
Munich Personal RePEc Archive

Capital Intensity, Unproductive Activities and the Great Recession of the US Economy

Tsoulfidis, Lefteris and Paitaridis, Dimitris

23 September 2017

Online at https://mpra.ub.uni-muenchen.de/81542/
MPRA Paper No. 81542, posted 25 Sep 2017 12:42 UTC

Capital Intensity, Unproductive Activities and the Great Recession of the US Economy

Lefteris Tsoulfidis* and Dimitris Paitaridis**

Mailing Address:

LEFTERIS TSOULFIDIS
Professor, Department of Economics
University of Macedonia
156 Egnatia Street, PO Box 1592
540 06 Thessaloniki, Greece
Tel. 30 31 891-788
e-mail: Lnt@uom.edu.gr

Abstract

The purpose of this article is to show that the 'great recession' of 2007 in the USA is of the classical type with basic features the rising value composition of capital which more than fully offset the rising rate of surplus value giving rise to a falling rate of profit. The tendential fall of the latter, from a point onwards, led to a stagnant mass of real net profits, thereby decreased net investment and eventually impacted on employment. The evolution of capital intensity and the consequences of unproductive activities remain key issues in the discussions of capital accumulation and its periodic ruptures.

Key Words: Composition of capital, unproductive labour, capital accumulation, rate of profit, growth accounting

JEL Classifications: B5, D33, E1, N12, O51

---

* Department of Economics, University of Macedonia, Thessaloniki, Greece
** Institute of Labour (INE), Athens, Greece
A preliminary version of this paper was presented at the IIPPE conference in Berlin School of Economics and Law, September 13-15, 2017.

1. Introduction

The purpose of this article is to review some crucial relations among the key variables that relate to the rate of profit, the principle macroeconomic variable that shapes the process of capital accumulation, and its rupture through periodic crises. The testing ground for these variables will be the US economy for it continues to shape, to a great extent, the stage of the world economy. The main thesis of this article is that in the postwar USA there have been two successive phase-changes in the long-wave-like evolution of its economy. The first, starting with a period of expansion lasting up until the mid to late-1960s and it has been characterized as the 'golden age of accumulation' and was followed by the 'stagflation crisis' of the late-1960s (known also as the 'silent depression') that ended in the early to mid-1980s (Tsoulfidis, 2002). The rising phase of the second postwar long wave known as the 'new golden age of accumulation' or 'neoliberal period' reaches its tipping point around the middle to the end of the first decade of the new millennium. The current situation is characterized by a continuation of the recessionary phase although the US economy seems to have recovered somewhat since 2007; however, the general sense is that this is far from a vigorous recovery. The phenomena observed in the identification of the two tipping points (by the late-1960s and the late-2000s) are quite similar and these are the falling rate of profit and the associated with it stagnating mass of real net profits. The latter slows down new investment spending; thereby leading to the devaluation of capital and to quite severe unemployment especially when the discouraged workers are counted in the official statistics as well as the rising number of the long-run unemployed population while part-time employment by no means should be equated to full-time employment. The fall in the rate of profit is consistent with the hypothesis of a rising rate of surplus value and a simultaneously increasing value composition of capital; the latter reflecting changes in the technical composition of capital, concepts explicated in the next section. Furthermore, the fall in the rate of profit affecting, and being affected by, the expansion of unproductive expenditures encapsulates interesting new developments in the area of technical change.

It is important to note that this description of the US postwar economy has been challenged by Zarembka (2015), who takes issue with the idea of the rising material composition of capital (or capital-output ratio) which he finds to be more or less trendless for the 1956-20011 period and so argues that the evolution of the rate of profit has been shaped mainly by distributional factors, in particular by the rate of surplus value which is also behind the rising value composition of capital. Mohun (2014), on the other hand, challenges the claim that the rising non-production labour and expenditures contributed to the precipitation in the fall of the net rate of profit. Clearly, these are important issues that must be fully addressed in the face of updated and newly released more detailed data (see Appendix 1) which allow for longer time span estimations and also for the more refined construction of the

above key variables. As a consequence, the present article responds to the issues raised by the above two authors and by doing so sheds additional light to the current predicament.

The remainder of the paper is organized as follows: Section 2 analyzes in a growth accounting framework the relationship between the value composition of capital, the evolution of the material composition of capital and the rate of surplus value as well as the effects of prices and demand. Section 3, argues that the fall in the rate of profit affects and is being affected by the unproductive expenditures which weaken the growth potential of the economy leading to the present prolonged recessionary situation. Section 4 summarizes and makes some concluding remarks.

2. The compositions of capital and the rate of surplus value

The various compositions of capital became the focus of analysis of many radical authors during the decades of 1970s and 1980s (*e.g.*, Rosdolsky, 1977 and Shaikh, 1987 and the literature cited there). Starting with the technical composition of capital (TCC) the "inner measure of the composition" of capital refers to the vector of capital goods per worker and it is transformed to a scalar when multiplied by the vector of labour values at the base year giving rise to an index called technical composition (TC) which by virtue of technological progress tends to rise secularly. The increase in TC will also tend to increase also the value composition of capital (VCC) defined as

$$\frac{C}{v} = \left(\frac{TC}{v_0}\right)\left(\frac{\lambda_1}{\lambda_2}\right)\left(\frac{1}{w}\right)$$

where C is the (gross) capital stock, v the variable capital, v_0 the unit of labour power at the base year, λ_1 and λ_2 the unit values of capital and consumer goods, respectively and finally w is the real wage. The materialized composition of capital (MCC) is defined as

$$\frac{C}{l} = \left(\frac{TC}{v_0}\right)(\lambda_1)\left(\frac{v_0}{h}\right)$$

with h the length of the working day and l the value of living labour or the value added.[1]

Clearly, both the VCC and MCC depend on the TC but also on the relative unit values, along with the distributional factors. However, the crucial determinant turns out to be the TC since the relative unit values are expected to be very close to each other. The idea is that the rising TCC induces changes in the unit values of the means of production and the means of consumption, because the two unit values refer to general categories of commodities, which on the one hand may overlap while on the other hand, it is in the nature of technological change not to be confined to any single industry or department of production, but to rather

[1] For the sake of simplicity, we eliminated the time symbol t from the above variables.

rapidly diffused across industries.[2] In other words, the totality of industries in the economy are aggregated into two major departments, and therefore the ratio of their unit values is not expected to be quite different and should display fluctuating behaviour around and not far from one.[3] The rising real wage may cause the VCC to lag more or less behind the organic composition of capital (OCC) defined as

$$OCC = \frac{TC}{v_0}$$

Thus, the OCC will form an upper bound in the evolution of the VCC while the MCC will form the lower bound of the VCC. The connecting link between the VCC and the MCC is the rate of surplus value. Thus we may write,

$$\frac{C}{v} = \frac{C}{l}\frac{l}{v} = \frac{C}{l}\left(\frac{v+s}{v}\right) = \frac{C}{l}(1+e)$$

If the MCC or the capital-output ratio is rising, then the VCC is also rising and if the rate of surplus value is rising then the VCC is rising even more. Thus, if this is true, then it follows that a rising *C*/*v*, reflects the changes in the MCC, that is, the ratio *C*/*l* and in general we will have

$$\underbrace{\frac{TC}{v_0}\lambda_1\frac{v_0}{h}}_{MCC} \leq \underbrace{\left(\frac{TC}{v_0}\right)\left(\frac{\lambda_1}{\lambda_2}\right)\left(\frac{1}{w}\right)}_{VCC \approx OCC \text{ if } \lambda_1/\lambda_2 \approx 1} \leq \underbrace{\frac{TC}{v_0}}_{OCC} \leq TC$$

The availability of data allows us to take a long enough time period of 51 years starting from 1964, a year near the end of a rising phase known as the "golden age of accumulation" and including the 'stagflation crisis' of the 1970s and early to mid-1980s followed by the period of neoliberalism of steady growth, known as the 'new economy' which was interrupted by the end of year 2007, the starting year of what has been characterized by orthodox and heterodox economists alike the onset of the 'great recession' whose impact extends up to the year 2015, the last year that we managed to collate reliable data. It is important to point out that in the estimation of the MCC, we used data gross capital stock data which we constructed for the total US economy. The rationale for the utilization of gross (instead of the available net) capital stock data as well as the estimating method is discussed in Appendix 2.

[2] "If it is further assumed that this gradual change in the composition of capital is not confined only to individual spheres of production, but it occurs more or less in all, or at least in the key spheres of production, so that it involves changes in the average organic composition of the total capital of a certain society, then the gradual growth of constant capital in relation to variable must necessarily lead to a gradual fall of the general rate of profit [...]" (Marx, 1894, pp. 212).

[3] The theoretical expectation but also the empirical findings on price-value deviations suggest that the more aggregated the input-output tables, the closer the labour values to market prices. This is an empirical regularity ascertained in a number of studies (Tsoulfidis, 2010, and the literature cited there).

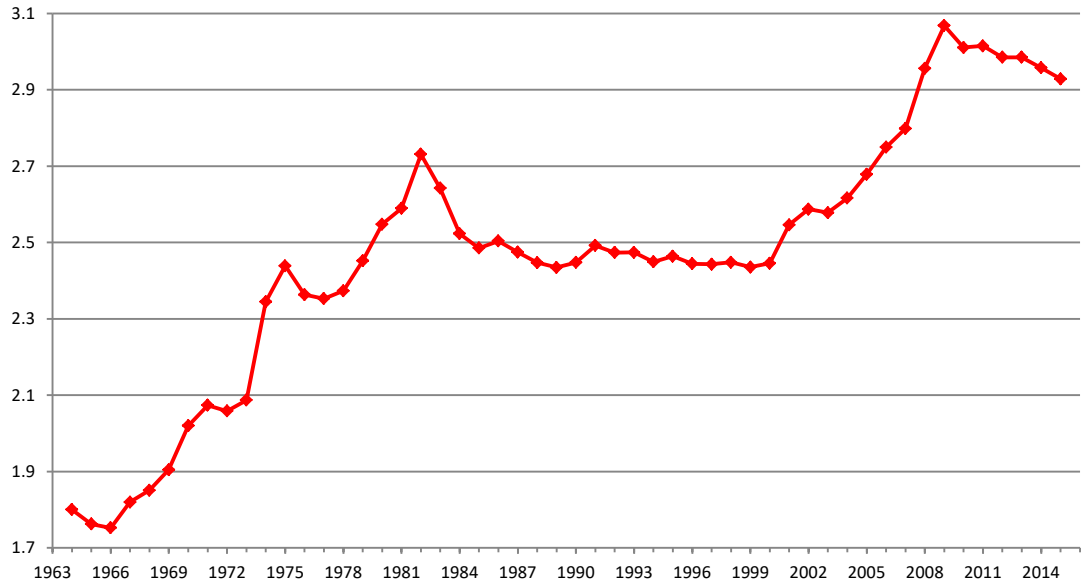

Figure 1. Materialized Composition of Capital, USA, 1964-2015

The average annual growth rate of the VCC during the period 1964-2015 is 1.79%, whereas for the same time period the growth rate of the rate of surplus value is at 1.07% and these estimates result in an overall falling rate of profit.[4] Meanwhile, the MCC grows mildly over the years at an average annual rate of 0.95%. In Figure 1, we observe that after 1999 and up until the year 2011 the growth rate of the MCC accelerates and reaches 1.78% and becomes negative thereafter. Zarembka's (2015) presents estimates of the MCC for meaningfully selected years and furthermore, he adjusts them by the degree of capacity utilization. Zarembka's data on the MCC display (especially after 1956) a pretty much trendless path leading to the idea that the rising VCC may be attributed to the rising rate of surplus value and not necessarily to the MCC. Such a conclusion necessitates the breaking down of the total growth in the VCC to its constituent components. The results of the growth accounting exercise conducted (see Tsoulfidis, 2015) on the basis of net capital stock showed that both the distributional and the technical factors are major determinants of the evolution of the VCC, but also that between the two, the technical factor, that is, the capital-output ratio in constant prices, was somewhat more influential. We repeat the same exercise using a longer time span and data that we constructed for the gross capital stock of the total economy and also adjust it by the degree of capacity utilization.[5]

[4] See the appendix for the estimation of the surplus value and variable capital.

[5] For the estimation of the gross capital stock of the total economy, we use the method employed by Shaikh (2016, Appendix 6.5) for the US corporate sector. The data on capacity utilization is for the total industrial sector and are reported in the Federal Reserve Bank of St. Luis http://research. stlouisfed.org/fred2/series/TCU. Hence, we are assuming that full capacity utilization is 82 percent, the usually assumed benchmark rate beyond which there are exercised inflationary pressures on the

Hence, we have an old empirical issue, the evolution of the capital-output ratio, which in the classical tradition is expected to be rising, because technological progress tends to be capital-using and labour-saving. Our data show that the capital-output ratio displays long fluctuations around a rising trend. From the early-1980s and the full decade of the 1990s, the capital-output ratio is nearly constant indicating that the growth in output is approximately equal to the growth of capital stock and from the late-1990s onwards, the capital-output display a rising trend up until the year 2011. To what extent, if any, the rising trend in the capital-output ratio (or MCC) is responsible for the rising value composition of capital and the falling tendency in the rate of profit is a question that can be dealt with by breaking down the growth rate of the value composition of capital to its four constituent components or factors; namely, the distributional, price, technical and finally the demand effects.

The breakdown of the VCC evaluated in market prices (not in values) can be shown starting with the definition of the value composition of capital

$$\frac{C}{v} = \underbrace{\left[\frac{p_k}{p_y}\frac{K \cdot u}{y}\right]}_{\text{MCC}} \underbrace{\left(\frac{p_y y}{v}\right)}_{1+e}$$

where C is the value or the fixed gross capital stock in current prices; v stands for the variable capital; p_k and p_y are the price indices of capital stock and value-added respectively; K and y are the capital and value-added, both evaluated in constant prices; finally, u is the rate of capacity utilization. The bracketed term in the above equation includes the components of the MCC whereas the term in the parenthesis is the ratio of value added to the variable capital or the term $1 + e$. By taking growth rates in the above equation, we can attribute the growth rate of the VCC into its constituent components and assess their relative contribution to the overall growth of the VCC. Thus, we may write

$$\widehat{\left(\frac{C}{v}\right)} = \underbrace{\widehat{\left(\frac{p_k}{p_y}\right)}}_{\text{Price Effect}} + \underbrace{\frac{\widehat{K}}{y}}_{\text{Technology Effect}} + \underbrace{\hat{u}}_{\text{Demand Effect}} + \underbrace{\widehat{\left(\frac{p_y y}{v}\right)}}_{\text{Distribution Effect}}$$

where a hat over a variable or a term indicates its annual average growth rate.[6]

The growth of the VCC therefore reflects not only the changes in the material features of the process of production, but also the induced changes in the structure of prices (relative prices) and income distribution as well as the strength of demand relative to supply as captured by the degree of capacity utilization. The effect of each and every one of these terms for selected time periods is given in Table 1 below.

economy (Mattey, 1996). Finally, we used data on investment and value added deflators of the base year 2009 from the Fed of St. Louis https://fred.stlouisfed.org/help-faq.

6 For the estimating methods and data sources see the Appendix 1

Table 1. Growth accounting of the value composition of capital, annual rates

Growth Rates / Periods	Value Composition of Capital (1)=(2)+(3)+(4)+(5)	Relative Price Factor Effect (2)	Technical Change Factor Effect (3)	Demand Factor Effect (4)	Distributional Factor Effect (5)
1964-2007	1.78	-0.27	1.30	-0.13	0.89
1964-1982	0.77	-0.37	1.87	-1.05	0.33
1982-2007	1.92	-0.79	0.89	0.53	1.29
2007-2015	-0.03	-0.62	1.19	-0.86	0.26
1982-2015	1.45	-0.75	0.96	0.19	1.04
1964-2015	1.50	-0.33	1.28	-0.24	0.79

We start off with the period 1964-2007 for the reason that it includes two long periods; the first, 1964-1982 recessionary period known as the 'stagflation crisis' and the second 1982-2007 booming period known as 'the new economy' or 'dot-com economy'. The underlying idea here is to examine to what extent, if any, these two long periods work in a way that their net effect leads to an overall falling rate of profit. We observe that the average annual growth rate of the VCC adjusted by capacity utilization is estimated at 1.78% whereas the growth rate of the technical change effect is 1.30% which is higher than the distribution effect of 0.89%. The price effect of -0.27% and the demand effect of 0.13% only play a minimal role.

In examining each of these two successive periods, we observe that in the 'stagflation' crisis of 1964-1982 the growth rate of the value composition of capital plummets to 0.77%, a result attributed mainly to the technical change effect amounting to 1.87%, an all periods high. The effect of the distributional factor was positive but minimal amounting to the anemic 0.33% which is another way to say that during a recessionary period real wages kept up with the growth of productivity holding down the growth of the rate of surplus value, as shown in Figure 2 below. The price effect was negative and equal to -0.37% reflecting the rather slow devaluation of the gross fixed capital stock. Also, as expected in a recessionary period, the demand effect was negative and its impact is estimated at -1.05%.

By contrast, in the 1982-2007 period of the so-called 'new economy', we observe the maximal growth in the value composition of capital with an estimated annual growth rate at 1.92% which is attributed, in large part, to the growth of the distributional factor which also reaches its maximal growth rate of 1.29% during this period. The growth of the technical change factor of 0.89% is the lowest of all examined periods while the demand factor, equal to 0.53%, was strong enough as expected in a growing economy. It is also of interest to note that the price effect was negative indicating the devaluation of capital attributed mainly to the

wide application of information technologies. Such results, at first sight, might lend partial support to the view that the rate of surplus value is responsible for the growth rate of the value composition of capital. On further examination, however, we conclude that the growth of the distributional factor is neither due to the influence of supervisory labour nor of the stagnant MCC but rather due to the application of neoliberal policies that, on the one hand, kept the real wages stagnant while on the other hand the rapid technological transformation of the US economy led to the growth rate in productivity resulting in the unprecedented growth of the rate of surplus value rendering a distributional effect of 1.29% which contributed the most to the growth of the VCC.

Similar to the 'stagflation crisis' are the results with respect to the breakdown of the growth of the value composition of capital during the 'great recession' included in the period 2007-2015. In fact, the growth of the value composition is negative and equal to -0.03% and is attributed to the sizable negative relative price effect of -0.62% and also to the negative demand effect equal to -0.86%. The technical change effect was, once again, strong and equal to 1.19% while the positive and weak distributional effect could not but lead to the observed stagnant and rather negative growth rate in the value composition of capital.

If, however, we extend the period under examination to include the years of the 'great recession'; and in particular, if we examine the period 1982-2015, we observe that the economy returns to its normal motion. In particular, the distributional factor remains in its upward direction whereas the technical factor is trailing behind so that we observe an approximate equality on the effects of these two factors. In the same time period, the demand effect is minimal and equal to 0.19% and the devaluation of capital is rising well above the usual.

The examination of the whole 1964-2015 period completes the picture in which what stands out is the rising value composition of capital at the annual growth rate of 1.50% which is attributed mainly to the technical change effect of 1.28% with the distributional factor contributing only by 0.79% while the effects of the other factors are by far smaller.

The next step in our analysis is to examine the impact of these two key variables on the rate of profit. For this purpose we express the rate of profit $r = s/C$ in terms of the MCC, $Q = C/l$, and by putting limits to the variation of the rate of surplus value, $e = s/v$, according to the total labour time l, with $l = s + v$. Thus, we may write

$$r = \frac{s}{l}\frac{l}{C} = \frac{s/v}{1 + s/v}\frac{1}{C/l} = \frac{e}{1+e}\frac{1}{Q}$$

The expectation is that in the long-run both e and Q will be rising, but that the increase in e although it may be higher than that of Q, will nevertheless have a progressively diminishing positive effect on the rate of profit since the potential increase of the term $e/(1+e)$ will be,

at most, equal to 1. While, on the other hand, Q, because of mechanization, increases without limits and therefore supersedes, in general, the increase in e. In effect, the rate of profit is highly inelastic with respect to (w.r.t.) e

$$\frac{\partial r}{\partial e}\frac{e}{r} = \frac{1}{(1+e)^2 Q}\frac{e}{r} = \frac{1}{(1+e)^2 Q}\frac{e}{\frac{e}{(1+e)}\frac{1}{Q}} = \frac{1}{1+e}$$

Clearly, the higher the rate of surplus value, other things being equal, the lower will its effect on the movement of the rate of profit be. In similar fashion, the elasticity of the rate of profit w.r.t Q will be

$$\frac{\partial r}{\partial Q}\frac{Q}{r} = -\frac{e(1+e)}{(1+e)^2 Q^2}\frac{Q}{\frac{e}{(1+e)}\frac{1}{Q}} = -1$$

Thus we have a unitary elastic r w.r.t. Q, which means that if Q changes say by one percent, all else constant, the rate of profit will also change by one percent, but in the opposite direction.

In Figure 2 below, we observe that the rate of surplus value in the US economy displays an overall rising trend. More specifically, the rate of surplus value over the period 1964-2015 is rising at an annual average growth rate of 1.07% and its overall average level is 285% while in the last fifteen years of our analysis the average is well above the 362%. It follows then that an increase in the capital-output ratio (or the MCC) by one percent requires a nearly fivefold increase in the rate of surplus value to maintain the rate of profit at the same level. This is equivalent to saying that the movement of the capital-output ratio is decisive in the actual movement of the rate of profit and that the effect of the rate of surplus-value, despite its strong actual rising trend progressively weakens with the passage of time. A corollary of this discussion is that the wage reductions or what is the same thing the economic policy effort to increase the rate of surplus value are not so effective in restoring profitability in the long-run as the devaluation of capital through innovations and in general technological change.

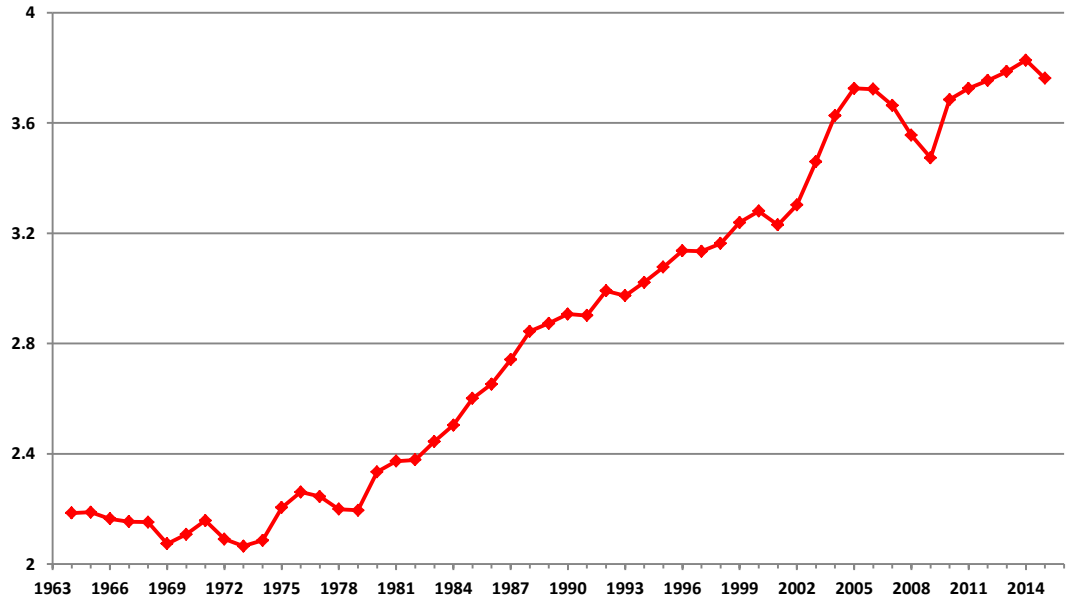

Figure 2. The rate of surplus value in the US economy 1964-2015

As the capital-output ratio becomes ever more important in the movement of the rate of profit, we discover that the official estimates of this ratio become less and less reliable probably because of the build-in neoclassical conceptualization of the movement of this ratio. More specifically, in the neoclassical theory, the capital-output ratio is expected to be a mean-reverting variable. If this ratio increases, it follows that capital is cheap (abundant) and labour is expensive (scarce); the extensive use of capital and the saving of labour will make capital more scarce than labour and the capital-output ratio will start its falling pattern. Thus, the neoclassical theory expects a mildly cyclical and an approximately constant capital-output ratio. The estimates of the capital stock by the Bureau of Economic Analysis (BEA) seem to bear this out to a certain extent. In fact, our estimates of the net capital-output ratio of the USA, based on data from the BEA for the year 1964, gave a net capital-output ratio of 2.70 while for the year 2015 this ratio was somewhat higher at 3.03. Very similar are the estimates that one derives from the measurement of the capital-output ratio by the EU's AMECO database (http://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm), where we observe, in most cases, trendless capital-output ratios. For example, in the AMECO database, it is assumed that all countries begin with the same real capital-output ratio which is equal to 3 in 1960. However, only Greece and Spain, two 'great recession' ridden countries, display in 2015 a real capital-output ratio substantially higher than its starting value, namely 4.35 and 3.64, respectively. The majority of countries display a capital-output ratio near 3! The average of all EU (28) countries in 2015 is 3 and if one starts in 1997 the average is 2.9! Meanwhile, the data show the USA to display the same capital-output ratio with the other EU countries

with a value at 3 in 1960 while in 2015 this ratio plummeted to 2.35, a level that remains approximately constant since the year 2007.[7] Clearly, there is something mysterious in the estimates of the real capital-output data, and we daresay that the measurement of this ratio is ideology-ridden. This is the reason that we opted for an alternative estimation of the capital-output ratio based on the gross capital stock whose rationale and details of its construction are discussed in Appendix 2.

The growth in the technical change factor during the examined 1964-1982 period as well as the 'great recession' of the post-2007 years together with the negative growth in the rate of capacity utilization and the fact that the prices of capital goods grow at a rate lower than that of the value-added deflator led to a relatively slow growth in the VCC and MCC. Such a result should not come as a surprise given the 'stagflation crisis' and the 'great recession' periods. The devaluation of capital was manifested in that the growth rates of the price index of capital goods were lagging behind those of the value-added deflator.

3. The Rate of Profit, Unproductive Activities and the Crisis

The concept of unproductive activity is fundamental for classical economists in general and Marx in particular. The idea is that the growth of unproductive activities implies that a portion of surplus value produced that would be available for investment is diverted to non-production activities to the detriment of capital accumulation and economic growth (for example, Gillman, 1957, p. 85; Moseley, 1991, p. 153, Shaikh and Tonak, 1994, among others). Mohun (2014) takes issue with this analysis by arguing, from a class perspective point of view, that unproductive labour, on the one hand, did not increase to such an extent as to thwart profitability and, on the other hand, supervisory labour (classified as unproductive) instead of being detrimental to surplus production turned out to be surplus-generating labour. Furthermore, supervisory labour increased since the 1960s and may have important insights to offer on the rising inequalities in the distribution of income and wealth during the period of neoliberalism.

Starting with the growth of unproductive labour Mohun (2014) is right that there has not been any spectacular increase in the ratio of unproductive labour so as in and of itself to threaten the stability of the system. However, Mohun limits his investigation to unproductive labour alone while the issue is broader for it refers to the growth of unproductive activities in general and not restricted to labour. Under these circumstances, it is worth stressing that in Marx (1857, p. 757 and 1968, p. 573) there are hints about unproductive activities which are thought to have an inherent tendency to expand. To what extent Marx's conjecture is ascertained or not is, in our view, an empirical question that must wait for its resolution (or at

[7] For further discussions on capital-output ratio of the US economy and its evolution since the 19the century see Mejorado and Roman (2014, ch. 7)

least have a more precise idea) until we have a longer span of data than at present. The underlying idea for the expansion of unproductive activities is that competition is intensified over time and thus larger and larger amounts of resources must be devoted to promotional efforts; furthermore, the growth of government expenditures (hence, one may also invoke the so-called Wagner's law or other relevant Schumpeterian arguments about the bleak future of capitalism under the pressure of growing state activities) leads to an increase in taxation and thus the surplus available for investment is used for the maintenance of social order and not necessarily in investment in production activities. Surprisingly enough, this idea may also be found in the neoclassical approach and more particularly in the hypothesis of the cost disease of (public) services (Baumol, 1967, *inter alia*) or the rent-seeking activities. According to Baumol, the increasing burden of services has mainly to do with the idea that the productivity of the service sectors is not only very hard to pinpoint but even when the various obstacles to its measurement are superseded, it is found that the labour productivity in services lags behind the economy's average productivity. Meanwhile, the tendency for uniform wage rates across sectors makes the cost of services progressively higher slowing down the economy's growth potential. Until very recently, at least, the idea that services are labour intensive activities and that it is a much more difficult enterprise to apply further division of labour and mechanization to services and by the extent to many non-production activities was widespread. In other words, technological change is not easily applicable to service activities which remain persistently labour intensive. It seems that during the neoliberal period of the 'new economy', the situation with respect to labour in services has changed radically, and even the hard to mechanize non-production activities became amenable to mechanization and thus both the number of people engaged in such activities as well as the cost of provision of these activities relative to the invested capital were reduced.

Figure 3 below may be used to explain these developments and lend partial support to Mohun's (2014) findings of the slowdown in the growth of unproductive activities. In effect, the share of non-production labour, shown on the right-hand side (r.h.s.) axis of Figure 3, was rising up until about the year 1990 and then became pretty much trendless indicating that the computerization, that is, the modern form of hyper-mechanization, reduced somewhat the share of the non-production labour to total employment. Nevertheless, if we take the whole 1964-2015 period into account there is a slightly rising slope, however, not very different from zero. While this is true in terms of employment, we cannot say the same thing in terms of the wages of non-production labourers, measured on the l.h.s. of Figure 3 whose share kept rising up until the years of the 'great recession' and then stabilized at a level much higher than that of the start year. These developments show that during the neoliberal period there has been a redistribution of income in favour of the non-production workers and since their number did not keep rising, we can reasonably speculate that, in this case, it was not the rise

of the average wage but rather the super-high salaries (plus commissions and bonuses) of the corporate officers (the so-called CEOs) for their supervisory and managerial functions that accounted for the observed inequalities. By no means has this implied that the managerial or supervisory labour contributed, in any way, to the creation of surplus value; this type of labour activity merely contributed to the redistribution of surplus value among its claimants. Mohun (2014) is right in that this labour activity might be responsible, at least in part, for the rising income and wealth disparities identified in a number of recent studies. It is interesting to note that the ratio of unproductive expenditures to surplus value, shown on the r.h.s. axis of Figure 3, is increasing on average up until the year 2000 and then starts to fall, a fall that gives rise to a slightly rising ratio over the examined 1964-2015 period. We speculate that the fall of this ratio after about the year 2000 is due, in large part, to the burst of the real estate and the stock markets bubbles. The innovations that followed targeted more the service sector and in general the unproductive activities undercutting their cost of operation.

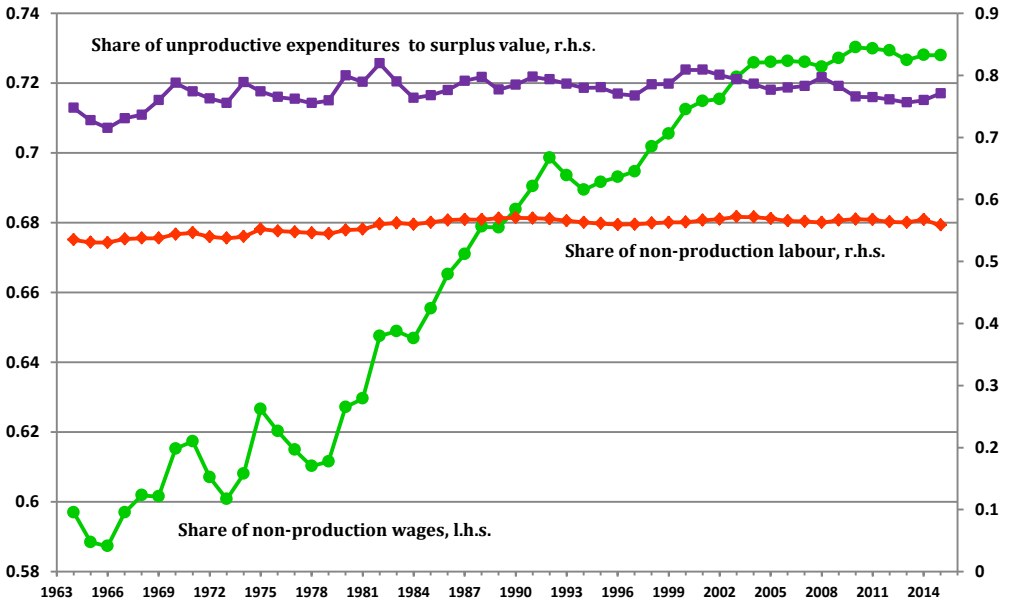

Figure 3. Shares of non-production expenditures, wages and labour, 1964-2015

A rising general rate of profit is fully consistent with rising unproductive expenditures even when their increase is so large that depresses the net rate of profit. The idea is that the rising general rate of profit shows that the system is basically healthy and capable of sustaining the increasing burden of unproductive activities. The situation changes when the general rate of profit is falling which may depress the net rate of profit even further in its downward direction. If the unproductive expenditures and activities are rising then they apply additional pressure on the economy-wide net rate of profit compressing it furthermore down thereby worsening the situation by leading the economy sooner rather than later to the tipping point of

a phase change. Thus, the general rate of profit, R, is equal to the net rate of profit, r, plus the ratio of unproductive expenditures, u, to capital stock C. Thus, we may write,

$$R = \frac{s}{C} + \frac{u}{C} \text{ and } r = R - \frac{u}{C}$$

Where s is the net profits measured by subtracting from the current GDP the sum of depreciation, the wages of employees of the private and government enterprises, the imputed wages of the self-employed population, the taxes on production and imports less subsidies plus business current transfer payments minus the imputations of the operating surplus. The remaining part of surplus value, that is the unproductive expenditures u, includes the sum of wages, materials and depreciation of the unproductive sectors of the economy, namely, the retail and wholesale trade as well as the finance and real estate sectors (see Table A1 for the North American Industry Classification System, NAICS, nomenclature of these unproductive activities) augmented by the indirect business taxes. Figure 4 below displays the evolution of the net rate of profit, r, along with the unproductive expenditures both estimated with the use of the gross capital stock in the US economy adjusted by capacity utilization. During, the entire period of our analysis both variables display very similar fluctuations and therefore similar trends.

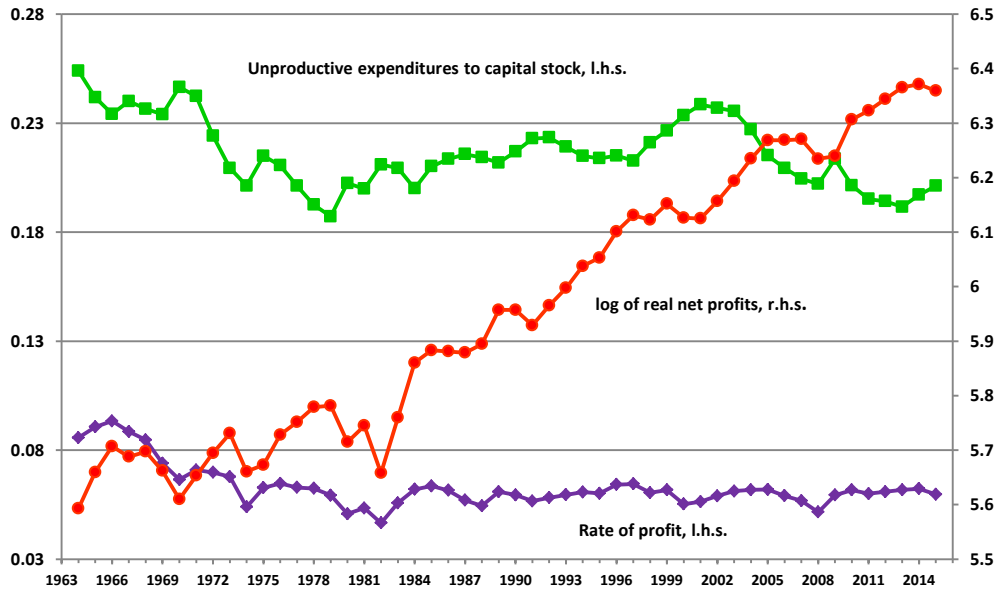

Figure 4. Unproductive expenditures and the net rate of profit

We observe that near the tipping points (of the late-1960s and late-1990s) the unproductive expenditures weighted by the capital stock remain at a high level and with the onset of the falling rate of profit follow in the downward direction, as we very well know from downsizing and restructuring of the business organization after the early 1980s. The

subsequent growth of the U.S. economy was accompanied by its necessary complement, that is, the growth of unproductive expenditures. The rising (general and net) rate of profit is accompanied by the rising unproductive expenditures until the attainment of another tipping point around 1997, where once again the unproductive expenditures will take another dip. A closer look at Figure 3 reveals that the falling pattern of the rate of profit in the post-1982 years seems to have begun in the year 1997, however as it has been repeatedly stated a falling rate of profit in and of itself does not lead to a crisis and may be fully consistent with a growing economy.[8] Only if the rate of profit falls persistently then a point is reached where the mass of real net profits becomes stagnant. In Figure 4 we also display the logarithm (for expositional purposes) of the real net profits measured on the r.h.s. axis. We observe that the real net profits stagnate in the late 1960s and that this stagnation lasts up until the early 1980s; we have a repetition of this pattern in the mid to late-2000s with net profits stagnating, once again, punctuating the period of the 'great recession'. Under these circumstances, that is, stagnating mass of real net profits, businesses on average are reluctant to invest, either because the profits that they make are not enough or because the expectations for future profits are bleak and also potential lenders are particularly reluctant to finance investment projects. As a consequence, massive bankruptcies follow and unemployment rates are on the rise. This is the period of time when we also expect and in fact, unproductive expenditure to fall consequent upon the path of the net rate of profit.

Our findings (see Figure 3) have shown that in the long-run, unproductive expenditures constitute a rising portion of total surplus value in the economy, however, this is an empirical and, we think, a very long-run issue. With the available span and quality of data, we can only say that the growth of unproductive expenditures is limited by the evolution of the general rate of profit. A falling general rate of profit sooner or later entails a fall in the net rate of profit and also the rate of unproductive expenditures weighted by capital stock. Consequently, both the average rate of profit and the rate of unproductive expenditures move together towards a downward direction and we may hypothesize that the movement of the average rate of profit shapes the movement of the unproductive expenditures. The rationale is as follows: A rising average rate of profit offers the fuel for the expansion of the nonproduction activities; the idea is that the rising rate of profit means more investment activity, higher production and higher need for the promotional efforts entailing the growth of retail and wholesale trade, the finance and real estate activities which may follow suit. The build-up of fixed capital stock, sooner or later, leads to a falling rate of profit which discourages investment and so slows down the demand for new loans, that is the demand for the output of financial institutions. The latter, in order to avoid losses from the defaults of their borrowers, are bound to lower

[8] "A fall in the rate of profit and accelerated accumulation are different expressions of the same process only in so far as both reflect the development of productiveness" (Marx, *Capital III*, p.241).

their interest rates in order to supply the needed liquidity and stimulate in any way possible the investment activity. However, the lower interest rates induce the financial institutions to expand (in the beginning and up to a point, at least) their lending activity in order to acquire the same revenues as before the fall in the rate of interest which makes them to lend out money without much consideration about the fundamentals of the borrowers and at the same time their own limitations. This is the reason that from the 1980s onwards financial institutions are pressing governments for more deregulation of what banks consider to be a growth-stifling financial environment. The result is the creation of a number of bubbles which when they burst lead to a fall in the size of the unproductive activities and, at the same time, to lower profit rates.[9]

4. Concluding Remarks

The US and the world economy since the year 2007 entered a new phase that bears startling similarities with that of the late-1960s. The evolution of the profit rate and the mass of real profits identify the year 2007 as the tipping point, that is, the year when profits stagnate and start their falling course. The falling net rate of profit is responsible for this new phase change, the 'great recession', and this fall in the net rate of profit is attributed mainly to the rising value composition of capital, further exacerbated by the rise in unproductive activities and the associated with these expenditures which reached a plateau somewhat earlier than 2007.

The empirical evidence corroborates the idea that the 'great recession' of the late-2000s shares the same salient features with the 'stagflation crisis' of the 1970s while of course there are important differences which have mainly to do with the fact that in current times the welfare state that converted back to the 1970s a major crisis into "a silent one", that is one with low unemployment, is no longer in place. Furthermore, the new technologies associated with computerization and automation seem to have expanded the scale of their application by including the service industries and the unproductive activities in general. As a consequence, employment in these industries diminished and the share of employment in unproductive activities in the total employment remained constant or slightly falling. However, we showed that this is not true for the share of unproductive wages which kept rising, lending support to the idea that the managerial and supervisory labour in these activities has been rewarded by much higher salaries which explain, at least in part, the increasing income and wealth disparities. The fall in the rate of profit led to the stagnant mass of net profits around the late-

[9] Preliminary econometric analysis utilizing both the Yamamoto and the ARDL cointegration tests of the three variables, namely, the rate of profit, the unproductive activities and the long-term interest rate showed unidirectional causality from the rate of profit to the interest rate and the unproductive activities.

2000s that reduced the net investment up until the recent years. For example, net investment of the private sector as a percentage of GDP during the 'great recession' of 2007-2015 was on an average equal to 2.01% as opposed to the 1964-2015 period when it was on average equal to 4.08% while the period of the 'new economy' the share of net investment in GDP was 3.70% which is lower than the average of the whole period suggesting a downward long-run trend in this ratio.[10]

The evolution of the mass of real net profits does not seem to have run its full trajectory thereby justifying all those that characterized it as the 'great recession'. It seems that Marx's thesis (1857 [1973], p. 750) about major crises which is that "[…] these regularly recurring catastrophes lead to their repetition on a higher scale, and finally to its violent overthrow" we cannot predict that will be fulfilled. All we can say is that the capitalist system will be quite different in the years to come, as major institutional changes are already under way and the sign of their direction (in favour of capital or labour) will depend on the way in which the political element will exert its pressure.

References

Baumol, W. 1967. Macroeconomics of unbalanced growth: The anatomy of urban crisis. *American Economic Review* 57 (3): 415-26.

Gillman, J. 1957. *The falling rate of profit*. London: Dennis Dobson.

Malikane, C. 2017. Profitability and Crisis in the South African Economy. MPRA Paper 76165, https://mpra.ub.uni-muenchen.de/76165/1/MPRA_paper_76165.pdf.

Marx, K. 1857. *Grundrisse*, *foundations of the critique of political economy*. New York: Vintage Books [1973].

Marx, K. 1869. *Theories of surplus value*, II. Moscow: Progress Publishers [1969].

Marx, K. 1894. *Capital III.* Moscow: International Publishers [1968].

Mattey, J. 1996. Capacity Utilization and Structural Change. *Economic Research, Federal Reserve Bank of San Francisco*. http://www.frbsf.org/economic-research/publications/economic-letter/1996/november/capacity-utilization-and-structural-change/

Mejorado, A. and Roman, M. 2014. *Profitability and the Great Recession*, New York: Routledge.

Mohun, S. 2014. Unproductive labor in the U.S. economy 1964-2010. *Review of Radical Political Economics 46*(3), pp. 355–379.

Moseley, F. 1991. *The falling rate of profit in the postwar United States economy*. New York: St. Martin's Press.

Nehru, N. and A. Dhareshwar, A. 1993. A new database on physical capital stock: Sources, methodology and results. *Revista de Análisis Económico, 8(1): 37-59.*

Rosdolsky, R. 1977. *The making of Marx's capital*. New York: Pluto Press.

Shaikh, A. 1987. Organic composition of capital. In *The New Palgrave: Marxian economics,* ed. J. Eatwell, M. Milgate and P. Newman. London: Macmillan, pp. 304–309.

Shaikh, A. and Tonak, E., 1994. *Measuring the Wealth of Nations: The Political Economy of National Accounts.* Cambridge University Press.

Shaikh, A. 2016. *Capitalism: Competition, Conflict, Crises*. New York: Oxford University Press.

[10] The estimates are based on data on long term interest downloaded from the following link https://fred.stlouisfed.org.

Paitaridis, D. and Tsoulfidis, L. 2012. The Growth of unproductive activities, the rate of profit, and the phase-change of the U.S. economy, *Review of Radical Political Economy*, 44(2): 213-233.

Tsoulfidis, L. 2002. Rethinking long cycles: Are the 1990s the onset of a new golden age of accumulation? In Georgopoulos T., Paraskevopoulos, C. and Smithin, J. (eds) *Globalization and economic growth. A critical evaluation* (pp. 81-96). Torondo: Athenian Policy Forum Press. http://mpra.ub.uni-muenchen.de/39739/

Tsoulfidis, L. 2010. *Competing Schools of Economic Thought*. Heidelberg: Springer.

Tsoulfidis, L. 2017. Growth Accounting of the Value Composition of Capital and the Rate of Profit in the US Economy: A Note Stimulated by Zarembka's Findings. *Review of Radical Political Economics*, vol. 49 (2), pp. 303-312 (2015).

Zarembka, P. 2015. Materialized Composition of Capital and its Stability in the United States, 1948-2011. Findings Stimulated by Paitaridis and Tsoulfidis (2012). *Review of Radical Political Economics Vol.* 47 (1), pp. 106-111 (2014).

Appendix 1: Data and their Source

The classification of economic activities into productive and unproductive is an absolutely necessary requirement for the meaningful estimation of the classical and Marxian categories of surplus value and variable capital. In a previous effort (Paitaridis and Tsoulfidis 2012) we based our estimations on the past classification system; namely SIC (1987). However, the revision of the US Industrial classification system from SIC into NAICS (1997) has necessitated the reconsideration of the productive and unproductive activities in a manner that suits better to the new classification system as is displayed in table A.

Table A1. Classification of Sectors

Productive Activities	Unproductive Activities	
Farms	Trade	Wholesale trade
Forestry, fishing, and related activities		Retail trade
Mining		Real estate
Utilities		Rental and leasing services and lessors of intangible assets
Construction	Royalties	Federal Reserve banks, credit intermediation, and related activities
Manufacturing		Securities, commodity contracts, and investments
Transportation and warehousing		Insurance carriers and related activities
Information		Funds, trusts, and other financial vehicles
Computer systems design and related services		Legal services
Educational services		Miscellaneous professional, scientific, and technical services
Health care and social assistance		Management of companies and enterprises
Arts, entertainment, and recreation		Administrative and support services
Accommodation and food services		Waste management and remediation services
Other services, except government		Federal general government (defense)
Government enterprises (Federal)		Federal general government (nondefense)
Government enterprises (State and Local)		State and local general government

The revision of the accounting system attempts to reflect the changing structure of the US economy of the recent decades with the emergence of the new (mainly information based) technology and the expansion of the service sector activities. This revision resulted in the availability of more detailed data especially for the service sector; that made possible the more consistent with the theory (of productive non-productive labour) classification of industries than those in the previous system. Furthermore, the new classification system renders possible the inclusion of a number of service industries with increasing importance, in the productive activities of the economy. For example, the trade sector (Wholesale Trade and Retail Trade, SIC codes 50-51 and 52-59) is viewed in principle as unproductive; nevertheless, there are particular activities, especially those that are near the completion of the product such as cutting and packaging which take place within the trade sector that are productive. At the same time, there are industries such as Eating and Drinking Places (SIC code 58) which would be classified as productive and in the former system were subsumed in the trade sector with no further information to reclassify them. The NAICS treats the Eating and Drinking Places as a separate industry and so we can place it in the productive sectors of the economy without the need to adopt any heroic assumptions for its reclassification as in the former system. This is also the case with the New Technology industries such as the Data Processing, Internet Publishing, and Other Information Services (NAICS codes 518, 519) and the Computer Systems Design and Related Services (NAICS code 5415). In the former classification system, these productive activities were included in the Computer Data and Processing Services (SIC code 7370) which in turn was part of the non-productive Business Services (SIC code 7300) again with no clue as to how to classify it properly.

Despite the above improvement of the US classification system, the estimation of long-term Marxian categories is not easy to carry out. The reason is that the US statistical agencies such as the BEA and the Bureau of Labor Statistics (BLS) have not fully updated the industrial data for the US postwar economy according to the NAICS system. In particular, although the BEA has made significant progress in updating the GDP by Industry and the Input-Output Accounts nevertheless there has not yet been equal progress in the case of employment and wage data, whose update is limited to the period from 1998 onwards. The same holds true with the BLS where in many industries the updated data do not fully cover the postwar period or at least the period from the early 1960s onwards. The treatment of this inconsistency in the data was overridden in two steps. Firstly, we attempted an abridgment between the industries that are classified according to the SIC and the NAICS following the guidelines of the US Census Bureau (2000). Secondly, we estimated the NAICS missing data[11] by extrapolating backward through the following formula:

$$Z_{t\text{-}1}^{\text{NAICS}}=1+\left(\frac{\sum_{j=1}^{n} Y_{j,t\text{-}1}^{\text{SIC}}-\sum_{j=1}^{n} Y_{j,t}^{\text{SIC}}}{\sum_{j=1}^{n} Y_{j,\text{t}}^{\text{sic}}}\right)\cdot X_{t}^{\text{NAICS}}$$

Where X is the last available data of NAICS industry at time t, Y is the SIC proxy industry to X, Z is the resulting estimated data of NAICS industry. Finally, $j = 1,2,\ldots,n$ stands for the various SIC industries. Comparing our new NAICS-based estimations on Marxian categories

[11] For some industries there were no available data with the SIC system. In that case, we relied upon Mohun's methodology (2005).

with our past SIC-based estimations we find relatively small deviations[12] thereby lending support to our proposed estimating method.

Having accomplished the integration of the time series, we are able to proceed with the estimation of the Marxian categories starting with the Marxian value added (MVA). In national account terms, the MVA is defined as the sum of the net (of depreciation) value added of productive sectors of the economy plus the royalties (taxes, rents, interests) paid by the productive sectors to the royalty sectors of the economy (financial institutions, unproductive services and government) plus the gross output of trade, real estate and rental and leasing sectors net of imputations.[13]

In economic terms, the MVA is the total value produced by the productive workers and consists of two parts, the surplus value and the variable capital. Thus, subtracting the variable capital, that is, the wages of the productive workers we can estimate the surplus value. For the estimation of variable capital we need two variables, the number of productive employees (L_p) and their respective nominal wage. We assess the number of productive employees starting with the total number of workers $(L_j)_{\text{NIPA}}$ employed in the production sectors $(j = 1,2,\dots,n)$ according to NIPA tables. In this total are included both employed and self-employed. In order to identify the number of the unproductive employees (and the so-called corporate officers) of the productive sectors, we use data from the BLS, and for each productive industry j we take the share of productive to the total number of employees, that is $(L_p/L)_j$. Consequently, the number of productive workers in sector *j* is estimated as follows

$$(L_p)_j = (L_p/L)_j \cdot (L_j)_{\text{NIPA}}$$

The estimation of variable capital should also include the employer's social security contributions because this is a labor cost for businesses. For this purpose, we estimate the ratio of the compensation of productive workers (EC) to the wages and salaries (WS) for each sector. The ratio between those two variables gives us a markup with the aid of which, we can estimate the social security contributions:

$$x_j = (EC/WS)_j$$

Subsequently, we multiply the average weekly wage of productive workers (w_j) in each productive sector by x_j in order to estimate in the wage data of the BLS the social security contributions. The so-estimated average wage is multiplied by 52 weeks to get the average annual wage, which multiplied by the total number of productive workers in each sector gives the variable capital in each productive sector of the economy:

$$V_j = (w_j \cdot w_j) \cdot (L_p)_j$$

Finally, the total variable capital is estimated by summing the variable capitals across industries.

[12] For instance, for the period 1964-2007 the Mean Absolute Deviation between the different estimations on Marxian value added is 1.72% and on Surplus Value is 2.04%.

[13] In the imputations, we include the owner-occupied housing output, the farm tenant-occupied housing owned by farm operator landlords, the farms owned by non-operator landlords and the various royalties (*i.e.*, patents, license fees *etc*.)

Appendix 2: Estimation of the total gross fixed capital stock

The capital stock is the accumulation of the past investment flows. Easy as this definition may be, its application to actual data is fraught with many difficulties associated with depreciation and replacement investment. In the USA the BEA publishes annual estimates of the capital stock based on the assumption of a given geometric growth rate of depreciation where the lifetime of investment goods is infinite. This was not true in the pre-1993 estimates of capital stock where the assumption was that the lifetime of fixed capital investment was finite and for this reason Shaikh (2016) in his estimations of capital stock for the US corporate sector employs the assumption of the finite life of capital goods utilizing a depletion rate for the gross capital stock as well as a depreciation rate for the net capital stock. Furthermore, both the old and the new BEA definitions of capital stock do not take into account the impact of the great depression of the 1930s and the effects of WWII. For this reason Shaikh (2016) in his estimations constructs an adjustment ratio utilizing the accounting values of fixed capital stock of the US corporate sector and applying this ratio to estimate the fixed capital of the BEA (1993) for the period 1925-1947 while for the period 1948-2011 he utilizes the Gross Perpetual Inventory Model (GPIM).

It is important to note that our estimations refer to the total private non-residential fixed assets and government enterprises of the US economy and not only its corporate sector. We refer to the total capital stock in order our estimates to be more general since productive or non-productive activities and employment are not restricted to the corporate sector. More specifically, starting from the year 1925 we estimate following Malikane (2017), the initial capital stock and for the remaining years we apply Shaikh's GPIM methodology. The formula for the estimation of the current value gross capital stock (GC) is as follows

$$GK_t = IG_t + (1+\delta_t)\frac{P_{k_t}}{P_{k_{t-1}}}KC_{t-1} = IG_t + (1-\delta_t)\big(1+g_{pk}\big)KC_{t-1}$$

where IG the gross investment in current prices, δ the rate of depreciation ($\delta = D_t/NK_{t-1}$), NK the net capital stock and g_{pk} the growth rate in prices. For the estimation of KC_t we need a starting value for the capital stock, that is, GK_0 for which we apply the following formula

$$GK_0 = \frac{IG_1}{(1+g_I)-(1-\delta)(1+\acute{g}_{pk})}$$

where $(1+g_I)$ is the average growth rate of the gross investment in the period under examination. In particular, for the estimation of g_I we determine initially the natural logarithm of the investment and subsequently we regress it against time and a constant. The advantage of this approach is that the information contained in the used investment series is making the result less sensitive to the initial period conditions (Nehru and Dhareshwar, 1993). The coefficient of the time trend is the g_I the parameter δ represents the average depreciation while $\acute{g}_{pk}$ is the average growth rate of prices during the examined period. It is important to note that the estimation of gross capital stock is based on the gross investment and that during the 1970s there has been a slowdown in the growth of investment IG which is also reflected on the stagnating or falling growth rate of GK while the rate of surplus value was growing at record high rates during the same time period.