Overhead labor and feedback effects between capacity utilization and income distribution: estimations for the USA economy

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Abstract

Empirical studies on the USA have not yet reached a consensus on whether this economy is wage- or profit-led, leading many scholars to scrutinize what drives the results of the empirical models. This study tests some possible explanations raised by previous studies by estimating a VECM to the USA from 1964 to 2010. The results suggest that the profit-led short-run outcome does not hold in the long-run, as Blecker (2016) suggests. Also, workers would stimulate the economy more than supervisors (overhead labor), who are also wage earners, as argued by Palley (2017), but there is no support for causality in these directions. Finally, increases in capacity utilization negatively affect the supervisors' share as argued by Lavoie (2014, 2017), but the long-run effect is positive, suggesting a complex determination of functional income distribution, as capacity utilization affects it in ambiguous ways.

Keywords: Demand Regimes, Functional Income Distribution, Within-Wage Distribution, Kaleckian Models.

JEL classification: E12, D33, C32.

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1 Introduction

The stagnationist literature was inaugurated by Baran and Sweezy (1966) and Steindl (1976, 1979), who were analyzing what seemed to be, at their time, a tendency of stagnation in rich countries related to an inelastic profit function that prevented an increase of the wage share that would stimulate demand. The following literature that builds on the work of these first authors is known as Kaleckian growth and distribution models (Bhaduri and Marglin, 1990, Blecker, 1989, Dutt, 1984, Rowthorn, 1981, Taylor, 1985). Different from the former authors, this second group of authors did not focus on the possibility of a tendency of secular stagnation in capitalist economies but rather on mathematical models that could represent the relation between functional income distribution and growth (Rugitsky, 2016). According to Blecker (2016), the basic logic of these models is that a redistribution of income towards wages will boost consumption, diminish the competitiveness of national products, and lessen profits (which are an incentive for private investment). The sum of these effects will determine whether aggregate demand will grow or diminish in reaction to a shift of income distribution toward wages; thus, if aggregate demand is wage- or profit-led respectively. As the theoretical models admit both outcomes, this relation must be tested empirically.

In this sense, several authors have analyzed many countries in order to identify their regime. There is not, however, a convergence between the results found by different studies on the same country, as discussed by Blecker (2016) and Lavoie and Stockhammer (2012). For the case of the United States, for instance, some studies conclude that it is wage-led, whereas others conclude that it is profit-led.

This lack of consensus has led some scholars to scrutinize what are the mechanisms of the economy and the particularities of the empirical methods that might be affecting the results. Blecker (2016), for instance, explores how the economy behaves in the long- and short-run and how econometric methods capture this. On more theoretical analyses, Lavoie (2017) argues that profit-led results might be capturing the cyclical effect of overhead labor and Palley (2017) shows that a redistribution of wages towards managers (overhead labor) might increase the likelihood of a profit-led regime.

These studies are the motivation of the present paper. Our aim is to test the hypotheses put forward by these authors by estimating an aggregative model capable of capturing long-run

relations and, then, by exploring how overhead labor affects the demand and distribution schedules. The novelty of this study is, thus, twofold as it estimates a long-run aggregative model and undertakes a class analysis by splitting the wage income between the working and supervisory classes, something that has been largely ignored in the literature[1] but that provides a more precise picture of income inequality and explore other consequences of the financialization process[2].

Besides this introduction, this paper has five other sections. Section 2 presents the literature review, section 3 presents the estimation strategy, section 4 brings the database and draws some stylized facts, and section 5 explores the empirical results. The last section presents our concluding remarks.

2 Literature Review

Empirical studies on the demand regime of the USA can be divided into two groups according to their methodology (Blecker, 2016). The structural approach, introduced by Bowles and Boyer (1995) and applied by Hein and Vogel (2008) and Onaran and Galanis (2014), among others, estimates single equations for each private aggregate demand component (investment, consumption, and net exports) and sums the partial effects of an income redistribution on each of them to have the overall effect on the economy. Stockhammer (2017B) observes that most of the followers of this method are Kaleckian authors and Blecker (2016) points out that they tend to find a wage-led regime. The second method is known as the aggregative approach, which is mostly used by neo-Goodwinians according to Stockhammer (2017B), such as Barbosa-Filho and Taylor (2006) and Carvalho and Rezai (2015). It consists in directly estimating a vector autoregressive model (VAR) with capacity utilization and the wage share as endogenous variables. These studies are more prone to finding a profit-led regime (Blecker, 2016) and a profit-squeeze distribution schedule, which are interpreted as a validation of the Goodwin's (1967) cycle mechanism.

This lack of convergence between these studies on the demand regime of the USA motivated several analyses on what is driving the econometric results found. Firstly, there is a debate on the econometric methodology used by them. Observing that the structural approach has been more prone to finding wage-led results than the aggregative one, Blecker (2016) suggests that

this might be the case because they are actually capturing different time lengths and because the economy might behave differently to a shock in income distribution as time goes by. He suggests that it is more likely that the economy behaves as profit-led in the short-run and as wage-led in the long-run because the negative effect of increasing the profit share on consumption is likely to be a longer-run phenomenon than the positive effect on investment and net exports. As the aggregative approach only captures short-run relations[3], it is capturing a profit-led short-run result that might not hold on the longer-run.

Secondly, the profit-led result might be explained by the existence of two different classes among wage earners: overhead labor (proportional to production capacity and represented by the managerial or supervisory class) and direct labor (proportional to actual output and represented by the working class). Here, the argument has two different roots. The first argument is inspired by the theoretical model with overhead labor[4] as in Rowthorn (1981), who showed that an increase of demand (leading to a higher rate of capacity utilization), will lead to an increase of the profit share, due to a *"more extensive and efficient use of labor"* (Rowthorn, 1981, p. 10). This is also shown by Asimakopulos (1975) in his analysis on the determinants of income distribution. According to Lavoie (2017), this means that empirical studies might be biased towards finding profit-led regimes (i.e., a positive relation between the profit share and capacity utilization) that are determined by the presence of overhead labor. Indeed, data calculated by Weisskopf (1979) shows that the profit share can vary because of changes in labor strength as well as changes in capacity utilization (through the effect of overhead labor). This latter effect would be stronger in the early expansion and contraction phases of the business cycle, while the former explains the long-run fall and the late expansion decline of the profit rate.

The second argument concerns the possibility that there are different consumption behaviors among wage earners because their different individual income levels make this a heterogeneous group and because propensities to save are expected to increase with income. Data by Mohun (2014, 2016) reveals a high level of within-wage inequality in the USA, with supervisors earning higher average incomes than workers (in 2010, for instance, supervisors represented 17.9% of employment but received 46.6% of wages), suggesting that the wage share is not a precise measure of inequality (as Dutt (2017) argues). This also has important implications to the empirical models as Palley (2017) shows that, if workers have a lower propensity to save than

supervisors, a wage income distribution towards the latter and away from the former might increase the likelihood of a profit-led regime as the stimulus on consumption of increasing the wage share diminishes. Palley (2015) also shows that increasing the share of direct labor in wages while maintaining the wage share will always increase growth and capacity utilization even if the economy is profit-led.

This might be the case of the USA economy, which has experienced a strong income redistribution towards profits and towards the managerial class in the last decades (Mohun, 2006, 2014, 2016), increasing the inequality among wage earners. This increase has been so strong that, despite a decreasing wage share, there has been an increase of the supervisors' wage share on national income, meaning that workers' wages have been squeezed both by profits and by supervisors.

This is one of the distributional aspects of financialization, along with the increase in the profit share as discussed by Hein (2014) and Stockhammer (2017A). In a historical perspective, the rise of finance and political decisions since the Reagan era changed the terms of the class struggle (Mohun, 2006) and led to the process of concentration of income in the USA. The association of managers' concerns with those of capitalists through the ideology of shareholder maximization has mobilized them to control workers' compensation shares (Guttmann, 2016), while they have also succeeded to increase their share in the surplus value, both as higher salaries and as executive stock options (Lazonick and O'Sullivan, 2000), because of their position as supervisors (Mohun, 2006). Thus, Duménil and Lévy (2015, p. 72) interpret neoliberalism *"as the expression of an alliance between capitalist and managerial classes"*, arguing that an important characteristic of the period is that high wages became the main channel of income concentration.

3 Estimation Strategy

The present study aims at contributing to the empirical literature inspired by the Kaleckian growth and distribution models by testing the possibilities raised by Blecker (2016), Lavoie (2017), and Palley (2017) that might explain the profit-led results found by empirical studies on the USA economy (Barbosa-Filho and Taylor, 2006, Carvalho and Rezai, 2015). We firstly

estimate an aggregative model that allows for a long-run relation and, then, we include two classes representing wage earners in this model.

The econometric model is estimated for the USA economy from 1967 to 2010 and includes capacity utilization and the wage share (split into two shares in the second model) as endogenous variables, following the aggregative approach. As all variables are treated as endogenous, this method estimates both a demand schedule (the effect of the wage share on capacity utilization) and a distribution schedule (the effect of capacity utilization on the wage share).

In formal terms, the demand schedule concerns the sign of the derivative of capacity utilization with respect to the wage-share, as shown in equation 1 below (Bhaduri and Marglin, 1990), where I_π and S_π are respectively the derivatives of investment and saving with respect to the profit share (π) and S_u and I_u are respectively the derivative of investment and saving with respect to capacity utilization (u). The basic rationale of Kaleckian growth and distribution models in a closed economy (in an open economy the mechanisms would be more complex, but, to some extent, the same rationale can be applied) is that if increases in the wage share lead to increases in consumption that overcompensate the negative stimulus of lower profitability on investment, the economy will be wage-led and the sign of equation 1 will be negative (assuming that the Keynesian stability condition holds, so $S_u - I_u > 0$).

$$\frac{du}{d\pi} = \frac{I_\pi - S_\pi}{S_u - I_u} \tag{1}$$

As suggested by Palley (2017), increases in the wage share that result from increases in the workers' wage share are likely to enhance the positive effect of the wage share on consumption, increasing the likelihood of an overall positive effect on aggregate demand (or, at least, diminishing the negative effect). Conversely, if the increase in the wage share is due to an increase in the income share of overhead labor, the impact on consumption is likely to be weaker. Thus, we expect S_π to be larger and $\frac{du}{d\pi}$ to be lower in case the increase in the profit share results from a decrease in the workers' share in income than if it results from a decrease of the supervisors' share, rendering a wage-led regime more likely in the former case. Empirically, this can be tested by estimating an aggregative model in order to determine the sign of equation 1 in case of a redistribution of income from workers to profits and from supervisors to profits.

The distribution schedule allows us to capture the effect of overhead labor on the distribution of income and thus test whether the profit share behaves pro-cyclically. Barbosa-Filho and Taylor (2006) and Carvalho and Rezai (2015) find a positive derivative for the wage share with respect to capacity utilization, suggesting a profit-squeeze distribution schedule, which is explained by the increase in the bargaining power of labor as capacity utilization increases. Yet, Lavoie (2014) suggests that because overhead labor does not increase with capacity utilization, the profit share behaves pro-cyclically. Our model estimates the effect of capacity utilization on the income share of overhead labor, capturing the short- and long-run effects of capacity utilization on the functional distribution of income.

The estimation strategy builds on Barbosa-Filho and Taylor (2006) and Carvalho and Rezai (2015). These authors estimate a VAR model including capacity utilization and the wage share as endogenous variables ($Y_t = [u_t, w_t]$, with all the variables in logarithm). While our first model is similar to this one, the second one includes the share of workers' income (wc) and the share of supervisors' income (nwc, standing for "non-working-class") separately ($Y_t = [u_t, wc_t, nwc_t]$). This allows us to capture how capacity utilization reacts to changes of the profit share that are due to a change in the workers' share or due to a change in the supervisors' share. It is expected that the impact of an increase in the workers' share leads to a higher increase (or, at least, a smaller decrease) in capacity utilization than an increase in the supervisors' share. It is important to note, however, that as all variables are taken as endogenous in our model, a change in the workers' share, for instance, will also impact the non-working-class share.

As our variables are non-stationary, we test for cointegration by following Johansen's (1995) procedure. In case there is cointegration, a vector error correction model (VECM) is estimated, as represented in equation 2 below:

$$\Delta Y_t = v + \alpha\beta^{'} Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-1} + u_t \tag{2}$$

where v is a Kx1 vector of parameters, with K being the number of variables, α is a Kx1 vector containing the adjustment coefficients, $\beta^{'}$ is a 1xK vector containing the cointegrating equations, $\Gamma\Delta Y_{t-1}$ is a KxK matrix providing short run dynamics of the model, and u_t is a Kx1 vector of white noises.

In this case, it is possible to capture both the level (long-run) and the difference (short-run) relation between the variables. This is an additional contribution of our study, as Blecker (2016, p. 387) points out the need of such approach by suggesting that more research should be done to *"explicitly compare short-run and long-term effects of distributional shifts on output or utilization as well as economic growth using appropriate econometric techniques"*.

4 Database and Stylized Facts

Given the data availability, our sample consists of 44 annual observations, covering the period from 1967 to 2010. For the capacity utilization rate we chose to work with the Industrial Capacity Utilization Index provided by the Federal Reserve (2017), which relies on surveys on firms' capacity and output, instead of using the deviations of current output from HP-filtered output. The wage share is provided by AMECO (2017) and represents the adjusted sum of compensation of employees (wages and salaries) and employers' social contributions divided by GDP at factors' costs. Mohun's (2014) data provides the share of production (*proxy* to workers) and supervisory (*proxy* to overhead) labor on total compensation of employees of the private sector. The author defines the working-class through the criterion of control: it is the class *"whose work is controlled by others"* (Mohun, 2014, p. 360). In order to have the ratio of each of these income categories in GDP at factors' cost, we multiply the shares given by Mohun (2014) by the wage share given by AMECO (2017)[5]. All our variables are taken as logarithm.

Figure 1 reports our series and allows us to draw some stylized facts regarding the USA economy from 1967 to 2010. Firstly, regarding the workers' income share, it is not possible to identify a cyclical dynamic, especially because it has a strong tendency of decline during the period and shows little volatility during the business cycle. Secondly, the supervisors' share shows a clear positive trend from 1967 to 2007 as well as cyclical fluctuations. Overall, when capacity utilization is high, the supervisors' share is low and the converse happens when capacity utilization is low. This reflects the fact that supervisors' income is proportional to capacity, so when output grows, it does not grow proportionately. Finally, the profit share seems to follow a pro-cyclical behavior as suggested by Lavoie (2017).

Since the 1980s, the high values observed for capacity utilization in the previous decades were no longer observed and the peak of each cycle seems to be characterized by a lower rate

than the previous peak. Moreover, the 1980s and 1990s present an overall smaller variation of capacity utilization rates that is not present in the 2000s, as this decade has shown higher volatility and has been characterized by strong reductions of this variable after the dot-com bubble and the global financial crises. This trend is simultaneous to the trend of decrease in the workers' share, suggesting that higher income inequality can hamper the economy.

INSERT FIGURE 1 HERE.

5 Estimation results

The assessment of the integration order of each series follows the Phillips-Perron and KPSS tests and the results are reported in the appendix section. At the 10% significance level, there is evidence that all series are non-stationary. Therefore, all the variables are taken as I(1). All reported models respect the assumptions underlying the econometric methods applied, so they have white noise residuals and are dynamically stable. Yet, none of the models have normal standard errors. The next section presents the long-run aggregative model; the following one presents the results of this model when within-wage inequality is accounted for[6].

5.1 Functional Income Distribution in the Long-Run

This section reproduces the models that are usually tested under the aggregative approach, so it includes the wage share and capacity utilization as endogenous variables, but allows for a long-run relation between them. Information criteria SC (Schwarz Criterion) and HQ (Hannan-Quinn) suggest a lag length of one or two respectively. We start with a VAR model with two lags, but one more lag is added in order to obtain white noise residuals in the VAR model, rendering a VECM with two lags. Given the data pattern, a model with linear trend and intercept in the error correction part seems adequate. This model would have one cointegrating equation at the 10% significance level according to both the trace and maximum eigenvalue tests reported in the appendix section.

The output of the estimated model is reported in the appendix section. Regarding the long-run part, the cointegrating equation represented by equation 3 shows that the levels of the variables are positively correlated. Moreover, from the short-run part it is possible to see that

both variables adjust themselves to deviations from this "equilibrium" relation, as the adjustment coefficients are significant for both. The short-run part of the model shows a negative short-run effect of the wage share on capacity utilization but also a negative effect of capacity utilization on the wage share.

$$ln(u) = 0.048 + 1.039^{***} ln(w) \tag{3}$$

Accumulated Impulse-Response Functions (AIRF) are reported in figure 2. The distribution schedule suggests that the wage share is positively affected by a shock on capacity utilization, while the demand schedule shows that, despite the negative impact of the wage share on capacity utilization in the first periods, this effect does not linger and becomes positive over time.

INSERT FIGURE 2 HERE.

Granger-causality tests on a VECM must be done following the slightly modified procedure suggested by Toda and Yamamoto (1995)[7]. Table 1 reports the statistics related to this test. We cannot reject the hypothesis that the level of the wage share does not Granger-cause the level of capacity utilization, but there is evidence of Granger-causality on the other direction.

INSERT TABLE 1 HERE.

Therefore, this model provides additional information concerning the relation between the two variables of interest that seems to be lost when only accounting for their short-run dynamics. Our results suggest that, considering the long-run relation between them, the profit-led conclusion does not hold. The effect of a higher wage share on capacity utilization would actually be positive, but the Granger-causality test does not support this causality direction, suggesting a neutral regime. On the other hand, our model corroborates the conclusion that the wage share positively reacts to changes in capacity utilization, despite showing a negative effect in the short-run part of the VECM output.

5.2 Functional and Wage Income Distributions in the Long-Run

The previous result can be modified by splitting the wage share between the two wage earners classes (workers and supervisors), introducing a class perspective to the model. In this case, the SC and HQ criteria suggest starting with a model that includes one lag of each dependent variable. However, this would render a VECM model without any short-run relation, so we applied the cointegration tests to a VAR model with two lags[8]. Once again, a model with linear trend and intercept in the error correction part is adopted, for which the cointegration tests suggest one cointegrating equation at the 10% significance level as reported in the appendix section.

The output of this model is also reported in the appendix section. The cointegrating relation expressed by equation 4 shows a positive and statistically significant relation between the three variables, suggesting that higher levels of capacity utilization are associated with higher levels of the supervisors' income share and of the working-class income share (and, thus, negatively associated with the profit share). The adjustment coefficients are significant for the capacity utilization and for the supervisors' share, indicating that these variables tend to adjust themselves to this long-run relation, while the workers' share does not. The short-run part of the model indicates that capacity utilization has a negative impact on the two income shares, while these two income shares have a negative impact on capacity utilization. Moreover, each income share has a negative impact on the other.

$$ln(u) = 0.800^{***} ln(wc) + 0.650^{***} ln(nwc) \tag{4}$$

Figure 3 reports the AIRF of an impulse in the workers' share assuming that it has an instantaneous impact on capacity utilization but not on the supervisors' share (thus, in the first period, there is a redistribution of income from profits to workers' wages). It is possible to see that an increase in capacity utilization and a decrease in the supervisors' share will follow an increase in the workers' share. Given the mean value of the income shares, an increase of one standard deviation of the workers' income share will lead to an increase of 3.80 percentage points (p.p.) of the workers' income share and a decrease of 0.91 p.p. of the supervisors' share at the tenth period, rendering a fall of about 2.89 p.p. of the profit share[9]. In this case, the

increase of the capacity utilization will be of around 4.43 p.p.

INSERT FIGURE 3 HERE.

Figure 4 reports the accumulated response to a shock in the supervisors' income share assuming that it has an instantaneous impact on capacity utilization but not on the working-class share. In this case, there will be a small decrease of capacity utilization in the first periods, but by the later periods the effect will be positive; therefore, the initial negative impact of an increase in the wage share on capacity utilization observed in the previous model is due to the impact of the supervisors' share rather than the one of working-class share. Moreover, a fall in the working-class share will also follow. At the mean value of the variables, an increase of one standard innovation of the supervisors' share results, by the tenth period, in an increase of 3.76 p.p. of this share and a decrease of 1.08 p.p. of the working-class share, rendering a decrease of 2.69 p.p. in the profit share. Regarding capacity utilization, it increases by 3.32 p.p.

INSERT FIGURE 4 HERE.

Finally, we estimate an AIRF for a shock in capacity utilization assuming that it has a simultaneous impact on both shares. In this case it is possible to see that both shares have a positive response, although the short-run response of the non-working class share is negative. Given the mean value of our variables, this means that an increase of one standard deviation in capacity utilization will lead, after ten periods, to an increase of 9.64 p.p. of it, an increase of the working-class share by 2.86 p.p., and an increase of the supervisors' share by 0.76 p.p. Roughly, this means that for every increase of one percentage point in capacity utilization, the profit share is expected to fall by 0.38 p.p. (both values at the end of the tenth period and assuming no other shock in the meantime).

INSERT FIGURE 5 HERE.

Granger-causality tests are once again applied following Toda and Yamamoto's (1995) procedure and are reported in table 2. In this case, there is no support for Granger-causality between the variables, except for Granger-causality from capacity utilization to the supervisors' share. This result is in line with the previous model and shows that the causality found from capacity utilization to the wage share is actually capturing causality from the former variable to the supervisors' share.

INSERT TABLE 2 HERE.

Overall, the results of this section allow for a better understanding of the dynamics underlying the results in section 5.1. Regarding the demand regime, when the profit share decreases by one percentage point due to a shock in the working-class share, capacity utilization increases by 1.53 p.p. (after ten periods). When this decrease is due to a shock in the supervisors' share, the increase of capacity utilization is of 1.24 p.p. (after ten periods). Granger-causality tests, however, do not support the hypothesis that each of these shares Granger-cause capacity utilization, so income distribution explains little of the dynamics of capacity utilization.

The profit-squeeze conclusion still holds in this case, as a one percentage point increase in capacity utilization leads to a decrease in the profit share (after some periods, at least). The workers' share seems to be the one that increases most with this increase in capacity utilization (0.30 p.p. by the tenth period), although we could not identify Granger-causality in this direction. On the other hand, the supervisors' share increases very little (0.08 p.p. by the tenth period), which might be the result of two phenomenon discussed by Lavoie. On the one hand, the supervisors' income, because of its overhead characteristic, is expected to be roughly stable through the cycle, so increases in economic activity will render a lower participation of this class in national income (Lavoie, 2014). On the other hand, firms are likely to be more prone to increase supervisors' wages in the boom phase of the cycle (Lavoie, 2009). Considering the magnitude of the increase in the supervisors' share over the period under analysis, it is quite likely that this has taken place and possibly overcame the first phenomenon.

As a profit share decrease will take place along with an increase in capacity utilization, profitability can still increase, and, in this case, the paradox of costs will hold. In this sense, our

results break the (Goodwin, 1967) cycle narrative as the downturn of the cycle does not seem to be caused by the decrease in the profit share, even if this actually takes place. Therefore, an analysis of the business cycle based only on the dynamics between capacity utilization and income distribution might be lacking other mechanisms that can explain it.

6 Conclusion

Most empirical studies that test the demand regime of the USA do not consider the fact that the wage income is divided between the working and the supervisory classes. The data provided by Mohun (2014) shows that wage earners are likely to form a heterogeneous group, so empirical research should account for this in order to have a more precise picture of income inequality and introduce a more accurate class perspective. In this study, we investigated whether taking these two classes separately leads to different estimates of an aggregative-systems model in which income distribution and capacity utilization are simultaneously determined. Also, as a necessary and clarifying first step, we estimated an aggregative model that allows for long-run relations.

Our models suggest that despite a (weak) profit-led dynamics identified in the short-run, this is not sustained across time, so sustained higher levels of the profit share will not lead to sustained higher levels of capacity utilization, as the overall effect is statistically neutral. This supports the possibility raised by Blecker (2016) that aggregative studies find a profit-led result that might only pertain to the short-run behavior of capacity utilization, so the policy implications from these studies should be questioned. Moreover, it appears that the short-run profit-led behavior is determined by the supervisory class rather than the working-class.

Thus, we fail to confirm the possibility raised by Palley (2015, 2017) that the redistribution of income from workers to supervisors has increased the likelihood of a profit-led regime in the USA, as our result already shows that considering the level relation between the variables, the regime is not profit-led and that the Goodwin cycle mechanism is not a robust explanation for the business cycle. Still, we do identify that an increase in the workers' share of income would lead to higher capacity utilization rates than an increase in the supervisors' share, but these stimuli explain little of the dynamics of capacity utilization. In any case, there is no trade-off between improving equality (by increasing the working-class share) and higher levels of economic activity.

Concerning the distribution schedule, we find a negative response of the supervisors' share to increases in capacity utilization (at least in the first periods), which is expected because of its overhead characteristic. This means that there might be an increase in the profit share as capacity utilization rises. If this is the case, there is ground to affirm that studies that only focus in the short-run might be capturing a positive correlation between the profit share and capacity utilization that can be explained by the cyclical impact of overhead labor (Lavoie, 2017). This effect must have become stronger with the increase in the supervisors' share during the period of analysis, as it represents an increase of overhead costs.

However, the model that only includes the wage share suggests that, on average, there would be an increase of the wage share along with capacity utilization. This suggests that labor strength plays some role in determining functional income distribution, which is also one of the conclusions of Weisskopf (1979). As our results express the average relation between the variables, they cannot capture which effect is likely to prevail in each phase of the cycle, despite suggesting that both are important. Weisskopf's (1979) analysis suggests that the profit share does not move in line with capacity utilization only by the late expansion, so it would be pro-cyclical during most of the cycle, which is also what figure 1 suggests. The fall of the profit share by the late expansion would be determined, according to the author, by an increase in labor strength.

Therefore, despite the short-run effect of an increase in capacity utilization on both wage shares being negative (shown in the short-run part of the VECM models), our results are also capturing a positive long-term relation between these variables that can be explained by the fact that at higher capacity utilization levels labor strength is increased and this can lead to higher wage shares. Thus, our results regarding the distribution schedule are the combination and interaction of these two determinants.

This was a first approach to the implications of considering long-run relations and of splitting the wage share on the results of the aggregative model. We contribute to the literature by suggesting some implications from our study that might be useful for future research on the topic. Firstly, our results suggest that studies that follow the aggregative approach by using a HP-filtered trend as a *proxy* to capacity utilization are missing an important mechanism, as Blecker (2016) suggests. Secondly, there is empirical support for considering that the profit

share is determined by capacity utilization in an ambiguous way, as both labor strength and overhead labor play a role. Finally, other control variables should be included to allow for a more precise narrative of what drives the business cycle, as the wage share seems to explain little of the dynamics of capacity utilization.

Notes

[1]The study that is closer to this is the one by Carvalho and Rezai (2015), which includes personal income distribution but does not undertake a class perspective. Even if income groups reflect social classes to some extent, splitting wage earners into workers and supervisors shows how this income group encompasses very different social classes.

[2]In addition, for instance, to the study by Onaran *et al.* (2011).

[3]Most studies use the deviation of actual GDP from a HP-filtered trend to measure capacity utilization, forcing the mean of the variable to be zero and ruling out the possibility of long-run relations (Blecker, 2016).

[4]There are other implications of the model with overhead labor, as explored by Lavoie (2009, 2014).

[5]Thus, we assume that public sector wages are split in the same way as in the private sector.

[6]The Eviews program is available from the author upon request.

[7]The procedure suggested by the authors consists in estimating a VAR with one more lag than what would be necessary (so, in our case, four lags) and testing for Granger-causality with the estimated parameters for all lags except this last one.

[8]Determining the lag length by the adjusted R^2 would lead to a VAR model with two lags.

[9]These values are calculated by converting changes in logarithm into changes in the level variables at their mean values. For the working-class share, for instance, it is equal to: $\Delta wc = \Delta ln(wc) * \bar{wc}$.

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Tables

Table 1: Specification 1: Granger-Causality Test

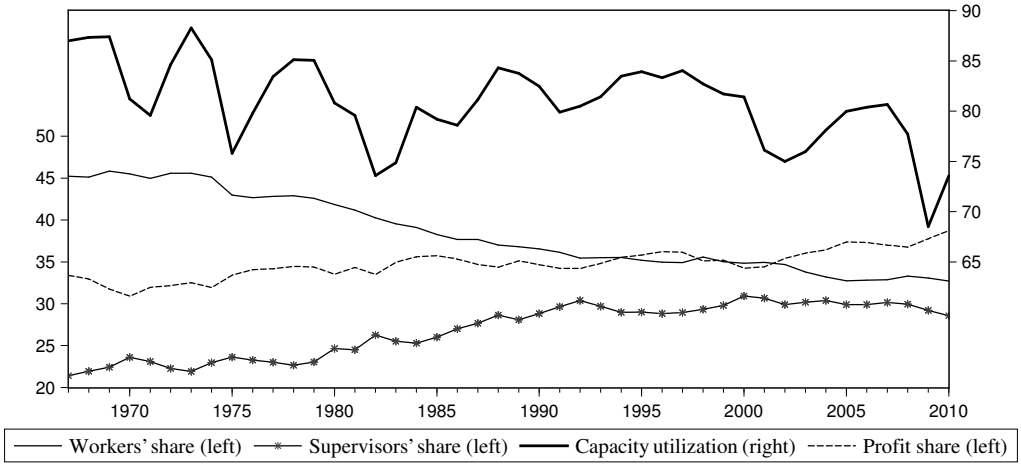
Ho	Chi-sq	df.	Prob.
ln(w) does not Granger-cause ln(u)	1.583	3	0.663
ln(u) does not Granger-cause ln(w)	20.593	3	0.000

Table 2: Specification 2: Granger-Causality Test

Ho	Chi-sq	df	Prob.
ln(wc) does not Granger-cause ln(u)	1.405	2	0.495
ln(nwc) does not Granger-cause ln(u)	1.691	2	0.429
ln(u) does not Granger-cause ln(wc)	2.592	2	0.274
ln(nwc) does not Granger-cause ln(wc)	2.187	2	0.335
ln(u) does not Granger-cause ln(nwc)	7.219	2	0.027
ln(wc) does not Granger-cause ln(nwc)	1.585	2	0.453

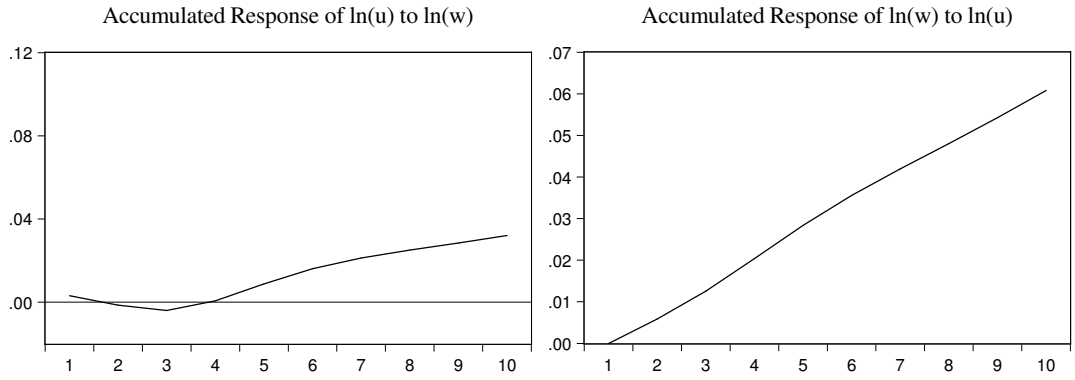
Figures

Figure 1: Income Distribution and Capacity Utilization in the USA from 1967 to 2010 (%)



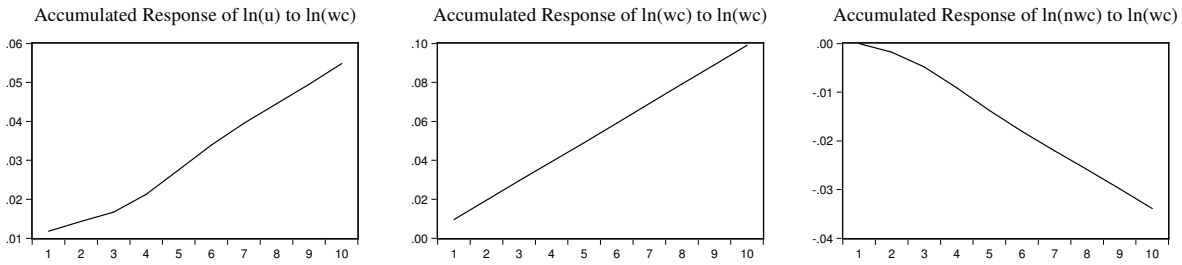
Sources: AMECO (2017), Federal Reserve (2017), and Mohun (2014). Author's own elaboration.

Figure 2: Specification 1: Accum. Response to Cholesky One Standard Deviation Innovations



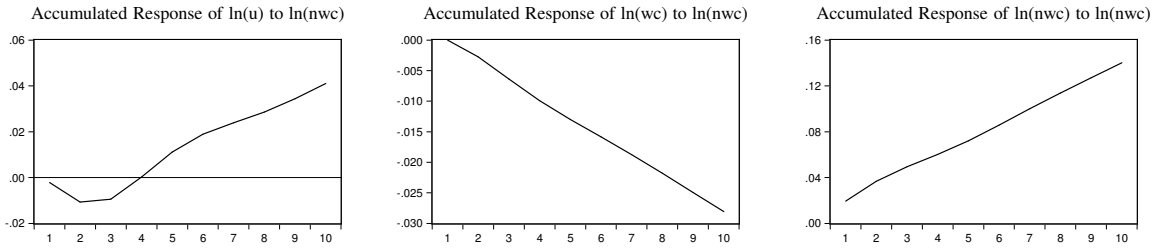
Note: Cholesky ordering: 1.ln(w), 2.ln(u).

Figure 3: Specification 2: Accum. Response to Cholesky One Standard Deviation Innovation in ln(wc)



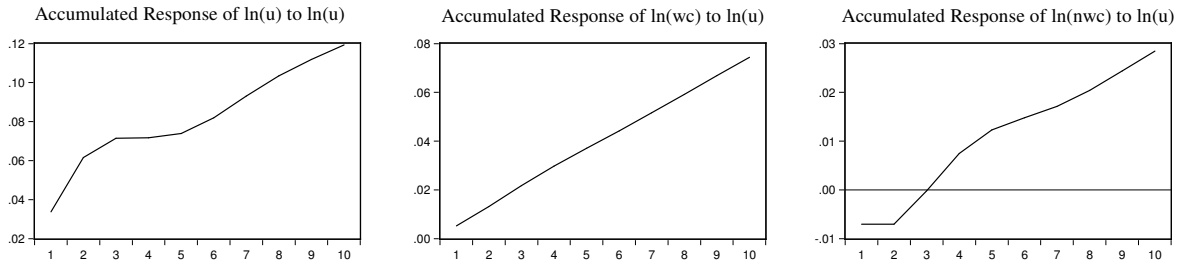
Note: Cholesky ordering: 1. ln(nwc); 2. ln(wc); 3. ln(u).

Figure 4: Specification 2: Accum. Response to Cholesky One Standard Deviation Innovation in ln(nwc)



Note: Cholesky ordering: 1. ln(wc); 2. ln(nwc); 3. ln(u).

Figure 5: Specification 2: Accum. Response to Cholesky One Standard Deviation Innovation in ln(u)



Note: Cholesky ordering: 1. ln(u); 2. ln(wc); 3. ln(nwc).

Appendix

Table A1: Unit Root Tests

	Phillips-Perron Test						KPSS Test	
Model	Constant, Trend		Constant		None		Constant, Trend	Constant
Ho	1 UR		1 UR		1 UR		0 UR	0 UR
	t-stat	p-value	t-stat	p-value	t-stat	p-value	LM stat.	LM stat.
ln(u)	-3.049	0.132	-2.586	0.104	-1.929	0.052	0.174	0.525
d(ln(u))	-9.297	0.000					0.379	0.378
ln(wc)	-1.642	0.759	-0.637	0.852	-3.925	0.000	0.162	0.810
d(ln(wc))	-5.202	0.000					0.112	0.132
ln(nwc)	-0.897	0.947	-1.895	0.332	1.670	0.975	0.173	0.762
d(ln(nwc))	-6.479	0.000					0.181	0.341
ln(w)	-2.910	0.170	-0.441	0.893	-1.165	0.219	0.082	0.736
d(ln(w))	-5.791	0.000					0.080	0.178

Note: In the KPSS test, the critical values at the 10% significant are equal to 0.119 and 0.347 for the model with constant and trend and the model with constant respectively.

Table A2: Specification 1: Unrestricted Cointegration Rank Tests

Trace Test				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value (10%)	Prob.
None	0.377	9.899	13.429	0.010
At most 1	0.013	0.530	2.706	0.467
Maximum Eigenvalue Test				
Hypothesized No. of CE(s)	Eigenvalue	Max. Eigen. Statistic	Critical Value (10%)	Prob.
None	0.377	19.370	12.297	0.007
At most 1	0.013	0.530	2.706	0.467

Note: Lag intervals: 1 to 2.

Table A3: Specification 1: Model Output

Cointegrating Eq:	CointEq1	
ln(u)(-1)	1	
ln(w)(-1)	-1.039***	
	(0.262)	
C	-0.048	
Error Correction:	D(ln(u))	D(ln(w))
CointEq1	-0.456**	0.191***
	(0.217)	(0.049)
D(ln(u)(-1))	0.296	-0.018
	(0.209)	(0.048)
D(ln(u)(-2))	-0.095	-0.096*
	(0.208)	(0.047)
D(ln(w)(-1))	-1.405**	-0.042
	(0.599)	(0.136)
D(ln(w)(-2))	-0.322	0.093
	(0.643)	(0.146)
C	-0.006	-0.003**
	(0.006)	(0.001)
R-squared	0.402	0.420
Adj. R-squared	0.316	0.337

Note: Standard errors in parenthesis. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table A4: Specification 2: Unrestricted Cointegration Rank Tests

Trace Test				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value (10%)	Prob.
None	0.434	26.953	27.067	0.103
At most 1	0.067	3.068	13.429	0.964
At most 2	0.004	0.169	2.706	0.681
Maximum Eigenvalue Test				
Hypothesized No. of CE(s)	Eigenvalue	Max. Eigen. Statistic	Critical Value (10%)	Prob.
None *	0.434	23.885	18.893	0.020
At most 1	0.067	2.899	12.297	0.953
At most 2	0.004	0.169	2.706	0.681

Note: Lag intervals: 1 to 1.

Table A5: Specification 2: Model Output

Cointegrating Eq:	CointEq1		
ln(u)(-1)	1.000		
ln(wc)(-1)	-0.800***		
	(0.260)		
ln(nwc)(-1)	-0.650***		
	(0.245)		
C	0.659		
Error Correction:	D(ln(u))	D(ln(wc))	D(ln(nwc))
CointEq1	-0.414***	0.063	0.304***
	(0.159)	(0.054)	(0.109)
D(ln(u)(-1))	0.294*	-0.009	-0.032
	(0.184)	(0.063)	(0.126)
D(ln(wc)(-1))	-1.141**	0.013	-0.272
	(0.544)	(0.185)	(0.372)
D(ln(nwc)(-1))	-0.608***	-0.095	0.123
	(0.242)	(0.082)	(0.166)
C	-0.006	-0.007***	0.003
	(0.007)	(0.002)	(0.005)
R-squared	0.393	0.115	0.244
Adj. R-squared	0.328	0.019	0.162

Note: Standard errors in parenthesis. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.