

WAGES, LABOUR PRODUCTIVITY AND UNEMPLOYMENT IN A MARXIAN MODEL WITH ENDOGENOUS MONEY SUPPLY

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1. Introduction

1.1 The aim of this paper is to integrate a wage-productivity direct relationship and a "discipline effect" of unemployment on wages and worker effort into the theory of the monetary circuit, in order to provide an explanation of involuntary unemployment and to clarify certain aspects of the determination of income distribution in a Marxian approach. This paper draws its inspiration from: i) Graziani's models of the monetary circuit (1990, 1994); ii) the macroeconomic models of distribution in a monetary perspective (Bellofiore-Realfonzo 1995); iii) the recent non-neoclassical literature on the efficiency wages theory (particularly Bowles 1985).

1.2 Marxian labour theory of value can be consistently set out in terms of the model of the monetary circuit. Here, money supply is endogenous and the monetary wage is bargained on the labour market while the real wage is determined on the market for goods. Three basic assumptions are superimposed onto a simple model of the monetary circuit: i) the bargained monetary wage depends on the unemployment rate, due to a "discipline effect" on workers' bargaining power; ii) labour productivity depends on the expected real wage, due to the conflict over the determination of worker effort in the workplace¹ and on the level of unemployment; iii) as prices fixed by firms are greater than prices expected by workers (so that the actual real wage is lower than the bargained real wage), workers react by reducing productivity in the ensuing productive process.

1.3 The paper is organised as follows. In section 2, a simple version of the theory of the monetary circuit is described and its links with Marxian thought are shown. In section 3, the assumptions on the working of labour market are made and commented upon, while in section 4 some possible equilibria in the labour market are analyzed. In section 5, workers' reaction function is defined and, in section 6, some possible strategies of firms in fixing prices are shown.

2. Monetary circuit and the rate of surplus value

2.1 In this section we briefly refer to a model of the monetary circuit developed by Graziani². Three classes of agents are supposed: banks, which produce money; firms, which, on the basis of their access to bank money, produce commodities; workers, who supply the labour power. The circuit of the capitalistic economy can be divided into the following logical phases, which go from the opening to the closing of the circuit (sequential process):

- a) banks create money in order to satisfy firms' production finance demands (initial finance);
- b) firms acquire the labour power;
- c) the productive process takes place;
- d) workers spend their income on consumption goods and securities (final finance);
- e) firms reimburse the initial debt contract to the banks.

2.2 Let us indicate with F the banks' finance to firms. In order to determine the demand for finance, firms bargain money wage, w , with workers. So we have $F=wN$, where N is the number of workers employed. Firms buy labour power and use it in order to produce commodities. Let us suppose, for the sake of simplicity, that firms produce solely consumption goods and that workers have a propensity to consume equal to one. After production has been made, workers spend their monetary income wN to buy goods. We have $wN=Cp_C$, where p_C is the price of consumption goods and C is the number of goods that workers really get, i.e. their real wage. We suppose that firms fix prices adding a margin of profit, q , to

¹ Bowles and Gintis, 1983; Bowles, 1985. Our treatment of the wage-effort relationship will be different from the conventional one (for example, Solow, 1979), since: i) our focus is not only on a partial equilibrium analysis of the labour market; ii) we assume that monetary variables affect the bargaining process; iii) we do not follow the neoclassical approach in deriving labour demand.

² Graziani 1990 and 1994.

the average cost per unit of product, w/p (where p is the average productivity per worker): $p_C = w/p(1+q)$. By selling the share $C = W/p_C$ of total production to workers, firms get back the whole initial finance and can pay back their debt to the banks³.

2.3 In this model firms have exclusive access to bank credit. By making loans to firms, banks create money; money is pure credit, a symbol without any intrinsic value. Money is not a commodity but a condition for the production of commodities. Without money, firms could not buy labour power and the production process could not start. That is why banks' decisions about loans are the logical starting-point of deposits and that is why the banks' potential credit is theoretically unlimited⁴.

2.4 According to section 2.3 above, firms could concede whatever workers' monetary wages demand. In fact, banks could finance any monetary wage bill. Assuming a propensity to consume equal to one, firms would always get back the monetary wage bill and reimburse banks (interest apart). On the other hand, firms could fix p_C autonomously determining the real wage (and thus the profit). In fact, the bargaining between firms and workers in the labour market concerns only the monetary wage. Since workers have given expectations about the price level, the advance payment of monetary wage determines a given level of expected real wage. In spite of this, the actual real wage will be known only on the market for goods, after worker effort has been given. The actual real wage is autonomously determined by firms. This means that the real wage expected by workers (the real wage *ex ante*) could be different from the real wage settled by firms (the real wage *ex post*).

2.5 Marx clearly recognised the difference between *ex ante* payment of monetary wages and *ex post* payment of real wages. In our opinion (as put out by Bellofiore and Realfonzo 1995), he preferred to analyse a case in which workers' expectations were confirmed. For this reason, Marx identified the origin of surplus value in the surplus labour extorted in production in excess of the hours of socially necessary labour to produce the wage goods as expected by workers and confirmed on the market. But surplus labour may also occur due to firms' choices that do not fulfil workers' expectations about real wages.

2.6 Let us suppose that the economic process repeats itself for a number of periods without any alteration in real and monetary variables. In this case, the expected real wage is confirmed on the market and it indicates the value of labour-power, i.e. the hours of socially necessary labour to produce the historically determined subsistence wage. Now, if firms fix prices greater than the expected prices, there would be a decrease in the real wage below the expected level. In Marxian terms, this means that the price of labour-power (the labour embodied in the real wage which the worker actually consumes) is lower than the value of labour-power. In this case, the rate of surplus will be higher relative to the situation where labour-power was paid at its value (for the sake of simplicity, we assume that the potential rate of surplus is always actualised in circulation).

2.7 Workers cannot oppose the price decrease of labour-power by the wage bargaining on the labour market. In fact, they only bargain the monetary wage with firms. Let us suppose that workers later demand an increase in monetary wage that re-establish, at the new level of prices, the desired real wage. Firms will have no problem in conceding the increase in monetary wages. On the other hand, banks will not check the firms' policy of wage expansion as they can make loans without any limit. Nevertheless, if firms do not reduce q , on the market for goods prices will increase again and workers will find their hopes dashed one more. This means that monetary disequilibrium - increase in prices, increase in monetary wages, further increase in prices and so on - may in theory repeat *ad infinitum*. If the reduction of the price of labour-power is confirmed for several periods, the value of labour-power will come down to the new level.

2.8 The only effective workers' reaction is the reduction of effort in the production process. In other words, firms may be in difficulty if they have a problem of extraction of labour from the labour-power. In sections 5-6 we will analyse workers' reactions to the failure of expectations, namely *workers' reaction function*.

3. The labour market. Assumptions

3.1 Let us make the following assumptions:

a) there are n homogeneous firms, producing consumption goods, and N_S homogeneous workers. Aggregate production function is $Q = pN$, where Q is output, p is average labour productivity and N is employment;

³For the sake of simplicity, we exclude the problem of the payment of interest to the banks.

⁴See Realfonzo-Bellofiore, 1996.

b) on the labour market, workers and firms bargain the average monetary wage. Given workers' expectations about the price level, the average monetary wage depends on the unemployment rate: the higher the unemployment rate, the lower the workers' bargaining power, the lower the average monetary wage. The average monetary wage varies from a minimum, higher than zero, and a maximum value, when there is full employment;

c) worker effort - and, consequently, his/her productivity - depends both on the expected real wage and on the level of unemployment: on the one hand, the higher the expected real wage, the higher worker effort; on the other hand, the higher the level of unemployment, the higher worker effort. Labour productivity varies from a minimum, greater than zero, and a maximum, corresponding to the maximum effort s/he can physically and psychologically provide;

d) firms determine the average price of consumption goods by adding a mark-up to the unitary cost of production. The amount of the mark-up depends on workers' reaction and on firms' behaviour over time, as we will show in section 6.

3.2 Let us briefly discuss assumptions *b* and *c*. Assumption *b* can be easily justified on the basis that each worker perceives the real threat of dismissal by firms when unemployment (the industrial reserve army) is high. The strength of this Marxian "discipline" effect of the industrial reserve army over workers' bargaining power is normally dependent on (i) the degree of replacibility among workers; (ii) how costly is for each worker not to be hired (or be fired). As workers become less replaceable and/or as they perceive as less costly the dismissal (for example, because of greater unemployment benefits), their bargaining power grows and, for a given level of employment and for a given expected level of prices, the average monetary wage grows. Since banks can supply limitless credit, there is no limit to monetary wage increases and to the monetary wage bill. Assumption *c* can be justified as follows. Suppose that each worker can choose the level of effort s/he will give to the firm in a interval going from full "cooperative behaviour" (i.e., to offer his/her maximum effort) to full "conflictual behaviour" (i.e. to offer his/her minimum effort). Worker's decision depends crucially on work dissatisfaction, in the sense that the higher the work dissatisfaction, the higher the tendency to conflict. Firms could make workers cooperative by promising them a high real wage (in other words, high wages compensate for work dissatisfaction): wage is a means of controlling social conflict⁵. Since monetary wages are advanced and real wages are known ex-post (once consumption goods have been produced), worker behaviour is affected by the expected real wage. We call this mechanism firms' "*high wages device*". Furthermore, worker effort is also affected by the level of unemployment. This assumption can be easily justified by the usual argument that being conflictual is very costly for a worker when unemployment is high, since firm can easily replace him/her. This means that the risk of job loss - deriving from conflictual behaviour - is higher, according to the level of unemployment and, consequently, it is more convenient for workers to be cooperative. We call this mechanism firms' "*discipline device*".

Let us now consider the equilibrium on the labour market.

4. The labour market: two cases

Case I: firms can control workers' tendency to conflict in the production process

4.1 Given the assumptions *a* and *c*, firms face two kinds of production function: the *technical* (or *exogenous*) *production function* and the *endogenous production function*. The *technical production function*, $Q=pN$, gives a relationship between employment and maximum output. More precisely, it shows the maximum output that can be obtained for any level of employment (given the technology) assuming that workers give maximum effort (i.e. workers have full cooperative behaviour). The *endogenous production function* - $Q=p[w/p^e, UN]N$, where w/p^e is the expected real wage and UN is the level of unemployment - derives from worker effort and indicates the available sub-optimal allocation of input. In other words, it shows the relationship between employment and the level of output that firms can produce for each value of worker effort. In our analysis the *endogenous production function* is the important production function for firms. In fact, the actual production depends on the worker effort and output is lower than or at least equal to (in the case of full cooperative behaviour) the maximum level technologically feasible.

4.2 In the case here, it is assumed that the high wages strategy is more effective than the discipline device. In other words, monetary wages increase always determines effort increase⁶. Obviously, effort

⁵See Forges Davanzati, 1996.

⁶ That labour productivity increases when monetary wage increases presupposes that workers have adaptive

increases will be higher, the lower the discipline effect. As a result, the more workers firms hire, the higher the expected real wage per worker, the higher workers' average productivity. For the sake of simplicity, let us assume that when there is maximum employment, workers are totally co-operative.

4.3 To determine the amount of employment which maximizes aggregate profits, it is necessary to determine the actual (not expected) real wage per worker. In so doing, let us, for the moment, consider firms' mark-up as a given (this assumption will be relaxed in sections 5-6), so that $p=(w/p)(1+q)$ is the average price of consumption goods (where w is the bargained monetary wage). The real wage becomes $w/p=p/(1+q)$. The conclusion is that firms maximize profits (P) by employing all workers. In fact, *since p is maximum when N is maximum* and p is always greater than $p/(1+q)$, we have that $P=Np-N(w/p)=N[p-p/(1+q)]$ is maximum when N is maximum.

4.4 The effect is shown in fig.1. The line w/p^e indicates the expected real wage which is, by assumption, positively dependent on the level of employment. The lines p and w/p indicate respectively the relationship between productivity and expected real wage and between actual real wage and employment for a given mark-up. In the area N-Q the production function is represented. In this case, since worker effort increases as employment increases (as the expected real wage increases), the *endogenous production function* shows increasing returns⁷. If employment exceeds E^* the actual real wage (settled by firms for a given mark-up) will be lower than the expected real wage. This is not a problem for firms since workers choose the level of effort on the basis of the expected real wage. Workers' expectations are confirmed only in the case where w/p^e is equal to w/p ; in that point, corresponding to E^* , the level of employment causes agreement between workers' demand and firms' decisions. In a sense, this level of employment can be conceived as the only one which allows price stability, or "monetary equilibrium"⁸. But, as seen in section 4.3, firms will maximize profits by employing all the workers. In this case, workers will be completely co-operative and technology will be completely exploited (in equilibrium, the endogenous production function meets with the technical production function). Workers' expectations will be systematically dashed and prices and wages will increase non-stop. The value of labour-power will establish itself at the value of the actual real wage. Note that the strength of the high wage effect in relation to the discipline effect affects E^* ; in the sense that - for a given bargained monetary wage function - the stronger the high wage effect, the lower the level of unemployment which allows monetary equilibrium.

4.5 Considerations of the results:

a) firms will choose to employ all workers when workers are particularly sensitive to monetary wage increases. This means that workers can easily be "deceived" by the promise of high real wages and nominal wage is an effective means of controlling social conflict;

b) if workers' bargaining power grows, expected real wage function shifts upward. This implies that, for each level of employment, every worker will receive a higher monetary wage and consequently will render a higher level of productivity. Firms will continue hiring all workers. In this case it is relevant to stress that the level of unemployment which guarantees the monetary equilibrium could change. It will decrease if the shift of w/p^e function is lower than the shift of the p function (see Fig.2)⁹.

Case II: firms cannot control workers' tendency to conflict in the production process

4.6 By contrast with the case below, here it is assumed that the discipline device is more effective than the high wages device. This means that, as employment grows, workers' effort decreases, in spite of the fact that monetary wage increases. It does not necessarily mean that there is no high wages effect, but simply that this is weaker than the discipline effect. In other words, the stronger the high wage effect, the less rapidly labour productivity decreases when employment grows¹⁰. Since labour productivity

expectations, so that they think that higher monetary wages imply higher real wages.

⁷ The endogenous production function has increasing returns in the sense that, as employment grows, average productivity grows for *all the employed*. What we call the endogenous production function is different from the conventional one because for each level of employment, on this function average productivity is *always* constant.

⁸It could be conceived as the conventional concept of NAIRU (see Carlin and Soskice, 1990).

⁹This conclusion casts some doubt on the standard neoclassical view that as workers' bargaining power grows, the NAIRU necessarily grows too (see Layard, Nickell and Jackman, 1994).

¹⁰ Effort reductions - when employment grows - depend on i) the costs of hiring and firing for firms and on ii) the cost of job loss for workers. If workers know it is very costly for firms to hire and fire (i.e., because of the high costs of workers' training), effort reductions will be high; and they will also be high if workers think they could be hired by other firms, or if the government supplies unemployment benefits. Consequently, the higher the costs of hiring and firing for firms and the lower the cost of job loss for workers, the lower labour productivity will be at each level of employment.

decreases as employment grows, the endogenous production function will show *decreasing returns*; theoretically, the maximum level of output could occur for every value of N .

4.7 In this case, it could be convenient for firms *not* to employ all workers. In fact, the endogenous production function would show decreasing returns (see Fig.3). The level of employment maximizing profits would correspond to the point where output is maximized. Up to this point, in fact, output would decrease, determining - since q is given - a proportional reduction in total profits and real wage bill. If the maximum level of output corresponds to a level of employment lower than N_s , as shown in Fig.3, the employment that maximizes profit will be lower than full employment.

4.8 In this case, unemployment is equilibrium unemployment, in the sense that no internal mechanism can allow the labour market to achieve full employment. In fact - by contrast with the case in which firms can control workers' propensity to conflict (sections 4.1-4.5) - now it is convenient for firms not to employ all workers because workers cannot be "deceived" at all. In this case, work dissatisfaction cannot be reduced by any "carrot". Note that even if the high wages strategy does not affect the level of employment which maximizes profits, however, it does affect E^* , in the sense that the more worker effort decreases as employment increases (i.e., the weaker the high wages effect is), the higher is the level of unemployment which allows monetary equilibrium, for a given bargained monetary wage function.

4.9 Here unemployment is not technological unemployment. This latter case is excluded by assumption, since there is no constraint for firms in choosing the optimal technique. The real cause of unemployment is, consequently, the inadequacy of wage as a means of controlling social conflict. The amount of involuntary unemployment depends on the strength of the discipline effect: the more rapidly workers reduce their effort, the higher the unemployment that maximizes profit will be.

4.10 The conclusions of section 4 are restricted to the assumption that firms' mark-up is exogeneous. Let us now explore the ways in which firms determine this.

5. Workers' reaction function

5.1 For the sake of simplicity, let us consider only the first case described previously (section 4.1-4.5). With a given mark-up, it can be seen that firms would choose to employ all workers. However, in fixing the mark-up firms must consider how workers would react to the possible difference between the actual real wage and the expected real wage. Here, it is reasonable to assume that workers will reduce their effort in the consequent productive period when the actual real wage is lower than the expected real wage. Let us call this phenomenon *workers' reaction function* and let us assume that it works only when the actual real wage is lower than the expected real wage (never the reverse). This is because it is difficult to imagine that workers reward firms with greater productivity simply because firms have not "deceived" them. In a sense, workers' reaction function expresses the intensity of class struggle, because workers' effort reductions are a sign of the existing conflict over distribution. And the degree of workers' reaction (given by effort reduction for a given negative difference between the actual real wage and the expected real wage) is a sign of their actual bargaining power (i.e., the more firms are unable to control worker effort directly or indirectly, the more workers are strong in the bargaining process over income distribution). Furthermore, let us assume that firms exactly foresee workers' reaction. Three distinct scenarios would follow.

6. The market for goods: three cases

Case I: the "hit and run" strategy

6.1 This is the case where firms live *one period* in the economy. Firms will find it convenient to fix a mark-up so as to settle the actual real wage next to zero. This is simply because they are not concerned about what will happen in the following productive period. As a result:

- i) firms will employ all the workers;
- ii) the difference between the actual real wage and the expected real wage will be maximum;
- iii) the difference between the aggregate profits and the wage bill will be maximum, or, in other words, income distribution will be the most unequal one.

6.2 However, the significance of these results is purely theoretical, since, in practice, at least one of the following assumptions must be true: i) if the economy considered is the *world economy*, one must imagine that *all the existing firms* live for one year; this is unrealistic and clearly inconsistent with the working of a capitalistic economy (where capitalists aim to accumulate for indefinite periods); ii) if our economy is a *single open economy*, one must imagine that *all the existing firms* are perfectly mobile, both

in a technical sense (i.e., they could produce the same goods and sell them everywhere) and in an economical sense (i.e., other things being equal, the cost of transferring the production process elsewhere is lower than the cost of the reduced productivity deriving from workers' reaction). In a more specific sense, the "hit and run" case can be conceived as an interpretation of the dynamics of economies where a large number of mobile firms (multinational corporations, above all) exist. The result is consistent with the thesis according to which the spread of multinational capital contributed to increasing income inequality and to reducing living standards¹¹.

*Case II: firms' aim is to obtain constant profits over time*¹²

6.3 Firms want to respect the condition $DP/Dt=0$. In so doing, they must hold $w/p^e=w/p$ and $DQ/Dt=0$ in order to avoid any reaction by workers¹³. If profits must be constant, it follows that, the output being constant, the wage bill in real terms must be constant too. Since the average real wage cannot be modified (to avoid workers' reaction), the level of employment cannot be modified either. The question then arises: which level of employment allows firms to maintain profits constant over time?

6.4 Let us suppose that the slope of the productivity function is lower than the slope of the expected real wage function. Since firms must fix the actual real wage so as to make it equal to the expected real wage, it follows that the actual real wage function must meet with the expected real wage function (see Fig.4). As a result, because of the lower sensitivity of labour productivity to employment (via real wage) than the sensitivity of real wage to employment, profits decrease as employment grows: firms will find it convenient not to employ all workers. Persistent involuntary unemployment follows; persistent because the condition $DP/Dt=0$ must hold, and thus all the conditions which guarantee it ($D(w/p)/Dt=0$ and $DN/Dt=0$)¹⁴. Figure 4 shows this situation, as a possible macroeconomic equilibrium. In the area N-w/p, the labour market is represented. Under the assumption that the actual real wage is equal to the expected real wage (because of firms' aim of avoiding workers' reaction), firms will not hire all workers, producing - via the *endogenous production function* - a level of output which gives rise to the aggregate supply (AS) shown in the area Q-p (quantity-price). The condition $p^*=p^e$ allows firms to avoid workers' reaction and, as a result, the difference between aggregate supply and aggregate demand (represented by a hyperbole, since it is given by $wN=pQ$, in the assumptions that $c=1$) gives firms' real profits. Note that in the area p-p, workers' reaction function is represented for every value of w/p^e .

6.5 On the contrary, let us now suppose that the slope of the labour productivity function is greater than the slope of the expected real wage function. In this case, as employment increases the difference between labour productivity and real wage increases, as do profits. As a result, firms will find it convenient to employ all workers.

6.6 Summing up, the basic results we found are the following. When the mark-up is endogenously determined, unemployment is not caused only by the decreasing returns of the endogenous production function. It also depends on firms' price strategy over time. Even if the endogenous production function shows *increasing* returns, in fact, firms might find it convenient not to hire all workers when they want to keep profits constant over time (here, the necessary condition for unemployment equilibrium is that labour productivity is less sensitive to real wage increase than real wage is sensitive to employment increases). This finding depends crucially on *workers' reaction function*: if workers greatly reduce their effort in response to a negative difference between the actual real wage and the expected real wage, then there is no ground for firms to increase profits by increasing prices. Furthermore, firms' attitude over time affects the rate of inflation and income distribution: the more firms are concerned about their long-run profits, the lower the inflation rate and unequal income distribution will be less unequal¹⁵.

Case III: firms' aim is to obtain increasing profits over time

6.7 Firms must settle employment in order to respect the condition $DP/Dt>0$; since it is not possible to increase worker effort by reducing prices above the level workers expect. The only way to avoid

¹¹See Crotty, Epstein and Kelly (1995),

¹²If firms live for a *finite* period, it could theoretically take place that a "hit and run" strategy would give firms more profits than the strategy of keeping profits constant. This is not the case where firms as a whole live for an *infinite* period.

¹³In the cases II and III, we are implicitly supposing that any reduction in actual real wage determines a reduction in output so that firms cannot keep profits constant.

¹⁴ This conclusion presupposes that the labour supply does not vary through time. For a Marxian approach to the question, see Howard and King (1985, pp.197 ff).

¹⁵Note that a) in the cases II and III (see below), both the unemployment rate and the inflation rate are constant and b) the level of employment which allows monetary equilibrium is always equal to the employment that maximizes profits in the cases II and III.

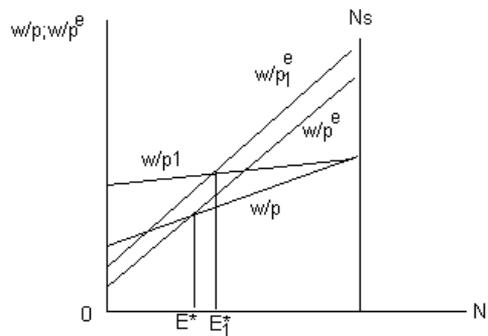


Figure 2

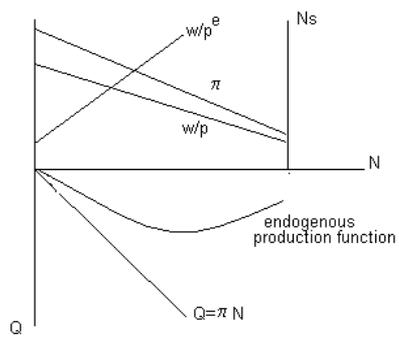


Figure 3

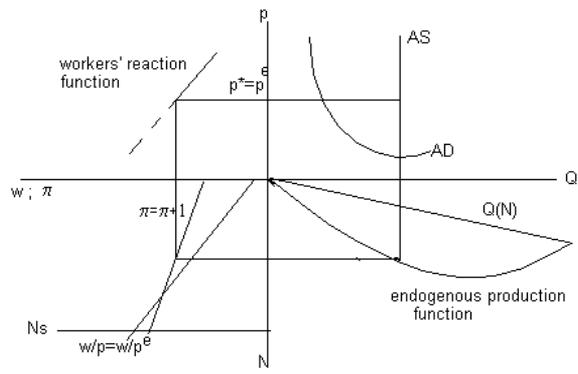


Figure 4