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COMMON MONETARY POLICY WITH ASYMMETRIC SHOCKS

Daniel Gros
Carsten Hefeker*

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CESifo
Center for Economic Studies & Ifo Institute for Economic Research
Poschingerstr. 5, 81679 Munich, Germany
Phone: +49 (89) 9224-1410 - Fax: +49 (89) 9224-1409
e-mail: office@CESifo.de
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Abstract

What policy objective should a common central bank in a heterogeneous monetary union pursue? Should it base its decisions on the EU-wide average of inflation and growth or should it instead focus on (appropriately weighted) national welfare losses based on national rates of inflation and growth? We find that a central bank that minimises the sum of national welfare losses reacts less to common shocks. This can lead to higher average union-wide expected welfare if the variability of common shocks is large relative to the inflation bias and if idiosyncratic demand shocks in the non-tradables sector are not too high.

JEL Classification: E52, E61, F33.

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Daniel Gros
Centre for European Policy Studies
Place du Congrès 1
B-1000 Brussels
Belgium

Carsten Hefeker
HWWA-Institute of International Economics
Neuer Jungfernstieg 21
20347 Hamburg
Germany
Carsten.Hefeker@hwwa.de

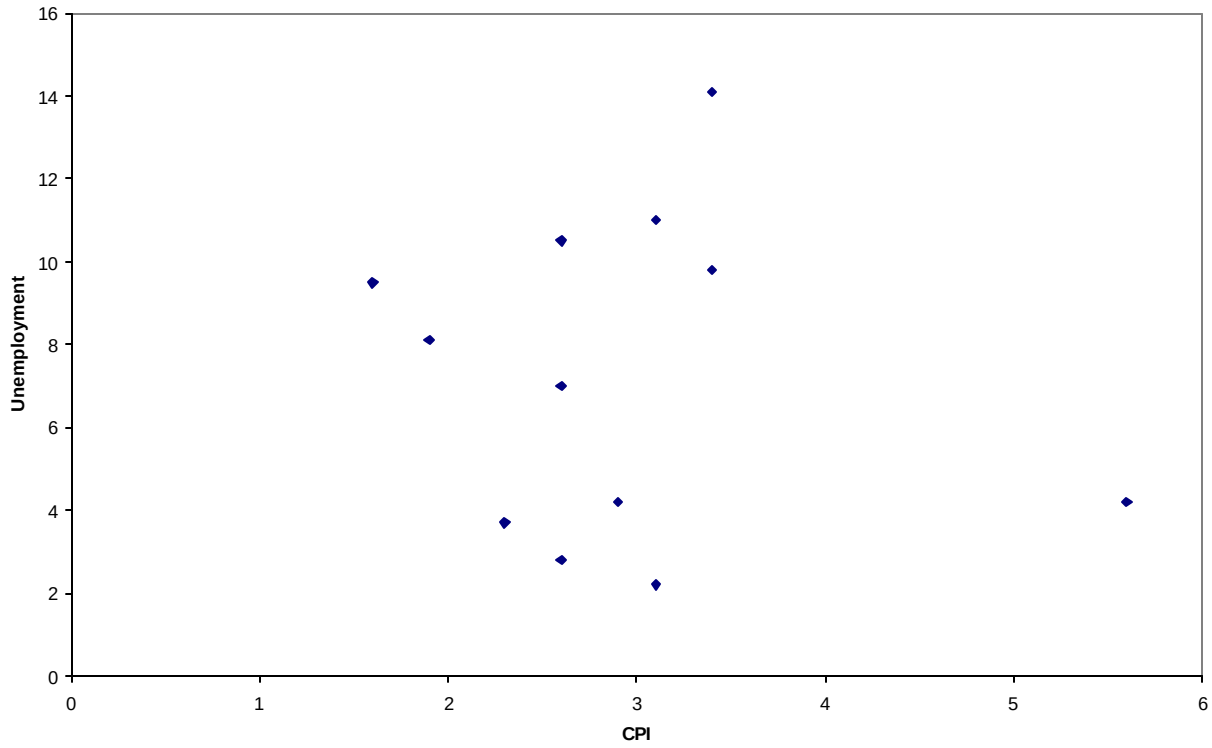
1. Introduction

The common monetary area in Europe reveals significant differences among its member states in inflation and growth, as Figure 1 documents. Should the EU's monetary authority, the European Central Bank (ECB), react to these divergences? The standard answer is no and the ECB is held responsible only for the average performance of the entire euro zone. This, at least, is the official mandate and position of the ECB. However, as in some countries the performance starts to diverge considerably from the average this answer is not satisfactory. It is not satisfactory because it does not take into account that the EU was created to serve the interests of its member states, which remain the basic political units in Europe. This distinguishes the euro area from nation states, even very federally organised ones, in which the main political unit coincides with the monetary union. Countries whose performance diverges a lot from the average are not served appropriately by a one size fits all policy if the welfare loss is a convex function of the output gap and inflation, as is usually assumed. The average welfare loss of member states increases as the standard deviations of output and inflation increase.

But in a monetary union it is impossible to have a nationally differentiated monetary policy. One is thus tempted to conclude that the ECB might bemoan national divergences within the euro area, but that there is nothing it could or should do about them. This conclusion is, however, rash if one admits that monetary policy, at least in the short run, can have output effects. Referring to the current problems the question is thus whether the inflation rate of, say, Ireland should be considered just as one element in the calculation of the average area-wide inflation rate or whether one should consider the high welfare losses it causes in Ireland separately. The situation in that particular country would presumably affect decisions by the ECB much more under the second approach.

What should the ECB do? Should it base its decisions on the area-wide averages of inflation and growth, or should it attempt to minimise the (weighted) average of national welfare losses resulting from national inflation and growth rates? We aim to provide a first step towards an answer by showing to what extend these two choices would lead to different policies even in a world where the preferences regarding inflation and unemployment are identical, but where there are differences in the monetary transition mechanism.

Figure 1: CPI-Inflation and Unemployment for EU-12



In order to focus on this issue, we consider the ECB as a homogeneous body where all members of the governing body have the same objective. This is in contrast to recent work that focussed on the impact nationally oriented policy makers within the ECB board have on the common monetary policy in the Euro-area (Aksoy, de Grauwe and Dewachter 2001; Berger and de Haan 2001). However, we consider two different objective functions namely the minimisation of a simple euro-area wide objective function and the minimisation of a weighted sum of national welfare losses. Similar approaches have been chosen before by De Grauwe (2000) and Gros and Hefeker (2002). We extend on the previous work and are able to provide a closed solution instead of using simulation analysis for our welfare analysis. Moreover, we explicitly consider the cause of divergent rates of inflation within the member countries, even if the rate of inflation is the same throughout the area for traded goods. We introduce a non-tradable goods producing sector which implies that higher growth rates lead to higher rates of

inflation. This is the short-run equivalent of the so-called Balassa-Samuelson effect (for empirical evidence see De Grauwe and Skudelny 2000; MacDonald and Ricci 2001).[1]

The remainder is organised as follows: The next section presents the model used for the analysis. We use a standard Barro-Gordon model because we want to draw attention to a general point that arises in a standard model, namely that there is a difference between area-wide welfare based on the (weighted) area-wide averages of national performances and the average area-wide welfare based on (also weighted) national welfare, which arises in the standard approach but has been neglected so far.[2] Section 3 calculates the policy resulting under both choices (in the form of reaction functions), while section 4 draws welfare conclusions. Section 5 concludes.

2. The National Economy

Consider the following generalised model. We consider an economy that produces two composite goods, a non-tradable good (indexed N) and a tradable good (indexed T). In both sectors production is with a Cobb-Douglas technology (where the capital stock is normalised to one).[3]

Then, output in the non-tradables sector is

$$Y_i^N = \left(\frac{P_i^N}{W_i}\right)^{\alpha_i} E_i$$

so that output is declining in real wages, where W is the economy-wide wage in country. E_i is a country and sector specific supply shock. Likewise, output in the tradables sector is

$$Y_i^T = \left(\frac{P^T}{W_i}\right)^{\alpha_i} \Xi$$

where Ξ is a supply shock to the tradables sector that affects all economies in the monetary union in the same way. Arbitrage ensures that prices for traded goods are equalised across the union.

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[1] This is a standard phenomenon: as overall demand increases the demand for non-tradable goods increases as well. But given that supply of non-tradables is less elastic (than that of tradables) their relative price has to increase.

[2] The general principle that taking country specific effects into account may be welfare increasing will survive in more elaborate set ups as well.

[3] For a derivation such of a model, see Adrian and Gros (1999).

Total output in economy i is a weighted product of output in the two sectors:

$$Y_i = \left(Y_i^T\right)^{(1-\beta_i)} \cdot \left(Y_i^N\right)^{\beta_i}.$$

The price level in the economy is also a weighted product of the price levels in the two sectors

$$P_i = \left(P^T\right)^{(1-\beta_i)} \cdot \left(P_i^N\right)^{\beta_i},$$

where β_i is the country specific share of non-tradables in the economy's production, i.e. the size of the non-tradables sector.

Finally, the market clearing condition in the non-tradables sector requires that the value of total output in the non-tradables sector equal the demand for non-tradabels in country i, a function of total output (or income):

$$P_i^N \cdot Y_i^N = \beta_i \cdot P_i \cdot Y_i \cdot \Phi_i$$

where Φ_i is a sector and country specific demand shock. It captures the influence of higher income growth in some of the member states. We have used the same weight β_i in both production and demand for non-tradables to ensure that in the absence of shocks the equilibrium implies a relative price of tradables to non-tradables of one. With Cobb-Douglas preferences the demand for non-tradables is a constant.

We assume that labour is mobile between sectors so that wages in the two sectors are equal. They are set at the beginning of the period and fixed for the rest of the period. Unions wish to stabilise current employment, so they will set wages equal to the expected price change

$$W_{i,t+1} = P_{i,t+1}^e - P_{i,t}.$$

Log-linearising, and transforming into rates of changes, the above equations and suppressing time subscripts, we can rewrite the system as (with lower case letters denoting logarithms)

$$y_i^N = \alpha_i\left(p_i^N - w_i\right) + \varepsilon_i \tag{1}$$

$$y_i^T = \alpha_i\left(p^T - w_i\right) + \xi \tag{2}$$

$$y_i = \left(1-\beta_i\right)y_i^T + \beta_i y_i^N \tag{3}$$

$$p_i \equiv \pi_i = (1-\beta_i)p^T + \beta_i p_i^N \tag{4}$$

$$p_i^N + y_i^N = p_i + y_i + \phi_i \tag{5}$$

$$w_i = \ln p_i^e - \ln p_i \equiv \pi_i^e \tag{6}$$

where we have set, without loss of generality, the constant $\ln \beta_i = 0$. All shocks have an expected value of zero and a constant and equal variance of σ_ξ^2, σ_ε^2 and σ_ϕ^2. The covariance between any two of them is assumed to be zero.

It is straightforward to solve this system. First use (1) and (2) in (5) and the result in (4) to get

$$\pi_i = p^T + x_i + z_i. \tag{7}$$

where $x_i = \frac{\beta_i}{1+\alpha_i}(\xi - \varepsilon_i)$ measures the relative importance of the shock to the tradables sector weighted by the size of the non-tradables sector. $z_i = \frac{1}{1-\beta_i} \cdot \frac{\beta_i}{1+\alpha_i} \cdot \phi_i$ measures the demand shock, again weighted with the relative size of that sector. In addition, the effectiveness of monetary policy α_i plays a role because it determines how much of an active monetary policy is needed to address shocks.

Total output in the economy is obtained by using (1), (2) and (7) in (3)

$$y_i = \alpha_i(p^T - w) + \alpha_i z_i + \xi - x_i. \tag{8}$$

As a basis for the evaluation of the alternative policy regimes introduce social welfare functions for each country. The national preferences are formulated as a loss function $\Lambda_i = E_{t-1}\left[\sum_{t=1}^{\infty} \delta^{t-1} L_{i,t}\right]$ where $L_{i,t}$ is the per period loss function of the monetary authority, and δ is the common discount factor. Because all periods are ex-ante identical we drop the time index. The period loss function is specified as

$$L_i = c\left[y_i - k_i\right]^2 + \pi_i^2, \tag{9}$$

where c is the relative weight country i places on employment in comparison to inflation π. k_i measures the output target in country i. If output is below the target output, this is usually due to distortions in the labour market or distortive taxation (see Barro and Gordon 1983). Taxation distorts supply of and demand for labour services, depending on what taxes are charged. Also, strong labour unions may use their power to push wages above the market clearing level. If labour unions are characterised by a separation into insiders and outsiders, the former will set wages too high for full employment. Normalising (the log of) natural output to zero, $k_i > 0$ measures the size of this distortion.

Notice that equation (9) is meant to apply to national governments, as well as to the common central bank. It is also used as the basis for the welfare comparison below. We therefore abstract from any problems of delegation and differences in preferences that has been the focus of much of the literature on central bank policy.

3. Monetary Policy

We now proceed to calculate the optimal monetary policy under two different assumptions about the objective of the ECB. It could either minimise the (weighted) average of national losses, or alternatively minimise the loss function calculated at the euro area level, using the (weighted) averages of national inflation rates and output gaps as input. The first case could represent the case where national representatives determine monetary policy. Assuming that they only care for their national developments, each of them would look at national welfare losses. Simply summing up these objective functions would yield such a policy, where it has been assumed that the weight of any single country can differ according to its economic importance. In addition, this would correspond to a weighted welfare function a la Bentham. The second case would be the case where the ECB board adopts a truly European perspective by looking only at EMU wide averages. This, in contrast to the first approach is what the ECB is expected to do according to its statutes.

3.1. Minimising national welfare losses

The union's monetary authority maximises the weighted average of national utilities (indexed N). This leads to the following programme:

$$\text{Minimise } L^{N}_{ECB} = \sum_i \mu_i \left[c(y_i - k_i)^2 + \pi_i^2 \right], \tag{10}$$

where the relative weight of country i is μ_i, with $\sum_i \mu_i = 1$. Notice that the ECB's instrument p^T is not, as usually assumed, the rate of inflation but the rate of inflation (price change) in the tradables sector because the ECB cannot directly address the different price levels in the non-tradables sector of member countries. The common area wide rate of inflation in tradable prices is equivalent to the weighted average of overall CPI. Inflation will differ across countries only due to unequal demand (or productivity) developments in the NTG sector, which we assume to cancel out on average.

This is ensured by the fact that all country specific shocks cancel in the European aggregate, i.e. $\sum_i \mu_i x_i = \bar{x} = 0$ and $\sum_i \mu_i z_i = \bar{z} = 0$, where a bar over a variable denotes its weighted average. By construction, any common component of asymmetric shocks is contained in the common shock.

Using equations (7) and (8) in (10) the first order condition is

$$\frac{\partial L^{N}_{ECB}}{\partial p^T} = \sum_i \mu_i \left[c\alpha_i \left(\alpha_i \left(p^T - \pi^e \right) + \alpha_i z_i + \xi - x_i - k_i \right) + \left(p^T + x_i + z_i \right) \right] = 0$$

leading to expectations about inflation that are equal across all countries as follows from (7) since all shocks have an expected value of zero. Thus $\pi_i^e = \pi^e = c\sum_i \mu_i \alpha_i k_i$. Using this in the above equation and collecting terms, we have the monetary policy of the ECB as

$$p^T = c\sum_i \mu_i \alpha_i k_i - \frac{1}{1 + c\sum_i \mu_i \alpha_i^2} \left(c\bar{\alpha}\xi + c\sum_i \mu_i \alpha_i^2 z_i - c\sum_i \mu_i \alpha_i x_i \right). \tag{11}$$

3.2. Minimising average welfare losses

Alternatively the ECB might base its decision on an area wide utility function that uses the averages of national output and inflation (indexed A). Its problem then becomes

$$\text{Minimise } L^{A}_{ECB} = \left[\sum_i \mu_i (y_i - k_i)\right]^2 + \left[\sum_i \mu_i \pi_i\right]^2. \tag{12}$$

Using weighted averages of variables in this expression and equations (7) and (8) in (12), the first order condition is

$$\frac{\partial L^{A}_{ECB}}{\partial p^T} = c\bar{\alpha}\left[\bar{\alpha}\left(p^T - \pi^e\right) + \xi + \sum_i \mu_i \alpha_i z_i - \bar{k}\right] + p^T = 0.$$

Rational expectations in the private sector imply $\pi^e_i = \pi^e = c\bar{\alpha}\bar{k}$. Using this in the above equation and collecting terms, we have the monetary policy of the ECB as

$$p^T = c\bar{\alpha}\bar{k} - \frac{c\bar{\alpha}}{1 + c\bar{\alpha}^2}\left(\xi + \sum_i \mu_i \alpha_i z_i\right) \tag{13}$$

3.3. Comparing rates of inflation

To compare the policy choices of the ECB board under the two alternative regimes, we first have to derive the rates of inflation from the price increases in the tradables sector. From (7) and (11) we can calculate the union wide rate of inflation as $\pi^N = \sum_i \mu_i \pi^N_i = \sum_i \mu_i p^T$, i.e. it has the same value as (11) if we take into account that average idiosyncratic shocks are zero. By the same logic the rate of inflation in the "average regime" π^A is as in (13).

For a direct comparison of the two rates of inflation, it is convenient to rewrite expression (11) with the help of the following definitions: Notice that $\sum_i \mu_i \alpha_i m_i = \theta_{\alpha,m} + \bar{\alpha}\bar{m}$ where $m_i = k_i, x_i, z_i$ and where $\theta_{m,\alpha}$ is the correlation between variables m and α. Define $\theta_{m,\alpha} = \sum_i \mu_i \left(\alpha_i - \bar{\alpha}\right)\left(m_i - \bar{m}\right)$ and

multiply it out to confirm the result. Further, we define the dispersion of the α_i's as $\theta_\alpha^2 = \sum_i \mu_i \left(\alpha_i - \bar{\alpha}\right)^2$ and have $\sum_i \mu_i \alpha_i^2 = \theta_\alpha^2 + \bar{\alpha}^2$.

Using these result we can rewrite (11) as

$$\pi^N = c\left(\theta_{\alpha,k} + \overline{\alpha k}\right) - \frac{1}{1 + c\left(\theta_\alpha^2 + \bar{\alpha}^2\right)}\left(c\bar{\alpha}\xi + c\sum_i \mu_i \alpha_i^2 z_i - c\left(\theta_{\alpha,x} + \overline{\alpha x}\right)\right)$$

Since $\bar{x} = 0$, the last term on the RHS of this expression vanishes. The last but one term on the RHS also vanishes if we assume that the correlation between the shocks x_i and the transmission of monetary policy α_i is zero. In fact, given that the shocks have expected value of zero, there is little reason to expect that there is a any relation between economic shocks and the transmission of monetary policy. We therefore set $\theta_{\alpha,x} = 0$.

However, as argued in Gros and Hefeker (2002), this reasoning does not apply to the correlation between structural distortions and the transmission of monetary policy. The effectiveness of monetary policy is likely to depend on structural characteristics of an economy and vice versa; hence the term $\theta_{\alpha,k}$ is not necessarily zero. In an explicit model of optimising wage setting behaviour of labour unions (that give rise to k) it can be shown that it is likely to be negatively related to α_i (Gros and Hefeker 2002).[4]

With these assumptions (14) simplifies to

$$\pi^N = c\left(\theta_{\alpha,k} + \overline{\alpha k}\right) - \Omega^N\left(\xi + \frac{\sum_i \mu_i \alpha_i^2 z_i}{\bar{\alpha}}\right) \qquad (14)$$

where $\Omega^N = c\bar{\alpha}/\left(1 + c\left(\theta_\alpha^2 + \bar{\alpha}^2\right)\right)$.

Using our definitions the rate of inflation under averaging (13) becomes

[4] A similar story could be told by assuming that high distortions k_i are likely to be related to a high degree of wage indexation which imply a low value of α_i.

$$\pi^A = c\overline{\alpha}\overline{k} - \frac{1}{1+c\overline{\alpha}^2}\left(c\overline{\alpha}\overline{\xi} + c\overline{\alpha}\left(\theta_{\alpha,z} + \overline{\alpha}\overline{z}\right)\right)$$

Again, this simplifies further by noticing that $\overline{z} = 0$ and assuming that the correlation between the transmission of monetary policy α and any idiosyncratic demand shocks z is zero as well. Then (15) collapses into

$$\pi^A = c\overline{\alpha}\overline{k} - \Omega^A\xi \qquad (15)$$

with $\Omega^A = c\overline{\alpha}/\left(1+c\overline{\alpha}^2\right)$ and thus $\Omega^N < \Omega^A$.

Obviously, the next step is to compare the rates of inflation that the two alternative objective functions for the ECB would produce. This difference is

$$\pi^N - \pi^A = c\theta_{\alpha,k} + \frac{c}{\omega}\left(\overline{\alpha}\overline{\xi}\cdot c\theta_\alpha^2 - \sum\nolimits_i \mu_i\alpha_i^2 z_i\left(1+c\overline{\alpha}^2\right)\right) \qquad (16)$$

with $\omega = \left(1+c\overline{\alpha}^2\right)\left(1+c\left(\theta_\alpha^2 + \overline{\alpha}^2\right)\right)$.

The comparison shows that the "national regime" will produce a lower rate of inflation if the correlation between the distortions and the transmission of monetary policy is negative (as is likely to be the case) and if the weighted sum of the demand shocks is large. In both cases the central bank will set a more restrictive monetary policy because it takes the negative correlation into account and stabilises demand shocks by restricting monetary policy. Only the common exogenous shock would push up the rate of inflation in this regime.

It is obviously important that $\theta_{\alpha,k}$ is non-zero for the rates of inflation to be different under the two regimes. One can this be explained? The intuition behind the result that the rate of inflation is higher

under the national welfare maximising monetary regime--if there is a positive relation between the effectiveness of monetary policy and labour market distortions--is the following: The more effective monetary policy is (a high α) the lower the marginal costs of using monetary policy. If in this situation, distortions (k) are also high, the central bank has a higher incentive to use active monetary policy. This problem is magnified by the fact that the central bank cares for national welfare instead of averages. In this case, countries with a high level of distortions are strongly taken into account. Given that this is known to rational private agents, the expected rate of inflation increases, hence a higher inflation bias results. If, on the other hand, α and k are negatively related, the result is reversed and the inflation bias is lower.

3.4. The importance of differences in the transmission mechanism

It bears noting that differences in the transmission mechanism are the only factor that drives differences in the policy choice in the two regimes. Setting the transmission mechanism in the countries equal ($\alpha_i = \alpha$), one notices that the difference between the two rates of inflation disappears irrespective of the decision making system in the ECB. This can be seen by setting $\alpha_i = \alpha$ in equation (14). In this case, the constant α can be put before the summation sign and thus the two expression become similar. Hence, we can establish that the only factor that really matters are differences in the transmission mechanism, and that demand shocks do not play a role in the decision making mechanism of the central bank. Regardless of the particular objective function of the central bank, they will be taken care of in the same way.

As differences in the transmission mechanism play a key role in our results, the question thus arises how important these are in reality. The literature on this point is difficult to interpret because the underlying question has usually been different from ours. Some maintain the differences in the transmission mechanism are so large that they will make the operation of EMU difficult (Cecchetti 1999). Others argue that these differences are due to differences in financial structures, which will diminish over time as countries share a common monetary policy (Dornbusch, Favero and Giavazzi 1998). Most empirical studies concur, however, that at present there are still large differences in the

transmission mechanism, although they are difficult to estimate precisely (see e.g. Borio 1995, Gerlach and Smets 1995, Eijffinger and de Haan 2000, Toolsema, Sturm and de Haan 2001). Table 1 reports the estimates from Cecchetti (1999) which suggest that the differences in the output multiplier are considerable. The highest coefficient is over 3 times larger than the lowest. There is thus some evidence that differences in the transmission mechanisms are large.

Table 1: Transmission of Monetary Policy

Country	Impact on Output of a 1-Percent Increase in Interest Rates (absolute changes)
EMU-Members	
Belgium	0.72
France	1.30
Germany	1.21
Ireland	0.76
Italy	0.64
Portugal	0.39
Spain	0.46
EMU-Nonmembers	
Denmark	0.48
Sweden	0.56
United Kingdom	0.53

Source: Cecchetti 1999.

4. A welfare comparison

4.1 Individual countries

Having derived the difference in inflation and in the stabilisation of shocks under the two alternative objective functions for the common central bank, it remains to be seen what welfare implications this would have.

Given that the comparison of welfare under the alternative regime should be done on an *ex-ante* basis, we concentrate on expected welfare losses and summarise them as $\Delta L_i = E\left[L_i^N\right] - E\left[L_i^A\right]$. We

start with an evaluation of the welfare difference for a single country. Using the rates of inflation in the loss function, we get

$$\Delta L_i = \left(1 + c\alpha_i^2\right)\left\{\left(\Omega^{N^2} - \Omega^{A^2}\right)\sigma_\xi^2 + \left(\Omega^N \frac{\theta_\alpha^2 + \bar{\alpha}^2}{\bar{\alpha}}\sigma_z^2\right)^2\right\} \qquad (17)$$
$$+ c^2\left\{\left(\theta_{\alpha,k} + \bar{\alpha}\bar{k}\right)^2 - \left(\bar{\alpha}\bar{k}\right)^2\right\}$$

It is not a priori clear if the individual country profits more from a national or an average regime. Given that $\Omega^N < \Omega^A$ the first term in curly brackets is negative. Thus the larger is the variance of the common shock the more the country profits from the national regime. The reason is that the national regime takes the larger variety of transmission mechanism more into account than the simple averaging does. This is beneficial for country i.

On the other hand, the larger the variance of the weighted sum of the idiosyncratic demand shocks is, the more the country would benefit from the averaging regime because then the monetary policy would not react at all to demand shocks, given that they cancel on average. Finally, the larger the negative correlation between distortions and transmission of monetary policy, the more attractive is the national regime. Thus, if demand shocks are not too important, individual countries are clearly better off if the common central bank follows a national regime.

One immediately sees that the national regime becomes less attractive if the variance of the demand shocks increases, $\frac{\partial \Delta L_i}{\partial \sigma_z^2} > 0$, which is due to the fact that in the alternative regime these shocks disappear with aggregation. In the national regime they are responded to and this affects individual countries negatively as monetary policy reacts to the idiosyncratic shocks in the other member states.

However, the attractiveness of the national regime increases if the (negative) correlation between distortions and transmission becomes larger since $\frac{\partial \Delta L_i}{\partial \theta_{\alpha,k}} > 0$ which is due to the reasons discussed above. Also, $\frac{\partial \Delta L_i}{\partial \sigma_\xi^2} < 0$ so that a higher variance of the common shock makes the national regime more

attractive as $\Omega^N < \Omega^A$. Again, this is due to the fact that in the national regime the divergence in the transmission of monetary policy is taken into account.

Overall, and not surprisingly, the transmission of monetary policy is the crucial factor deciding on the relative merits of each of the two regimes. To see in which way, disregard the second expression in (17) and set $\theta_{\alpha,k} = 0$ for simplicity. If $\alpha_i \to 0$ the expression is clearly negative because $\Omega^N < \Omega^A$. Thus, if monetary policy is not effective at all, the country is better off under the national regime. As monetary policy is less active under this regime this must be better for a country that does not benefit from monetary policy. Otherwise inflation variability would increase without providing any benefit at all for country i.

If, on the other hand $\alpha_i \to \infty$, ΔL_i is a function of $\left(\Omega^{N2} - \Omega^{A2}\right)\sigma_\xi^2 + \left(\Omega^N \frac{\theta_\alpha^2 + \bar{\alpha}^2}{\bar{\alpha}}\sigma_z^2\right)^2$ only.

Thus, the national regime is more attractive, ΔL_i<0, if the variance of the common shocks is sufficiently larger than the variance of the demand shocks. If, on the other hand the demand shocks are more important, the averaging regime is more attractive for a country with a super-effective monetary policy.

4.2. Average welfare in the monetary union

Taking finally the expected welfare comparison for the entire union, $\Delta L = \sum_i \Delta L_i$, we get

$$\Delta L = \left(1 + c\bar{\alpha}^2\right)\left\{\left(\Omega^{N2} - \Omega^{A2}\right)\sigma_\xi^2 + \left(\Omega^N \frac{\theta_\alpha^2 + \bar{\alpha}^2}{\bar{\alpha}}\sigma_z^2\right)^2\right\} + c^2\left\{\left(\theta_{\alpha,k} + \overline{\alpha k}\right)^2 - \left(\overline{\alpha k}\right)^2\right\} \tag{18}$$

which, like above, shows the influence of the size of the common shocks, which would suggest the national regime, and the variance of the demand shock which would suggest the average regime. In addition, we have the difference between the time consistency problem and the response to the shocks. Given that $\Omega^N < \Omega^A$, it is likely that the overall expression is negative and that thus the countries within

the monetary union would, on average, benefit if the ECB followed a national rather than an average policy regime.

5. Conclusion

We have found that it makes a difference whether the central bank of a monetary union bases its decisions on the average values of inflation and employment for the entire area, or whether it recognises that differences in national performance can lead potentially to large differences in national welfare and therefore tries to minimise the average of national welfare. If it minimises the (weighted) average of national welfare it will clearly stabilise less than a central bank concerned with union wide developments would do. It might, on the other hand, also produce a higher inflation bias, depending on the relation between the transmission mechanism and the distortions in member countries. Given that such a central bank stabilises common shocks less, member countries gain more if the variance of common shocks increases. This is because the central bank takes into account that stabilisation might be too strong for some countries. The reason for the somewhat counterintuitive result is that less stabilisation might actually be welfare increasing.

A result which is usually not taken sufficiently into account when discussing the decision making of the ECB is that it becomes unimportant which mechanism the ECB uses once the transmission of monetary policy is equal within the member states. The empirical evidence that at present there are still large differences suggests that it is far from irrelevant on what aggregation procedure the ECB bases its policy decision. There might, at the present, be thus large potential welfare implication from a shift to another objective function. On the other hand, one might expect that with a common monetary policy the differences in the transmission mechanism might be reduced over time. At present however, and in particular with a view on the upcoming enlargement not only of the EU but also of the EMU, the ECB should reconsider its decision mechanism. The problem that we have pointed out here might lose its importance for the current members of EMU over time but with the enlargement it is likely to regain force. One can reasonably expect that newcomers to the EMU will show considerable differences in their transmission of monetary policy in comparison to the older members. Thus agreeing on the

appropriate decision making process in the ECB upon its enlargement should not only take into account that too many members will make it more difficult to reach decisions (Buiter and Grafe 2002). It is also important that national asymmetries be taken into consideration.

This, however, raises a question that we have not answered in this paper. How could one design a mechanism and ensure that it is implemented that pays more attention the national developments than the current averaging does?

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