Departamento de Economía

Serie documentos de trabajo

2015

The share of wages in national income and its effects in the short and long run economic activity and growth

Alejandro Rodríguez

Enero 2015

Documento de trabajo No. 2, 2015

The share of wages in national income and its effects in the short and long run economic activity and growth

Abstract

This paper sets a model where savings as a ratio of capital depend upon negatively on the share of wages in national income and positively on the rate of interest. The ratio of investment to capital depend upon negatively on both the share of wages the rate of interest. An increase in the share of wages in the short run may have multiple combined effects on capacity utilization and the growth of capital. Adding the concept on normal capacity utilization, a higher share of wages will always have a negative effect on the long run growth of capital.

JEL E21 E22 E24

Alejandro Rodríguez Arana
Departamento de Economía
Universidad Iberoamericana, Ciudad de México
alejandro.rodriguez@ibero.mx

The share of wages in national income and its effects in the short and long run economic activity and growth

Introduction

The distribution of income has been a hot topic since centuries ago. For the classics, as David Ricardo and Karl Marx, capitalists, as a dominant class, set wages at the level of survival appropriating themselves from profits that ultimately are produced by workers. Marginalists, like John Bates Clark, Knut Wicksell and Phillip Wickstead, propose an endogenous distribution of income generated by the marginal product of factors, mainly capital and labor (see for example Sandmo (2013)).

Different economists challenged the neoclassical marginalist approach of an endogenous distribution of income and rescued the classical view; among them some of the most important are Sraffa (1960) and Kalecki (1971). Other Post Keynesian economists, like Kaldor (1956) (1957), Robinson (1956) and Pasinetti (1962), make the distribution of income endogenous but for reasons different to the so-called marginal productivities.

An important sub topic of the general theme of the distribution of income is the one of the share of wages in national income. This topic has been studied also for a long time (see for example Hahn (1951), Solow (1958), Lance Taylor (1989))). Particularly, an important question in the sub topic is whether higher share of wages on income increases or decreases economic activity and ultimately growth.

Different studies differ in their conclusions. As Lance Taylor (Taylor (1989)) assert[1], Keynes in the General Theory (Keynes (1936)) and Kalecki (1971) suggest that higher share of wages should increase capacity utilization and growth because workers have lower propensity to save than capitalists. This line of thought has been followed in the works of Rowthorn (1982), Dutt (1984), Bhaduri and Marglin (1990), Lavoie (1995) and more recently Hein (2010) and Lavoie and Stockhammer (2012).

Some other Post Keynesian economists have a different view. Bhaduri and Marglin (1990) claim that, in some cases, a higher share of wages could generate a reduction of capacity utilization and growth (the profit led growth case). However, they follow the Kaleckian or Sraffian line where income distribution is, in some way, exogenous. Instead, Keynes (1930) in the Treatise of Money, Kaldor (1956) (1957), Robinson (1956), Pasinetti (1962) and more recently Marglin (1984), Taylor (1985), Araujo (1995) and Lavoie (1998) make endogenous the distribution of income when inflation is considered.

This paper proposes first a type of Kaleckian model where the distribution of income is exogenous. Changes in the share of wages may have different results on capacity utilization and growth. In one extreme case-the pure wage led growth case- an increase in the share of wages generates higher

[1] In fact, Taylor (1989) describes that this problem of inequality in the share of wages was addressed by Sismondi in the second decade of the XIX century.

capacity utilization and higher growth. In the other extreme case- the pure profit led growth case- an increase in the share of wages reduces both capacity utilization and growth.

The novelty of the model is the introduction of the rate of interest in both the saving's and investment's equations. Also, it takes into account the concept of the normal capacity utilization, which is a threshold for this variable. Above it inflation rises, below it inflation falls. Monetary policy is described by a Taylor's rule in the manner proposed by Romer (2000) or John B Taylor himself (Taylor (2000)). It is shown that an increase in the short run share of wages has a negative effect on growth in the long run in all cases, irrespective of the nature of the short run response of growth and capacity utilization to changes in the aforementioned variable.[2]

I.- The model

We start with a modified version of the Bhaduri-Marglin's model (Bhaduri and Marglin (1990)). Savings come from earnings of entrepreneurs and incomes from capital. Income coming from wages is not saved. We follow Kaldor (1956) (1966) (See also Lester Taylor et al (1971)) in that people have different propensities to save from different sources of income and not because there are different types of people, for instance workers and capitalists. In Kaldor's view a person that is both capitalist and worker saves differently the incomes that come from capital and those coming from labor. Instead, Pasinetti (1962) takes the view that propensities to save depend upon different types of people.

The saving equation is then proposed as:

$$S = s_0(Y - w_r L - rK) + (s_0 + s_1)rk \qquad (1)$$

Where S are savings; Y is total output, w_r is the real wage; L is labor; r is the rate of interest and K the quantity of capital. The parameter s_0 is the propensity to save out of profits of firms, s_0+s_1 is the propensity to save out of capital earnings, which we consider greater than the propensity coming out from profits. Differently from many authors in the Post Keynesian tradition[3], we consider that profits in firms must discount capital earnings (rk) even if capital were property of entrepreneurs. This is because there is an opportunity cost of all capital, not only of the rented capital.[4]

Dividing equation (1) by total capital K and rearranging we have:

$$\frac{S}{K} = s_0(1 - \phi)A + s_1 r \qquad (2)$$

Where

$\phi = \frac{w_r L}{Y}$ The share of wages in total output

---

[2] The share of wages

[3] See for example Kaldor (1956), Robinson (1956), Pasinetti (1962), Marglin (1983), Badhuri and Marglin (1990), Lavoie (1995), Hein (2010).

[4] This must be true in a situation where there are many producers, so they can rent their capital to other producers. In a closed economy where there is only one producer the opportunity cost of the own capital would be zero.

$A = \frac{Y}{K}$ Output divided by capital, a proxy of capacity utilization (Marglin (1983 chapter 4)).

We propose a general investment function in the spirit of Bhaduri and Marglin (1990)

$$I = H_0 K + i_1(1 - \phi)K + i_2 Y - i_3 r K \quad (3)$$

Where H_0 is a parameter that in the majority of cases is considered positive and related to the "animal spirits" instinct to invest, but that in certain cases, especially in profit led growth models, may be zero or even negative.

The investment function indicates that investment is related negatively to the share of wages in total income, since that represents a cost for the firm (see Bhaduri and Marglin (1990)). It depends positively in output and negatively in the cost of total capital. This last variable is something addressed in the well-known IS-LM model originally exposed by Hicks (1937) but that is not considered in the majority of Post Keynesian works, including the work by Bhaduri and Marglin (1990).

Dividing equation (3) by K, we have investment as a ratio of capital, which in fact is total growth of capital plus the rate of depreciation. In this case we consider capital as indestructible and then the rate of depreciation is zero. Then

$$g_k = \frac{I}{K} = H_0 + i_1(1 - \phi) + i_2 A - i_3 r \quad (4)$$

Where g_k is the rate of growth of capital.

The solution of this model is to equate savings and investment and then to solve for a pair of variables. In the Kaleckian tradition (see Kalecki (1971), Bhaduri and Marglin (1990)) the solution is for capacity utilization A and the growth of capital g_k. In the Robinson-Kaldor approach, the solution would be for the share of profits- or the share of wages- (1-φ) and the rate of growth of capital g_k. In a variation the loanable funds model the solution would be for the rate of interest r and the rate of growth of capital g_k (see Holgstrom and Tirole (1997)).

II.- Solution of the model in the short run: the pure wage led growth case and the pure profit led growth case

We assume that in the short run the rate of interest and the share of wages in output are given. Therefore, the Kaleckian solution is for capacity utilization A and the rate of growth of capital g_k.

Since the investment function is rather complex, we take two extreme cases: the pure wage led growth case and the pure profit led growth case. In the first one the investment function does not include the share of wages in output and then i_1=0. At the same time, the parameter H_0 is highly positive, indicating that investment as a proportion of capital is influenced by animal spirits in a considerable way. Without any loss we assume the cost of capital remains there in such a way that i_3>0.

II.1.- The pure wage led growth case.

The investment function in this extreme case is given by:

$$g_k = \frac{I}{K} = H_0 + i_2 A - i_3 r \quad (5)$$

Equating (5) to the saving function (2), we obtain reduced forms for capacity utilization and the growth of capital

$$A = \frac{H_0 - (i_3 + s_1) r}{(s_0(1-\phi) - i_2)} \quad (6)$$

$$g_k = \frac{s_0(1-\phi)(H_0 - (i_3 + s_1) r)}{(s_0(1-\phi) - i_2)} + s_1 r \quad (7)$$

To preserve the stability of the model, in every case we assume that the savings rate multiplied by the profit rate (1-ϕ) is greater than the response of investment to capacity utilization i_2 (s_0(1-ϕ)-i_2>0), as Bhaduri and Marglin (1990 p. 381)) assert.

For the model having an economic meaning H_0 has to be positive enough to be greater than the term (i_3+s_1)r almost in every case, since capacity utilization cannot be negative. The short run model indicates that higher share of wages in output increases both capacity utilization and growth, which may be observed taking the derivative of A and g_k in (6) and (7) with respect to (1-ϕ).

$$\frac{dA}{d(1-\phi)} = \frac{-s_0(H_0 - (s_1 + i_3) r)}{(s_0(1-\phi) - i_2)^2} < 0 \quad (8)$$

And

$$\frac{dg_k}{d(1-\phi)} = -\frac{s_0 i_2 (H_0 - (s_1 + i_3) r)}{(s_0(1-\phi) - i_2)^2} < 0 \quad (9)$$

An increase in the share of wages in output (an increase in ϕ or a reduction in 1-ϕ) increases both capacity utilization and the rate of growth of capital. For this reason this kind of model is called a wage led growth model.

The intuition behind this result is that an increase in wages reduces savings without affecting investment in the first place, generating higher output and capacity utilization, which, at the same time, generates a strong secondary incentive to investment. Therefore growth also rises.

II.2.- The pure profit led growth case.

The other extreme case is one where investment as a ratio of capital does not depend upon capacity utilization (i_2=0) but depends strongly in the profit share (1-ϕ). An extreme assumption is one where the animal spirit instinct is zero (H_0=0), in such a way that the investment function becomes

$$g_k = \frac{I}{K} = i_1(1-\phi) - i_3 r \quad (10)$$

Equating equation (10) of investment to equation (2) of total savings gives, as a result:

$$A = \frac{i_1(1-\phi) - (i_3 + s_1) r}{s_0(1-\phi)} \quad (11)$$

$$g_k = i_1(1-\phi) - i_3 r \quad (12)$$

For the system being economically meaningful, the term $i_1(1-\phi)$ must be high enough to compensate for the cost of capital since again capacity utilization cannot be negative.

An increase in the profit margin 1-ϕ- a reduction in the share of wages in output- increases both capacity utilization and growth since

$$\frac{dA}{d(1-\phi)} = \frac{(i_3+s_1)r}{s_0(1-\phi)^2} > 0 \quad (13)$$

And

$$\frac{dg_k}{d(1-\phi)} = i_1 > 0 \quad (14)$$

A rise in the share of wages in output has a strong negative effect on investment and a positive effect on consumption (a negative effect on savings). However, the reduction of investment is higher than the increase in consumption. Therefore output falls and so does capacity utilization, since capital is predetermined.[5] While investment falls, growth also falls.[6]

II.- The transition from the short run to the long run: The normal capacity utilization and the inflation response.

Several authors[7] of very different schools criticize the type of models seen in the last sections because capacity utilization seems to change "forever". Furthermore, changes in savings and investment do not affect the rate of interest. Neoclassical economists, like McElhattan (1978) (1985) or Nahuis (2003), coined two terms: the NAICU (Non accelerating index of capacity utilization) and NARCU (Non accelerating rate of capacity utilization) to refer to a level of capacity utilization where below it inflation falls and above it inflation rises. Kaleckian authors, like Lavoie (1995) or Hein (2010), rebut the arguments of neoclassical, neo-Ricardian and neo-Marxian schools about the normal level of capacity utilization, saying that this concept is not exogenous but endogenous.

We will take the view of McElhattan (1978) (1985) and Nahuis (2003) of NAICU or NARCU and define a Phillips curve similar to the one expressed by Romer (2000), but where acceleration of inflation is linked to the difference between actual capacity utilization and NARCU and not between the difference between actual output and natural output, as in Romer (2000). Inflation is supposed to be a predetermined variable, which implies that in continuous time it cannot give jumps, it only goes up or down in a continuous way (see Buiter (1982)).

$$\frac{d\pi}{dt} = \gamma(A - A^*) \quad (15)$$

[5] A predetermined variable in continuous time is one that cannot give jumps. It can go up or down but in a continuous way always. See Buiter (1982) .

[6] An interesting result emerges when H_0 is highly positive because in that situation the rise in the share of wages increases capacity utilization, meaning that consumption rises more than the fall of investment, but growth falls.

[7] In the neoclassical approach McElhattan (1978) (1985), Garner (1994)), Nahuis (2003). In the neo-Ricardian Garegnani and Palumbo (1998) and Commendatore (2006).

Equation (15) is the Phillips curve, where π is the rate of inflation and A^* is the normal capacity utilization or NARCU, a threshold level for changes in the sign of the acceleration of inflation. If actual capacity utilization is above A^*, inflation is rising continuously. If, on the contrary, A is below A^*, inflation is falling also constantly. The parameter γ represents the velocity of adjustment of inflation.

Apart from that, we define a monetary policy based on interest rates and that follows the Taylor's principle (John B Taylor (1993) (2000), Romer (2000)). An increase in one point of inflation makes the central bank to raise the nominal interest rate by more than one point, which implies that there is a positive relation between the real interest rate and inflation.

The simplest Taylor's relation between the real interest rate and inflation in the spirit of Romer (2000) and John B Taylor (2000) is:

$$r = z + \Omega\pi \quad (16)$$

Where z and Ω are parameters of the monetary policy.

Equating the saving's equation (2) to the complete investment equation (4), and introducing the Taylor's rule (16), we get reduced forms for capacity utilization and the growth of capital in the short run.

$$A = \frac{H_0 + i_1(1-\phi) - (s_1 + i_3)(z + \Omega\pi)}{(s_0(1-\phi) - i_2)} \quad (17)$$

$$g_k = s_0(1-\phi)\frac{(H_0 + i_1(1-\phi) - (s_1 + i_3)(z + \Omega\pi))}{(s_0(1-\phi) - i_2)} + s_1(z + \Omega\pi) \quad (18)$$

Substituting (17) in the Phillips curve (15) we obtain a linear differential equation for inflation

$$\frac{d\pi}{dt} = \gamma\left(\frac{H_0 + i_1(1-\phi) - (s_1 + i_3)(z + \Omega\pi)}{(s_0(1-\phi) - i_2)} - A^*\right) \quad (19)$$

The derivative of the acceleration of inflation (dπ/dt) with respect to the rate of inflation itself is:

$$\frac{d\left(\frac{d\pi}{dt}\right)}{d\pi} = -\gamma\frac{(s_1 + i_3)\Omega}{(s_0(1-\phi) - i_2)} < 0 \quad (20)$$

(20) implies a stable model for inflation, which converges to an equilibrium point where the acceleration of inflation is zero and capacity utilization tends to NARCU A^*. In mathematical terms that implies

$$\lim_{t\to\infty} A_t = A^* \quad (21)$$

In the long run, under the Phillips curve (15) and the Taylor´s rule (16), capacity utilization tends to its normal level A^* . The endogenous variables of the model become the real rate of interest r and the rate of growth g_k. This result is independent of the nature of the short run model, whether it is a pure wage led growth model or a pure profit led growth model or a combination between these two extremes.

III.- The role of the share of wages in output on the long run rate of growth of the economy.

In the long run capacity utilization tends to the normal value A^*. Any change in the share of wages in output will not affect that variable. We will show now that a permanent increase in the share of wages will deteriorate the long run growth of capital of the model in all cases. Then we will analyze the trajectories of the main macroeconomic variables when the share of wages increases in the extreme cases of the pure wage led growth model and the pure profit led growth model.

The complete model in the long run may be set as:

$\frac{S}{K} = s_0(1-\phi)A^* + s_1 r$ (22) Equation for savings in the long run

$\frac{I}{K} = H_0 + i_1(1-\phi) + i_2 A^* - i_3 r$ (23) Investment´s function in the long run

$\frac{S}{K} = \frac{I}{K} = g_k$ (24) Equilibrium condition.

The long run's solution operates as a version of the loanable funds model. Equality between savings and investment solves for the growth of capital and the real rate of interest, while capacity utilization is equal to normal capacity A^*.

Under these circumstances solutions for the rate of interest r and the growth of capital are:

$$r = \frac{H_0 - (s_0(1-\phi) - i_2)A^* + i_1(1-\phi)}{(s_1 + i_3)} \quad (25)$$

$$g_k = s_0(1-\phi)A^* + s_1\left(\frac{H_0 - (s_0(1-\phi) - i_2)A^* + i_1(1-\phi)}{(s_1 + i_3)}\right) \quad (26)$$

Positive changes in the profit rate- or negative changes in the share of wages- have the following results.

$$\frac{dr}{d(1-\phi)} = \frac{-s_0 A^* + i_1}{(s_1 + i_3)} <> 0 \quad (27)$$

$$\frac{dg_k}{d(1-\phi)} = \frac{i_3 s_0 A^* + s_1 i_1}{(s_1 + i_3)} > 0 \quad (28)$$

While the real rate of interest may rise or fall, the growth of capital falls when the share of wages increases in all cases, as equation (28) proves.

For the pure wage led growth case, an increase in the share of wages raises the long run real rate of interest since $i_1=0$. For the pure profit led growth case the increase in the share of wages reduces the long run rate of interest. This can be seen using equation (11). In a long run equilibrium:

$$i_1(1-\phi) = s_0(1-\phi)A^* + (s_1 + i_3)r \quad (29)$$

If we consider that the rate of interest is always positive, in the pure profit led case dr/d(1-ϕ) has to be positive and the increase in the share of wages reduces the real rate of interest.

Trajectories for capacity utilization, the growth of capital, inflation and the real rate of interest are the following in the extreme cases considered:

Figure 1. Trajectories of main macroeconomic variables under a rise in the share of wages on output in the pure wage led growth case

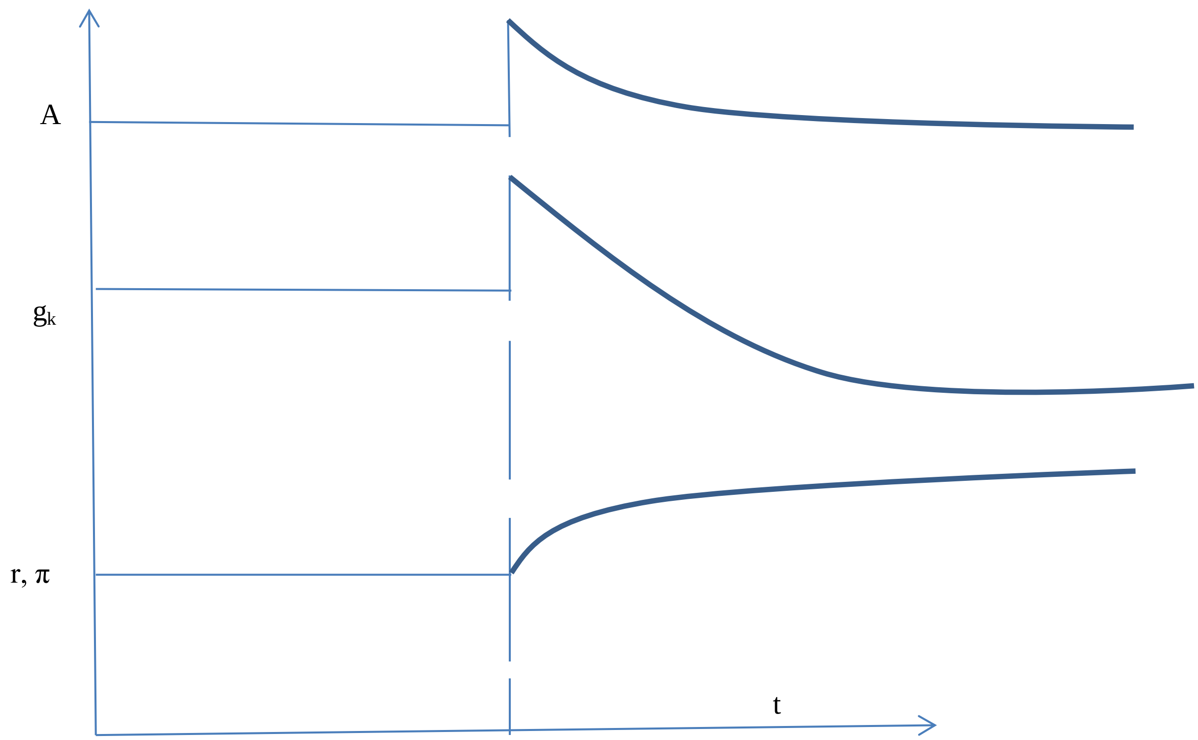


Figure 2: Trajectories of main macroeconomic variables under a rise in the share of wages on output in the pure profit led growth model

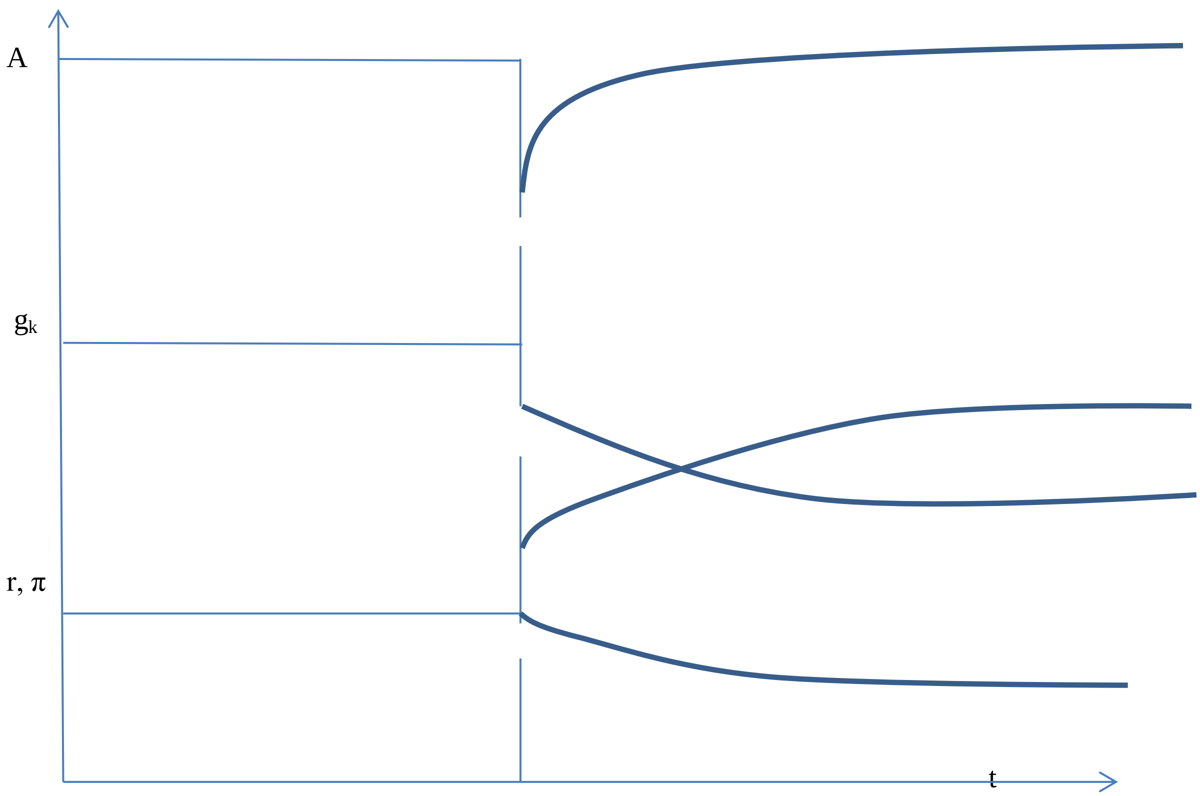


Figure 1 shows the pure wage led growth rate case. An increase in the share of wages ϕ raises capacity utilization and growth at once. As inflation rises the real interest rate also goes up. Capacity utilization then starts falling until it reaches its normal initial level. The rate of growth of capital also falls but its long run value is lower than the initial one.

Figure 2 shows the profit led growth rate case. An increase in ϕ makes capacity utilization to fall as well as the growth rate of capital. Inflation starts falling and so does the real interest rate. For this reason capacity utilization returns to its original point. The growth of capital may have two trajectories: one where after the first fall it rises but finishes in a lower point that the original; the other where after the first fall it continues going down until it reaches its equilibrium value.

IV.- The possible dependence of the share of wages- or the profit rate- in the rate of interest

The model explained before may be criticized because it takes the share of wages in output as exogenous all the time. In strict sense that means an exogenous markup of prices to wages (see for example Hein (2010)). However, since we acknowledge that the rate of interest is a cost for the firm even in the case where entrepreneurs are the owners of the capital, it is logical to think that the markup of prices to wages is influenced positively by the rate of interest (see Hein (2010)).

The markup of total nominal output on wages is defined as:

$$PY = (1 + \tau)WL \quad (30)$$

Where τ is the markup of prices on wages. P is the price level. W is the nominal wage

Since

$$w_r = \frac{W}{P} \text{ and } \phi = \frac{w_r L}{Y} \quad (31)$$

$$(1 - \phi) = \frac{\tau}{1+\tau} \quad (32)$$

And also

$$\frac{d(1-\phi)}{d\tau} = \frac{1}{(1+\tau)^2} > 0 \quad (33)$$

We assume that the markup τ is related positively to the rate of interest r. At the same time, the profit margin 1-ϕ is related positively with the markup. Therefore, 1-ϕ is has a positive relation with the rate of interest.

To make the exercise tractable, we assume linear relation between the profit margin 1-ϕ and the rate of interest, in such a way that

$$1 - \phi = h_0 + \beta_1 r \quad (34)$$

Which means that there is a negative relation between the share of wages and the rate of interest.

None of the results in the short run changes because of this new assumption. In the short run the rate of interest is given and so it is the share of wages. However, as the rate of interest changes, because of inflationary pressures, the share of wages become endogenous.

We will show now that an increase in the short run profit margin- a reduction in the share of wages- because of a rise in parameter β_1- will generate –under certain plausible assumptions- a rise in the long run profit margin- a reduction in the long run share of wages- and an increase in the long run rate of growth of capital. Therefore, previous results already explained under the assumption of a completely exogenous share of wages remain practically unchanged.

To see this, we take first equation (17) for capacity utilization and introduce equation (34), given, as a result, equation (35)

$$A = \frac{H_0 + i_1 h_0 - (s_1 + i_3 - i_1\beta_1)(z + \Omega\pi)}{(s_0(h_0 + \beta_1(z + \Omega\pi)) - i_2)} \quad (35)$$

The following step is to use equation (15) of the adjustment for inflation and to substitute there equation (35).

$$\frac{d\pi}{dt} = \gamma[\frac{H_0+i_1h_0-(s_1+i_3-i_1\beta_1)(z+\Omega\pi)}{(s_0(h_0+\beta_1(z+\Omega\pi))-i_2)} - A^*] \quad (36)$$

We have now a non-linear differential equation in π that has a source of instability in the term $i_1\beta_1$ in the numerator.

If-but not only if- the term $s_1+i_3-i_1\beta_1$ is greater than zero, the differential equation (36) is stable. In this case the numerator of the first term in the right hand side of equation (36) has a negative relation to inflation and the denominator has positive relation with the same variable. For these two reasons:

$$\frac{d(\frac{d\pi}{dt})}{d\pi} < 0 \qquad (37)$$

There is a monotonic-though non-linear-relation between the acceleration of inflation and inflation. There is a stable unique long run equilibrium where

$$\lim_{t\to\infty} A_t = A^* \quad (38)$$

If that is the case, the long run model may be set in the following way

$$\frac{S}{K} = s_0(h_0 + \beta_1 r)A^* + s_1 r \quad (39)$$

$$\frac{I}{K} = H_0 + i_1(h_0 + \beta_1 r) + i_2A^* - i_3 r \quad (40)$$

$$\frac{S}{K} = \frac{I}{K} = g_k \quad (41)$$

Results for the rate of interest and the growth of capital are:

$$r = \frac{H_0-(s_0A^*-i_1)h_0+i_2A^*}{(s_1+s_0\beta_1A^*-i_1\beta_1+i_3)} \quad (42)$$

$$g_k = s_0h_0A^* + (s_0\beta_1A^* + s_1)[\frac{H_0-(s_0A^*-i_1)h_0+i_2A^*}{(s_1+s_0\beta_1A^*-i_1\beta_1+i_3)}] \quad (43)$$

We have already assume that $s_1+s_3-i_1\beta_1>0$. Therefore the denominator in (42) is positive

For the model to be economically meaningful we need

$$H_0 - (s_0A^* - i_1)h_0 + i_2A^* = j > 0 \quad (44)$$

Which happens when H_0 and/or i_1 and/or i_2 are sufficiently high.

The derivative of the rate of growth of capital with respect to parameter β_1 is, after tedious algebra:

$$\frac{dg_k}{d\beta_1} = \frac{(s_0A^*i_3+i_1s_1)j}{(s_1+s_0\beta_1A^*-i_1\beta_1+i_3)^2} > 0 \quad (45)$$

An increase in β_1 is a decrease in the share of wages ϕ in the short run. This is because the rate of interest is given in that moment. As long as r changes so does the share of wages. However, the short run decrease in the exogenous part of the share of wages raises the long run rate of growth. That result is independent of the nature of the short run model, that is to say whether we have a wage led growth model of a profit led one.

Now we will show that a short run decrease in the share of wages will generate also a long run decrease of the same variable. To do that, we derivate the profit margin (1-ϕ) with respect to r using the result for r in (42).

$$\frac{d(1-\phi)}{d\beta_1} = \frac{d(h_0+\beta_1 r)}{d\beta_1} = \frac{(s_1+i_3)j}{(s_1+s_0\beta_1 A^{*}-i_1\beta_1+i_3)^2} > 0 \quad (46)$$

An exogenous increase in the share of wages in the short run will generate an endogenous increase of the same variable in the long run. In the short run, this fact will generate higher growth and higher capacity utilization in the pure wage led growth model. It will decrease growth and capacity utilization in the pure profit led case and will generate a variety of results in mixed cases. However, it will reduce growth in the long run with respect to the original in all possible meaningful economic situations.

Concluding remarks

The main conclusion of this paper is that at the end an increase in the share of wages will generate lower growth. The intuitive reason for this result is that under normal capacity utilization- and variable interest rates- higher share of wages reduces both savings and investment. In a plane where savings is related positively to the rate of interest, and investment is related negatively to the same variable, a shift of both functions to the left will generate an uncertain result for the real interest rate but a reduction for sure in the rate of growth of capital.

Policies oriented to increase wages in the short run may be successful on increasing growth and economic activity but they will reduce the long run growth of the economy. In situations where labor is given, and there are constant returns of output on capital, that means that while the real wage may increase now there will be a moment where it will be lower than if the policy of increasing the share of wages wouldn't had taken place (see appendix).

One reason why we obtain these results is because of the assumption of a vertical long run Phillips curve. Some theoretical and empirical work, like the one of Akerlof et al (2000) or Palley (2008), challenge the view of a vertical Phillips curve in developed countries. For those two papers, when inflation is low there is a long run tradeoff between inflation and unemployment. For some medium rates of inflation there is actually a perverse relation where higher inflation is related positively to higher unemployment. Only above certain threshold value of inflation the Phillips curve becomes vertical.

It would be interesting to analyze the present model under the assumptions of Akerlof et al (2000) and Palley (2008). For low levels of inflation, perhaps, it would be possible to find that in some cases the pure wage led growth model generates higher growth not only in the short run, but also in the long run.

References

Akerlof, G, W. Dickens and G. Perry (2000). "Near rational wage and price setting and the long run Phillips curve." *Brookings Papers on Economic Activity*, 1, pp. 1-76.

Araujo, J.T (1995). "Kaldor's neo Pasinetti theorem and the Cambridge theory of distribution." *Manchester School of Social and Economic Studies*, pp. 311-317.

Bhaduri, A and S. Marglin (1990). "Unemployment and the real wage: the economic basis for contesting political ideologies." *Cambridge Journal of Economics*, 14, pp. 375-393.

Buiter, W. (1982). "Predetermined and non predetermined variables in rational expectations models" en *NBER Technical paper series 21*, Washington D.C: National Bureau of Economic Research.

Burnside, C, M. Eichembaum and S. Rebelo (1990). "Labor hoarding and the business cycle." *NBER Wording Paper 3556*. National Bureau of Economic Research.

Commendatore, P. (2006). "Are Kaleckian models relevant for the long run?" in N. Salvadori and C. Panico (editors): *Classical, neoclassical and Keynesian views of growth and distribution*, Cheltenham: Edward Elgar.

Dutt, A (1984). "Stagnation, income distribution and monopoly power." *Cambridge Journal of Economics*, 8, pp.025-40.

Garegnani, P and A. Palumbo. (1998). "Accumulation of capital" in H. Kurz y N. Salvadori (editors): *The Elgar companion to classical economics*, Cheltenham: Edward Elgar.

Garner, A. (1994). "Capacity utilization and the US inflation" *Federal Reserve Bank of Kansas City Economic Review*, 79-4, pp. 5-23.

Hahn, F (1951). "The share of wages in the national income." *Oxford Economic Papers*, 3-2, pp. 147-157.

Hein, E (2010). "The rate of interest as a macroeconomic distribution parameter: Horizontalism and Post-Keynesian models of distribution and growth." *Berlin School of Economics and Law, Working Paper 07/2010*.

Hicks, J. (1937). "Mr. Keynes and the classics: A suggested interpretation" en *Econometrica*, vol. 5, num.2, pp. 74-86.

Holmstrom, B and J. Tirole (1997). "Financial intermediation, loanable funds and the real sector." *Quarterly Journal of Economics*, 112-3, pp. 663-691.

Kaldor, N (1956). "Alternative theories of distribution." *Review of Economic Studies*, 23, pp. 83-100.

Kaldor, N (1957). "A model of economic growth." *Economic Journal*, 67, pp. 591-624.

Kaldor, N (1966). "Marginal productivity and the macro-economic theories of distribution." *Review of Economic Studies*, 29, pp. 174-192.

Kalecki, M (1971). *Selected essays on the dynamics of the capitalist economy*. Cambridge University Press.

Keynes, J.M (1930). *A treatise on money*. In *The Collected Writings of John Maynard Keynes*. Reprinted in 1978. Cambridge University Press.

Keynes, J.M (1936). *The general theory of employment, interest and money*. In *The Collected Writings of John Maynard Keynes*. Reprinted in 1978. Cambridge University Press.

Lavoie, M. (1995). "The Kaleckian model of growth and distribution and its neo-Ricardian and neo-Marxian critiques" in *Cambridge Journal of Economics*, 19-6, pp. 789-818.

Lavoie, M (1998). "The neo Pasinetti theorem in Cambridge and Kaleckian models of growth and distribution." Eastern Economic Journal, 24-4, pp. 417-434.

Lavoie, M and E. Stockhammer (2012). "Wage led growth. Concept, theories and policies." *Conditions of work and employment series 41*. International Labor Office (ILO). Geneva.

Marglin, S (1983). *Growth, distribution and prices*. Harvard University Press.

Marglin, S (1984). "Growth, distribution and inflation: A centennial synthesis." *Cambridge Journal of Economics*, 8, pp. 115-144.

McElhattan, R. (1978). "Estimating a stable-inflation capacity utilization rate" In *Federal Reserve Bank of San Francisco Economic Review*, Autumn, pp. 20-30.

McElhattan, R. (1985). "Inflation, supply shocks and the stable-inflation capacity utilization rate" In *Federal Reserve Bank of San Francisco Economic Review*, Winter, pp. 45-63.

Nahuis, N.J. (2003). "An alternative demand indicator: The non-accelerating inflation rate of capacity utilization" *Applied Economics*, 35-11, pp. 1339-1344.

Palley, T (2008). "The backward bending Phillips curve: A simple model." *Political Economy Research Institute. Working Paper 168*. University of Massachusetts in Amherst.

Pasinetti, L (1962). "Rate of profit and income distribution in relation to the rate of economic growth." *Review of Economic Studies*, 29, pp. 267-279.

Robinson, J (1956). *The accumulation of capital*. Macmillan. London

Romer, D. (2000). "Keynesian macroeconomics without the LM curve", en *Journal of Economic Perspectives*, 14-2, pp. 149-169.

Rowthorn, B (1982). "Demand, real wages and economic growth." *Studi Economici*, 18, pp. 3-53.

Sandmo, A (2013). "The principal problem in political economy: income distribution in the history of economic thought." Institutt for Sanfunnsokonomy. Department of Economics. It may be download from: http://ssrn.com/abstract=2337488

Solow, R (1958). "A skeptical note on the constancy of relative shares." *American Economic Review*, 48-4, pp. 618-631.

Sraffa, P (1960). *Production of Commodities by Means of Commodities: Prelude to a Critique of Economic Theory*. Cambridge University Press.

Taylor, L (1985). “A stagnationist model of economic growth.” *Cambridge Journal of Economics*, 9, pp. 383-403.

Taylor, L (1989). “Demand composition, income distribution and growth.” In *Joan Robinson and Modern Economic Theory*. G. Feiwel (editor). Macmillan. London, pp. 623-637.

Taylor, LD (1971), J. Dusemberry, R Hall and G. Jaszi “Savings out of different sources of income” *Brookings Papers on Economic Activity*, 2, pp. 383-415.

Taylor, J. (1993). “Discretion versus policy rules in practice” en *Carnegie Rochester Conference Series in Public Policy*, vol. 39, num. 1, pp. 195-214.

Taylor, J. (2000). “Teaching modern macroeconomics at the principle levels” en *American Economic Review*, 90, pp. 90-94.

Appendix

The behavior of real wages in a wage led growth situation and the presence of labor hoarding.

A consistent assumption of the model analyzed in this paper is one where production function may be defined as

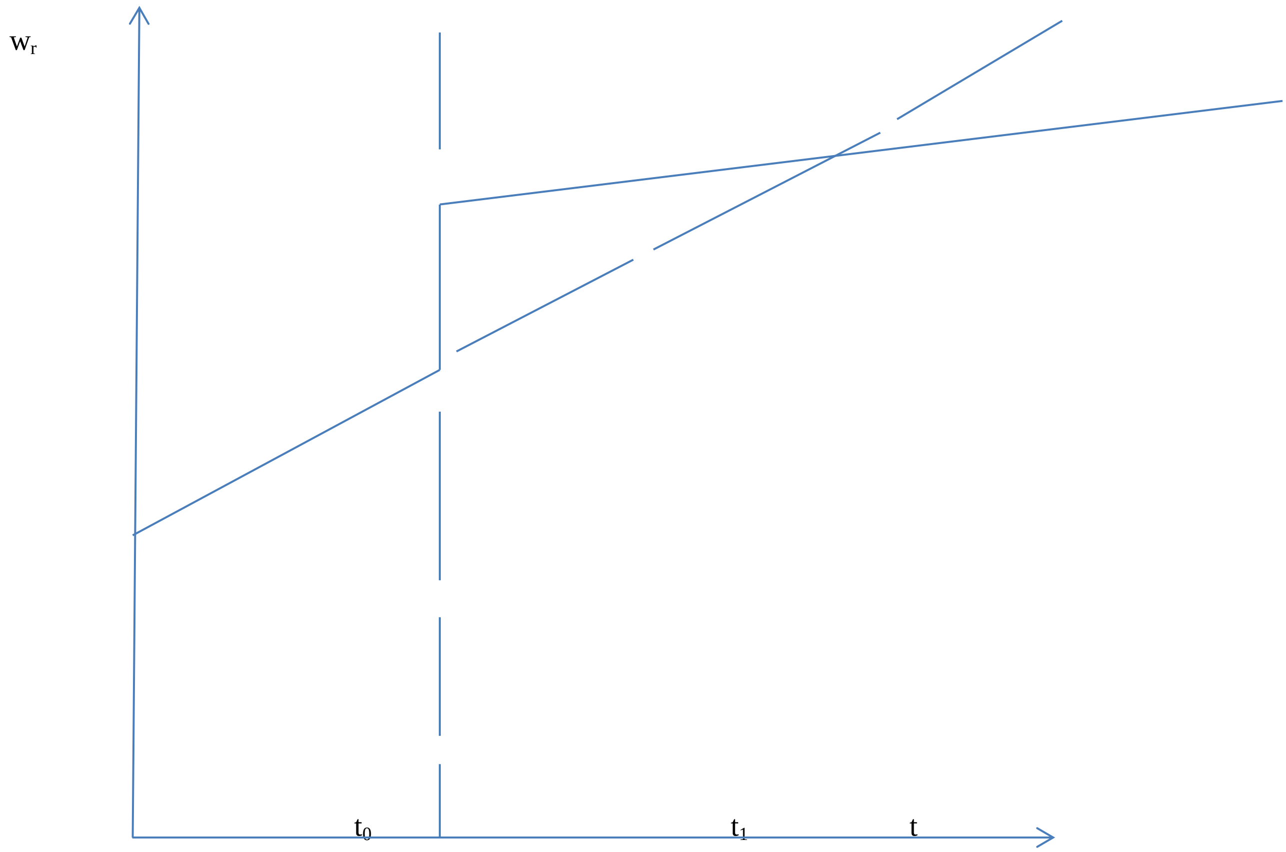
$$Y = AKL^{\alpha} \quad \text{(A.1)}$$

Where L is labor and α represents the returns of labor on production. We assume decreasing returns for labor ($\alpha<1$) but, as equation (A.1) points out, constant returns of capital.

It has been seen that labor is more stable than capacity utilization because of the so-called labor hoarding phenomenon (see for example Burnside et al (1990)). It is costly to hire and fire people, so sometimes workers remain in recessions, and capacity utilization falls, and they also remain in booms and then capacity utilization goes up. Normalizing then L=1, we obtain that A=Y/K as the text assumes.

In a pure wage led growth model ϕ rises. Since labor is constant and Y rises because of it is related one to one to capacity utilization, the change in the real wage W_r is even greater than the change in Y. As A is approaching in time to A^* and the growth rate starts falling so does the real wage. In the long run, the rate of growth of capital is lower than the original one and $A=A^*$, therefore there is a point in the future where real wages start being below the point where they would be if ϕ would had never changed. Figure 1 shows the plausible stylized trajectory of the real wage:

Figure A.1. Stylized trajectory of the real wage under an increase in the share of wages under a wage led growth model.



Before period t_0 the real wage is increasing at the rate of growth of output, which in the long run equilibrium is equal to the rate of growth of capital. In t_0 the share of wages rises. Capacity utilization and output also increase and then the real wage grows even more than Y. As long as A is approaching A*, and g_k starts falling, the rate of growth of real wages falls. In t_1 the real wage takes the value that it would have taken if ϕ had been constant. After that period the real wage is lower. Therefore it is possible to have a higher share of wages in output with lower real wages.