Labour Market Institutions and Monetary Policy in EMU: Do Asymmetries Matter?

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"If, indeed, labour was always in a position to take action (and were to do so), whenever there was less than full employment, to reduce its money demands by concerted action to whatever point was required to make money so abundant relatively to the wage-unit that the rate of interest would fall to a level compatible with full employment, we should, in effect, have monetary management by the Trade Union, aimed at full employment, instead of the banking system". "Except in a socialised community where wage policy is settled by decree, there is no means of securing uniform wage reduction for every class of labour.{…}A change in the quantity of money, on the other hand is already within the power of most governments{…}. Having regard to human nature and our institutions, it can only be a foolish person who would prefer a flexible wage policy to a flexible money policy.."(pp 268-269). J.M. Keynes

1 - Introduction

The debate about European Monetary Union has been polarised between the desire to exploit the economics of greater integration (directly derived from the OCA literature); and the presence of significant differences in economic institutions and traditions. These differences are important in assessing which economic policy framework will be more capable of providing macroeconomic stability in each member state.

This paper analyses the interaction between common monetary policy and differentiated labour market institutions. This interaction is particularly important given that the policy framework established in EMU assigns a central role to labour market policies for creating flexible and responsive national economies at the microeconomic level. But because EMU will be characterised by a continuous emphasis on fiscal discipline, and because the constraints on performance at the national level have not been supplemented by an explicit Europe wide system for co-ordinating national economic policies, the only "policy instrument" remaining at the national level is labour market policies.

Consequently, we have to ask which labour market structure would provide this role of economic stabiliser of the nominal wage? How is that choice affected by the monetary policy framework and by the other players in the labour market ? Is the framework chosen able to overcome the relevant asymmetries; or is a more explicit coordination framework needed ?

These are the main issues we want to address here. To do so we develop a model of a two country monetary union. In each country, different labour market institutions are distinguished by the degree of centralisation in wage bargaining. In each country the government can also use an instrument (general taxation or payroll taxes) to influence their overall labour costs. Finally a common monetary policy is followed in a "conservative" manner, as defined by Rogoff (1985).

We compare three regimes: in one of them the labour market is fully centralised in all countries. As in Calmfors and Driffill (1991), a fully centralised labour market raises the Trade Union stake in the overall policy mix. An increase of real wages

will therefore trigger a reaction from the central bank that will produce a reduction in employment levels. On the other hand the Trade Union could operate an expansionary (real) monetary policy simply reducing nominal wages, increasing the competitiveness of the national economy versus the other member states. The results therefore depend heavily on the distance between trade unions, central bank and fiscal authorities in terms of their preferences.

In a fully decentralised labour market, without national asymmetries, the responsibility of achieving national objectives will be shifted totally towards fiscal policy. This scenario shows the possibility of conflict and the need of co-ordination between monetary and fiscal policy, as already analysed by Demertzis and al. (1999) among others.

In the final scenario we analyse a situation of asymmetric labour market structures. The analysis shows that a fully centralised labour market de-facto provides an extra instrument of economic policy for the country that has centralised wage bargaining. This extra instrument can be used to respond asymmetrically to a symmetric shocks. Since that option is not open to the second country, this will put more pressure on the country with fully decentralised labour market to produce more active fiscal policies for domestic stabilisation, increasing the possibility of conflict with the monetary policy objectives. The result, one might suppose, would be worse outcomes for one, if not for both countries.

In conclusion the analysis shows one way in which structural asymmetries matter in the determination of economic policy; and that, especially in presence of such asymmetries, the co-ordination of economic policies maybe necessary if we are to achieve macroeconomic stability.

2 - The Model

The objective of the paper is to analyse how labour market asymmetries affect the design and conduct of economic policy in EMU. The model therefore must have one monetary policy, which is supposed to fix the level of prices for the union as a whole. That policy will be derived by minimising a generic quadratic objective function, such as :

$$\min_{\pi} L = \frac{1}{2}\left[(\pi)^2 + \gamma(y_a - k)^2\right] \quad (1)$$

where $\gamma \geq 0$ is the relative importance, in the Central Bank's view, of stabilising output levels across the union as a whole. So y_a is the average level of output in the union, with target value k[1]. Aggregate supply in the two countries constrains the average level of output that can be achieved in the union:

$$y_a = \frac{1}{2}(y_1 + y_2) = \pi - \frac{1}{2}(w_1 + w_2) - \frac{1}{2}(t_1 + t_2) + \frac{1}{2}(e_1 + e_2) \quad (2)$$

This relationship therefore constrains the minimisation of (1). We assume that the ECB's monetary policy controls inflation directly, and that wages (w_1, w_2) are set at the national level on the basis of their different labour institutions. The fiscal policy fix the tax rates (t_1, t_2), which can be defined as the net tax revenues in the two countries (where $t_j < 0$ means a fiscal deficit in country *J*). Finally the two economies are subjected to supply shocks (e_1, e_2) with the usual properties of zero mean and constant variance

Thus, wage changes in the model represent the expected changes in production costs. We will therefore assume that wage bargainers determine their desired level of wage inflation in each of the three labour market regimes studied below; and that they do so on the basis of what they expect to be the outcomes (in terms of inflation and employment) of whatever monetary and fiscal policies the Central Bank and fiscal authorities can be expected to choose in their own interest. This means we have a hierarchical game in which independent monetary and fiscal authorities play a Nash game among themselves, while playing a Stackelberg game with respect to the wage setters.

[1] For an extensive justification of the presence of $k > 0$, see Persson and Tabellini (1991)

In it useful to look at the problem also in term of difference between the two national level of output[2]. This is defined as:

$$y_d = \frac{1}{2}(y_1 - y_2) = -\frac{1}{2}(w_1 - w_2) - \frac{1}{2}(t_1 - t_2) + \frac{1}{2}(e_1 - e_2) \qquad (3)$$

This expression for the difference in income levels makes clear what has always been argued by OCA literature. If the shocks are asymmetric, asymmetries in labour market or in the use of fiscal policy could be used to reduce the differences between countries.

The moves of our game are as follows: first unions, or individuals, set wages; then shocks occur; and finally monetary and fiscal authorities set their instruments in a non cooperative manner. Non cooperation is an essential element; it preserves the independence of the Central Bank, as foreseen in the Treaty of Maastricht. Consequently, the ECB maximises (1)subject to (2), while the two fiscal authorities maximise their own national objective functions using their fiscal instrument; i.e.

$$\min_{t_j} L_j = \frac{1}{2}\left[(\pi)^2 + (t)^2 + \beta\left(y_j - k\right)^2\right] \qquad (4)$$

for *j = 1 , 2* , subject to the same national supply functions which underlie (3). The parameter $\beta > 0$ determines the importance, as the government see it, of output stabilisation relative to inflation control or deficit control. Minimising (1) and (4) for *j=1,2*, conditional on the wages set according to whichever labour market regime is in place, now yields a sequence of three optimal reaction functions - one for each player:

$$\pi = \frac{\gamma}{1+\gamma}\left[\frac{1}{2}(w_1 + w_2) - \frac{1}{2}(t_1 + t_2) + k - \frac{1}{2}(e_1 + e_2)\right] \qquad (5)$$

[2] This technique of dividing the analysis up between the sums and the differences of national outputs is due to Aoki (1978). In our context it has the advantage of distinguishing clearly the policy domains of the different actors (the ECB target the average while the national governments and national unions target the national levels), while at the same time it points out the potential asymmetric effects of different policies.

$$t_j = \frac{\beta}{1+\beta}\left[\pi - w_j - k - e_j\right] \qquad \text{for j=1,2} \tag{6}$$

Solving this system of three equations in three unknowns, we have:

$$\pi = \frac{\gamma}{1+\gamma+\beta}\left[\frac{1}{2}(w_1 + w_2) + k - \frac{1}{2}(e_1 + e_2)\right] \tag{7}$$

$$t_1 = -\frac{\beta}{1+\beta+\gamma}\left[w_1 + k - e_1\right] + \frac{\beta}{1+\beta+\gamma}\left[\gamma\frac{(w_1 - w_2)}{2} + \gamma\frac{(e_1 - e_2)}{2}\right] \tag{8}$$

$$t_2 = -\frac{\beta}{1+\beta+\gamma}\left[w_2 + k - e_2\right] - \frac{\beta}{1+\beta+\gamma}\left[\gamma\frac{(w_1 - w_2)}{2} + \gamma\frac{(e_1 - e_2)}{2}\right] \tag{9}$$

Equations (8) - (9) show the pressure which is put on fiscal policy by the presence of asymmetric shocks or asymmetries in the labour market. Because the monetary policy operates on the averages, fiscal policy (or wages) must intervene to make up and stabilise any difference in income levels.

The equilibrium expressed in equations (7) - (9) is conditioned to the wage formation mechanism present in each country. We analyse our three labour market regimes next - two regimes are symmetric, with either full centralisation or complete decentralisation in the labour market. The third is asymmetric with wage bargaining centralised in one economy, but decentralised in the other.

3- Regime One: Non Cooperation with symmetric decentralised labour markets

a) The Optimal Policies and Their Outcomes

In this regime workers move first, setting a one period wage contract before any shocks appear and before fiscal and monetary policy are set .However the labour markets are identical in the two countries and atomistic. Therefore real wages will

be set such that they will be equal to the inflation rate expected at the beginning of each period, i.e.

$$w_j = \pi^e \tag{10}$$

Assuming rational expectations, substituting equations (7) - (9) in (10), and solving out the resulting system of equations, we obtain the equilibrium rate of wages and price inflation:

$$w_j = \pi^e = \frac{\gamma}{1+\beta} k \tag{11}$$

Substituting this equilibrium value into the reaction functions of the policy authorities, we obtain the equilibrium level of inflation and taxation for the two countries, respectively:

$$\pi = \frac{\gamma}{1+\beta} k - \frac{\gamma}{1+\beta+\gamma} \frac{(e_1 + e_2)}{2} \tag{12}$$

$$t_j = -\frac{\beta}{1+\beta} k + \frac{\beta}{1+\beta+\gamma} e_j + \frac{\beta}{1+\beta+\gamma} \left[\gamma \frac{(e_j - e_i)}{2} \right] \tag{13}$$

This will give an average European income equal to:

$$y_a = \frac{\beta}{1+\beta} k + \frac{1}{1+\beta+\gamma} \left[\frac{(e_1 + e_2)}{2} \right] \tag{14}$$

While the difference relation is given by:

$$y_d = \frac{1+\gamma(1-\beta)}{1+\beta+\gamma} \left(\frac{e_1 - e_2}{2} \right) \tag{15}$$

Equation (15) shows the importance of the conditions from the OCA literature quite clearly. Evidently the more similar the shocks, the smaller the differences in

regional income levels and the smaller the need for regional stabilisation. But it does not follow that the tax reactions are also smaller or less reactive; they may be, but that requires the domestic shock (i.e. e_j in (13)) to be small, as well as the differences between the shocks $\left(e_j - e_i\right)$ to be small. If the single monetary policy cannot deal with the former problem, then fiscal policy will have to become more active and deal with two different problems at once (absolute and relative stabilisation). To prevent instrument overload, policy makers will naturally look elsewhere for an additional instrument. Interventions in the labour market are then the obvious candidate.

b) Output Stability and Policy Volatility

An analysis of expected values and variances of the five main policies variables $\left(\pi, t_1, t_2, y_a, y_d\right)$ allows us to say something about the interrelation between the shocks and the policy targets, and how the economy's stability is affected by both the policy preferences of the Central Bank and the governments, and the variability of those shocks. We have, for example

$$E(\pi) = \frac{\gamma}{1+\beta}k \qquad E(t_j) = -\frac{\beta}{1+\beta}k \qquad E(y_a) = \frac{\beta}{1+\beta}k \qquad E(y_d) = 0$$

Hence the expected and average outcomes are not different from the single economy case. But the variability of these outcomes is strongly affected by the nature of the shocks, by their similarities or otherwise across countries, and by the fact that monetary policy is set centrally:

$$V(\pi) = \frac{1}{4}\left(\frac{\gamma}{1+\beta+\gamma}\right)^2\left(\sigma_1^2 + \sigma_2^2 + 2\rho\sigma_1\sigma_2\right) \tag{16}$$

$$V(t_1) = \frac{1}{4}\left(\frac{\beta}{1+\beta+\gamma}\right)^2\left((\gamma+2)^2\sigma_1^2 + \gamma^2\sigma_2^2 - 2\gamma(\gamma+2)\rho\sigma_1\sigma_2\right) \tag{17}$$

$$V(t_2) = \frac{1}{4}\left(\frac{\beta}{1+\beta+\gamma}\right)^2\left((\gamma+2)^2\sigma_2^2 + \gamma^2\sigma_1^2 - 2\gamma(\gamma+2)\rho\sigma_1\sigma_2\right) \tag{18}$$

$$V(y_a) = \left(\frac{1}{1+\beta+\gamma}\right)^2 \left(\sigma_1^2 + \sigma_2^2 + 2\rho\sigma_1\sigma_2\right) \quad (19)$$

$$V(y_d) = \left(\frac{1+\gamma(1-\beta)}{1+\beta+\gamma}\right)^2 \left(\sigma_1^2 + \sigma_2^2 - 2\rho\sigma_1\sigma_2\right) \quad (20)$$

From relations (16) - (20) we can see the importance of the degree of correlation, ρ, between the shocks for determining the behaviour of the policy instruments, and hence the behaviour of the target variables themselves. In fact these results reaffirm the conclusions of the Optimal Currency Area literature. Inflation, and hence the application of monetary policy, will necessarily be more variable than in the single country case. This is because the shocks of a second country have to be taken into account; and also because the higher the degree of integration between those regional shocks (and hence the more suitable are the countries to form a monetary union) the more will the shocks be transmitted from one member economy to another.

Fiscal policy by contrast has to be more active because it too has to deal with the additional source of volatility from foreign shocks. But it will be less active the closer is the integration between those shocks, since regional (i.e. relative) stabilisation will be less important. Likewise aggregate output will be more volatile than in the single economy case; and the more so the stronger is the mutual reinforcing effects of similar shocks hitting the two member economies. That follows from the behaviour of the common monetary policy. But the differences in income levels will, naturally enough, show less variation if those shocks are more integrated, especially if fiscal policy becomes more active (as β rises).

c) Overall Performance Under This Regime

The characteristics described above are also reflected in the expected loss function (welfare indicator) of each country and for the Central bank. Considering first the Central bank, its expected loss function is:

$$\min_{\pi} L = \frac{1}{2}\left[(\pi)^2 + \gamma(y_a - k)^2\right]$$

$$E(L)=\frac{\gamma(1+\gamma)}{2}\left[\frac{1}{(1+\beta)^2}(k)^2+\frac{1}{4(1+\beta+\gamma)^2}\left(\sigma_1^2+\sigma_2^2+2\rho\sigma_1\sigma_2\right)\right]$$

While at the national level, considering that :

$$y_1 = y_a + y_d$$
$$y_2 = y_a - y_d$$

we have:

$$y_1=\frac{\beta}{1+\beta}k+\frac{1}{(1+\beta+\gamma)}e_1+\frac{\gamma(1-\beta)}{(1+\beta+\gamma)}\left(\frac{e_1-e_2}{2}\right)$$
$$y_2=\frac{\beta}{1+\beta}k+\frac{1}{(1+\beta+\gamma)}e_2+\frac{\gamma(1-\beta)}{(1+\beta+\gamma)}\left(\frac{e_2-e_1}{2}\right)$$

Evaluation with a generic loss function of like[3]:

$$LP_j=\frac{1}{2}\left[(\pi)^2+(t)^2+\lambda\left(y_j-k\right)^2\right] \tag{21}$$

we have that the expected value of the loss function is equal to:

$$E\left(LP_j\right)=\frac{1}{2}\left[\frac{\gamma^2+\beta^2+\lambda}{(1+\beta)^2}k^2+A\sigma_j^2+B\sigma_i^2+C\rho\sigma_j\sigma_i\right] \tag{22}$$

where

[3] In this general formulation λ may be equal to β, the governments' relative priority. Or it may be equal the relative priority of the electorates median voter. See Demertzis at al. (1999) for the importance of this distinction.

$$A=\left(\frac{1}{1+\beta+\gamma}\right)^2\left[\frac{\gamma^2}{4}+\frac{\beta^2(2+\gamma)^2}{4}+\frac{\lambda(2+\gamma+\gamma\beta)^2}{4}\right]$$

$$B=\left(\frac{1}{1+\beta+\gamma}\right)^2\left[\frac{\gamma^2}{4}+\frac{\beta^2\gamma^2}{4}-\frac{\lambda(\gamma-\gamma\beta)^2}{4}\right]$$

$$C=\left(\frac{1}{1+\beta+\gamma}\right)^2\left[\frac{2\gamma^2}{4}+\frac{2\beta^2\gamma(\gamma+2)}{4}+2\lambda\frac{2\gamma(1-\beta)+\gamma^2(1-\beta)^2}{4}\right]$$

Inspection of condition (22) shows that being in a monetary union has worsened the overall performance of each individual economy to the extent that each has to absorb the disturbance caused by the transmission of foreign shocks (σ_i^2 in (22)), as well as the disturbances caused by their own shocks[4]. That is also a standard result from optimal currency area literature: one has to share in the macroeconomic pain if one wants to share in the microeconomic gains. But the extent to which one has to share in that macroeconomic pain depends critically on the correlation between shocks, and also on the monetary policy responses to correlated shocks. In fact, the correlation coefficient plays a role only with an active monetary policy.

e) Sensitivity to Variations in the Priorities

The last step is to compute the sensitivity of the policy results in this regime as the preferences of the policy makers - as measured by their relative priorities for output stabilisation - vary. This is simply an exercise to see how the policies and stability of monetary union might vary as new policy makers (or governments) take responsibility for policy.

In practice we would probably be most interested in what happens if more liberal (less inflation adverse) governments appeared, and if more conservative (more inflation adverse) Central Bank policies were introduced. We can best evaluate the changes in the policies and their outcomes as priorities change by signing the corresponding partial derivatives with respect to β and γ. The results are collected together in Table 1. The first panel shows the effect on aggregate

[4] The first term in (22), representing the systematic part of the problem, is identical to the single economy case (Demertzis et al 1999). Therefore there is no change in the nonstochastic part of the problem due to monetary union.

(Europe wide) variables, where E denotes expected value and V its variance (or volatility). The second panel shows the effect on national output level and on the differences between them.

Table 1: Sensitivity Analysis

	β	γ		β	γ
$E\pi^*$	−	+	Ey_d	0	0
$V\pi^*$	−	+	Vy_d	−	−
Et_j	−	0	Ey_1	+	0
Vt_j	−		Vy_1	−	−
Ey_a	+	0	Ey_2	+	0
Vy_a	−	−	Vy_2	−	−

Finally, the expressions for y_1 and y_2 above, show that an increase in β would decrease the impact of asymmetric shock on national incomes, and hence on any differences between. This means more liberal governments would indeed undertake more regional stabilisation. This remark refers to the impact of a given level of country specific shock on the domestic economy ($e_1 - e_2$ for y_1 and $e_2 - e_1$ for y_2). On the other hand, a more conservative Central Bank (a smaller value of γ) would cause a given level of asymmetric shocks to have a larger impact on national incomes (if $\beta \leq 0$) and the differences between them - whatever fiscal policies try to do in mitigation. Hence a conservative Central bank will exagerate the impact of asymmetries in a monetary union if national governments are not very liberal; but liberal governments will reverse these effects.

4 - Regime 2: Non Cooperation with two centralised unions

We now switch to our second regime. Monetary union is still in place, but we now assume that both countries have a single centralised union - and that national wages will be set according to the objectives of those unions. This is again a symmetric regime: both countries have the same wage bargaining arrangement in which a single union set wages according to the conditions in their labour market.

a) Optimal Policies and Output Volatility

Because the structure of the game has not changed from the hierarchical structure used in the previous regime, the Central Bank and governments have the same reaction functions as before:

$$\pi = \frac{\gamma}{1+\gamma+\beta}\left[\frac{1}{2}(w_1 + w_2) + k - \frac{1}{2}(e_1 + e_2)\right] \tag{23}$$

$$t_j = -\frac{\beta}{1+\beta+\gamma}\left[w_j + k - e_j\right] + \frac{\beta}{1+\beta+\gamma}\left[\frac{\gamma}{2}(e_j - e_i)\right] \tag{24}$$

Moreover, each union still determines the wage rate at the beginning of each period. Each union aims for the full employment and also a certain level of real wage, as exemplified in the following objective function:

$$\min_w L_{uj} = \frac{1}{2}E\left[(w_j - \pi)^2 + \delta(y_j - k)^2\right] \tag{25}$$

Employment objectives like these translate into output stabilisation in our framework. So this regime is the first in which wages (or more generally interventions in the labour market) could become an additional policy instrument. Inserting the supply function equations and solving for the expected values of taxes and inflation we have the reaction function for the unions

$$w_j = \pi^e - \frac{\delta}{1+\delta}(t_j + k)^{5} \tag{26}$$

Next, substituting the three reaction functions (22) - (23) into (25) we obtain the equilibrium nominal wage

[5] This reaction function could be misleading, because it implies that a centralised union would always fix real wage lower than the one determined in a fragmented labour market. This is true only if we restrict the parameter δ to be greater than *0.* If we allow $\delta<0$, we can consider the case in which the unions try to achieve an increase in real wage, i.e. has a target nominal wage different from the expected inflation. Although not strictly correct (it violates the second order conditions for a minimum for the Trade Unions), this simplification does not change the basic implications of our results: that monetary union increases the power associated with a monopolistic union position. How this monopoly will be used is an open question. Varying δ, allows us to consider both the case where they try to increase the real wage extracted for the members, or to stabilise employment at home at expense of employment abroad

$$w_j = -\frac{\delta(1+\gamma)+\gamma(1+\delta)}{1+\delta+\beta}(k) \tag{27}$$

which gives the following equilibrium levels of inflation and taxation:

$$\pi* = \frac{\gamma}{1+\gamma+\beta}\left[\left(1-\frac{\delta(1+\gamma)+\gamma(1+\delta)}{1+\delta+\beta}\right)k-\frac{1}{2}(e_1+e_2)\right] \tag{28}$$

$$t_j* = -\frac{\beta}{1+\beta+\gamma}\left[\left(1-\frac{\delta(1+\gamma)+\gamma(1+\delta)}{1+\delta+\beta}\right)k-e_j\right]+\frac{\beta}{1+\beta+\gamma}\left[\frac{\gamma}{2}(e_j-e_i)\right] \tag{29}$$

From the expressions it is clear that the labour market characteristics do not affect the way in which policies react to shocks. This is because wages are set before any shock occurs. Wages, therefore, represent a structural characteristic of the economy and can be used to influence economic policy only in so far as economic policy generally seeks to reach structural objectives (in this case represented by the parameter *k*).[6]

As a result of all this, the variances of the policies will be the same as in regime 1. And the impact of asymmetric shocks will also be the same. Similarly the same supply shock variance and covariance elements of the objective functions values will continue to apply. But the systematic part of the policy outcomes are different to the decentralised wage bargaining case. If $\delta > 0$, which means the Trade Unions care about output stabilisation, it is easy to check that this regime will lead to lower inflation rates on average and smaller fiscal deficits on average. This is because, with an extra instrument coming into play, output will be better stabilised which means that the central bank can devote more effort to inflation control and the fiscal authorities to deficit stabilisation.

On the output side, there is again no systematic differences in national incomes. But substituting for w_j, t_j and π from (26), (27) and (28) in (2), we can write:

$$y^a = \left[\Omega(1-\Phi)+\Phi\right]k \qquad (30)$$

where

$$\Omega = \frac{\beta+\gamma}{1+\gamma+\beta}, \Phi = \frac{\delta(1+\gamma)+\gamma(1+\delta)}{1+\delta+\beta}$$

This allows us to deduce that aggregate income may be larger or smaller on average than the decentralised bargaining, depending on the parameter values. For example, if γ is small and β fairly large (β>0.62), y_a will fall on average. That is the case of a conservative Central bank but liberal governments. Conversely, if β and γ are both small (both the policy authorities are conservative), then y_a will rise on average. Finally if δ is large, meaning that the unions are strongly committed to the stabilisation of their own economies rather than the preservation of real wages, then y_a will again fall.

b) Sensitivity to Variations in Priorities

We can compute the sensitivity of these averages outcomes to variations in β, γ and δ. The results are collected together in table 2 below.

[6] Although this modelling strategy restricts the interpretation of our results, we believe that the interrelations between policies can be easily extended in an setting in which the timing of events is not so rigidly defined

Table 2: Sensitivity Analysis

	β	γ	δ
$E\pi^*$	+	− (?)a	$+/-$
Et_j	$+/-$ d	+ b	−
Ey_a	− c	− c	$+/-$
Ey_j	−	$+/-$	$+/-$
Ew_j	+	+	$+/-$

Notes
a= positive if β large or δ small (see text)
b= assuming $\beta \geq \gamma$
c= if $\gamma > (1+\beta)/(1+2\beta)$
d= negative if $\gamma > (1+\beta)/(1+2\delta)$
e= positive if $\delta < \gamma(1+2\beta)$
For the sensitivity of the volatility of policies and outcomes, see table 1

From (26) we can see that more liberal governments will generate higher nominal wages; while, unsurprisingly, both a more conservative Central bank and more socially minded Unions will lead to smaller wage rises. As far as inflation is concerned, more liberal governments will bring higher inflation, unless δ is very strong and leads the Unions to exert a strong moderating influence on wages "in the society interest". On the other hand a more conservative Central Bank in this regime would rise inflation on average - counter to Rogoff's (1985) result - if δ is fairly large. If $\delta > (1+\beta)(1+\beta-\gamma)/\left[2\gamma(1+2(1+\beta))\right]$ in fact. Thus, socially minded unions can overturn Rogoff's famous result. But conversely, self-interested unions and liberal governments will produce the opposite effect, confirming Rogoff's conclusions.

These results are very similar to the one analysed, in a different set up, by Demertzis at al (1999). They come from the conflicts between wage policies and monetary policies (in this case), and from the conflict between monetary and fiscal policy in Demertzis et al, when preferences diverge strongly. If they do diverge, then a tougher monetary policy will trigger a response in the form of higher wages and higher deficits designed to counter the constrains which that monetary policy as imposed on output stabilisation.

As far as fiscal policy is concerned, what should be noted is that $\partial E(t_j)/\partial\delta < 0$ holds for all values of the parameters. This means that a wage policy can always be used to substitute for fiscal policy in this regime, although not necessarily with the same degree of efficiency. This is our basis for arguing that a fiscally constrained government have an incentive to use interventions in the labour markets in order to supplement their fiscal policies when it comes to employment and output stabilisation. Therefore, they may well favour moving to a regime of centralised bargaining and less market flexibility, rather than moving the other way.

Finally, aggregate European income y_a will be affected as well: $\partial E(y_a)/\partial\beta$ is negative if $\gamma > (1+\beta)/(1+2\delta)$, and $\partial E(y_a)/\partial\gamma$ is negative under the same conditions. Thus liberal governments will cause aggregate income to fall if the Bank is also liberal and the unions are socially minded relative to the government. Similarly an increasingly conservative Central Bank, confronted with a liberal government and a self interested central bank, will cause y_a to fall. Moreover y_a will fall the more self-interested the unions are, that is if $\delta < \gamma(1+2\beta)$, a rather easy condition to satisfy

c) Overall Performance Under This Regime

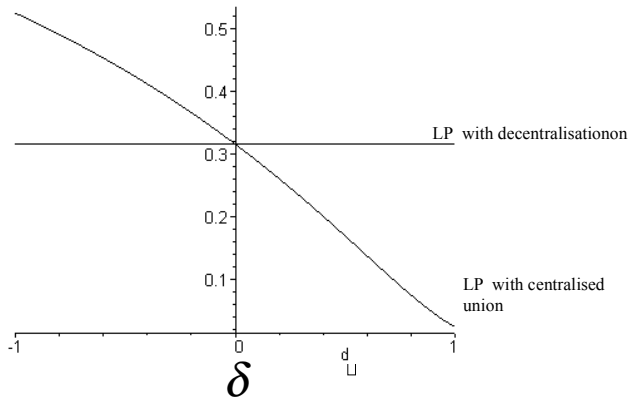
The objective function values are too complicated to analyse directly in this case. But we can evaluate them numerically. The welfare of the median voter can be obtained by substituting the three equilibrium expressions (26)-(28) into the loss function LP_j. This will therefore becomes a function only of the parameters of the model

$$LP_j = LP_j(\lambda, \beta, \gamma, \delta, \kappa)$$

Numerical simulations then allow us to visualise how different parameter values affect the welfare of a representative individual, in comparison to the case of perfect decentralisation analysed before. Again we can abstract from the effects of shocks because, as noted above, the stochastic elements and shocks variances

are the same in both regimes. The typical outcome of that comparison, as wage bargaining behaviour varies from the self-interested to the most sociallybeneficial, is given below:

Figure 1: The Welfare Effect of Having Centralised Trade Union



$$LP_j(\lambda = 1, \beta = 1, \gamma = 0.5, \kappa = 1)$$

It is clear from this that centralisation produces a benefit, from welfare point of view, only if it uses its extra instrument to achieve aggregate output objectives. Otherwise, as expressed by Calmfors and Driffill, its power will collide with the objectives of the economic policy maker, making everybody worse off (this is our $\delta<0$ case)

5 - Regime 3: Non Cooperation with Two Different Labour Markets - a parable of flexible vs. inflexible labour markets

In this regime we analyse the effect of a different kind of asymmetry. The two countries have now two different wage bargaining structures. In Country 1, a total decentralisation of bargaining produces wages equal to expected inflation. This is the economy with flexible labour market. In Country 2, total centralisation in wage setting makes wages a policy instrument in the hands of the union and wages will be set according to the reaction function (25). This is the economy with more rigid markets.

While in the single economy case studied by Calmfors and Driffill (1988), the total centralisation and total decentralisation of wage bargaining produce the same results, in a monetary union the differences are pronounced and play an important role in the way an economy reacts to economic policy.

a) FISCAL POLICY OFF

We will develop the argument gradually. First we switch fiscal policy (t = 0) off to see the relationship between monetary policies and asymmetries. In the light of (13), the best way to switch the policy off is to set β=0. With β=0 in both for the two countries, the monetary policy reaction function becomes:

$$\pi = \frac{\gamma}{1+\gamma+\beta}\left[\frac{1}{2}(w_1 + w_2) + k - \frac{1}{2}(e_1 + e_2)\right] \tag{31}$$

Substituting the wage formation rules (10) and (26) for country one and two respectively, into (31) we obtain:

$$\pi = \frac{\gamma}{1+\gamma}\left[\frac{1}{2}\left(\pi^e + \pi^e - \frac{\delta}{1+\delta}k\right) + k - \frac{1}{2}(e_1 + e_2)\right]$$

and simplifying

$$\pi = \frac{\gamma}{1+\gamma}\pi^e - \frac{\gamma(2+\delta)}{(1+\gamma)(2+2\delta)}k - \frac{\gamma}{1+\gamma}\frac{(e_1 + e_2)}{2} \tag{32}$$

Assuming rational expectations and white noise properties for the shocks we have:

$$E\pi = \frac{\gamma}{1+\gamma}\pi^e + \frac{\gamma(2+\delta)}{(1+\gamma)(2+2\delta)}k \text{, or}$$

$$E\pi = \frac{\gamma(2+\delta)}{2(1+\delta)}k \tag{33}$$

Substituting (33) into (32) we obtain the level of inflation as determined by the ECB:

$$\pi = \frac{\gamma(2+\delta)}{(2+2\delta)}k - \frac{\gamma}{1+\gamma}\frac{(e_1+e_2)}{2} \tag{34}$$

From (34) one source of interaction between wage setting and ECB policies is made clear. If wage setters country 2 care about employment (δ is large) this reduces the pressure on the ECB to provide expansionary monetary policy to achieve the output objective. On the other hand this interdependence between Trade Union behaviour and monetary policy is not evenly distributed, given that centralised wage bargain is present only in half the Monetary Union. We look at that next.

Given (34) and the wage equations (10) and (27), the aggregate and national aggregate supply functions will be equal to:

$$y^a = \frac{\delta}{2(1+\delta)}k + \frac{1}{1+\gamma}\frac{(e_1+e_2)}{2} \tag{35}$$

$$y_d = \frac{\delta}{1+\delta}k + \frac{1}{2}(e_1 - e_2), \tag{36}$$

implying

$$y_1 = \frac{2+\gamma}{2+2\gamma}e_1 - \frac{\gamma}{2+2\gamma}e_2 \tag{37}$$

and

$$y_2 = \frac{\delta}{1+\delta}k + \frac{2+\gamma}{2+2\gamma}e_1 - \frac{\gamma}{2+2\gamma}e_2 \tag{38}$$

In this case aggregate output is affected by wage bargaining as long as the union will accept that a reduction in real wages is a way to boost employment in its own country. But if they do that, both aggregate output and the differences between the national outputs will be systematically increased - that is before any shocks hit (country specific or otherwise). In other words, due to the asymmetric market structures, a common monetary policy has created a permanent asymmetric shock throughout the union. Country 2 benefits from a systematic output expansion, but country 1 does not.

b) MONETARY POLICY OFF

Secondly we switch off monetary policy by setting γ=0, to see the interactions between fiscal policy and the labour market. In this scenario the two countries effectively become independent from each other, because the earlier interdependence had, in our model, been created by a common monetary policy directed at stabilising average output. But with $\gamma = 0$, the two fiscal policies will become:

$$t_1 = -\frac{\beta}{1+\beta}(k - e_1) \tag{39}$$

in country one (the one with flexible labour market). And

$$t_2 = -\frac{\beta}{1+\beta+\delta}k + \frac{\beta}{1+\beta}e_2 \tag{40}$$

in country two (the one with a less flexible labour market). Evidently the deficit will be larger in the country with the more flexible labour market , even if fiscal policies do not have to react to foreign shocks or the spillovers from foreign shocks. But at the same time, output will be systematically lower in the country with smaller deficits, and higher in the country with larger deficits:

$$y_1 = \frac{\beta}{1+\beta}k + \frac{1}{1+\beta}e_1$$

$$y_2 = \frac{\beta+\delta}{1+\beta+\delta}k + \frac{1}{1+\beta}e_2$$

Again there are systematic differences, even before the possibility of country specific shocks is considered. But aggregate output has risen; and since there is no monetary policy $(\gamma = 0)$, there is no inflation or expectation of inflation $(\pi = \pi^e = 0)$.

c) ALL THE POLICIES ACTIVE

With all the policies active the algebra becomes a bit more messy. In order to perform a proper comparison between all regimes, it is necessary to resort to numerical simulations.

The reaction functions for the three policy authorities in this regime are as follows:

$$\pi = \frac{\gamma}{1+\gamma+\beta}\left[\frac{1}{2}(w_1 + w_2) + k\right] \tag{41}$$

$$t_1 = -\frac{\beta}{1+\beta+\gamma}\left[w_1 + k - e_1\right] + \frac{\beta}{1+\beta+\gamma}\left[\gamma\frac{(w_1 - w_2)}{2}\right] \tag{42}$$

$$t_2 = -\frac{\beta}{1+\beta+\gamma}\left[w_2 + k - e_2\right] - \frac{\beta}{1+\beta+\gamma}\left[\gamma\frac{(w_1 - w_2)}{2}\right] \tag{43}$$

in which we have considered the shocks to be equal to zero, for simplicity. Substituting (40) - (42) into the wage rule in the two market, separately[7]:

$$w_1 = \pi^e$$

$$w_2 = \pi^e - \frac{\delta}{1+\delta}(t_1 + k)$$

and solving the resulting equations simultaneously, we have:

$$w_1 = -\frac{\Omega(\Theta + \Theta\Psi - 2)}{2(1-\Omega-\Theta) + \Theta\Omega\Psi}k \tag{44}$$

$$w_1 = -\frac{2(\Theta - \Theta\Psi - \Omega) + \Omega\Theta(\Psi - 1)}{2(1-\Omega-\Theta) + \Theta\Omega\Psi}k \tag{45}$$

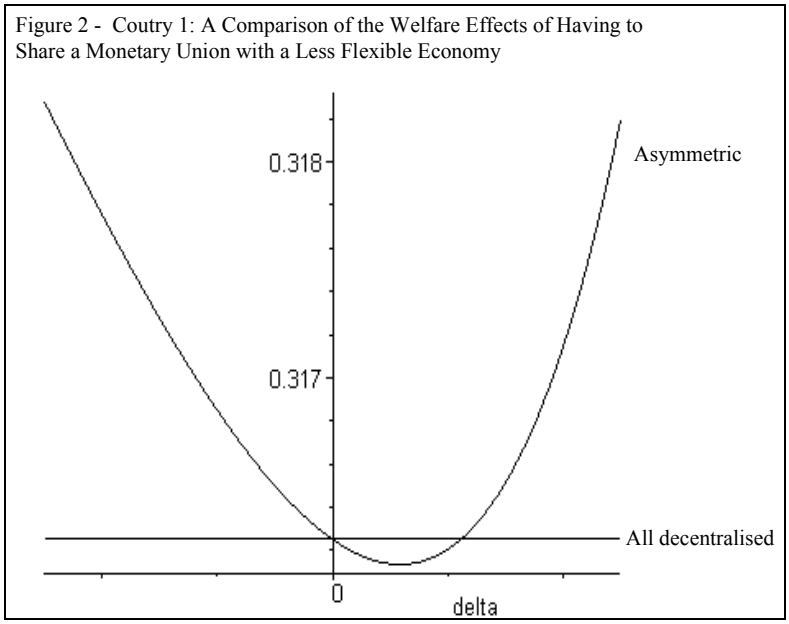
$$\Omega = \frac{\gamma}{1+\gamma+\beta}, \Psi = \frac{\beta}{1+\gamma+\beta}, \Theta = \frac{\delta}{1+\delta}$$

Then substituting (43) and (44) into the reaction functions of the policy makers and solving simultaneously we obtain the equilibrium level of inflation, taxation and output. But looking at the complexity of expressions (43) - (44), it is clear that none

of those results would give us any clear indication of what is going on. We therefore prefer to analyse the relationships numerically, looking at the effect on public welfare of having asymmetric structures in the labour market, and comparing these results to the regimes analysed previously.

As before, we analyse the effect of asymmetries, given a certain set of typical parameters: we choose $\lambda = 1, \beta = 1, \gamma = 0.5, k = 1$ and allow δ to vary to show the effect (on the outcomes in both countries) of different union behaviour in one of the two countries. In the following figures we present the welfare implications for Country 1, with flexible markets, of having to share a monetary union with a country which has a centralised labour market and markets less flexible than its own.

Figure 2 - Coutry 1: A Comparison of the Welfare Effects of Having to Share a Monetary Union with a Less Flexible Economy



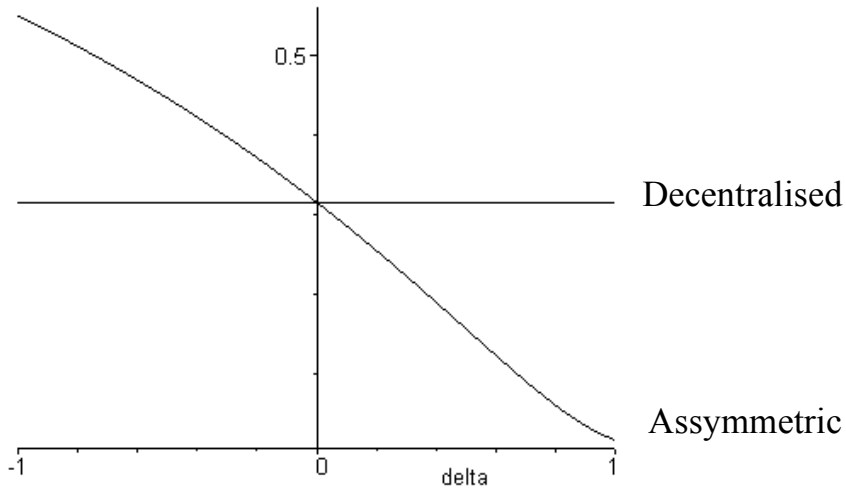
What is striking in figure 2 is that for a country with decentralised labour market, it is almost always more costly to have to share a monetary union with a country that has more centralised wage bargaining structure, independently of the preferences of the Trade Unions in the centralised economy. This is because the common monetary policy reacts to this asymmetry by shifting the cost of adjustment onto the country with more flexible markets and without a centralised wage bargaining structure. Thus only when the wage setters in the centralised economy effectively choose to behave like the wage setters in the decentralised one, by trying

[7] Recall that the wage setters go first in our hierarchical game. This step solves out the wage setters reactions/decisions conditional on the leaders decision rule.

passively to preserve the value of their real wage (i.e. when $\delta \to 0$), would the more flexible economy become even indifferent to joining a monetary union composed of countries with less flexible markets than itself. In all other circumstances its welfare would be higher staying outside the monetary union.

What we have here is a new version of the "Graucho Marx theorem". The traditional analysis of inflation and credibility shows that a country would only want to join a monetary union consisting of countries with greater monetary credibility than itself; and therefore those already in the union would only be prepared to accept new members who had at least as much monetary policy credibility as they had (Hughes Hallett, 1998). But. in this case figure 2 shows that, when there are asymmetries in market structure, a country with flexible markets would only want to join a monetary union that consists of countries whose markets are at least as flexible as its own. And we have the converse result too. If we plot the corresponding welfare/loss function values for the more centralised economy (country 2), we get figure 3 below

Figure 3 - Country 2 (centralised) : A comparison of the welfareimplications of having to share a MUwith a more flexible economy than ones own

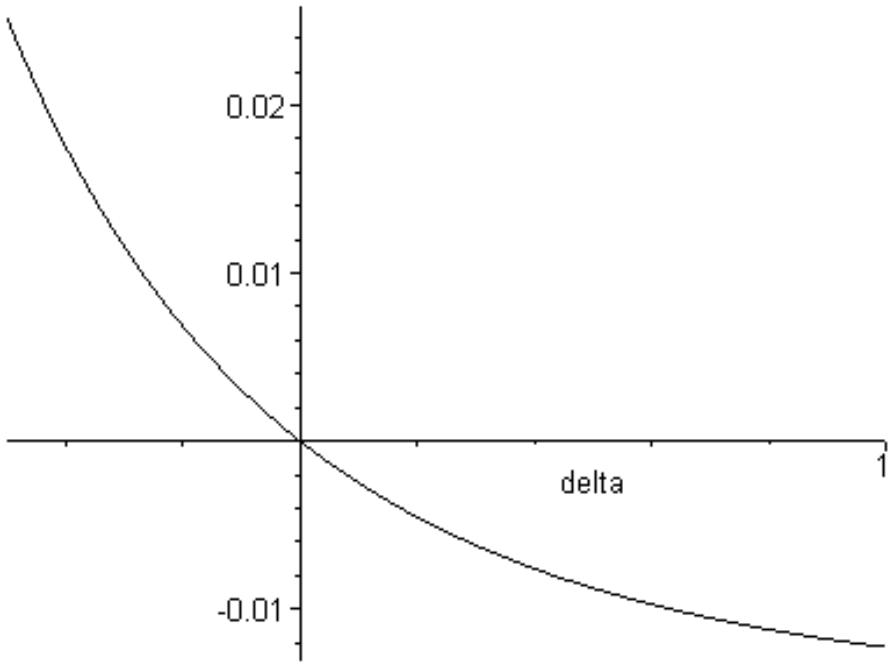


This figure shows, equally plainly, that country 2 would be indifferent to having the more flexible country join the union only if the wage bargainers in country 2 did not care about output and employment objectives. If they do care about those targets $(\delta \to 1)$, then they would actually like country 1 to join. In other words, a country

with less flexible markets would only be prepared to accept new members with more flexibility than themselves, not those with less flexibility.

This result has further implications. If a monetary union is formed nonetheless, a joining country with decentralised or flexible markets has no incentive to retain those characteristics once it is a member. If we compare country 1's expected losses if it is centralised as well (regime 2) with its expected losses if it remains decentralised in an asymmetric union (regime 3), we find that its welfare improves if it moves to centralised, less flexible markets as well and focuses its wage bargaining on output stabilisation to any extent. This is shown in figure 4 below (a similar story also holds for country 2, as can be inferred from figure 1)

Figure 4. The difference between the value of the loss function for country 2 when sharing an asymmetric union or being in an union with other cetralised labour markets. (negative is a gain)



Consequently

- Asymmetries in structure have important implications for a monetary union. Countries with more flexible labour markets will face costs in joining a union with less flexible markets.
- Countries with less flexible markets face a positive incentive to form unions with, or accept new members from those who have more flexible markets than themselves. This is because they can shift some of the cost of macroeconomic adjustment onto the countries with more flexible markets
- Once in the union, there is no incentive to make the labour market more flexible. In fact the incentive to make them less flexible, up to the level of the least flexible in the union - because this allows national policy makers to bring in labour market policies an extra policy instrument to replace that lost to the common monetary policy.

If there is no incentive to decentralise, it is doubtful that dynamical analysis would show anything different - unless it is a convergence toward centralisation. This may be an explanation for the reluctance of some countries to liberalise their markets despite the competitive pressure generated by a common currency regime.

6 - Conclusions

This paper has established four things about asymmetries in the operation of a monetary union

- Asymmetries are important, both in structures and in shocks. And they are also important when they reflect differences in preferences, or relative priorities, between the different sets of policy makers who operate their own policy instruments.
- Using our simple framework, a study of asymmetries in shocks neatly reaffirms the main conclusions of the optimal currency area literature. But it also shows that any asymmetries in shocks will typically interact with the asymmetries in preferences, to make the impact of both together bigger than the sum of either

alone. One example was the tendency of a conservative Central bank to exagerate the impact of asymmetric shocks on individual economies.

- Asymmetric shocks have the predicted effects on national differences, but they also help reduce the extra volatility in the main aggregates. Whether this proves to be a source of tension between the "centre" and member state, is an open question.
- But the main problem caused by asymmetries stems from differences in market structures and institutions. We found that countries with flexible markets will not wish to join an union of economies with markets less flexible than their own, because that allows the less flexible economies to shift their adjustment burdens onto the more flexible. But, by the same token, the less flexible will prefer only the more flexible to join. And, what is more important, there is little incentive to decentralise and make market more flexible once countries have joined. Indeed, if anything the incentive is to centralise because, to the extent that wage setters already do or can be persuaded to share targets with their governments, employment conditions can be used as an extra policy instrument to improve national welfare.

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