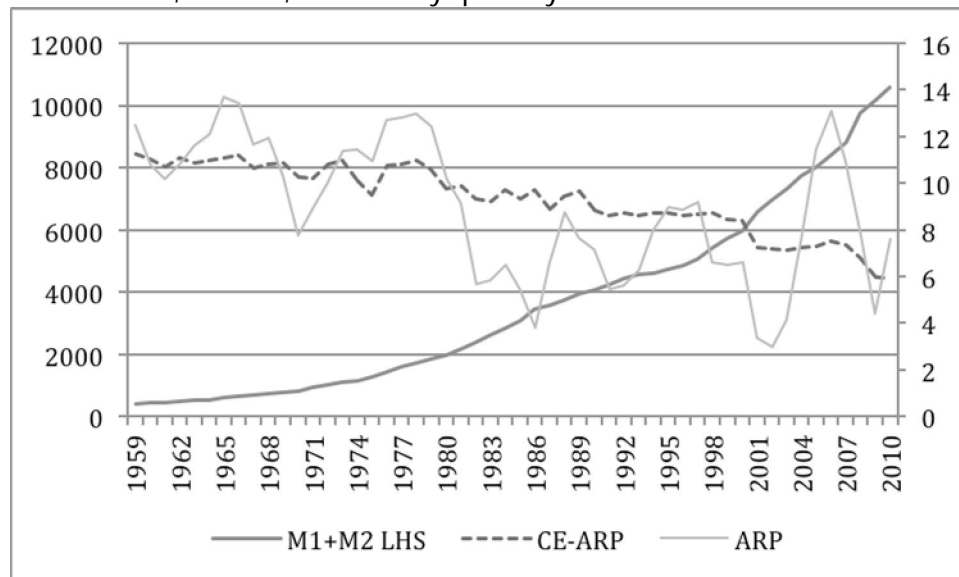
While the quantity of money (M1+M2) grows persistently, the ARP falls up to the mid-1980s and rises afterwards while the CE-ARP falls persistently. Whether variations in *distribution* (i.e. in the rate of exploitation) are factored out or not, the increase in the quantity of money has

no influence on the long-term decrease in the *production* of surplus value relative to the capital invested.[23]

IX. From the Golden Age to the Long Depression. Let us now disaggregate the post-WWII secular period into two medium-terms periods, or phases.[24] Given the cardinal function of value in Marx's theory, the discriminating factor should not be GDP but employment and thus value. Table 7 below shows that in the upward phase, employment grows from 17.56 million in 1947 to 24.97 million in 1979. Both total value and new value rise. In the next phase, employment falls to 17.79 million in 2010, approximately the 1947 level. Both the growth and the rate of growth of total value and new value fall

Table 7.

Employment	Employment % increase	Total value	New value
1947: 17.5 m 1979: 24.9 m	+42.8%	% increase: 231.3% Average % increase:7.0%	% increase: 538.3% Average % increase: 16.3%
1980: 2010: 17.7 m	-28.7%	% increase: 140.1% Average % increase: 4.5%	% increase: 186.2% Average % increase: 6%

The period from the end of WWII to the mid-1970s has been called the Golden Age of capitalism. In line with the long-term increase in employment, the end of the Golden Age is about 1979. Its vigorous economic growth (relative to 1980-2010) seems to contrast with the fall in profitability (in terms of both the ARP and the CE-ARP) in the same period. How can this apparent inconsistency be accounted for?

The war produced a massive destruction of capital. In the US, it was not a destruction of the physical productive structure and infrastructures. They were unscathed. There was the annihilation of the value contained in the means of destruction (weapons and military apparel). But this is not the most important aspect. For some authors, capital destruction is the depreciation of assets of the bankrupt capitals and the acquisition by the surviving capitalists of those assets at bargain prices. But this is not destruction, only a redistribution of value. If capital is essentially a production *relation*, the war delivered a destruction of capital *as capitalist production relations* in the *civilian* sphere and their reconstitution *in the military sphere*. There was the massive conversion of the civilian economy plagued by high unemployment, great excess capacity utilization and falling profitability into a full employment military economy with full capacity utilization, guaranteed realization, high profits and profitability, and high levels of saving. Let us elaborate.

First, before the war capacity utilization was very low. But as early as June 1941 it had reached

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[23] I use the conventional definition of money, as M1+M2, to show that not only money proper (bills and coins) but also credit (which is not money) are impotent against the tendency towards the fall in profitability and thus crises.

[24] I do not use the term 'long waves' because I submit empirical evidence limited to the post-WWII period in the US productive sectors.

100% in the production of iron and steel and durable goods of all types. Idle capital practically disappeared and with it its dead weight on profitability. Profits grew on this account.

Second, net fixed investment fell. Using investments indexed at 2005 prices = 100, investments fell from 4.9 in 1941, to -1.6 in 1942, to -3.2 in 1943, to -1.6 in 1944, to +1.3 in 1945.[25] They rose above the 1941 level only in 1946. The capital composition fell and so the ARP grew.

Third, real wages fell although nominal money wages did grow due to near full employment. The shortage of male industrial workers (10 million were absorbed by the war effort) was made good by the proletarianization of agricultural labour and by the influx of women in the labour process. But wartime shortages in consumer products meant that US labour's nominally increasing purchasing power could not be spent in spite of higher money wages. And a share of those wages was saved in various forms, for example, war bonds. The government used this borrowing to finance the war industry and its profits. So as long as the war lasted, the share of new value going to labour decreased. The organic composition of capital fell and the ARP rose also on this account. These three factors account for the jump in the wartime ARP.

With the end of the war, the liberation of the pent-up purchasing power and the reconversion of the military economy into the civilian one spurred the production first of the means of consumption and then of the means of production.[26] Automobilisation (and the suburbanisation it made possible) played a pivotal role (Harvey, 2010, p.169). Constant capital's rate of growth was the highest in the whole post-WWII period. It grew by an average of 4.45% from 1948 to 1986 (as opposed to 3.8% from 1987 to 2010). The unemployment caused by technological innovations was absorbed by the vigorous rate of growth of capital accumulation. Employment grew. Greater employment, wages, and profits followed and with them a further surge in purchasing power. The application to the production process of new technologies developed during the war also increased labour's productivity. New needs were created in order to absorb this greater and qualitatively new output.

The Golden Age was the initial phase of the *reconstitution of civilian capital*. In essence, capital was first destroyed in the low profitability civilian sphere, then reconstituted in the high profitability war economy, and then reconstituted again as civilian capital within the context of a large-scale, robust, and sustained expanded reproduction. Growth and (maldistributed) welfare spread from the productive sector to the rest of the US economy and then to Western economies. Economic expansion – together with favourable political and ideological relations (the Cold War) - made the rise of the welfare state possible, not the other way around.

But the high economic growth (an average annual growth of new value of 16.3% from 1947 to 1979), high employment (+42.2% in the same period) and the surge in mass consumption hid the creeping economic malaise, the fall in both the ARP and in the CE-ARP. Not by chance was the Golden Age marred by six crises, two of which (in 1957-58 and in 1974-75) were particularly severe.[27] The exceptionality of the Golden Age is the reason why high growth and high employment could coexist with a falling ARP. But this was also the reason why crises could

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[25] BEA, Table 5.2.3: Real Gross and Net Domestic Investment by Major Type, Quantity indexes, at http://www.bea.gov/iTable/iTable.cfm?ReqID=9&step=1#reqid=9&step=3&isuri=1&910=X&911=0&903=138&904=1940&905=2011&906=Q

[26] Of course, the military industry keeps playing an important role in the US.

[27] Writing from an underconsumptionist perspective, for Foster the end of the Golden Age has been due to drying up of "the consumer liquidity that fed the post-war buying spree" (Foster, 2012).

mature and emerge within the context of a vigorous and protracted economic expansion.[28] Labour in the productive sectors reached its maximum strength in the 1947-1986 period. The wage share (the share of wages to total value) increased from 42.2% in 1948 to 44.8% in 1973 and then fell to 40.4% in 1986. A fall of 1.8 percentage points in a quarter of a century is very modest and did not indicate yet a weakening of labour. At the same time the CE-ARP fell from 11.6% in 1948 to 9.7% in 1986. The fall in profitability was increasingly undermining economic growth from within because it was starting to reduce employment and thus the new value produced. As more firms closed down and unemployment could not be absorbed any longer by capital accumulation, the second phase set in. Difficulties of realization in the productive sectors began to emerge because both the falling labour force and the capitalists (whose profitability and thus purchasing power was falling) had increasing difficulties in absorbing the rising output. The investment of capital in the financial sectors, where higher profit rates could be reaped, accelerated. Financial crises started to emerge and became a recurrent feature. Profits in these sectors grew as a percentage of total profits from 6.8% in 1982 to 40.2% in 2003. In the Great Recession, that percentage fell to 12% in 2008 but it has recovered since (reaching 25.9% in 2010).

Higher profits and profitability in the unproductive sectors are the other side of the coin of falling profitability in the productive sectors. Falling profitability as well as capital's bargaining and political weakness had to be redressed. Around the middle of the 1980s capital unleashed a savage attack and labour suffered an historic defeat. From 1986 to 2010, the wage share tumbled from 40.4% in 1986 to 24.1%. Unfortunately, labour has not yet been able to reverse this trend.

APPENDIX.

Profits are from NIPA tables 6.17A, 6.17B, 6.17C, 6.17D: Corporate Profits before tax by Industry
[Billions of dollars]. In the first three tables utilities are listed apart but in table 6.17D they are listed together with and cannot be separated from transportation. I have decided to disregard utilities in all four tables. See note 4 above.

Constant capital is here the same as fixed capital (see note 12 above). The BEA defines fixed assets as "equipment, software, and structures, including owner-occupied housing" (http://www.bea.gov/national/pdf/Fixed_Assets_1925_97.pdf). The data considered in this paper comprise agriculture, mining, construction, and manufacturing (but not utilities, see above). Fixed assets are obtained from BEA, Table 3.3ES: Historical-Cost Net Stock of Private Fixed Assets by Industry [Billions of dollars; yearend estimates].

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[28] Some authors (e.g. Duménil and Lévy, 2004, p. 29) question the inverse relation between higher productivity and employment. They argue that during the 1960s both labour productivity and employment advanced rapidly and that, when technological progress slowed down, structural unemployment arose. Indeed, in the 1947-79 period both labour productivity (+136.7) and employment (+42.2) did rise. However, Marx relates productivity to employment *per unit of capital* and argues that when the former rises, the latter falls. Chart 1 above shows that throughout the whole post-WWII period, while productivity rises, the labour/assets line falls, i.e. employment *per unit of capital* falls, thus supporting Marx's hypothesis. Employment per unit of capital is not *total* employment. As Marx says: 'The number of labourers employed by capital ... *can*, consequently, increase, and increase progressively, in spite of the progressive drop in the rate of profit" (Capital, Vol. III, p.218, emphasis by Marx)", i.e. in spite of the increased productivity of labour. Here Marx refers to total employment, which depends not only of efficiency/productivity but also on capital accumulation. In the Golden Age, the shedding of labour caused by a rise in efficiency/productivity was more than counterbalanced by the rising employment following the reconstitution and reproduction of civilian capital on an expanded scale.

Wages for goods producing industries and are obtained from NIPA Tables 2.2A and 2.2B: wages and salaries disbursements by industry [billions of dollars].
Employment in goods producing industries is obtained from: US Department of Labor, Bureau of Labor Statistics, series ID CES0600000001.

Money ARP is computed by dividing profits of a certain year by fixed and variable capital of the preceding year, conforming to the temporal approach. It is computed for the productive sectors. The best approximation are the goods producing industries. These are defined as agriculture, mining, utilities, construction and manufacturing. However, in this paper, utilities are disregarded (see above). See note 15.
Money and value ARP. Suppose we want to compute the ARP in value (i.e. labour) terms as the end point of period t2-t3. We must start our data collection one period earlier, t1-t2. At t2, the price of the means of production as outputs of t1-t2, the units of labour employed during that period, the money wages paid, and the profits realized are known. Then we divide the total of money wages and profits by the labour units (or hours) of new labour and obtain the units of new labour corresponding to one unit of money wages plus profits. Given the inherent homogeneity of value (as abstract labour) and of money, we apply this ratio to the price of the means of production at t2. This is the value of those means of production as outputs of t1-t2. They enter t2-t3 as inputs and thus with the same value. So we have the labour content of the means of production at t2 as the beginning of t2-t3. Next we compute at t3 wages as a percentage of total wages plus profits. We do the same with profits. If we multiply these percentages by the units of labour expended, we obtain the value of labour power and of profits in terms of labour. We now have assets in terms of labour at t2 as the initial point of t2-t3 plus wages and profits also in terms of labour at t3. The *temporal* ARP in terms of labour (value) follows. It also follows that it is possible to measure the value of the output of t2-t3 before it is sold. Value exists before it become manifest as money.

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