# One Size Must Fit All
# National Divergences in a Monetary Union *

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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 and that this can lead to higher average union-wide expected welfare, if the variability of common shocks is large relative to the inflation bias. But for countries with a transmission mechanism close to the average, welfare can actually be lower in this case. The inflationary bias depends on the interaction between the transmission mechanism and distortions in labour markets.

**Keywords:** Monetary Policy, Monetary Union, Transmission Mechanism.

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## 1. Introduction

In any monetary union there will be differences between regions in terms of economic performance. Should the monetary authority react to these divergences? For Europe, i.e. the euro area, the standard answer is no: The ECB is held responsible for the average performance of the entire euro zone. However, as in some countries the performance starts to diverge considerably from the average this answer appears superficial. 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 differentiates the euro area from nation states, even very federally organised ones, in which the main political unit coincides with the monetary union. Therefore, countries which differ largely from the average would not be served appropriately by such a policy.

The issue of what should be the political unit whose welfare should be taken into account by the ECB is important because welfare is usually assumed to be a convex function of economic performance. To use a concrete example: imagine a monetary union of two regions/countries of equal size. If one assumes, as usual, that the welfare of each region/country is a quadratic function of one variable, say unemployment, the average welfare of the two regions will fall as the standard deviation increases (for any given mean). If (national) welfare loss = $(\text{unemployment})^2$ and if the two countries have unemployment rates equal to +d and –d (so that the average is always equal to zero) the average welfare loss is equal to $d^2$.

Average welfare losses thus increase with the dispersion of unemployment. 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 involves, at least in the short run, a trade-off between two policy goals; e.g. inflation and employment. In this case very high national unemployment rates enter the objective function with a *de facto* higher weight because they are squared. Referring to the current problems the question is thus whether the unemployment rate of Spain (which during

the year 2000 will be about one-half higher than the euro area average) should be considered just as one element in the calculation of the average area-wide unemployment or whether one should consider the high welfare losses it causes in Sapiin separately. The situation in Spain would presumably affect decisions by the ECB much more under the second approach.

The deeper issue is thus what should the ECB do when one size clearly does not fit all? Should it base its decisions on the area-wide averages of inflation and unemployment, or should it attempt to minimise the (weighted) average of national welfare losses resulting from actual national inflation and unemployment rates? In this short paper, we aim to provide a first step towards an answer by showing to what extend these two choices would lead to different policies in a world where the preferences regarding inflation are identical, but where there are differences in the monetary transition mechanism.

We thus go beyond the existing literature, where it is usually assumed that the common central bank bases its decision only on union wide state variables (Alesina and Grilli 1992). The literature on central bank constitutions for monetary unions, in contrast, assumes the same for the centrally appointed members of the decision making body whereas the representatives appointed by the constituting regions of the monetary union are assumed to look only at the welfare losses of their home region (von Hagen and Süppel 1994, de Grauwe, Dewachter and Aksoy 1999). Both strands of the existing literature thus to not deal with the problem discussed here, namely how a homogenous body of decision makers in the ECB council should set monetary policy.

The remainder of this note is organised as follows: The next section presents the model used for the analysis. Purposely, we use a standard model because we want to draw attention to the general point 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. 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 model

We use a standard model, based on the usual two building blocks, a labour demand function (or an output supply function) and a welfare function defined over inflation and employment (or output). We assume that there are j=1..N member countries in the monetary union.

Labour demand in country j is given as

$$n_j = \alpha_j(\pi_j - \pi_j^e) + \varepsilon_j + \varepsilon_{EU}, \tag{1}$$

where $\varepsilon_j$ is a pure national shock with $E(\varepsilon) = 0$ and $E(\varepsilon_j^2) = \sigma_{\varepsilon_j}^2$. As the $\varepsilon_j$'s represent national asymmetric shocks we assume that the covariances among them are equal to zero. To the extent that the national shocks are correlated their covariance should show up in a higher variance of the common shock $\varepsilon_{EU}$. The latter thus captures truly common shocks plus any covariance among national shocks.

The parameter $\alpha_j$ measures the employment effects of monetary policy in country j. There is, in addition, an area wide common shock $\varepsilon_{EU}$ with $E(\varepsilon_{EU}) = 0$ and $E(\varepsilon_{EU}^2) = \sigma_{\varepsilon_{EU}}^2$ that affects all countries equally. It could best be thought of as a world-wide commodity shock, a global recession, or the external exchange rate. We assume that the common shock is not correlated to national shocks $E(\varepsilon_j \varepsilon_{EU}) = 0$.

Preferences of the (welfare maximising) authorities are formulated as a loss function $\Omega_j = E_{t-1}\left[\sum_{t=1}^{\infty} \beta^{t-1} L_{j,t}\right]$ where $L_{j,t}$ is the per period loss function. Because all periods are *ex-ante* identical we drop the time index and are only interested in the current loss, which is specified (all variables are expressed as logs) in the usual way:

$$L_j = b(n_j - k_j)^2 + \pi_j^2, \tag{2}$$

where $b$ is the relative weight country j puts on the employment aim, $k_j$ expresses the level of distortions on the labour market which keep employment below its full employment level

(Barro and Gordon 1983, Rogoff 1985). As usual it is assumed that employment is below its potential due to the influence of strong labour unions that 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. Unemployed outsiders have no influence on wage setting.

All of this is standard, and so is the problem for the monetary authority, namely to minimise the one period loss. We emphasise that the parameter b does not have a subscript because we assume that preferences (i.e. inflation aversion) are identical in all countries as we want to see whether divergences in national performance should influence the decisions of the ECB even if preferences are identical.

## 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.

### 3.1. Minimising national welfare losses

The union monetary authority maximises the weighted average of national utilities. This leads to the following programme:

$$\text{Minimise } L = \sum_j \mu_j \left[ b\left(n_j - k_j\right)^2 + \pi^2 \right], \tag{3}$$

where the relative weight of country j is $\mu_j$, with $\sum_j \mu_j = 1$. In equation (3) we have already used the fact that in our one good model inflation is the same all over the monetary union. This implies that our model cannot replicate one of the problems facing the ECB, namely divergences in national inflation rates. Different national inflation rates could e.g. arise in a model with non-tradables and tradables. We abstract from this complication, however.

Using (1) in (3) and minimising this expression with respect to the (common) rate of inflation, the first order condition is :

$$\frac{\partial L}{\partial \pi} = 2b\left[\sum_j \mu_j \alpha_j \left(\alpha_j \left(\pi - \pi^e\right) + \varepsilon_j + \varepsilon_{EU} - k_j\right)\right] + 2\pi = 0,$$

The expected rate of inflation is thus $\pi^e = b\sum_j \mu_j \alpha_j k_j$. We can now calculate the actual rate of inflation in the standard way by using this result in equation (4).

$$2b\left[\sum_j \mu_j \alpha_j \left(\alpha_j \left(\pi - b\sum_j \mu_j \alpha_j k_j\right) + \varepsilon_j + \varepsilon_{EU} - k_j\right)\right] + 2\pi = 0,$$

For convenience we define a new aggregate shock which consists of the sum of the common shock $\varepsilon_{EU}$ and the average national shock $\sum_j \mu_j \varepsilon_j$ : $\xi \equiv \varepsilon_{EU} + \sum_j \mu_j \varepsilon_j$. To simplify notation, we further define an average $\alpha$: $\sum_j \mu_j \alpha_j \equiv \bar{\alpha}$.

Solving for the rate of inflation yields us

$$\pi^N = b\sum_j \mu_j \alpha_j k_j - \frac{b\bar{\alpha}}{1 + b\sum_j \mu_j \alpha_j^2}\xi. \qquad (4)$$

where the superscript N denotes the case of monetary policy based on national welfare. Inflation is increasing in the size of the distortion in all member economies (the inflation bias) and in response to a common shock.

### 3.2. Minimising area-wide welfare losses based on national performance

Alternatively, the ECB might base its decision on an area-wide utility function which uses the averages of national rates of employment and inflation as input. The problem then becomes:

$$\text{Minimise } L = b\left[\sum_j \mu_j \left(n_j - k_j\right)\right]^2 + \pi^2, \tag{5}$$

Substituting into equation (1) for employment, this becomes

$$L = b\left[\sum_j \mu_j \alpha_j \left(\pi - \pi^e\right) + \sum_j \mu_j \varepsilon_j + \sum_j \mu_j \xi - \sum_j \mu_j k_j\right]^2 + \pi^2,$$

Differentiating this expression with respect to the rate of inflation, gives the first-order condition

$$\frac{\partial L}{\partial \pi} = 2b\bar{\alpha}\left[\bar{\alpha}\left(\pi - \pi^e\right) + \xi - \bar{k}\right] + 2\pi = 0$$

where we have used again the fact that $\sum_j \mu_j = 1$, the definition of $\xi$, and introduced the notation $\sum_j \mu_j k_j \equiv \bar{k}$. In this case, $\pi^e = b\bar{\alpha}\bar{k}$, so that the rate of inflation set by the ECB becomes

$$\pi^A = b\bar{\alpha}\bar{k} - \frac{b\bar{\alpha}}{1 + b\bar{\alpha}^2}\xi \equiv b\bar{\alpha}\bar{k} - \Omega^A \xi, \tag{6}$$

with $\Omega^A > 0$ and where the superscript A denotes the case of monetary policy being tailored to area wage averages of national performances. Inflation is again increasing in the average size of the distortion in the member economies (the inflation bias) and in response to a common shock.

### 3.3. A comparison of inflation rates

In the next step, we explore what influence the difference in the objective function of the central bank in the two alternative cases would have. Comparing equation (4) and (6) reveals that the difference between the two solutions stems from two sources: First the inflation bias,

resulting from the aggregation of national distortions, is different in the two cases. However, the terms $\bar{\alpha}\bar{k}$ and $\sum_j \mu_j \alpha_j k_j$ are linked through the relation between the $\alpha_j$'s and the $k_j$'s: $\sum_j \mu_j \alpha_j k_j = \theta_{\alpha,k} + \bar{\alpha}\bar{k}$.[1] The second difference in the two solutions, the term denoting the reaction of the common monetary policy to the common shock lies in the difference between the terms $b\bar{\alpha}^2$ and $b\sum_j \mu_j \alpha_j^2$. They are linked by: $b\sum_j \mu_j \alpha_j^2 = b\left(\theta_\alpha^2 + \bar{\alpha}^2\right)$.[2]

With this notation, the rate of inflation, when the central bank cares about national welfare, can be rewritten

$$\pi^N = b\left(\theta_{\alpha,k} + \bar{\alpha}\bar{k}\right) - \frac{b\bar{\alpha}}{1 + b\left(\theta_\alpha^2 + \bar{\alpha}^2\right)}\xi \equiv b\left(\theta_{\alpha,k} + \bar{\alpha}\bar{k}\right) - \Omega^N \xi \tag{4'}$$

with $\Omega^N > 0$, whereas in the alternative case it does not change and remains as derived in (6).

Comparing equations (4') and (6) shows that $\Omega^N < \Omega^A$ for a positive $\theta_\alpha^2$. Given these results, we can compare the rates of inflation in the two cases

$$\pi^N - \pi^A = b\theta_{\alpha,k} + \frac{b^2 \theta_\alpha^2 \bar{\alpha}}{\left(1 + b\left(\bar{\alpha}^2 + \theta_\alpha^2\right)\right)\left(1 + \bar{\alpha}^2 b\right)}\xi \tag{7}$$

It is thus not possible to say whether a central bank which addresses its policy to national objectives will produce a higher inflation bias. This will be the case only if there is a positive relation between the effectiveness of monetary policy and the level of distortions $\theta_{\alpha,k} > 0$.[3]

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[1] Define $\sum_j \mu_j \left(\alpha_j - \bar{\alpha}\right)\left(k_j - \bar{k}\right) \equiv \theta_{\alpha,k}$ and multiply this out to see that $\sum_j \mu_j \alpha_j k_j = \theta_{\alpha,k} + \bar{\alpha}\bar{k}$.

[2] Define $\sum_j \mu_j \left(\alpha_j - \bar{\alpha}\right)^2 \equiv \theta_\alpha^2$. Multiply out this expression and notice that $-2\sum_j \mu_j \alpha_j \bar{\alpha} + \sum_j \mu_j \bar{\alpha}^2 = -\bar{\alpha}^2$. Thus $\sum_j \mu_j \alpha_j^2 = \theta_\alpha^2 + \bar{\alpha}^2$.

[3] See the appendix for an example in which the relation between $\alpha_j$ and $k_j$ is explicitly derived.

However, a central bank that minimises (the average of national) welfare losses will in general stabilise aggregate shocks less (the second term being positive). The overall effect on the rate of inflation is thus indeterminate.

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 two key parameters, the effectiveness of monetary policy and labour market distortions--is the following: The more effective monetary policy is (a high $\alpha$) the lower the marginal costs of using monetary policy. If in this situation, distortions (k) are also high, the central bank as 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, $\alpha$ and k are negatively related, the result is reversed and the inflation bias is lower.

The central bank will also take into account that the impact of monetary policy differs in the member countries, according to the size of the variance of the monetary policy transmission mechanism. This implies that for some countries much less monetary policy is necessary to stabilise shocks whereas for others more would be needed. But since only one common monetary policy can be set, the central bank is required to balance these influences, leading in the end to the result that common shocks are stabilised less because a stronger reaction would hurt some countries more than they would gain. In other words, the ECB becomes more cautious in using monetary policy to stabilise shocks.

As differences in the transmission mechanism play a key role in our results, the questions 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 (Cechetti 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). Table 1 reports the estimates from Cechetti 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.

**4. A welfare comparison**

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. We start with an evaluation of the average welfare of all union members. In the case that the common central bank cares for averages, we have expected losses for the entire union of (after using equation (1) to substitute out for employment):

$$E\left[L^A\right] = E\left[b\sum_j \mu_j \left(\alpha_j \Omega_A \xi + \xi + \varepsilon_j - k_j\right)^2 + \left(\pi^A\right)^2\right] \tag{8}$$

which can be rewritten, by multiplying out the quadratic terms as

$$E\left[L^A\right] = b\sum_j \mu_j \left(1-\alpha_j \Omega_A\right)^2 \sigma_\xi^2 + b\sigma_\varepsilon{}^2 + b\bar{k}^2 + \left(b\bar{\alpha}\bar{k}\right)^2 + \Omega^A \sigma_\xi^2$$

where the last terms, the variance of the aggregate common shock, can be written as $E\left(x^2\right) = s_{e_{EU}}^2 + s_e^2 / N$ if all countries are of equal size, and the number of countries is indicated by N. For a sufficient large number of member countries the variance of the aggregate common shock will thus be dominated by its area-wide component.

Likewise, the expected loss under the alternative is

$$E\left[L^N\right] = b\sum_j \mu_j \left(1-\alpha_j \Omega_N\right)^2 \sigma_\xi^2 + b\sigma_\varepsilon^2 + b\bar{k}^2 + b^2\left(\theta_{\alpha,k} + \bar{\alpha}\bar{k}\right)^2 + \Omega^N \sigma_\xi^2 \tag{9}$$

The difference is thus given as

$$E\left[L^A\right]-E\left[L^N\right]=\left\{\sum_j \mu_j\left(1-\alpha_j\Omega_A\right)^2+\Omega_A^2-\left[\sum_j \mu_j\left(1-\alpha_j\Omega_N\right)^2+\Omega_N^2\right]\right\}b\sigma_\xi^2 \qquad (10)$$
$$-b^2\sigma_{\alpha,k}\left[\bar{\alpha}\bar{k}+\theta_{\alpha,k}\right]$$

On average the members of the monetary union can be thus better off under a common central bank which minimises national welfare losses, as the first term in (10) is positive given that $\Omega^N<\Omega^A$. This first result is not surprising: the average of national welfare losses should be lower under a central bank that explicitly attempts to minimise them than under a central bank that does not. What is not so evident is that the gain from having the ECB look at national losses is increasing in the variance of the common shock $\sigma_\xi^2$. As we have already argued above, this reflects the fact that ECB now takes into account that different countries have a different need for active monetary policy in reaction to a *common* shock. It will therefore stabilise less which is beneficial for any single country. Obviously, the gain from this regime is thus larger the higher the variance of the common shock. The effect is strengthened if the (common) dispersion of the $\alpha_j$'s increases. This can be seen by rewriting (10), by using the definitions made above, as

$$E\left[L^A\right]-E\left[L^N\right]=\left(\Omega_A-\Omega_N\right)\left\{\left(1+\theta_\alpha^2+\bar{\alpha}^2\right)\left(\Omega_A+\Omega_N\right)-2\bar{\alpha}\right\}b\sigma_\xi^2$$
$$-b^2\theta_{\alpha,k}\left[\bar{\alpha}\bar{k}+\theta_{\alpha,k}\right]$$

The second term expresses the fact that the inflation bias might be higher whenever the central bank cares of national welfare rather than average welfare. This is the case if the relation between the effectiveness of monetary policy and distortions is positive. As argued above, in this situation the central bank has a higher incentive to use active monetary policy, thus pushing up the expected rate of inflation. If, on the other hand, $\theta_{\alpha,k}<0$ the result is reversed and countries are clearly better off under a central bank that maximises national welfare.

However, even if union member countries are *on average* better off under a common central bank that looks at national welfare, this does not necessarily imply that every country is better off in this situation.

Dropping the summation in (10), the welfare comparison for any single country yields:

$$E\left[L_j^A\right] - E\left[L_j^N\right] = \left\{\left(1-\alpha_j\Omega_A\right)^2 + \Omega_A^2 - \left[\left(1-\alpha_j\Omega_N\right)^2 + \Omega_N^2\right]\right\} b\sigma_\xi^2 - b^2\theta_{\alpha,k}\left[2\bar{\alpha}\bar{k}^2 + \theta_{\alpha,k}\right] \tag{11}$$

For any individual country, the welfare difference under two policy options for the common central bank remains thus the sum of the differences in the inflation bias and the stabilisation to common shocks. The inflation bias term is unchanged, and remains, as discussed above, a function of the relation $\theta_{\alpha,k}$. Given that we do not have any information about this relation, except for our very special example in the appendix, it seems more promising to focus on the stabilisation role of monetary policy and ask how the transmission mechanism determines under which regime a country would fare better. We thus set $\theta_{\alpha,k} = 0$ and focus on the first term in (11).

Obviously, this is a function of $\alpha_j$ only. We begin by setting $\alpha_j = 0$, in which case the first term would clearly be positive given that $\Omega_A > \Omega_N$. The country would hence gain if the central bank would care for national welfare. Since monetary policy in this country is assumed to be ineffective ($\alpha_j = 0$) it loses from an active monetary policy because inflation variability would increase without any gain in terms of lower output variability. Thus, the less the common central bank stabilises the better it is for such a country. The same is true if $\alpha_j \to \infty$ because then the first term would also be clearly positive. In this case monetary policy would be supereffective and the country would also prefer a less stabilising central bank as moderate monetary policy would be sufficient. Otherwise, output variability would increase by too much for this country.

Hence, the regime preferred by country j is a non-linear function of its own $\alpha_j$. To derive the critical $\tilde{\alpha}_j$ at which the country would just be indifferent with respect to the

objectives of the common central, we set the first term in (11) equal to zero so that $(1-\alpha_j\Omega_A)^2+\Omega_A^2=(1-\alpha_j\Omega_N)^2+\Omega_N^2$. The critical $\tilde{\alpha}_j$ is thus implicitly determined by:

$$\frac{\tilde{\alpha}_j}{1+\tilde{\alpha}_j^2}=\frac{\Omega_A+\Omega_N}{2}=b\bar{\alpha}\frac{1+b\left(\bar{\alpha}^2+\theta_\alpha^2/2\right)}{\left[1+b\left(\bar{\alpha}^2+\theta_\alpha^2\right)\right]\left(1+\bar{\alpha}^2 b\right)}<1 \qquad (12)$$

There are hence two solution for $\tilde{\alpha}_j$ that fulfil this condition (see Figure 1). To find the maximum of the function $\tilde{\alpha}_j/(1+\tilde{\alpha}_j^2)$, we set $\frac{\partial\left[\tilde{\alpha}_j/(1+\tilde{\alpha}_j^2)\right]}{\partial\tilde{\alpha}_j}=\frac{1-\tilde{\alpha}_j^2}{(1+\tilde{\alpha}_j^2)^2}$ equal to zero. This is the case at $\tilde{\alpha}_j=1$, which thus determines the maximum of the RHS of equation (12) function.

**5. Concluding remarks**

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 react less to common shocks than a central bank concerned with union wide developments would do. It might also produce a higher inflation bias, however, depending on the relation between the transmission mechanism and labour market distortions across member countries. It is thus not possible to say which policy orientation leads to lower average welfare. Countries with a transmission mechanism close to the average will prefer a central bank that looks only at area-wide averages of inflation and employment.

Proceeding independently De Grauwe (2000) addresses the same question. With a two country model he arrives at similar conclusions using a series of simulations. Our more general formulation allows us to derive general analytical results in a multi-country setting.

It is worthwhile to emphasise that our results are completely independent from two issues that usually come up in any discussion of national divergences within EMU. First, whether and how the ECB should weigh the variables from member countries when it

calculates area-wide averages (i.e. population or GDP weights). And second, whether different countries have different preferences concerning the trade off between output and inflation, an issue that much dominated public discussion in countries like Germany. We have explicitly assumed that preferences are the same in all countries, reflecting the evidence that preferences on this seem to have converged over the last decades (Collins and Giavazzi 1993, Hayo 1998).

Another, somewhat deeper, issue that remains unresolved in our view is that of the foundation of the aggregate welfare functions used in most policy analysis. The basis for a national welfare function is usually the assumption that all agents within one country are in the same situation so that one can think of a country as being populated by one representative agent. This assumption becomes probably even more problematic, than it is already in the standard national context, when one considers the euro area because the euro area is even more heterogeneous than even large member countries. Moreover, at the national level preferences can be mediated via a single integrated political system. This is much less the case in the EU, which does not constitute a political union.

**Appendix 1: An example for the relation between $\alpha_j$ and $k_j$**

In this appendix we derive the connection between distortions and the transmission mechanism explicitly. We begin with labour demand and the endogenous amount of distortion in the labour market. The productive sector in each country is represented by a Cobb-Douglas technology $Y_j = K_j^{1-\gamma} N_j^{\gamma}$, $\gamma \in [0,1]$, where the capital stock K is constant and normalised to one. Labour N is employed by profit maximising firms to the point where its marginal productivity is equal to the real wage $N_j = \frac{1}{\gamma}\left(\frac{W_j}{P_j}\right)^{\frac{1}{\gamma-1}}$ where $W_i$ and $P_i$ denote the national wage and price levels respectively. We normalise $P_{j,-1} = 1$. Lower case letters denote natural logarithms and parameters are constant and positive. $\pi$ denotes inflation and therefore the logarithm of the current price level. Taking natural logs, labour demand becomes $n_j = -\ln\gamma + \frac{1}{\gamma-1}(w_j - \pi_j) \equiv \bar{n}_j - \alpha_j(w_j - \pi_j)$ where $\bar{n}_j$ is the full employment level. Thus, labour demand is falling in real wages, resulting in employment below full employment. We assume that labour is supplied inelastically. Hence the level of employment is determined by the labour demand schedule. Note that we assumed that the reaction of labour demand to real wages is the same as the slope of the Phillips-curve $\alpha_j$.

Next we assume that preferences of all national labour union members are identical, and since firms produce a homogenous good, this allows us to represent them by a single union that covers the whole country and maximises the objectives of a representative union member. His or her objectives are given over real wages $(w_j - \pi_j)$ and a deviation of employment from full employment $(n_j - \bar{n}_j)^2$.

Our assumptions are reflected in the following utility function for the labour union in country j $U_j = \beta_j(w_j - \pi_j) - \frac{1}{2}(n_j - \bar{n}_j)^2$. $\beta_j$ measures the degree of union aggressiveness that is, for instance, determined by the influence of the group of insiders in the labour union (Lindbeck and Snower 1988). Given this utility function, we can derive the wage demand of

the labour union by maximising this function with respect to $w_j$ as $w_j = \pi + \frac{\beta^j}{\alpha_j^2}$, leading to an employment level of $n_j = \bar{n}_j - \frac{\beta_j}{\alpha_j}$.

Next we use this setup to show that one can also directly link the $\alpha_j$'s and $k_j$'s. Thus, we explicitly relate the efficiency of monetary policy in country j $\alpha_j$ with the level of distortion in country j $k_j$. We define $k_j = \bar{n}_j - n_j$ and normalise the (log of ) full employment level to zero to have finally $\alpha_j k_j = \beta_j$ which inversely relates the slope of the Phillips-curve to the level of distortions in each country.

Intuitively this can be understood as follows: Assume e.g. that the distortions which are responsible for the fact the output is below its potential are due to distortions in the labour market. The power of labour unions pushes the wage level above its market clearing level; as a consequence employment is lowered. The level of distortions must be considered as endogenous because it is due to the influence of labour unions, and the latter will take into account how monetary policy affects output. The more monetary policy can achieve in stimulating output, the less incentives there are to avoid distortions. Thus, the endogenous determined amount of distortions in an economy is inversely related to the effectiveness of monetary policy.

We presented this bare bones model only as an example. Different specifications of what distortions cause a difference between desired and equilibrium output might come to different results. The general point we wanted to make is simply that one should not consider the slope of the short run Philips to be independent from these distortions.

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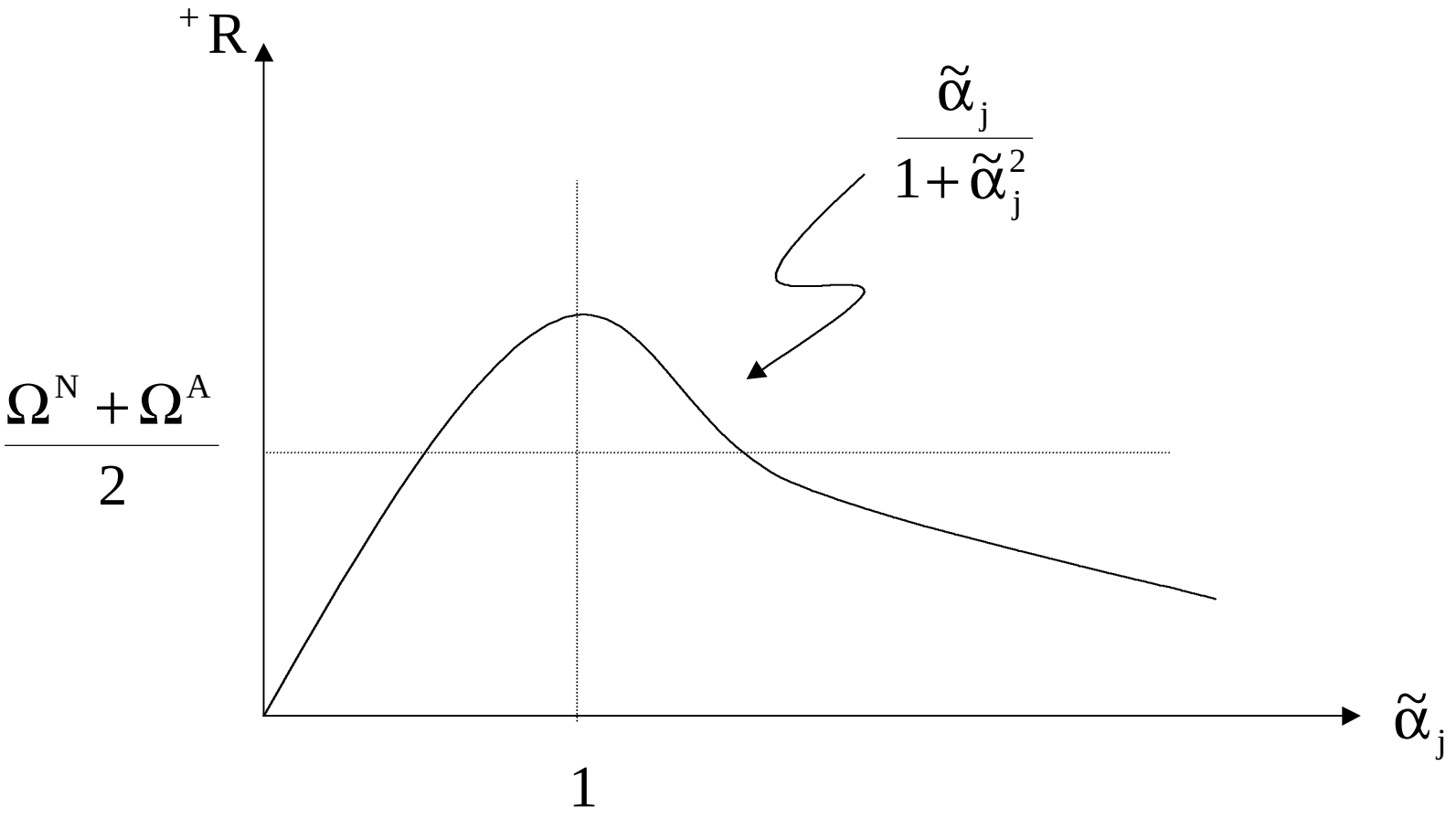
**Table 1. Differences in the Transmission Mechanism**

| 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: Cechetti 1999.

Figure 1


+R
$\frac{\tilde{\alpha}_j}{1+\tilde{\alpha}_j^2}$
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1