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EFFICIENCY WAGES, INFLATION AND GROWTH

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The efficiency wage hypothesis is introduced and a work effort function is specified in which labor productivity depends on the distribution of income between wages and profits and the general level of output. The function is then incorporated in a structuralist-Keynesian growth model in which investment decisions depend on income distribution, inflation and the level of output. A 'conflict theory of inflation' is then developed in which wage and price change depend on real income aspirations and the rate of employment. It is, then, shown that changes in income distribution exert a direct effect, via aggregate demand, and an indirect effect, via work effort, on output and inflation. The two separate effects may be complementary or contradictory. The direction and magnitude of the overall impact on inflation and growth depends on institutional factors, such as the specification of the effort function, the different savings propensities, the determinants of capital accumulation and the state of income distribution.

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1. INTRODUCTION

Inflation persistence, output volatility and sluggish labor market adjustment during the last decade have been an intensely investigated topic. One line of research focused on labor market institutions and wage rigidity. The latter were seen as an important source of relatively high unemployment in Europe (Jackman (1999)). Recent evidence suggests that unionization and collective bargaining coverage are positively related to real wage rigidity, and that differences in the degree of wage rigidity may partly explain differences in unemployment rates across countries (Dickens *et al*. (2006), Holden and Wulfsberg (2007)).

Wage rigidity can impact not only on unemployment, but also on inflation dynamics. The findings of the Eurosystem Inflation Persistence Research Network conclude that wage rigidity can be a cause of price stickiness observed in the Euro area. Numerous

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papers document that prices change less frequently for sectors characterized by a larger labor share, like services (Altissimo *et al*. (2006), Alvarez *et al*. (2006), Dhyne *et al*. (2006), Vermeulen *et al*. (2007)). Thus, wage and price stickiness imply that output becomes the prominent adjustment variable to shocks, leading to higher volatility in real output. Ongoing inflation persistence implies larger interest rate changes to contain inflation, thus exacerbating real output variations.

Several theoretical explanations have been developed to explain wage rigidities and unemployment. Efficiency wage models rest on the assumptions that unobservable effort of workers may be stimulated by high/fair wages (Akerlof (1982), Akerlof and Yellen (1990), Shapiro and Stiglitz (1984)). Turnover models assume that persistently high wages might increase profitability by reducing quitting and hence lowering expenditure on hiring and training (Hashimoto and Yu (1980), Stiglitz (1974), Weiss (1980)). Insider-outsider models generate real wage rigidity (Lindbeck and Snower (1988)). Since workers' individual characteristics, such as age or tenure, education, job type or wage level, may imply different worker productivity, on-the-job experience, replacement costs, ability to find a job and monitoring cost, these theories also predict that wage rigidity may vary across high-wage and low-wage workers or across workers of different age classes. Several other models, relying on different institutional features of labor markets (indexation, coverage rates, scope of collective bargaining, wage structures, etc.), have been put forward to explain wage rigidity.

The explanation of inflation persistence, output volatility and sluggish labor market adjustment by the mainstream neoclassical approaches rested on the use of 'revised' versions of monetarism and New Keynesian Phillips curve models. However, these models proved unable to explain the appearance of 'stagflation' (Blanchard and Fischer (1989), for an early critique) and high inflation persistence in post-WWII data (Blanchard and Gali (2007)). Moreover, their theoretical foundations were long ago shown unable to survive sophisticated econometric tests (Allen and Hall (1991), Hall, Henry and Wilcox (1990), Hendry and Ericsson (1991), Desai (1983)).

The inadequacy of the prevailing neoclassical approach to the problem of providing an adequate and realistic explanation of inflation persistence, output volatility and labor market sluggishness has led to the development of several alternative theoretical approaches on output and employment determination. These were based on Keynes's principle of effective demand (Keynes (1936), Kalecki (1971), Steindl (1952)), on the Marxian theory of profit squeeze and realization crises (Rowthorn (1982), Marglin and Bhaduri (1990)) and, finally, on the structuralist perspectives to development and growth (Taylor (1991), Dutt (1984)). The models were also based on conflict inflation theories which analyze both price and wage setting behavior and are concerned with conflict between aggregate labor and aggregate capital over the appropriation of total real income produced by the existing productive capacity of the economy.[1] According to

[1] This model can be expanded to incorporate the State (or any other rent-seeking interest) as a competing

conflict inflation theory, workers' target real wage is taken to be governed primary by the expected price level, whilst firms' target real price is taken to be governed by the expected level of nominal wages (Rowthorn (1977), Dalziel (1990), Lavoie (1992), Dutt (1994), Palley (1996)). The rate of change in both wages and product prices is therefore determined by the disparity between these expectations and the strength of either party to enforce their preferences. In other words, if all groups or classes in the economy were in effect content with the prevailing distribution of income, then inflationary pressures would be expected to remain constant. This conception of conflict inflation highlights an 'inflation barrier', akin to the NAIRU and the 'natural rate of unemployment' concepts proposed in the literature.[2]

Neoclassical theories of inflation essentially depict inflation as the excess of demand for output over the value of output at current prices, while theories of conflict inflation depict inflation as the excess of income claims (wages, profits and taxes) over the value of output at current prices. The heart of the difference lies in the ultimate source of power. For neoclassical theory, demand must be supported by effective purchasing power - ultimately high-powered money - while for the conflict inflation theory, income claims must be supported by market power, supported by endogenous credit money created by the modern banking system. Market power occurs when demand for goods or services and thus the source of income (wages, profits or taxes) is not totally elastic and remains positive at the face of normal pricing.

In this paper, a model of conflict inflation and growth is developed in the Keynesian-structuralist tradition with the purpose of advancing the understanding of the relationship between income distribution, inflation and economic growth at the presence of labor market institutions. The novelty lies in the consideration and explicit formulation of variable 'labor efficiency' and the elucidation of its implications for

factor, through its tax policies, in the conflict over total real income and therefore as a source of inflationary impact.

[2] The inflation barrier reflects the level of economic activity at which the rate of inflation is maintained constant. If increases in aggregate demand raise (rapidly) the level of activity significantly above the inflation barrier, then the rate of inflation increases. This concept of the inflation barrier used here has similarities with the concept of the NAIRU, but important differences too (see Galbraith (1997), Arestis and Sawyer (2003)). The first difference is that the NAIRU is the level of activity toward which the level of demand will tend to adjust through the impact of wealth effects. No such tendency is envisage in this model, since money is endogenously determined and the wealth effect does not exist. The second difference is that the NAIRU is developed on the conception of separate supply and demand functions in the economy, whilst in this model investment is seen as affecting both demand and capacity (to meet the demand) and therefore affects the inflation barrier. The third difference is that the NAIRU if directly affected by labor market institutions which are perceived as 'imperfections', in contrast with the approach taken in this model where labor market institutions are perceived as 'inherent' elements in the normal operation of the economic system and the labor extraction process thus determining the wage rate.

inflation dynamics and growth. The model builds on the conflict-inflation, growth and income distribution models by Dutt (1994) and Arestis and Sawyer (2003) and may be taken as an advance, amounting to a widening of possible theoretical outcomes, over models of growth, income distribution and inflation of the type developed by Marglin (1984), Taylor (1991) and Dutt (1990). It is concerned with the demonstration of theoretical possibilities and not with their empirical examination neither with the long-run stability of the economic system, tasks that are too large to fall within its scope.

Labor efficiency has always caught the economists' attention, but only recently have its macroeconomic implications been more adequately explored (Shapiro and Stiglitz (1984), Bowles (1985), Akerlof and Yellen (1986), Bowles and Boyer (1988, 1991), Stiglitz (1987), Green (1988)).[3] These authors point out that the determination of the intensity of work during the process of production reflects the conflicting interests of the participating agents within a changing institutional environment. Given the amount of workers hired, firms face the formidable problem of ensuring that a certain amount and quality of work is done. The effective transformation of labor input into a certain amount of actual output is not a guaranteed outcome. Changes in the general conditions of production affect the workers' personal motivations and thus modify their choices between alternative combinations of income proceeds and work effort.

The commitment to productive work is the result either of a ‘natural’ inclination to shirk or of a ‘social’ determination of preferences, which is in turn related to the allocation of property rights, the command over the course, scale and surveillance of production and the subsequent distribution of the surplus. Changes in those factors revise the expected ‘cost of job loss’ and this, by affecting the level of work effort, determines labor productivity. During this process, the only means left to individual firms for raising or, at least, maintaining work effort levels is the threat of dismissal, which becomes effective if the workers suffer a non-negligible cost of job loss.[4] This being the case, the individual firm, following its own profit-maximizing strategy, finds it profitable to pay a higher real wage. The increase in the real wage, however, apart from its impact on work effort, also directly affects unit labor costs and consumption expenditures. These different effects may be complementary or contradictory and hence,

[3] The approaches are somewhat different in their rationale. On the one hand, Shapiro and Stiglitz (1984), Akerlof and Yellen (1986) and Stiglitz (1987) base their conclusions on an individualistic methodology and a ‘contractarian’ approach to economic institutions. In their view, the determination of workers motivations and subsequently their social utility functions are taken to be mostly exogenous, thus interpreting the incentive for productive work to be the result of an individualistic choice between work and leisure made by the agents’ rational, contractual stance in economic life. On the other hand, Bowles (1985), Bowles and Boyer (1988, 1991) and Green (1988) base their conclusions on the ‘social determination of preferences’ by existing institutional arrangements, conventional norms of behavior, conflict and/or cooperation among agents.

[4] The ongoing globalization may raise the cost of job loss by allowing domestic firms to attract more easily high quality foreign applicants, especially those being citizens of a monetary union, such as the EU.

depending on the relative importance of each in each particular case, profitability, output and employment may or may not increase. In this view, unemployment constitutes a market failure characterizing the inherent inability of the normal operation of the market mechanism to secure, if left alone, full utilization of its productive resources.

In the proposed model, it will be shown that, following exogenous changes in income distribution (real wage), the overall impact on total output and inflation consists of a direct effect exerted via aggregate demand (relative to the size of productive capacity), and an indirect effect exerted via work effort. In this framework, the 'labor intensity effect' regulates the level of work effort performed and thus determines unit profitability. This in turn, by regulating the level of consumption, induces additional shifts in the aggregate savings and investment schedules. The associated impact on the rate of price change, by affecting capital accumulation, further affects output and economic growth. The upshot of the argument is that the relative strength of the 'labor intensity effect' determines both the magnitude and the overall direction of the resulting outcomes of inflation and growth.

These are new theoretical results, which may be taken as an amendment to the 'standard' view arrived at by the conflict theories of inflation and growth, namely that the rise in the real wage, by squeezing profitability, results in an increase in price inflation. In this model, it is possible that, depending on the prevailing macroeconomic conditions and social institutions, a redistribution of income towards higher wages may not only achieve labor peace and raise workers consumption levels but may also contribute to the fight against inflation and unemployment, and vice versa. The purpose of the analysis, apart from the demonstration of formal results, is to emphasize an important institutional dimension in the production and income distribution process, namely the endogenous variability of labor productivity, the extent of which is subject to the 'disciplinary' force of economic and non-economic factors.

In the model the concept of money underlying the use of monetary variables is taken to be endogenous credit money created by the banking system. It is created through the bank lending process and the impact of the credit multiplier. Bank loans create bank deposits, which multiply according to the demand for loans and the banks' willingness and ability to satisfy this demand. At any given time, the stock of money held by the agents in the economy (demand for money) largely reflects those agents' views on holding money relative to other assets. While the stock of money and nominal income move in tandem, the direction of causation runs from nominal income to the stock of money.

The structure of the paper is as follows: Section 2 describes a simple 'microeconomic' model of firm production, representing the real side in the economy. It presents, first, a specification of the amount of work effort performed and the 'cost of job loss.' It exemplifies, second, the relationships between the amount of work effort, the 'cost of job loss' and also specifies the 'equilibrium' wage rate that firms would find 'optimal' to pay. Then, given the technical conditions of production, the section provides an examination of the relationships between the rate of profit, the real wage rate and the

degree of capacity utilization. Section 3 provides a specification of the rate of wage and price change. Section 4 introduces the macroeconomic formulation of the savings and investment functions. Section 5 determines overall macroeconomic equilibrium and analyzes the impact of changes in income distribution on total output and inflation. Finally, section 6 offers some conclusions.

2. WORK EFFORT, INCOME DISTRIBUTION AND CAPACITY UTILIZATION

In the model described, a single-sector, closed economy with no state activities is assumed in which there exists underutilized capacity, thus allowing firms to respond to fluctuations in expected demand by variations in output. The homogeneous output can be produced by a constant return to scale, fixed-coefficient technology. Firms are assumed to operate in a non-competitive environment in which their ability to set prices is seriously impaired by the existence of institutional forces, exogenous to them, which have a decisive role to play in their profit-maximization strategies. In such an environment, demand conditions do not play any direct role in price determination and consequently, at a given point in time, the average price level may still be given by a mark-up over prime costs.[5] However, the rate of mark-up is not fixed by firms due to their monopoly power, but varies endogenously in accordance with the 'efficiency wage', which reflects the outcome of the conflicting forces regulating the labor extraction process. In the economy, capital accumulation depends on income distribution, inflation and the level of output. There are two classes, capitalists and workers. For reasons of simplicity, capitalists are assumed to own the total capital stock, from the productive employment of which they receive profit income. Workers contribute directly manual labor to the production process, in proportion to the level of actual output

[5] Ever since Max Weber's (1922) work it is widely accepted that close adherence over time to and consistent application of a set of corporate decision rules is necessary for organizational rationality. That is more so for market valuation decisions in modern industrial economies operating under oligopolistic market conditions that differ from the perfect competitive ones postulated by the standard neoclassical model. Mark-up pricing falls in this domain for various reasons, such as monopoly power and the desire of firms to generate cash flows sufficient to finance corporate investment along forced savings lines (Eichner (1973, 1991), Taylor (1991, 2004)). Markup pricing rules are common in firms ranging from small bakeries to large industrial enterprises. Markup prices are only indirectly responsive to changes in factors such as demand conditions and competitive intensity, so that markup prices do not optimize profits on any given product except by chance. However, markup prices can be determined quickly, cheaply, and accurately over a wide range of products. In addition, markup pricing insures that revenues exceed variable costs and help provide consumers with prices that seem both logical and reasonably predictable. Efficiency and reliability, therefore, may help explain the widespread use of markup pricing rules.

produced and they receive, in return, wage income. Those actually employed are paid a uniform wage rate for their services. Savings in the economy come from capitalists' profit and workers' wage incomes. The capitalists' savings propensity is taken to be larger than the workers' savings propensity. Price change is determined by conflicting claims of the different classes. For ease of exposition capital stock is assumed not to depreciate. In the absence of any other resource scarcities, the rate of growth of the economy is given by the rate of capital accumulation.

The notation is as follows: f is the amount of effort, in hours, per unit of labor hour hired, ω_c is the real cost of job loss, w is the money wage rate, ω is the real wage rate (w/P), ω_a is the real wage rate paid by all other homogeneous firms (w_a/P), ω_u is the real income transferred by the government to each unemployed worker (w_u/P), Q is the level of gross *actual* output, N is the amount, in hours, of total labor force, L is the amount, in hours, of the actually employed labor force, L^* is the amount of actual labor in efficiency units ($L^* = fL$), h is the rate of employment (L/N), K is the stock of physical capital in existence, P is the average price level, r is the rate of profit, a is the amount of labor hired per unit of actual output (L/Q), k is the capital:labor ratio in productivity units ($K/(N/a)$) and u is the degree of capacity utilization (Q/K).

The amount of work effort f is specified as an increasing function of the expected real 'cost of the job loss', ω_c, with positive first and negative second derivatives, $f' > 0$ and $f'' < 0$. The function f is assumed to take the particular form:

$$f = f(\omega_c) = \omega_c^{\rho}, \tag{1}$$

where ρ is an indication of labor intensity and $1 > \rho > 0$, $f' > 0$, $f'' < 0$.[6, 7] Following Bowles and Boyer (1988, 1991), the expected 'cost of the job loss' is related, in a

[6] The specification of this particular work effort function is a especially useful one for it meets the first and second order requirements $f' > 0$ and $f'' < 0$, since $df/d\omega_c = \rho\omega_c^{\rho-1} > 0$ and $d^2 f/d\omega_c^2 = -\rho(1-\rho)\omega_c^{\rho-2} > 0$. At the same time, it produces a concrete relation among the variables involved, which makes it easier to comprehend the outcomes of manipulation.

[7] Effort is a complex variable involving quantitative and qualitative aspects. Thus, there is a considerable problem concerning its measurement (Currie and Steedman (1993)). It is here assumed that effort could be measured on the basis of some institutionally specified proxy variables. These variables need not be the same in all economies, as long as they clearly reflect an economy's prevailing view of what constitutes a quantitative approximation of effort. For example, an approximation of the quantity of effort performed might be given by some function of the machinery's intensity of utilization or on the basis of some statistical distribution related to the scale and frequency of surveillance methods in production.

simplified linear form, to the rate of employment (*h*) the real wage rate paid by the firm (ω), the real wage rate paid by all other identical firms (ω_a), and the rate of unemployment benefits (ω_u):

$$\omega_c = \omega - h\omega_a - (1-h)\omega_u , \tag{2}$$

where $\omega > \omega_u$ and ω_u is taken for simplicity to be exogenously fixed. Thus, the cost of job loss changes positively with the rate of real wages paid by the firm and the rate of unemployment whilst it changes negatively with the rate of unemployment benefits and the rate of real wages paid by the other firms.

The efficiency factor *f* affects the employment rate, *h*. Indeed, defining actual labor in efficiency units, so that $L^* = fL$, the rate of labor actually employed, *h*, can be alternatively written as the product of capacity utilization, the inverse of the efficiency factor and the capital-labor ratio, *k*, expressed in productivity units:

$$h = \frac{L}{N} = \frac{L}{L^*}\frac{L^*}{Q}\frac{Q}{K}\frac{K}{N} = \frac{u}{f}\frac{K}{N/a} = \frac{u}{f}k , \tag{3}$$

where $k = K/(N/a)$ and $f = f(\omega, u)$. The individual firm wishes to maximize profits which, given the technical coefficients of production and the degree of capacity utilization, involves the maximization of the amount of work-effort extracted per unit of wages paid, f/ω. From the first order Solow (1979) conditions, we get the equilibrium real wage which the firm, following its *own* cost minimization strategy, would in ideal conditions find 'optimal' to pay:[8]

$$\omega = \frac{f(\omega_c)}{f'(\omega_c)} . \tag{4}$$

Except the real wage, all other terms in ω_c are exogenous to the firm. The first order conditions determine the individual firm's equilibrium, but general labor extraction equilibrium in production entails, in addition, real wage uniformity. Given the latter, ongoing profit-maximization strategies by the firms, based on the first order conditions, strive towards the equilibrium 'optimal' wage. Thus, using (2) and (3), expression (4) gives, after taking wage uniformity into account and manipulating, the

[8] The first order conditions are obtained from setting the derivative $d[f(\omega_c)/\omega]/d\omega = 0$. The subsequent theoretical derivation of the 'optimal' wage rate does not necessarily mean that firms actually behave in this manner and set wages accordingly.

equilibrium wage that firms would ideally find optimal to pay:[9]

$$\omega = \frac{(f - uk)\omega_u}{f(1-\rho) - uk}. \tag{5}$$

The above equation defines a relationship between the efficiency factor, the real wage rate and the rate of employment (in effect the degree of capacity utilization), given the rate of unemployment benefits. It shows how the firms vary their wage offers as a function of variations in the rates of employment. Other things constant, higher labor employment levels—a smaller reserve army of unemployed labor—implies that workers are stronger. The threat of dismissal is weaker and the level of work-effort is smaller. Given employment conditions, firms raise real wages in order to partly offset the erosion in discipline for the wage increase counteracts the decline in the 'cost of job loss' and hence raises the amount of work-effort. It is important to note that, since the wage rate depends on the level of work effort which is given at a certain point in time, the above relationship determines the wage rate at given points in time characterized by different labor conditions; it does not describe the dynamics of the wage rate which depend on bargaining and the level of output, as will be made clear later in the text.

The decomposition of the value of total output *QP* between wages and profits gives:

$$QP = rKP + w\frac{a}{f}Q. \tag{6}$$

Thus, the higher the amount of effort *f* extracted the lower the unit labor cost w/f in producing the output. Dividing both sides of (6) by *QP* and manipulating we obtain an expression for the rate of profit that takes explicitly account of work effort:

$$r = u\left(1 - \omega\frac{a}{f}\right), \tag{7}$$

where $\partial r/\partial u > 0$ and $\partial r/\partial\omega \geq (<)0$ according as $\rho \geq (<)\omega/\omega_c$.

[9] The effort function, as Solow (1979) pointed out, must be such as to guarantee that the elasticity of substitution of effort with respect to the wage is smaller or larger that unity, while the value of unity is associated with the 'optimal' real wage. In the effort function proposed exist consistent and reasonable values of ω, ω_u, h and ρ such that the long run relationship can be satisfied. Thus, for example, the expression $f'\omega/f = \rho/[(1-h)(1-(\omega_u/\omega))]$ will be greater than one if $\omega_u/\omega = 0.8$, $\rho = 0.30$, $h = 0.90$; it will be less than one if $\omega_u/\omega = 0.6$, $\rho = 0.04$, $h = 0.85$, and finally, it will be equal to one if $\omega_u/\omega = 0.7$, $\rho = 0.036$, $h = 0.88$.

3. MONEY WAGE AND PRICE CHANGE

In this model both money wage and price dynamics depend on bargaining and the level of output. At a point in time the money wage is given, but over time money wage growth changes as a result of two factors: First, in the spirit of 'conflict theory of inflation', workers are assumed to have a real wage target level given by ω_t which depends on the state of class conflict. When their desired real wage exceeds their actually obtained one, workers push up their money wages. From the workers' point of view, high unemployment levels, associated with labor powerlessness, raise the 'cost of job loss', thereby inducing an increase in work effort. In these conditions, the workers incentive for pushing toward higher wages is lowered. Second, following the wage-adjustment argument by Marglin (1984), money wage growth is taken to respond positively, however less than proportionately, to the rate of expected inflation p^e, which in conditions of perfect foresight (assumed for simplicity) is taken to be equal to the current rate *p*. Thus, using hats over the variables to denote rates of time change, we can write:

$$\hat{w} = a_1(\omega_t - \omega) + a_2 p\,, \tag{8}$$

where $\alpha_1 > 0$ and $1 > \alpha_2 > 0$, that is money wage changes are less than proportionate than the change in inflationary expectations. Following a 'Phillips curve' rationale, according to which money wage growth responds positively to the economy's rate of labor employment and given that a tighter labor market increases the bargaining power of workers, the real wage rate targeted by workers is taken to be a linear function of the economy's employment rate. Assuming that $1 > \varepsilon_0 > 0$, $\varepsilon_1 > 0$ and recalling (3), we write:

$$\omega_t = \varepsilon_0 + \varepsilon_1 \frac{u}{f} k\,. \tag{9}$$

From (8) and (9) we obtain an expression for:

$$\hat{w} = a_1(\varepsilon_0 + \varepsilon_1 \frac{u}{f} k - \omega) + a_2 p\,. \tag{10}$$

Thus, the time change of the money wage rate depends on the rate of inflation, the level of activity, the technological capital/capacity ratio in the economy, the level of work effort and the particular nature of labor market institutions prevailing in a particular economy, as exemplified by he coefficients ε_0, ε_1, a_1 (bargaining power) and a_2. Under this specification, money wages may rise faster or slower than the

increase in prices.

Turning to pricing decisions, since in the theoretic tradition adopted demand conditions do not play any direct role in price determination, at a given point in time the price level set by an individual firm for its product may be taken as given by a markup, μ, over unit labor costs, thus reflecting enterprise market power. However, as noted earlier, the rate of markup μ is endogenously determined by the outcome of the labor extraction function. Thus, we write:

$$P = (1+\mu)w\frac{a}{f}. \tag{11}$$

This implies that the rate of markup is inversely related to the efficiency wage prevailing at a given point in time, and the level of effort.

Over time the rate of price change is taken to change as a result of two factors: First, in the spirit of 'conflict theories of inflation,' firms are assumed to have a desired mark-up target, ω_f, which is taken to reflect their perception of the general market conditions. Given that the markup is inversely related to the real wage, each time their desired real wage (mark-up) is lower (higher) than what they actually pay (obtain), firms bid up the price of their output. It must be noted that the higher is work effort the lower is the target markup and hence the more modest the price increase will be. From the firms' point of view, higher levels of work effort are associated with higher unit profitability. Thus, a rise in the real wage (which in conditions of constant effort would necessarily be associated with a lower markup) may, under certain conditions, raise workers' productivity and thus succeed in maintaining or even increasing firms' desired profitability. As a result more room will be available for concessions towards the workers' aspired real wage levels. Second, the rate of price change will accelerate with the rate of expected inflation since the latter will raise expected costs. Taking, for simplicity, expected inflation to correspond to the current inflation, we write the rate of price change as:

$$\hat{p} = b_1(\omega - \omega_f) + b_2 p, \tag{12}$$

where $b_1 > 0$ and $1 > b_2 > 0$. The desired markup is in turn taken to be related, in a linear form, to the level of employment in the economy, *h*:

$$\omega_f = \delta_0 - \delta_1\frac{u}{f}k, \tag{13}$$

where $1 > \delta_0 > 0$ and $\delta_1 > 0$. Higher levels of output and employment are associated with greater pressure on the utilization of existing resources and greater labor strength as

a result of reduced unemployment. Thus, a higher markup (lower wage) is required in response to the upcoming resource shortages, bottlenecks and labor pressures. The sign of δ_1 can be either positive or negative. However, during economic expansions firms incur higher investment levels mostly financed through higher retained earnings and therefore they desire higher markups, so $\delta_1 > 0$ (Dutt (1994, fn5), Wood (1975)). Equations (12) and (13) give an expression for the rate of price change:

$$\hat{p} = \frac{b_1}{(1-b_2)}\left(\omega - \delta_0 + \delta_1 \frac{u}{f} k\right). \tag{14}$$

Thus, the rate of price change depends on the rate of expected inflation, the level of activity, the technological capital/capacity ratio in the economy and the level of work effort as well as on the particular nature of labor market and enterprise market power conditions prevailing in a particular economy, as exemplified by the coefficients δ_0, δ_1, b_1 (market power) and b_2.

4. AGGREGATE SAVINGS AND INVESTMENT

Assuming that savings comes out of the non-consumed portion of capitalists' profit income and workers' wage only income, we write the expression for the rate of aggregate net real savings per unit of capital, s':[10]

$$s' = \frac{S}{K} = \frac{S_c}{K} + \frac{S_w}{K} = \frac{s_c rK}{K} + \frac{s_w \omega L}{K} = s_c r + s_w \omega a u, \tag{15}$$

where $L/K = (L/Q)(Q/K) = au$. Also, s_c is the capitalists' savings propensity out of profit income and s_w is the workers' savings propensity out of wage income ($1 > s_c > s_w > 0$).

Investment behavior is modeled below in a way that conceives of the rate of capital accumulation i' (the ratio of the amount of investment (*I*) to capital stock (*K*)) as being a positive function of the expected rate of profits r^e, and the expected rate of price inflation p^e. In conditions of minimum risk, associated with full information assumptions, these

[10] The rate of aggregate net savings is not taken to depend on the rate of price inflation even though that may be an interesting hypothesis for the economy (Taylor (1991)). The savings propensities, and in particular the capitalists' savings propensity out of profits (s_r) need not be constant but may vary, each at different rates, as the pace of accumulation changes.

expected values are taken to be equal to their current ones, *r*, and *p*. In addition, the rate of capital accumulation is taken to be a positive function of the current degree of capacity utilization, *u*. This modeling, in linear form, gives:[11]

$$i' = \hat{K} = \alpha' + \beta r + \gamma u + \zeta \hat{p}\,, \tag{16}$$

where $\alpha', \beta, \gamma, \zeta > 0$. α' represents the rate of autonomous investment as a proportion of capital stock and can be taken as a reflection of Keynes's 'animal spirits'. β represents the responsiveness of the rate of accumulation to changes in the current rate of profit. The higher is the profit rate the more optimistic expectations will be as to its future level and thus the higher investment expenditures will be. γ can be taken to reflect the accelerator coefficient, which represents the independent influence on the rate of accumulation of past levels of utilization and therefore reflects existing demand conditions. Finally, ζ represents the separate influence of changes in the rate of inflation on the rate of accumulation.[12] Indeed, up to a point, an expected increase in the rate of change of the average price level will reduce the real cost of capital. Moreover, price increases will raise the nominal value of profits and hence it will encourage further investment. Finally, given that there is some real income transfer by the government to the unemployed workers, the required expenditure G_u per unit of capital stock *K* in the economy is indicated by $g_u = G_u / K$.

[11] Investment behavior, which conceives of the rate of capital accumulation as a positive function of distribution and effective demand, has been analyzed by Kalecki (1971), Steindl (1990), Kaldor (1978) and more recently by Rowthorn (1982), Amadeo (1986), Dutt (1984, 1990), Taylor (1983, 1991), Marglin (1984), Marglin and Bhaduri (1990) and Kurz (1991). Those authors have made a fruitful effort to provide a synthesis of keynesian and classical ideas for the explanation of the factors determining the rate of capital accumulation, by illustrating the double role of the distributional outcome as both a cost-raising and a demand-enhancing factor.

[12] The positive impact of inflationary acceleration on the rate of capital accumulation, via reductions in the real value of average costs, is known as the Mundell-Tobin effect. However, in practice, the opposite effect may also be true, since a rise in the rate of inflation may shake the investors' state of confidence and hence discourage investment. It is here assumed, however, that the former effect dominates and therefore $\zeta > 0$. The direct dependence of the rate of accumulation on the rate of inflation is also suggested by Marglin (1984, pp. 488-489), where it is argued that this hypothesis is postulated in order to overcome an indeterminacy in his model which stems from the requirement of a long term equilibrium between savings and investment at a rate of profits which is exactly the rate implied by the conventional real wage.

5. MACROECONOMIC BALANCE AND THE IMPACT OF CHANGES IN INCOME DISTRIBUTION

The short-run growth equilibrium requires $s' = i' + g_u = g$, where g is the economy's equilibrium growth rate. Taking account the above equilibrium condition as well as Equations (15), (16), (7) and (14), we obtain the excess supply function, *E*:

$$E: u(s_c - \beta)(1 - \frac{\omega}{f}a) + u(s_w \omega a - \gamma) - \zeta \frac{b_1}{1 - b_2}(\omega - \delta_0 + \delta_1 \frac{u}{f}k) - \alpha' - g_u = 0 \qquad (17)$$

which, after some manipulation, gives the short-run equilibrium value of capacity utilization:

$$u = \frac{g_u + \alpha' + \zeta \frac{b_1}{1 - b_2}(\omega - \delta_0)}{(s_c - \beta)\left(1 - \frac{\omega}{f}a\right) + s_w \omega a - \gamma - \zeta \frac{b_1}{1 - b_2}\delta_1 \frac{k}{f}}. \qquad (18)$$

The equilibrium value of *u* will be stable if the denominator of (18) denoted by ξ is positive. The expression ξ represents the conventional short-run Keynesian stability condition which says that, at the margin, total savings are more sensitive than investment to variations in the degree of capacity utilization ($\xi > 0$).

The impact of exogenous shocks (i.e., changes in income distribution) on capacity utilization is given by:

$$\frac{du}{d\omega} = \frac{1}{\xi}\left(\frac{au}{f}(s_c - \beta)\left(1 - \frac{\omega\rho}{\omega_c}\right) - s_w au + \zeta \frac{b_1}{1 - b_2}\left(1 - \frac{\delta_1 ku\rho}{f\omega_c}\right)\right). \qquad (19)$$

Given that the quantity-adjustment process is stable ($\xi > 0$), the ambiguous effect of changes in income distribution on employment can be explored. Indeed, the short-term impact of changes in income distribution on employment is given by:

$$\frac{dh}{d\omega} = k\frac{d(u/f)}{d\omega} = \frac{k}{f}\left(\frac{du}{d\omega} - \frac{u\rho}{\omega_c}\right) \geq 0 \quad \text{if} \quad \frac{du}{d\omega} \geq \frac{u\rho}{\omega_c}. \qquad (20)$$

Thus, a real wage increase will redistribute net income towards the wage earners, thus resulting in an increase in the amount of work effort performed. The overall effect on the rate of profit will be the joint outcome of the direct negative effect of increased wage costs and the positive indirect effect of increased labor productivity. It will be

negative if the institutionally determined 'labor intensity effect' is small (small values of ρ relative to the cost of job loss) and vice versa. Workers' consumption will increase but overall private savings and investment, depending on profitability, may or may not increase. The resulting overall impact on output and labor employment will depend on the reactions of both aggregate demand and work effort, that is the difference between the responses of overall capitalist saving and investment behavior to variations in profitability and the strength of 'labor intensity effects'. There are four cases to be distinguished (see Table 1): two of them secure a positive response of output to a real wage increase and two secure a negative response.

These are theoretical possibilities and do not have to be necessarily all met in reality. This is an empirical question that remains to be examined. Thus, a positive response of capacity utilization is obtained in two cases. First, when the proportion of capitalists saving (s_c) is sufficiently greater than the profitability effect on investment behavior (β) and at the same time ρ is sufficiently small in relation to the existing cost of job loss. Second, when the capitalist savings propensity is smaller than the profitability effect on investment and the labor intensity effect is relatively strong. The magnitude of the effect will also depend on the response of the rate of inflation. The latter, following an increase in the real wage, may or may not increase (see below). If it does, then provided that the firms' ability to pass higher labor costs onto prices is solid (high b_1), and the subsequent increase in accumulation via accelerated inflation is strong (high ζ), the positive effects on capacity utilization will be, in the first of the two cases, reinforced whilst, in the second case, retarded. Any positive response will, however, be somewhat checked by the loss of consumption associated with relatively strong workers saving habits; it will be the stronger the higher is the initial level of output. In the other two cases, output and employment will fall. In all cases, the magnitude of the overall effect depends positively on the initial levels of capacity utilization and the capital: labor ratio.

The short-run impact of changes in income distribution on the money wage is given by differentiation of (10):

$$\frac{d\hat{w}}{d\omega} = -a_1\left[1-\frac{\varepsilon_1 k}{f}\left(\frac{du}{d\omega}-\frac{u\rho}{\omega_c}\right)\right] \geq 0 \quad \text{if} \quad \frac{du}{d\omega} \geq \frac{f}{\varepsilon_1 k}+\frac{u\rho}{\omega_c}. \tag{21}$$

Turning to inflationary repercussions, the overall short-run impact of a real wage increase on the rate of price change is obtained from differentiation of (14):

$$\frac{d\hat{p}}{d\omega} = \frac{b_1}{1-b_2}\left[1+\frac{\delta_1 k}{f}\left(\frac{du}{d\omega}-\frac{u\rho}{\omega_c}\right)\right] \geq 0 \quad \text{if} \quad \frac{du}{d\omega} \geq f\left(\frac{u\rho}{\omega_c}-\frac{1}{\delta_1 k}\right). \tag{22}$$

Thus, the overall impact will consist of two effects: a direct one and an indirect one, via capacity utilization, which in turn depends on labor conditions. Taking the former, a

rise in ω will increase wage costs whilst, at the same time, may also raise labor productivity. The overall net effect on unit profitability depends on the strength of the 'labor intensity effect' and may be either positive or negative. It is possible that a high enough value of ρ relative to the other parameters may result in an overall direct *decrease* in the rate of price change. Taking the latter effect, a rise in the real wage, as was shown earlier, may or may not increase capacity utilization and employment. This will depend on the properties of the economy under consideration and the extent of the resulting 'profit squeeze.' Assuming that labor intensity effects are, in general, not too strong and that savings reacts more than investment to changes in profitability, it might be reasonably expected that the overall impact of a real wage increase on the rate of inflation will be positive. It will, instead, be negative if labor intensity effects are relatively strong. However, if the latter is true whilst investment reacts more than savings to changes in profitability, the overall result might be positive. In all cases, the resulting impact is the stronger the lower is the initial amount of effort and the higher is the firms' ability to pass higher wage costs on output prices (high market power). Thus, the level of the inflation barrier is therefore obtained by the interaction of price and wage determination, which in turn depends on the structural and institutional characteristics of the particular economy as well as the level of investment that affects capacity utilization. The resulting equilibrium position does not imply that the economy is operating at nor it is tending towards full employment of labor.

Consider now the special case, where no efficiency wage effects exist: $\rho = 0$ and $f = 1$. Then the content in the big parenthesis of Equation (19) would be unambiguously positive as long as s_c is sufficiently larger than β. This would render the sign of the total equation dependent essentially on the relation between s_c and β, as in the models by Dutt (1994), Taylor (1991) and Marglin and Bhaduri (1990). Similarly, the first argument in the right hand side of Equation (22) would be positive but small in magnitude and as a result the response of the rate of inflation to changes in income distribution would solely depend on the response of capacity utilization. This means that the response of inflation would also depend essentially on the size of s_c relative to β.

These are new theoretical results, which may be taken as an amendment to the 'standard' view arrived at by the 'conflict theories of inflation', namely that the rise in the real wage, by squeezing profitability, necessarily increases inflation and vice versa. Thus, it is possible that a redistribution of income towards the workers may not only achieve labor peace and raise consumption levels but may also contribute to the fight against inflation. The opposite is also possible: decreases in the wage rate may reduce employment, cause labor unrest and accelerate inflation. The overall impact cannot be decided *a priori* but depends on the prevailing economic circumstances and the institutional forces at work affecting investment behavior, enterprise market power and the labor extraction process. The opening up of the economy to international trade and finance and its subjection to the influence of the ongoing globalization forces is expected to affect substantially these theoretical results, and would allow for the modeling of the

impact of different external shocks (import costs, financial liquidity constraints, etc).

Table 1. Response of Capacity Utilization and Inflation to Changes in the Real Wage

Labor market conditions	*Economy conditions*	
	$ds'/d\omega > di'/d\omega$	$ds'/d\omega < di'/d\omega$
Insignificant Profit Squeeze: $\rho > \omega_c/\omega$	$du/d\omega < 0$ $dp/d\omega < 0$	$du/d\omega < 0$ $dp/d\omega > 0$
Significant Profit Squeeze: $\rho < \omega_c/\omega$	$du/d\omega > 0$ $dp/d\omega > 0$	$du/d\omega < 0$ $dp/d\omega > 0$

6. CONCLUSIONS

In the model described, it was argued that the commitment to productive work is related to the institutional structure of the labor market, depending on factors such as the allocation of property rights, the command over the course, scale and surveillance of production and the subsequent distribution of the surplus. Changes in those factors revise the expected 'cost of job loss' and this, by affecting the level of work effort, determines labor productivity and unit profitability. Thus, a real wage increase causes a direct decrease in profitability as a result of higher labor cost and may, depending on the circumstances prevailing in the economy, cause an indirect increase in profitability as a result of higher work effort.

On the macroeconomic side, investment decisions depend on income distribution, inflation and the level of output, whilst inflationary movements are taken to be determined by workers and capitalists real incomes aspirations and the general level of output. Following then exogenous variations in income distribution, the economy-wide impact on capacity utilization and growth involves two effects. The first is a direct effect, exerted via aggregate demand, the magnitude of which is determined by shifts in aggregate savings and investment. The second is an indirect effect, exerted via endogenously induced variations in labor productivity, the magnitude of which is determined by the conditions governing labor intensity and enterprise market power.

Assuming that the quantity adjusting process is stable and given the two separate effects, it is shown that real wage increases may or may not raise overall capacity utilization, labor employment and economic growth. In addition, it may either accelerate or decelerate the rates of price and real wage inflation. The direction of the change and its magnitude will depend on the conditions determining the strength of the 'inflationary' parameters, enterprise market power, the different classes' savings habits and the institutionally determined 'labor intensity effect.' Thus, the responses of output and inflation to exogenous shocks [redistribution of income in this case, but other shocks —i.e., high import (oil) prices, or financial constraints (illiquidity)—can be modeled] may

not be the ones expected by neoclassical inflation models. Any deviations should not be envisaged as resulting from various inhibitions/imperfections in the proper functioning of the economy, as is typically postulated by 'revised' neoclassical models, but from the normal operation of a particular economy, characterized by particular investment and saving structures and particular labor market institutions, as reflected in the values of the model's parameters. Moreover, the dynamic evolution of this economy would be expected to follow diverse paths characterized by either stable or unstable long-term equilibria.

These theoretical results provide a basis for a better understanding of the non-systematic patterns characterizing the relationship between observed labor costs, inflation dynamics and growth performance in capitalist economies, as well as of the observed disparities in employment and inflation performance among them. The questions of empirical verification of the model's theoretical predictions and of its long-term stability remain to be addressed. In this respect, it is interesting to note that the OECD (2000) found that NAIRU estimates tend to follow observed unemployment, thus highlighting the direct relation between investment, output and inflation, whilst Baker *et al*. (2002) found direct links between labor market institutions and unemployment.

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