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IMPERFECT COMPETITION, UNEMPLOYMENT BENEFIT AND THE NON-NEUTRALITY OF MONEY: AN EXAMPLE

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Introduction

WHAT influence does trade union power have on the nature of macroeconomic equilibrium, and the ability of the government to influence that equilibrium? Given the importance of unions in many industrialised economies, this is an issue of central importance for those who wish to adopt a microeconomic approach to understanding macroeconomic equilibrium.

Whilst there has been relatively little formal analysis of this issue, there are at least two opposing views of the significance of unions for analysing macroeconomic policy. Both of these views accept that in some sense unions can cause an equilibrium level of employment below the Walrasian level, by raising wages above the Walrasian level. The most important difference stems from the view taken on the ability of the government to influence the private sector equilibrium by monetary policy, or even fiscal policy.

One view is advocated by adherents to the Natural Rate Hypothesis (NRH): Whilst "trade unions play an important role in determining the position of the natural level of umemployment" (Friedman (1975) p. 30), the government is unable to influence this National Rate through monetary policy (see also Friedman (1968)). The possibilities open to the government to influence employment in the long run using monetary policy are little different to those in a Walrasian economy. Whilst Friedman himself did not formalise his point of view, this Natural Rate property is present in the models of unemployment with unions of Nickell and Layard (1985) and Dixon (1987a) (see also Benassy (1987), Blanchard and Kiyotaki (1987)).

The opposing view is that not only can unions influence the equilibrium level of employment, but also the effectiveness of monetary policy. In particular, it has been argued that imperfect competition can provide "Keynesian" policy features. Perhaps the most influential paper to formalise this notion is Hart's model of imperfect competition with Keynesian features (1982). The underlying logic of this view is simple: the disequilibrium macroeconomics of the seventies had shown how fixed prices could yield Keynesian policy results; imperfect competition might provide both a coherent theory of Non-Walrasian prices, and wage/price comparative statics with Keynesian features.

Of course, one would not expect imperfect competition in itself to

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indicate just one answer to these issues: whilst there is only one basic equilibrium concept employed in the Walrasian paradigm, there are many different approaches to understanding equilibrium with unionised labour markets. The study of imperfect competition in a general equilibrium macroeconomic framework is as yet in its infancy, and it remains to be seen what general lessons are to be learnt. The main lesson to be learnt from this paper is that the presence of a particular feature—in this case unemployment benefit—can have very different implications with imperfect competition than with a Walrasian economy. The model presented is more of an example than a general analysis. However, in the underlying Walrasian economy, the presence of unemployment benefit has no influence on either the equilibrium or the effectiveness of policy: with unions, however, the presence of benefits can lead to nominal wage rigidity in the long run, resulting in the non-neutrality of money. This complements the findings of Blanchard and Kiyotaki (1987) and Rankin (1987) in which the presence of respectively menu costs and non unit-elastic price expectations have more significant effects with imperfect competition. This perhaps suggests that the idea of the Natural Rate may be less robust in the context of imperfect competition. While the present paper has no pretence to generality, we hope that it provides a useful example, even if only to provide a more accessible account of the Keynesian side.

The government raises taxes and pays out unemployment benefit. There are many sectors in the economy, and in each sector there is a labour market with several unions acting as "syndicates", restricting the supply of labour in order to influence the wage and the resultant "surplus" which members earn over the benefit rate. In equilibrium, the unions choose a wage which is a constant mark-up over the benefit level, unaffected by the level of demand. An increase in the money supply leads to a standard Keynesian multiplier effect, with no effect on nominal or real wages until full-employment is reached. In the long-run the government is able to achieve full-employment by either cutting the benefit level or expanding the money supply: in the short run, however, we argue that there are strong reasons to prefer monetary policy to benefits as a policy instrument. Not only does monetary expansion lead to an immediate increase in employment, but distributional factors also argue for a Rawlsian or Utilitarian government to prefer monetary expansion over benefit cuts. Money is, of course, non-neutral in this model, despite the standard homogeneity properties of underlying behavioural equations. It should be stressed that in the context of the example presented, neither benefits or imperfect competition are on their own sufficient to generate unemployment in equilibrium. It is their combination that generates the results.

1. The model

There are n identical sectors in the economy, where n should be thought of as a large number. In each sector there is a labour market and a product market. For simplicity, we adopt Keynes' assumption that the product

market is perfectly competitive (although we could allow for imperfect competition, as in Dixon (1988, 1987a, 1987b)). Firms have a simple constant-returns technology with one input, labour. The production technology is identical across sectors, and without loss of generality industry output X_i equals industry employment N_i:

$$X_i = N_i \qquad i = 1, \ldots, n \tag{1.1}$$

Firms treat the wage as given, so that with perfect competition the price P_i will equal the sectoral wage W_i.

There are H households in each industry $h = 1, \ldots, H$. They have one unit of labour which they supply with no disutility, and labour is industry-specific (due to job-specific skills perhaps), there being no inter-sectoral labour mobility. Throughout this paper we assume that household preferences are Cobb–Douglas, with unit income and own-price elasticities. Household utility depends on its consumption of the n goods produced in the economy X_h, and nominal end-of-period money balances M_h (with Cobb–Douglas preferences it makes no difference to Marshallian demands whether nominal or real money balances appear in the utility function). The presence of money balances in utility can be seen as arising from direct liquidity services, or if we interpret it as an indirect utility function. Household income consists of initial money balances M_h^0, and wage income W_i if employed, or benefit b if unemployed. Households pay lump sum taxes t. There are no profits in this economy (see below). Households solve the following programme

$$\max_{X_h, M_h} \sum_{i=1}^{n} \frac{c}{n} \log X_{ih} + (1-c) \log M_h \tag{1.2}$$

$$\text{s.t.} \sum P_i X_{ih} + M_h \leq W_i + (M_h^0 - t) \quad \text{(employed)} \tag{1.3a}$$

$$\leq b + (M_h^0 - t) \quad \text{(unemployed)} \tag{1.3b}$$

Since preferences are homothetic, we can aggregate over employed and unemployed households. Total initial money balances are M^0, and total taxes $\tau = nH \cdot t$. The demand for goods and money resulting from (1.2–1.3) are of course constant-expenditure shares:

$$P_i X_i = \frac{c}{n}(M^0 - \tau) + \frac{c}{n} \sum_{j=1}^{n} (W_j N_j) + \frac{c}{n} \sum_{j=1}^{n} (H - N_j) b \tag{1.4}$$

where c can be interpreted as the marginal propensity to consume from income: proportion $1-c$ of income is devoted to accumulating money balances. Note that because preferences are homothetic, the distribution of lumpsum taxes is irrelevent to aggregate demand, and so there is no loss in generality in assuming that they are uniform.

The government spends money on unemployment benefit, which it pays for by raising taxes. For simplicity, we assume that the government

"balances its budget" so that the total tax raised exactly covers unemployment benefit paid

$$\tau = \sum_{i=1}^{n} (H_i - N_i)b \tag{1.5}$$

Per capita taxes are then $t = \tau/Hn$ (and therefore vary with the level of employment). Since there is only one financial asset, there is no real monetary policy: a helicopter drop of money is equivalent to a subsidy. We will talk about the government varying M^0 as "monetary policy", merely to distinguish it from the government's unemployment benefit decision b.

Substituting (1.5) and (1.4), and noting that $P_iX_i = W_iN_i$, we have for each $i = 1,\ldots, n$:

$$W_iN_i = \frac{c}{n} M^0 + \frac{c}{n} \sum_{j=1}^{n} W_jN_j \tag{1.6}$$

Defining K_i as the nominal expenditure on sector i (which equals the income of workers in i) $K_i = W_iN_i$, $i = 1,\ldots,$ we can write the n equations in (1.6) as:

$$K_i = \frac{c}{n} M^0 + \frac{c}{n} \sum K_j \qquad j = 1,\ldots, n \tag{1.7}$$

Since demand in each sector is the same:

$$\sum K_j = n \cdot K_i \tag{1.8}$$

Hence

$$K_i = \frac{c}{1-c} \cdot \frac{M^0}{n} \tag{1.9}$$

Nominal expenditure K_i on each sector depends on average initial money balances in the economy. Summing over all sectors $i = 1,\ldots, n$, (1.9) yields nominal national income Y

$$Y = \sum_{i=1}^{n} K_i = \frac{c}{1-c} M^0 \tag{1.10}$$

With Cobb–Douglas preferences and constant returns to scale, the expenditures in each sector K_i are independent of nominal wages and prices, and depend only on initial money balances. Because of the government's budget constraint, the unemployment benefit level b does not affect aggregate or sectoral demands. Furthermore, the exact distribution of initial money balances or lump-sum taxes does not matter: since only aggregates matter here, there is no loss in generality by assuming M^0 and τ to be divided equally between the $n \cdot H$ households.

The Walrasian equilibrium of this simple economy is for the labour

market to clear in each (identical) sector, with $W_i = \theta$, where:

$$\theta = \frac{K_i}{H} \qquad i = 1, \ldots, n \tag{1.11}$$

Throughout this paper we will assume that $W_i \geqslant \theta$, so that employment is given by the "objective" demand curve:

$$N_i = \frac{K_i}{W_i} \tag{1.12}$$

Furthermore, to avoid trivialities, we assume that it is worthwhile working, so that $b < \theta$, so that there is full employment in the Walrasian equilibrium. Any unemployment that occurs in equilibrium will be due to imperfect competition.

2. Unions and wage determination in the long-run

In each sector i there are r_i unions $k = 1, .., r_i$, where for simplicity we let $r_i = r$ for all sectors i. Following Hart (1982), we assume that the unions act as "syndicates" which influence the wage in their sector by restricting employment. That is, there is a Nash-equilibrium in which each union chooses its own employment N_{ik} *given* the employment levels of other unions in its own sector.

For policy analysis, it is necessary to distinguish between two periods of time: the long-run and the short-run. It is conventional in macroeconomic analysis to distinguish between the *short-run* and the *long-run*. In the long run, wages and prices are taken to be perfectly flexible, and government policy fully anticipated. In the short-run however, wages are taken to be fixed, and we allow for there to be *unanticipated* government policy. We will capture this distinction by adopting a two-period model: the first period represents the short-run, the second the long-run.

Turning first to the long-run equilibrium, each union i chooses its own employment level N_{ik}, and then the wage W_i is determined by the market clearing condition:

$$W_i = K_i \Big/ \sum_{k=1}^{r} N_{ik} \tag{2.1}$$

Unions treat the aggregate price level as fixed (this is reasonable if there are many sectors). They choose N_{ik} to maximize the "rent" appropriated by their members, given the "objective" demand function (2.1). They thus solve the programme:

$$\max_{N_{ik}} (W_i - b) N_{ik} \tag{2.2a}$$

$$\text{s.t. } W_i = K_i \Big/ \sum_{j=1}^{r} N_{ij} \tag{2.2b}$$

Since the aggregate priced level is treated as exogenous, it is a multiplicative deflator which drops out of the objective function (2.2a). Rent maximization is of course a standard union model (it is equivalent to expected utility maximisation if workers are risk-neutral).

The unions in each sector choose their labour supply N_{ik}, treating the labour supplies of all other unions in their sector and the price level as given. The resultant Nash-equilibrium[1] between unions is symmetric, and results in a union "mark-up" μ_i of wages over benefits of:

$$\mu_i \geqslant \frac{W_i - b}{W_i} = \frac{1}{r} \tag{2.3a}$$

and wage

$$W_i \geqslant \frac{r}{r-1} \cdot b \tag{2.3b}$$

The inequality will be an equality if $b \cdot r/(r-1) \geqslant \theta$: the inequality will be strict with full-employment when $W_i = \theta$. The level of equilibrium employment in each industry is simply:

$$N_i = \min\left[\frac{K_i \cdot (r-1)}{r \cdot b}, H\right] \tag{2.4}$$

Equilibrium employment is determined uniquely by (r, b, M^0). Clearly, from (2.4), as the number of unions becomes large, the outcome becomes competitive:

Proposition 1: As $r \to +\infty$, $W_i \to \theta$, and $N_i \to H$.

Proof

If $b = \theta$, then W_i converges uniformly to θ with r. If $b < \theta$, then for r large enough $W_i = \theta$. Q.E.D.

Note that the economy is "Chamberlinian" in that having more sectors does *not* increase the competitiveness of the outcome in each sector. This is of course simply due to the assumption of Cobb–Douglas preferences, which constrains sectoral demands to be unit elastic irrespective of the number of sectors.

3. Wages and employment in the short-run

In the short-run, the unions need not fully anticipate government policy. In the first period, therefore, we assume that the labour market clears given

[1] To derive the wage benefit markup, the first order condition to (2.2) is:

$$\left(K_i \Big\backslash \sum N_{ij}\right) \cdot \left[1 - \left(N_{ik} \Big\backslash \sum N_{ij}\right)\right] = b$$

hence

$$W_i[1 - s_k] = b$$

where s_k is union k's employment share $N_{ik} \backslash \sum N_{ij}$: since the model is symmetric, in equilibrium $s_k = 1 \backslash r$, from which we obtain (2.3).

expected government policy and the resultant employment level. Let expected government policy be (M^e, b^e)—Unions and firms are assumed to have point expectations. The expected demand for sector i is then K_i^e. Unions choose expected employment levels to maximize utility as before. This results in a market-clearing wage:

$$W_i^e = \frac{r}{r-1} b^e; \qquad N_i^e = (K_i^e / W_i) \tag{3.1}$$

In the short-run (period 1) we assume that this wage is fixed. This is certainly the common assumption in macroeconomics, reflecting the view that wages are inflexible in the short run, and actual employment (given the wage (3.1)) will be demand determined. This might at first seem odd, since unions have employment as their strategy. However, it is not credible for unions to maintain their chosen level of employment at the given wage in the presence of unanticipated demand shocks. If demand at the wage is greater than expected, then union utility is increasing in employment at the given wage, since union rent is increasing in N_i given W_i. If demand is less than expected, the union cannot maintain employment, since the firms are perfectly competitive with constant returns, they earn zero profits. If the unions made the firms maintain employment, the firms would therefore go bankrupt. In the short-run, then, with fixed wages, the unions cannot credibly control employment. We will therefore assume that employment will vary with demand, and that the additional jobs (or job losses) are divided equally between unions—an assumption that is easily relaxed.

4. Government policy

The government has two policy variables (M^0, b). In the short-run the wage is fixed (reflecting private sector expectations); in the long-run government policy is fully anticipated. In the long-run, the policy effects of M^0 and b are similar except with respect to the wage/price level. Either or both can be utilised to achieve full employment. In the short-run, however, the two instruments have rather different effects, and these make "monetary" policy rather more attractive.

Proposition 2: In the short-run, given private sector expectations (M^e, b^e), an unanticipated change in policy will have the following effects:
(i) An increase in M^0 has the multiplier

$$\frac{\partial N}{\partial M^0} = \frac{1}{W^e} \frac{c}{1-c}.$$

So long as $N_i < H$.
(ii) A change in b has no effect on employment, $\partial N_i / \partial b = 0$.

Proof
(i), (ii) from (3.1) and (1.9). Q.E.D.

Proposition 3: An increase in M^0 will (in the presence of unemployment) cause a Pareto improvement in the short-run.

Proof

From Proposition 2(a), the increase in the money supply increases employment. Households who remain employed or unemployed have an increase in net income as falling employment reduces lump sum taxes via the governments budget constraint. Households who become employed increase their utility. Hence there is a Pareto improvement in household utility. Note that union utility also increases in the short-run. Q.E.D.

A decrease in unemployment benefits does not lead to a Pareto improvement in the short-run: unemployed households are, of course, worse off, whilst employed households have lower tax (from the government's budget constraint (1.5)), and are better off.

Thus, whilst the long-run effects of monetary and benefit policy are equivalent, their short-run effects are very different. Monetary policy is Keynesian in both the short and the long-run, and indeed the short run and long run Keynesian multipliers are the *same* (for a given and anticipated $b = b^e$). Monetary expansion leads to an increase in employment, and an immediate Pareto improving adjustments to the long-run equilibrium.

A change in unemployment benefit has no short-term impact on employment, and makes the unemployed initially worse-off. The two alternative policies may not be Pareto-comparable, since the employed may do better with a cut in benefits (and hence in taxes) than they do with an expensionary monetary policy. However, other welfare criteria suggest that a monetary expansion is preferable to a cut in unemployment benefits. If the government is utilitarian or Rawlesian, then monetary expansion is strictly preferred to a cut in unemployment benefit as a means of resotring full-employment. Since the long-run effects are the same, we need only compare the short-run effects. The worst-off households are the unemployed. These do worst in the short-run with a cut in benefit level b, so a Rawlesian government will prefer an expansionary monetary policy. For a utilitarian government, the redistribution from the employed to the unemployed consequent to a reduction in b does not alter total utility. However, monetary expansion increases utility (since there is a Pareto improvement).

There are thus strong short-run arguments for monetary expansion over cutting benefits as a method of reducing unemployment, although the two have similar long-run effects. Monetary expansion leads to an immediate shift to the new long-run equilibrium. Benefit cuts, however, have no short-run impact on employment, and have to rely on the downward adjustment of wages to achieve an expansion in employment.

Other considerations point to the superiority of monetary expansion over benefit cuts. The model presented assumes that in the long-run nominal wages are perfectly flexible, both upwards and downwards. It is often argued that nominal wages are less flexible downwards than they are

upwards. Thus the process of downward wage-adjustment in response to a cut in b may be very protracted, whilst the quantity adjustments in response to a monetary expansion may be more immediate.

It might be argued that it is not clear in this model why the government pays unemployment benefit in the first place. If the government set benefits at zero, then the union maximizes the nominal wage bill as in Hart (1982). Under our assumptions, this yields full employment in the long run equilibrium. In the short run, as the economy adjusts to equilibrium, unemployment may be generated by unanticipated demand shocks, and there is a clear justification for the presence of benefits on ground of *ex post* inequality of income between the employed and the unemployed (who bear the brunt of the adjustment). Whilst we do not explicitly model the choice of benefits by the government, in practice most countries have chosen to introduce unemployment benefits to reduce inequality (and poverty) caused by unemployment. This paper explores the implications of this for macroeconomic policy with unionised labour markets.

To what extent is the nominal wage rigidity in the equilibrium introduced through the back door, by the assumption that the government sets *nominal* rather than *real* benefits? In fact, in this particular model it makes no difference to the results if the government indexes benefit, so that the nominal level depends on the price level and the real benefit level β: $b = P \cdot \beta$. As we have shown, there is no price inflation in response to monetary expansion (so long as the sectoral employment constraints do not bind), so that holding nominal and real benefits constant comes to the same thing. However, it should be noted that as wages (and hence prices) are a markup on benefit, the real benefit level is fixed in the long run equilibrium: from (2.3a), real benefits β are $(r - 1/r)$. Any attempt by the government to index at a level above this level will lead to an inflationary spiral.

In the Walrasian model, benefits below the market clearing wage θ generate neither unemployment nor Keynesian multipliers: there is always full employment in the long run. With imperfect competition, the presence of unemployment benefit has the dramatic effect both of generating unemployment and Keynesian multiplier effects. This illustrates that imperfectly competitive models can have significantly different behaviour to competitive models. The reason for this difference is that in the unionised economy, a change in benefit b alters the marginal trade-off between employment and unemployment for the union. In the Walrasian economy, with no disutility of labour, households will always want to work so long as the benefit level is below the market clearing wage.

Money is of course non-neutral in this model: this is to some extent surprising, given that the equilibrium is homogeneous of degree zero in $(M^0, \underline{W}, b)$. If the government chose to double the money supply and the nominal benefit level, wages and prices would double, leaving real variables unaffected. Hence:

Proposition 4: Let $\lambda > 0$. If $(\underline{W}, \underline{N})$ is an equilibrium for policy (M^0, b), then $(\lambda \underline{W}, \underline{N})$ is an equilibrium for $(\lambda M^0, \lambda b)$.

Proof

We will take the case where $N_i < H$. From (2.3b), if W_i is an equilibrium for b, then λW_i is an equilibrium for λb. From (1.10), an increase in M^0 of proportion λ leads to an equiproportionate increase in final demand K_i. Since N_i is HODO in W_i and K_i (1.12), there is no change in employment. Q.E.D.

Despite the homogeneity of the behavioural equations in this simple framework, money is not neutral. This argues against the view that the Natural Rate Hypothesis is simply an assertion about homogeneity. Whilst this view may be correct in the Walrasian context, it certainly need not hold in an imperfectly competitive economy.

Although there exists a unique private sector equilibrium for any given government policy, there exists a continuum of levels of employment that can be achieved by an appropriate policy. There is thus a *Natural Range* of employment as in Dixon (1988, 1987b). It is easy to characterise the Natural range in this economy. Given that the government sets a level of benefits below the market clearing level θ, there is a clearly defined lower bound on employment:

Proposition 5: *The Natural Range.* With r unions in each sector, given that benefit is set below the market clearing level $b \leqslant \theta$, the Natural Range of employment is given by:

$$[((r-1)/r) \cdot H, H]$$

Proof

Given the definitions of K_i and θ in (1.7) and (1.11), since $b \leqslant \theta$:

$$b \leqslant \theta = \frac{c}{1-c} \frac{M^0}{nH}$$

In a unionised economy, wages are given by (2.3b), so that:

$$W_i = (r - 1/r) \cdot b \leqslant \frac{r-1}{r} \frac{c}{1-c} \frac{M^0}{nH}$$

Hence we have the lower bound for employment:

$$N_i = K_i/W_i \geqslant (r - 1/r) \cdot H$$

The upper bound on employment is of course H. Q.E.D.

The Natural Range property is generated by imperfect competition. In the Walrasian model, so long as $b \leqslant \theta$, there will be full employment in equilibrium. Note that the fewer the number of unions (the less competition), the larger is the Natural Range. With two unions per sector, the Natural Range constitutes half of the labour force. However, even with many unions, the Natural Range is still fairly "large" from the policy point

of view: for example with 20 unions per sector, the Natural Range covers 5 per cent of the labour force, which would represent over one million in the UK context. Whilst it is of course not very enlightening to draw policy conclusions from such a specific model, Proposition 5 does suggest that the degree of imperfect competition in the labour market can have a significant effect on the ability of macroeconomic policy to influence the level of employment in the economy.

Conclusion

This paper provides an example of how a unionised economy can be 'Keynesian', both in the sense that there is unemployment in equilibrium, and that there are Keynesian multipliers. What general lessons can be learnt from such a specific model?

Most importantly, the model illustrates that the behaviour of an imperfectly competitive model can be very different to the behaviour of Walrasian economies. In the model presented, the presence of unemployment benefit makes no difference to the equilibrium or policy effectiveness in the Walrasian economy. In the unionised economy, however, the presence of unemployment benefit directly influences the level of unemployment, and results in the non-neutrality of money and multiplier effects. The significance of a particular feature of the economy can have different implications in the presence of imperfect competition from the Walrasian case. Unlike 'Natural Rate' models of unionised economies, imperfect competition matters here, and despite the lack of generality, we hope that the model presented will serve as a useful counter-example to Natural Rate models.

To turn the more general issues, there are many possible further avenues for research on imperfect competition and macroeconomics. This example shows how the introduction of a particular feature (in this case unemployment benefit) can have very different effects in the Walrasian and imperfectly competitive cases. This confirms the conjecture of Blanchard and Kiyotaki (1987) and others that it need not be so much that imperfect competition in itself which yields non-Walrasian results, but rather that it can magnify the effect of a particular feature (in their case, menu costs). It remains to be seen in the further applications whether this conjecture is confirmed or refuted.

It is worth noting at the outset that it is unlikely that this research programme will yield results which are solely in the standard Classical or Keynesian mould. Models of imperfect competition in the product, labour and other markets are far more rich and diverse than those in the strict Walrasian paradigm. However, as the example of this paper shows, imperfect competition can shed new light on standard problems, and the

diversity of potential results should be taken as an invitation rather than a warning.

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