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SCOPE OF ASYMMETRIES IN THE EURO AREA

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Abstract

We discuss the scope of asymmetries in growth and inflation developments in the euro area countries, taking the euro area as the natural benchmark since the establishment of EMU. We start with a descriptive analysis of a set of indicators that can give a first idea of the likelihood of or extent to which Member States can show asymmetries with respect to the euro area. This approach typically leads to a division of countries between a core and a periphery, the former consisting over the 1993-2000 sub-period of Belgium, Germany, France, Italy, Spain and Austria and perhaps the Netherlands. However, it is rather difficult to weight the indicators and to draw a firm line between "insiders" and "outsiders" in this way. Moreover the dichotomy does not provide any information on the true extent of the asymmetries inside the core and periphery.

Accordingly, we move to a quantitative approach (SVAR models) that makes it possible to assess two forms of asymmetry: asymmetry stemming from country-specific shocks and asymmetry stemming from differences in the way countries react to symmetric euro area shocks. The asymmetries are measured along two dimensions: growth and inflation developments. We find that over the years 1971-2000 growth in many countries is driven by the symmetric shocks while the opposite holds true for inflation where asymmetric (country-specific) shocks dominate. However regarding growth, the responses of the different countries to the symmetric shocks do not really differ and these shocks are not a major source of divergence. As a consequence, for growth as well as for inflation, the asymmetries with respect to the euro area are mainly the result of genuine asymmetric shocks. We notice a marked decrease in the impact of asymmetric shocks on inflation over the years, a phenomenon that is also present for growth, albeit less pronounced. If the years 1993-2000 can be used to evaluate the current situation, it appears that countries are spread along a line going from close similarity to the euro area (France) to extensive asymmetry (Ireland). Asymmetric shocks are not negligible yet with an average annual impact of around 1 percentage point on country growth or inflation. Some countries usually thought to belong to the core, are still exposed to such average shocks, in terms of growth or in terms of inflation.

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1. INTRODUCTION

In 1999 eleven countries of the European Union set up the EMU, while Greece joined in January 2001. Benefits of forming a monetary union have often been formulated in terms of decreasing transaction and hedging costs between the participating countries, greater price transparency leading to more competition, disappearance of exchange rate uncertainty stimulating investment decisions or, at the macroeconomic level, increased price stability and enhanced co-ordination of economic policies. At the same time, however, countries joining the EMU gave up the ability to set interest rates at a national level or to use their exchange rate as an adjustment tool that could lower adjustment costs in the presence of nominal rigidities. These adjustment costs are related to the well-known concept of an optimal currency area (OCA hereafter).

The basics of OCA literature go back to Mundell (1961), McKinnon (1963) and Kenen (1969). In short, this literature states that participating in a monetary union is beneficial if the gains described above exceed the costs of adjusting to asymmetries stemming from shocks through means other than monetary policy, that is labour mobility, wage and price adjustments or fiscal policy. Not surprisingly, this literature gained importance in the run-up to the EMU as several studies focused on the similarity of countries and regions supposed to participate in the monetary union.

Some authors concentrated on correlation measures of business cycles, such as Artis and Zhang (1995), Inklaar, De Haan and Sleijpen (2000) and Belo (2001). However, this methodology does not allow to ascertain whether differences between business cycles result from different shocks or from different responses to the same shocks, since both are part of the short-run cyclical component.

The VAR methodology addresses this shortcoming because it makes it possible to distinguish shocks from responses. In addition, the structural VAR framework (SVAR) allows for a disaggregation of the reduced shocks to identify their origins (e.g. demand or supply). In an important paper Bayoumi and Eichengreen (1992) measured the degree of shock symmetry by the correlation of supply and demand shocks of various regions with those of an anchor region, in this case Germany. Several analyses have been developed on the basis of this paper, such as Angeloni and Dedola (1999) to name but a recent one. Boone (1997) applied the Kalman filter technique to the structural shocks to get a dynamic measure of the evolving symmetries between European economies. The above studies, though, concentrate on the structural shocks, but do not address differences in responses to the shocks between countries. Chamie, de Serres and Lalonde (1994) overcame the problem of having to choose an anchor country by using state space models, which allowed the shocks to be decomposed into symmetrical and asymmetrical components.

Ballabraga, Sebastian and Valles (1993) estimated a VAR which contained variables of four major European countries (Germany, France, United Kingdom and Spain) and some "world variables" (oil price, US-GDP, etc.). They tried to assess the relative importance of external and internal sources of European fluctuations. Other multi-country approaches can be found in Rubin and Thygesen (1996) and Beine et al. (2000). These two papers use variables in levels looking for co-integration and codependence vectors (the latter are linked to the common cycles). It is however difficult to assess the extent of asymmetries on the basis of the number of codependence vectors found. Kouparitsas (1999) estimated one SVAR model per country. Each model included the GDP of the relevant country and several aggregate variables, the same for all the countries.

An elaborate survey of the use of the VAR framework in the OCA context can be found in Beine (1999) and Mongelli (2002). Recently the VAR methodology has been applied to assess the potential participation of the accession countries in EMU (see for instance Fidrmuc and Korhonen, 2001).

Due to the differences in methodologies, variables, time spans, countries included, etc., the results of the above-mentioned studies are not uniform though some patterns emerge. Artis and Zhang (1995) found more synchronization and correlation between the business cycles of the euro area countries and the German business cycle since the creation of the EMS. The correlation result is confirmed by Angeloni and Dedola (1999), who also covered the 1993-1997 period. Although correlations and their evolution over time provide interesting information, they do not allow to quantify the scope of asymmetries. Moreover, Germany should not remain the focal point of analysis after the establishment of the euro area. Rubin and Thygesen (1996) and Beine et al. (2000) treat Germany on an equal footing. From their results, it appears that a unique common cycle is not enough to explain the cycles of all euro area countries even if adjustment delays are introduced. A common cycle was found by Beine et al. between Germany, Belgium and the Netherlands (with a delay of five months and sharp amplitude differences). These three countries could qualify as a core although their cycle probably differs from the euro area cycle. For the remaining countries, it is again difficult to assess the extent of asymmetries on the basis of the number of codependence vectors found and the adjustment delays. The results of the other studies also point to a distinction between a core and a periphery. The core usually includes Belgium, France and Germany and sometimes the Netherlands and Austria while Finland, Ireland and Greece are mentioned as peripheral countries. Italy, Spain and Portugal often alternate between the core and the periphery.

Our SVAR approach will focus on the extent of asymmetries with respect to the euro area. It has two important features. First, like in Kouparitsas, we estimate one VAR per country and we include aggregate variables as well as variables of the country in the same VAR. The variables included are growth and inflation in both the euro area and the Member State. This will allow the identification of a symmetrical component in the growth and inflation fluctuations of a Member State, i.e., fluctuations that are observed both at the euro area level and at the country level, and an asymmetrical component, i.e., fluctuations that are only observed at the country level and that are independent from the symmetrical component. Second, whereas many of the above-mentioned papers do not or hardly discuss inflation, growth and inflation asymmetries will receive equal attention in our discussions.

Faced with the fact that the euro area has come into being, the question being raised is "to what extent is a participating country integrated in the euro area" instead of: "which countries should belong to the euro area", the main question in the run-up to the EMU. The more closely a country is integrated in the euro area, the more amenable a country participating in a monetary union is to support a common monetary policy stance. Monetary and exchange rate policy can no longer be used as an instrument for national stabilisation, so the presence of asymmetries could give rise to dilemmas and conflicts in the conduct of the single monetary policy. Some countries, however, lost most of their monetary independence long before the advent of the monetary union, as Germany dominated the determination of interest rates during the EMS-period. Nevertheless, realignments were still possible.

Taking the euro area as the benchmark, larger countries could look less asymmetric than smaller ones but rightly so if the focus of the analysis is kept on national entities. An analysis based on European regions could give other results.

In the second section of this paper we will take a closer look at some indicators that will give us an idea of the extent to which countries are likely to depart from the euro area as a whole. A tentative classification in terms of core and periphery will be provided. In the third section we will use the SVAR technique to provide quantitative estimates of the asymmetries between the countries and the euro area. The analysis will be applied to the seventies, eighties and nineties in order to assess the evolution of asymmetries over time.

2. THE POTENTIAL FOR ASYMMETRIES IN THE EURO AREA

In this paper, we presume that the economies of the euro area behave differently from the euro area as a whole. To what extent and by what source (common or country-specific) will formally be tested in the next section of this paper. In this section, we selected a set of indicators that can give us a first idea of the likelihood of or extent to which Member States can show asymmetries with respect to the euro area. This approach is similar to OECD (1999) in which they describe the susceptibility to shocks of the Member States by looking at foreign direct investment, consumption and trade patterns. The same approach can be found in an IMF (1997) study on Finland which discusses a range of variables related to output and trade patterns and compares them with other EU countries. Lenain and de Serres (2002) also mention some variables, such as inter-industry trade, trade specialization and discretionary policies, which they call "forces of convergence or divergence" for business cycle synchronization between the countries of the euro area. Our selection of indicators also aims at anticipating the next section, picking variables conceptually linked to supply and demand shocks.

Looking for asymmetries, we present most of the data[1] as differences with respect to the euro area. We cover the 1971-2000 period. In order to evaluate whether asymmetries decreased over time, we split our sample into three sub-periods (1971-1980, 1981-1990, 1993-2000)[2].

A word of caution is appropriate here. Some asymmetries could be the by-product of the catching-up process of a country converging to euro area standards. These kinds of asymmetries should not necessarily be problematic for the conduct of a common monetary policy. The SVAR models of the next section will address the problem to some extent.

2.1. Long-term Determinants of Growth

Two long-term determinants of (potential) economic growth are labour supply and total factor productivity. As pointed out above, we will look at the differences vis-à-vis the euro area and ascertain how these differences have evolved over the sample period. To that end, we will compute the absolute value of the difference between the average growth rate

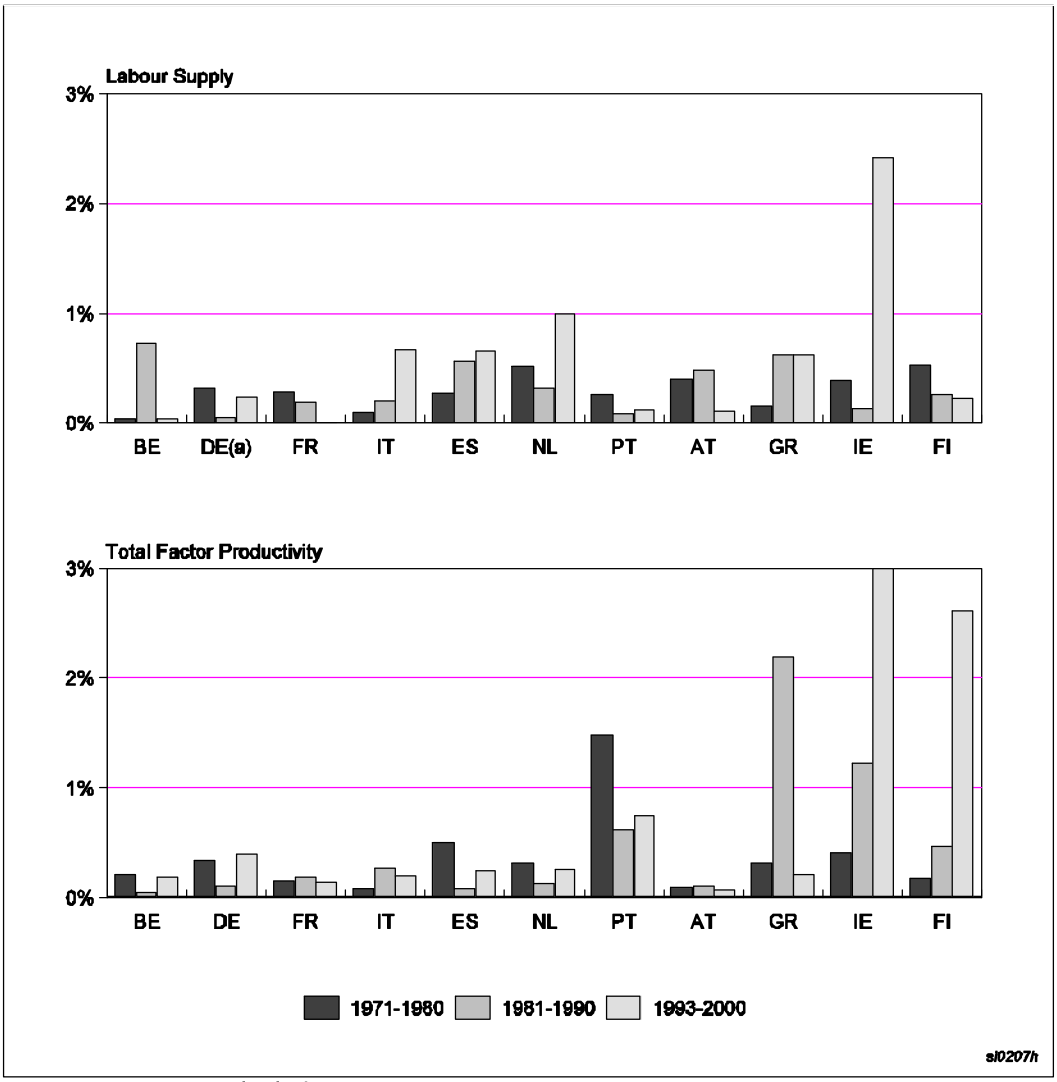
1 Our main source for the statistics was the Ameco Database of the European Commission. Luxembourg was left out of the analysis due to a lack of data.

2 The years 1991 and 1992 were left out. Due to the German reunification there was a break in the series, which hindered the calculation of growth rates for that period. 1993 is also seen as the start of the pre-Emu period (Angeloni and Dedola - 1999).

of a variable in a country in one sub-period and the corresponding average growth rate for the euro area. We do this for the three sub-periods.

In the two panels of figure 1 we show the differences in growth of labour supply and of total factor productivity, respectively. The differences in growth rates of labour supply are significant in Spain, the Netherlands, Greece and Ireland. Differences in growth of total factor productivity with the euro area are higher in Portugal, Greece, Ireland and Finland. With the exception of Finland and the Netherlands, these differences are partially related to catching-up processes (such as the higher TFP growth rate in Portugal and Ireland over the whole sample period).

Figure 1 - Differences in growth of labour supply and total factor productivity vis-à-vis the euro area



Source: EC, own calculations.
(a) DE stands for Western Germany over the two first decades.

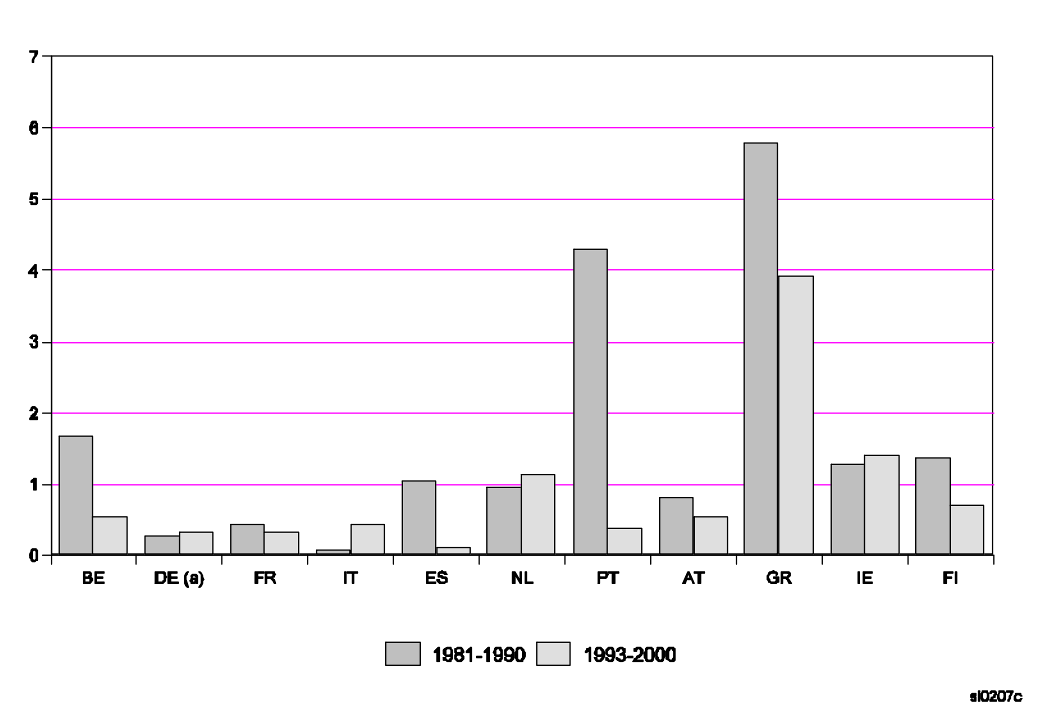
When taking a closer look at the last time period (1993-2000) no clear picture of increasing or decreasing differences vis-à-vis the euro area emerges. Only for Ireland are the reported values for both variables higher than in the two previous sub-periods. In Finland this was the case for TFP, and in the Netherlands for labour supply. It cannot be ruled out that some countries will always show at one time period or another a specific economic development as we observed several of these in the nineties.

2.2. Economic Policy

Before 1999 both monetary and fiscal policies were national policy instruments and have been a possible source of asymmetry for the Member States, although they could be used in order to smooth the impact of other shocks as well. Both policy domains, though, were already characterized by some degree of co-ordination at the European or bilateral level. Clearly for monetary policy there was the creation of the EMS in 1979, and later on some countries linked their currency more tightly to the Deutsche Mark than was required by the EMS. In the run-up to EMU fiscal policy too got a "European dimension" as one of the four Maastricht criteria focused on the budget balance and gross debt. Since the creation of the EMU, participating countries are subject to the Stability and Growth Pact and euro area members share a single monetary policy. We will first focus on differences between monetary policies and then turn to fiscal policies, remembering that it is not easy to separate genuine policy shocks from responses to other developments.

To measure the stance of monetary policy, we make use of the real short-term interest rate (interest rate minus GDP deflator). As in figure 1 we take the absolute value of the difference between the average real short-term interest rate of a country in one sub-period and the corresponding real short-term interest rate for the euro area, the latter calculated as a weighted average of the euro area Member States. Figure 2 shows that differences were very significant in Greece. Belgium, Portugal and to a lesser extent Spain and Finland showed substantial differences during the eighties but for all four countries these differences narrowed in the last sub-period. This was not the case in Ireland and the Netherlands but, on average, differences with the euro area went down.

Figure 2 - Differences in monetary policy vis-à-vis the euro area[1]



Source: EC, own calculations.

1 The absolute value of the difference between the average real short-term interest rate of a country in one sub-period and the corresponding real short-term interest rate for the euro area.

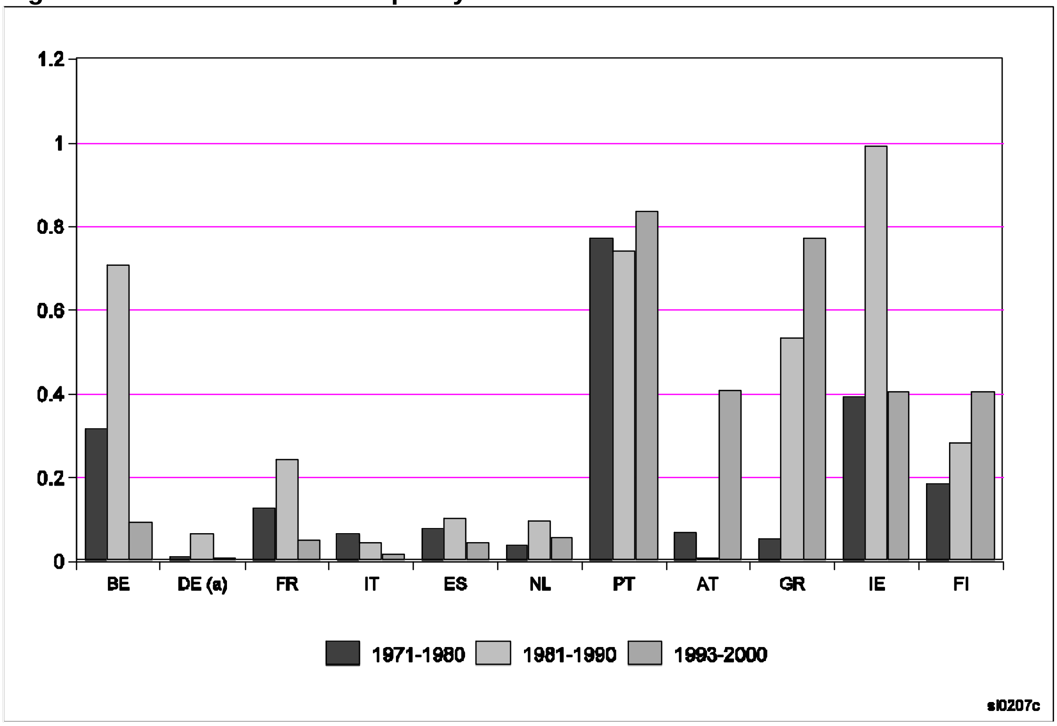
(a) DE stands for Western Germany over the first decade.

In order to check for differences in fiscal policy, we will take a closer look at the differences of the so-called orientation of fiscal policy, i.e., the changes in the structural primary surplus (in percentage of GDP). These changes should only account for discretionary movements in fiscal policy as they are adjusted for developments in interest expenses and cyclical developments.

In figure 3 we calculated the differences as described above for figures 1 and 2. For Portugal and Ireland differences in fiscal policy were substantial over the whole sample period and show no tendency to decline in the last sub-period when the fiscal policy stance in the euro area as a whole got more restrictive while Portugal and Ireland followed a steadier course. The latter applies also to Austria, while the fiscal policy stance got much more restrictive in Greece during the nineties, resulting in increasing differences vis-à-vis the euro area. Overall we see that the divergences with the euro area were higher during the eighties than in the seventies. The former was a period of growing deficits and outstanding debts in most countries. The latter was a period where excesses were strongly reversed in Belgium, Portugal and Ireland. But, during the 1993-2000 period, in which the Maastricht Treaty, and later on the Stability and Growth Pact, came into force, differences decreased somewhat.

These findings are in line with the results of De Bandt and Mongelli (2000) who find inter alia that cross-correlations between government net lending at the country level and the euro area level followed a U-shape over their sample period (1970-1998) and that fiscal dispersion between countries has been declining from 1980 onwards. However they also find that country-specific components still contribute to a significant share of the variance of net lendings over time.

Figure 3 - Differences in fiscal policy vis-à-vis the euro area[1]



Source: EC, own calculations.

1 The absolute value of the difference between the change in the structural primary surplus of a country in one sub-period and the corresponding change for the euro area.

(a) DE stands for Western Germany over the first two decades.

Both policy measures point to more similarity to the euro area in the last sub-period. It is in a sense surprising since in the run-up to the EMU, some countries had to adapt their policy considerably. Having established the EMU with a single monetary policy and the fiscal rules emanating from the Stability and Growth Pact, the eventual contribution of economic policy to asymmetries should remain on the low side in the future.

2.3. Trade Indicators

The degree of openness, measured as the average of imports and exports over total demand, is an important indicator to measure the extent to which an economy is linked with other economies and also to show the extent to which a country is sensitive to shocks in foreign economies, since the higher the openness, the higher the sensitivity to foreign shocks. It is also true that the higher the degree of openness, the higher the similarity between countries with strong trade links. In short, a difference in degree of openness can significantly influence the way two countries react to the same symmetric shock.

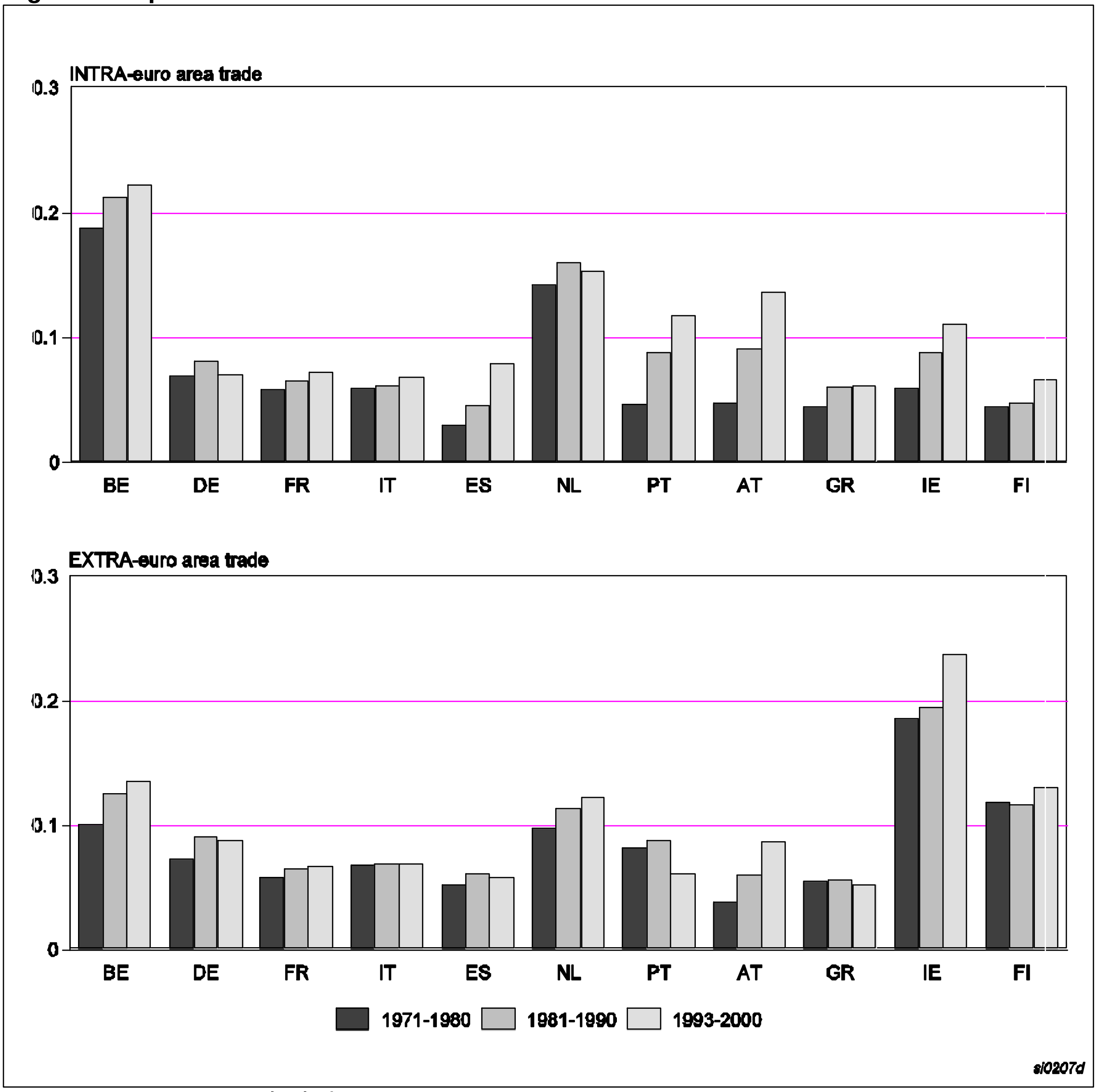
The total degree of openness, however, is an ambiguous indicator because it shows the sensitivity to all foreign shocks and the degree to which a country is linked with all foreign economies. That is why we will split up the degree of openness according to trade destination. We will do this by separating extra-area trade from intra-area trade to the euro area. The extra-area degree of openness gives an indication of the sensitivity of the Member States to non-euro area shocks, whereas the intra-area degree of openness indicates how closely the economies of the euro area are linked with each other and hence how similarly these economies will react to symmetric shocks.

In figure 4, the overall picture is that trade flows within the euro area have increased over the three sub-periods. Over the full sample period, Belgium and the Netherlands are the countries with the highest degree of openness in intra-area trade whereas in some countries like Spain, Portugal, Austria and Ireland, the trade links with other Member States have expanded significantly.

The extra-area degree of openness, for its part, also increased in most countries, but this increase was smaller than the one in intra-euro area trade in all but three countries (BE, NL, DE). Belgium, the Netherlands, Finland and Ireland have the deepest trade links with non-euro area countries. For Belgium and the Netherlands, however, these trade flows are less important than those with Member States. Although a small economy, Greece has a rather low degree of openness both for extra- or intra-area trade. Greece has the advantage of being less sensitive to non-euro area shocks than the other countries, but it reacts less similarly to symmetric shocks[3].

[3] Because of the limited availability of data, trade refers only to goods. Including services, Greece would have reported a higher degree of openness because of the large tourism sector.

Figure 4 - Openness to trade[1]



Source: OECD, own calculations.

1 Calculated as the average of imports and exports over total demand (= GDP + M).

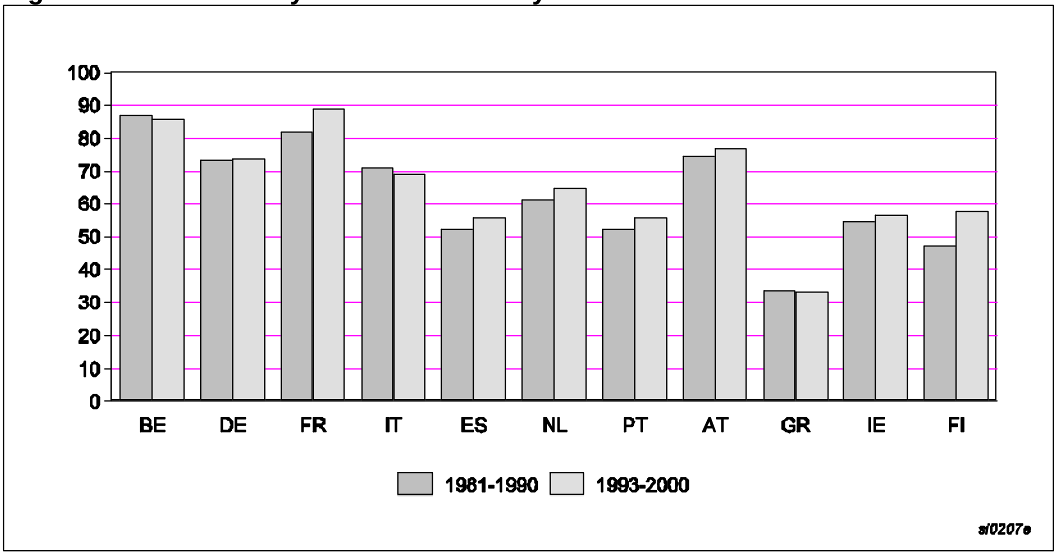
A second indicator for measuring the extent to which the euro area economies are linked by trade is intra-industrial trade. This is a pattern in international trade that consists of the simultaneous import and export of goods from the same industry. We took a rather rough measure by applying the commonly used Grubel-Lloyd ratio to data at the two-digit SITC level, only taking into account trade with other Member States of the euro area for 23 product classes in the manufacturing sector. The data were taken from the OECD International Trade by Commodities Statistics. The index of the extent of intra-industry trade between country (A) and the other countries of the euro area (B) is given by the following ratio:

$$IIT_{AB} = \sum_i \left[\frac{(X_i + M_i) - |X_i - M_i|}{(X_i + M_i)} \cdot \frac{(X_i + M_i)}{\sum_j (X_j + M_j)} \right] \cdot 100$$

where i, j are the product classes.

This index reaches the minimum value of zero when there are no products in the same class that are both imported and exported, and the maximum value of 100 when all trade is intra-industrial (and X_i equals M_i). The results are shown in figure 5.

Figure 5 - Intra-industry trade[1] of a country with other EMU Member States.



Source: OECD, own calculations.

1 As a percentage of total industry trade with EMU Member States.

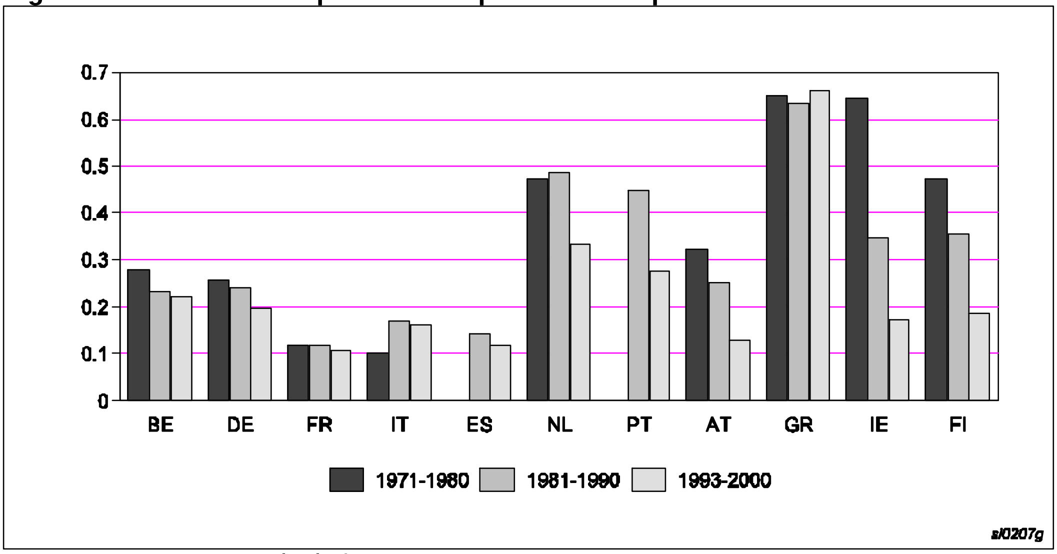
For most of the euro area countries we found that intra-industry trade is more important than inter-industry trade, which indicates that on the industry level countries are fairly well linked. The values reported for Spain, Portugal, Ireland and Finland fluctuate around 50 pct., while for Greece inter-industry is more important than intra-industry trade.

It appears that these values were rather stable over time. In the nineties, though, a discussion emerged as to whether an economic union would increase or decrease intra-industry trade and thus economic convergence. According to one point of view, the so-called Krugman vision, trade integration that occurs as a result of economies of scale also leads to regional concentration of industrial activities. The other view, the so-called EC view, argues the opposite, namely that the lifting of barriers within an economic union would reinforce intra-industry trade so that European economies would be more closely linked. For a more detailed discussion see De Grauwe (1997), Fidrmuc (2001) and Mongelli (2002).

The last indicator in figure 6 is the difference in the product composition of exports. When the composition of exports of a country sharply deviates from the composition of exports of the euro area, sector-based shocks - such as an increase in production costs or a reduced demand for a particular product - can have an asymmetric effect on the country vis-à-vis the euro area as a whole.

In order to present the indicator in a synthetic way, we first calculate the share of every product (at the two-digit SITC level, 9 product classes) in the total export of products. This is done for every country and the euro area[4] and for every sub-period. Then for one sub-period at a time we take the absolute value of the difference between the share of product X in the country and the share of product X in the euro area. And finally we add up these absolute values.

Figure 6 - Differences in product composition of exports[1]



Source: OECD, own calculations.

1 Sum over all products of the absolute value of the difference between the product shares in the country and the euro area.

We notice that for most countries the differences have diminished over time, as is particularly the case for the Netherlands, Portugal, Austria, Ireland and Finland. Greece

4 The euro area share is calculated as a weighted average of the country shares.

and to some extent the Netherlands still show a rather deviating composition of trade in the last sub-period.

Regarding trade, a broadly positive picture emerged from the trade indicators discussed above, with linkages between euro area countries becoming stronger over the sample period. The intra-euro area degree of openness increased for most countries. A core of countries is very well linked with the euro area by intra-industry trade, and differences in product composition of exports diminished fairly well in many countries. The countries that stood out most clearly from these common features were Greece, Ireland and Finland. Greece shows a low degree of openness, inter-industry trade dominates trade with other euro area countries and differences in product composition of exports remain relatively important. Ireland and Finland showed increasing trade linkages over the sample period but their exposure to non-euro area economies remains important.

There is a suspicion that stronger trade links between countries bring more business cycle correlation between them. Frankel and Rose (1998) have advanced a strong thesis that a monetary union may become optimal ex post, even though the individual countries that join it do not meet the optimality criteria ex ante, through increasing trade, the so-called endogeneity of the OCA. Rose and Engel (2000) also argue that membership increases business cycle correlation. Kenen (2000) and Hallett and Piscitelli (2001) warn, however, that interpreting Frankel and Rose's results requires some caution, because they do not discuss the relation to structural indicators (e.g. institutions) that might explain the similarity of business cycles. Fidrmuc (2001) emphasises intra-industry trade and adds that insofar as intra-industry trade is positively correlated with trade intensities, his results confirm the OCA endogeneity hypothesis. An interesting discussion on this topic can also be found in Mongelli (2002).

2.4. All in all ...

In this section of the paper we have taken a closer look at some data in order to assess the likelihood of asymmetries in Member States of the euro area and their evolution over time. We will now try to make a tentative classification of the euro area Member States in terms of "core" and "periphery", concentrating on the last sub-period, that is 1993-2000. Notice that these terms are somewhat inappropriate, since we have used the euro area as a benchmark. One should speak of countries closer to or further away from the euro area.

The core would consist of Belgium, Germany, France, Italy, Spain and Austria. For these countries differences with respect to the euro area were very limited along all dimensions. The Netherlands could also be included in the core, although a few indicators show some diverging developments.

The periphery would consist of the remaining four countries, that is Portugal, Finland, Greece and Ireland. These countries show substantial differences vis-à-vis the euro area in terms of various indicators or variables, although some of the differences can be attributed to a catching-up phenomenon. It is difficult to assess the relative importance of the diverging indicators. Some are interrelated and maybe some important factors were left aside. To solve these problems, we will in the next section resort to a quantitative approach relying on the measurement of asymmetries. We will see that in the end countries are spread along a line going from close similarity to the euro area to extensive asymmetry.

3. MEASURING ASYMMETRIES

Throughout this section we make a distinction between two forms of asymmetries. The first form relates to the importance of symmetric (euro area) versus asymmetric (country-specific) shocks in growth and inflation for each Member State (= criterion 1). The second form of asymmetry is the result of differences in reaction to symmetric shocks. Differences can be expressed in amplitude or impact (= criterion 2) and in timing or synchronization (= criterion 3). The analysis is made by means of SVAR models, the technicalities of which are explained in section 3.1, while the results are presented in section 3.2.

3.1. Specification of the SVAR models

The popularity of VAR models reflects their ability to generate valuable empirical representations of macroeconomic dynamics on the basis of simple agnostic models. Imposing a minimal set of economic restrictions, structural VARs or SVARs make it possible to evaluate the relative importance of the different structural shocks to the economy and their dynamic impact (e.g. impulse responses).

Here, this identification is achieved by imposing some long-run restrictions on the dynamics. We will use two sets of restrictions. The first one allows to distinguish between symmetric and asymmetric shocks, the second one between demand and supply shocks.

The VAR we estimated for each country contains four variables: the growth rate of real GDP of the euro area, the inflation rate of the euro area, the real growth rate of the Member State and its inflation rate. Inflation is based on the GDP deflator. If x_t is a 4x1 matrix that contains these variables and e_t is a 4x1 matrix containing the independent structural shocks, we can write[5]

$$x_t = \sum_{h=0}^{\infty} A_h \varepsilon_{t-h}$$

leaving aside the constants for reasons of simplicity.

[5] For a formal treatment of (S)VAR-models we refer inter alia to Enders (1995) and Favero (2001).

For the sake of legibility we drop the time subscripts in the following matrix presentation:

$$\begin{bmatrix} \dot{y}_{euro\ area} \\ \dot{p}_{euro\ area} \\ \dot{y}_i \\ \dot{p}_i \end{bmatrix} = \begin{bmatrix} a_{11}(L) & a_{12}(L) & a_{13}(L) & a_{14}(L) \\ a_{21}(L) & a_{22}(L) & a_{23}(L) & a_{24}(L) \\ a_{31}(L) & a_{32}(L) & a_{33}(L) & a_{34}(L) \\ a_{41}(L) & a_{42}(L) & a_{43}(L) & a_{44}(L) \end{bmatrix} \begin{bmatrix} e_{\sup ply}^{common} \\ e_{demand}^{common} \\ e_{\sup ply}^{country-specific} \\ e_{demand}^{country-specific} \end{bmatrix}$$

$\dot{y}$ = real growth of GDP

$\dot{p}$ = inflation rate

i = Germany, France, Italy, Spain, the Netherlands, Belgium, Austria, Portugal, Ireland, Finland and Greece.

As pointed out in the introduction, this model is characterized by the inclusion of variables of both the euro area and one Member State. The inclusion of the variables of the euro area will allow to make a distinction between symmetric (common) and asymmetric (country-specific) shocks. To this end we introduce a first set of long-run restrictions: $a_{13}(1) = a_{14}(1) = a_{23}(1) = a_{24}(1) = 0$. These restrictions imply that in the long run the euro area output and price levels are only affected by symmetric shocks and not by asymmetric ones.[6]

A second set of long-run restrictions is introduced to identify the fundamental demand and supply shocks that have driven output and prices in each Member State and in the euro area. Blanchard and Quah (1989) pioneered this technique. Output is only driven by supply shocks in the long run. This is for example the case in the standard AD-AS model with a downward sloping aggregate demand curve and an upward sloping short-run aggregate supply curve, whereas the long-run aggregate supply curve is vertical.

Demand shocks include, inter alia, policy innovations, and supply shocks typically include resource and technology shocks. The response to a permanent positive demand shock is thus a short-term rise in output coupled with a permanent rise in price level. Unlike positive demand shocks, positive supply shocks result in a permanent positive effect on output and a permanent negative effect on prices. In table 1 we recapitulate the short-run

[6] In this set-up, it was not possible to impose a zero impact of asymmetric shocks at each horizon. So asymmetric shocks may still exert an impact on the euro area in the short and the medium run but this impact turned negligible in estimation. As a consequence, the estimated common shocks as well as the impulse responses for the euro area were very similar across country models.

and long-run dynamic responses of output and price due to AD and AS shocks based on the AD-AS framework. This results in three additional zero restrictions: $a_{12}(1) = a_{32}(1) = a_{34}(1) = 0$. The sign impacts implied by theory in the short as well as in the long run are not imposed. The results should verify them if our identification makes sense. This turned out to be true in the vast majority of cases.

Table 1: Predicted dynamic responses from AD-AS framework

		short-run	*long -run*
output response to positive	AS shock	positive	positive
	AD shock	positive	neutral
price response to positive	AS shock	negative	negative
	AD shock	positive	positive

Our identification scheme will thus allow four kinds of shocks to be distinguished: symmetric supply and demand shocks and asymmetric supply and demand shocks.

Before commenting the results, we will take a closer look at the data. The data used in our estimation were extracted from the NiGEM-data base. The range was 1970-2000 on a quarterly basis. Where necessary, series were seasonally adjusted. In the VAR model for Germany a dummy was introduced at the time of German reunification.

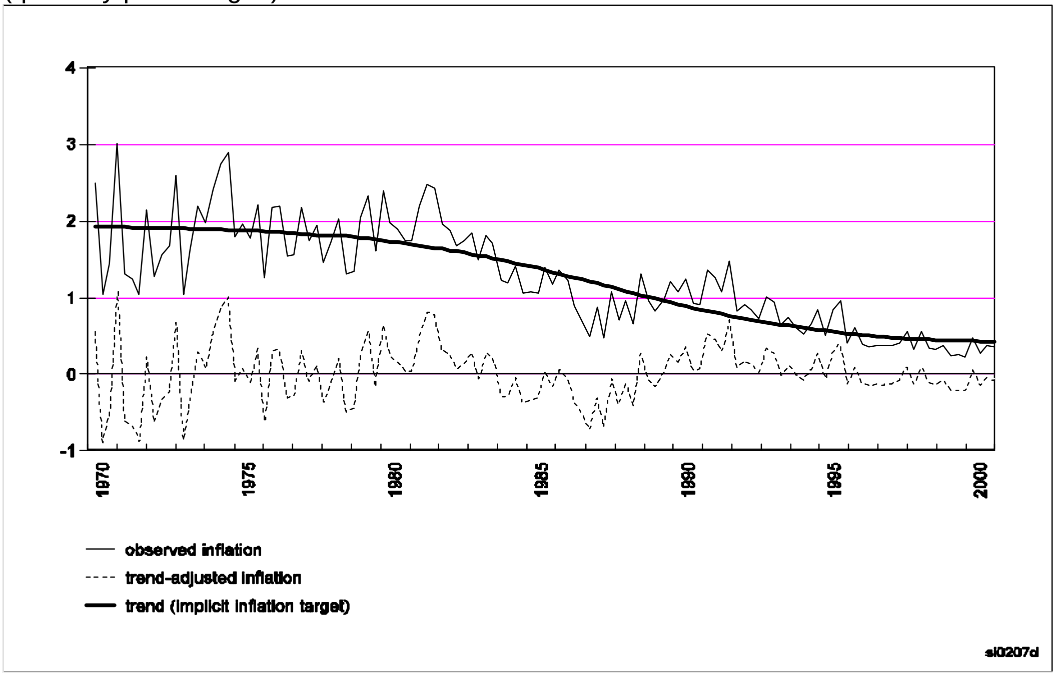
For the euro area and most countries, inflation was non-stationary; so we adjusted inflation for a flexible trend, which could capture the impact of the downward trend that is observed in most countries. The high inflation record of many countries in the 1970s raised greater concern for inflation among central bankers. The falling inflation may be attributed to the growing commitment on the part of monetary policymakers to achieve and maintain low inflation. The gradual decline of inflation could therefore be interpreted as a fall in the average (implicit) inflation objective of the central banks (Gerlach and Svensson, 2001).[7]

In order to adjust inflation for its flexible trend we use a logistic function. The same method is used to calculate a specific trend, for each individual country and for the euro area. Figure 7 illustrates the results for the euro area.

7 In the US, Clarida, Gali and Gertler (2000) argue that there was no significant change in the inflation objective of the FED but a rise in the response to inflation expectations. However, inflation objectives are not readily observable and an auxiliary assumption is required to derive the result. Pervasive mismeasurement of the output gap as shown in Orphanides (2000) could also be responsible for apparent changes in the inflation objective.

Figure 7 - Adjusting euro area inflation for a logistic trend

(quarterly percentages)



One inconvenient aspect when calculating the logistic trend is that we have to set a long-run value or "end point" for inflation. With respect to the euro area, the choice was made easier by the primary objective of the ECB and the implicit inflation target laid down in the definition of the reference value of M3, which gives an end point of 0.375 pct. on a quarterly basis. The end points of the various countries may differ from this objective, as the inflation rate in the euro area is by definition an average of the inflation rates of the Member States. In order to choose an end point for each individual country, we noticed that the average inflation amounted to 1.5 pct. for the euro area over the 1996-2000 period, a period during which macroeconomic shocks remained limited. So we took the average inflation of the 1996-2000 period of each country as the asymptotic inflation for the country.

In order to test how sensitive our results were to the choice of end points, we calculated two alternative scenarios. First we took 1.5 pct. as an end point for every country. Second, we took the values reported in Sinn and Reuter (2001) for minimum inflation rates. They calculated, on the basis of productivity differences in the traded and non-traded sectors, the minimum inflation rate that can be reached in the euro area without observing deflation in any of the Member States. In both of the alternative computations our results did not significantly differ from the base calculations.

As the (log)levels of GDP and the adjusted prices are all I(1), we also tested for co-integration between the series of the euro area and the series of each Member State. For some countries we found evidence of co-integration, but this was not generally the case. So we preferred to keep the same model for every country and all variables in first differences. It implies that for the countries where co-integration was found, some long-run restrictions were not imposed in estimation although validated by the data. Finally two lags were introduced on all variables.

Before discussing the empirical results, it is worth mentioning that systematic drifts in inflation and/or growth rates are not considered to be asymmetries in the econometric analysis. Since constant terms are included in the VAR specification, systematic drifts are removed from the variables, if still necessary for inflation. As a consequence, long-run catching-up or inflation discrepancies of the Balassa-Samuelson (or any other) type are not regarded as asymmetric phenomena in this section of the paper.

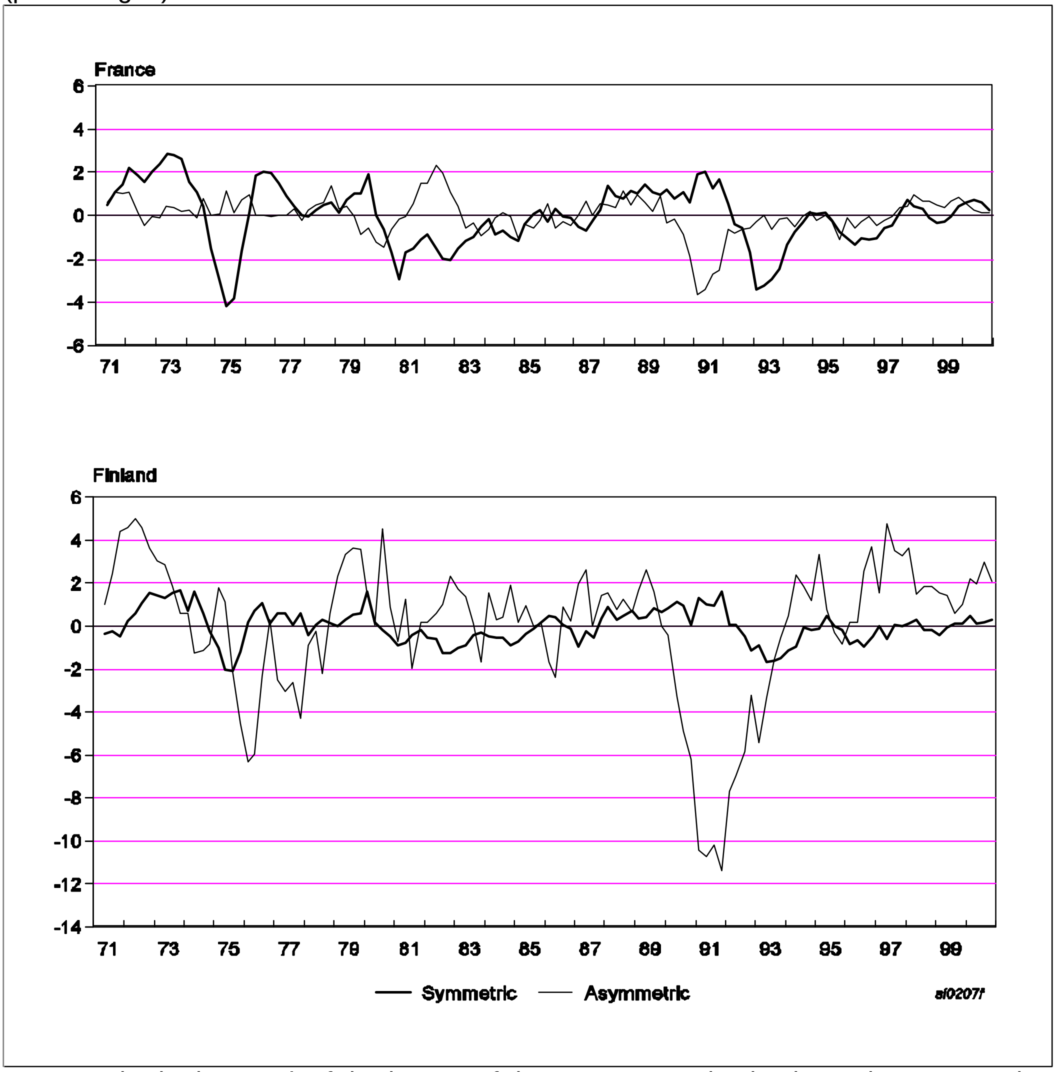
3.2. Empirical Results

As an illustration, we show in figure 8 the impact of symmetric and asymmetric shocks on annual growth for France and Finland, as identified by the respective SVAR models. "Symmetric" is the sum of the "cumulative historical effects" of the symmetric supply and demand shocks and "Asymmetric" is the sum of the cumulative historical effects of the asymmetric supply and demand shocks. France is an example of a country where symmetric shocks are clearly important, whereas for Finland asymmetric shocks are equally, if not more, important.

We can interpret the "Symmetric" lines with regard to events such as the two oil shocks or the recession in 1993. Looking at "Asymmetric" lines, we can identify the banking and financial crisis in Finland in the early nineties, linked to the severe recession in eastern European countries. An economic recovery followed, mainly due to the rapid expansion of the ICT sector in the second half of the nineties. This kind of analysis, if produced for 11 countries, would lead us too far, so we will now focus on measures of (a-)symmetry computed over the three periods of section two: 1971-1980, 1981-1990 and 1993-2000.

Figure 8 - Historical impact of symmetric and asymmetric shocks on annual growth

(percentages)



"Symmetric" is the result of the impact of the two symmetric shocks and "Asymmetric" of the two asymmetric shocks.

3.2.1. *Asymmetries in the growth patterns of the Member States*

In order to evaluate the asymmetries in the growth patterns of the Member States, we will rely on the cumulative historical effects described above.

Criterion 1: To measure our first form of asymmetry (symmetric versus asymmetric shocks), we computed the absolute value of the impact of the two symmetric shocks on annual growth as well as the absolute value of the impact of the two asymmetric shocks in every quarter. We then took the average of these absolute values over every sub-period.[8] The values are provided in table 2a in appendix. Values in bold indicate which source of shock was the most important per country per sub-period.[9]

For economic growth in Belgium, Germany, France, Italy, Spain, Portugal and Greece, symmetric shocks have been the most important source of fluctuations since the eighties, although for Portugal the values of the asymmetric shocks are also on the upper side. For the Netherlands and Austria, values for symmetric and asymmetric shocks are within the same range. Economic growth in Finland and Ireland has clearly been dominated by asymmetric shocks.

Taking the average for all countries of the asymmetric shocks per sub-period, we observe that the importance of asymmetric shocks has decreased between the seventies and the eighties but not afterwards. Excluding Finland and Ireland changes the picture as we then see a continuous decrease in the importance of asymmetric shocks in growth fluctuations.

The **second form of asymmetry** may result from the diverging way in which a country reacts to symmetric shocks. We calculated a synthetic measure by first taking the difference between the impact of the symmetric shocks on the relevant country and the impact of the symmetric shocks on the euro area. We then took the average of the absolute values of these differences over the sub-period. The values are shown in table 2b. Taking 0.5[10] as a benchmark, we notice that Portugal, Ireland, Finland and Greece have a rather asymmetric behaviour when confronted with symmetric shocks. For Spain this was only the case in the seventies. The average of all countries indicates that this second form of asymmetry has decreased over time. This can be related to the diminishing impact of symmetric shocks that can be observed in table 2a.

This second form of asymmetry is further split up into differences in amplitude, which correspond to criterion 2, and differences in synchronization, which correspond to criterion 3.

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8 Standard tools associated with SVAR models like the forward error variance decomposition are not appropriate for measuring asymmetries over decades. They rely on assumptions of independence and absence of correlation between structural shocks that are not valid per sub-period.

9 Values over 1970-1980 could be biased because the shocks are known from 1970 onwards and previous shocks cannot be taken into account in the computations.

10 0.5 is about the average of the asymmetric impact of symmetric shocks over the 1993-2000 period.

Criterion 2: In table 2a we reported values for the importance of symmetric shocks. We now use these values to measure the differences in amplitude of the reaction to symmetric shocks, i.e. the values in the left panel of table 2b are the differences between the values in the left panel of table 2a for each country and the corresponding values for the euro area. We report the absolute value of these differences, so, the lower the value, the less countries differ from the area in the way they react to symmetric shocks in terms of amplitude. The values in bold are values that are 0.5 or higher.

Ireland, Portugal and to a somewhat lesser degree, Finland and Greece emerge as the countries that showed the highest differences vis-à-vis the euro area.

Criterion 3: In order to measure the differences in response to symmetric shocks in terms of synchronization, we simply corrected the measure of the second form of asymmetry for the differences in amplitude just computed. So, the lower the value, the more a country reacts in a synchronised way to symmetric shocks as the euro area does. Again we take 0.5 as the threshold value. We observe that values are on the whole quite low and that Spain and Greece exceeded the threshold value only in the seventies. This does not mean that differences in synchronization do not dominate amplitude differences in some countries, as is the case in Germany, the Netherlands and Austria but without much absolute impact.

So we can say that for only a minority of countries asymmetric shocks were the most important source of growth fluctuations. However, when we compare table 2a (right panel) and table 2b, asymmetries generated by genuine asymmetric shocks are the dominant factor behind growth asymmetries. On average, their weight is two to three times larger than the asymmetric consequences of symmetric shocks. These were mainly due to differences in amplitude and just to a minor degree to differences in synchronization. The impact of asymmetric shocks is far from negligible even over the recent period, with an average of 1.2 percentage points on annual growth. The impact of asymmetric shocks is especially large in Finland and Ireland while in countries like Germany, France, Italy, Spain and Austria the impact remains more limited. Except for the latter country, there is clearly a small country / large country dimension to the result.

3.2.2. Asymmetries in inflation developments

We now apply the same calculations to the cumulative historical effects of shocks on annual inflation. The results are reported in tables 3a and 3b.

Criterion 1: The majority of values in bold is in the right panel of table 3a, which indicates that for a majority of countries asymmetric shocks were more important than symmetric ones as a source of inflation fluctuations. Only in Belgium, France and Italy were inflation developments clearly dominated by symmetric shocks, whereas in Germany that was the case in the first two sub-periods. As was the case for economic growth, the values for the asymmetric shocks reported for inflation in the Netherlands were quite close to those for the symmetric shocks. Inflation in all other countries was clearly dominated by asymmetric shocks. Over time, though, the importance of asymmetric shocks has decreased markedly, which is probably the result of more converging economic policies.

The measure for the **second form of asymmetry** in table 3b shows that, except for France, all countries experienced quite significant asymmetric developments as a result of symmetric shocks during the seventies and eighties. In the last sub-period, values for Belgium, Germany, Spain and the Netherlands fell beneath the threshold value but the movement was general and is reflected in a continuous decrease of the average over the sample period. This is related to the fall in the impact of symmetric shocks observed in table 3a.

Criterion 2: Differences in amplitude are the main contributor to the asymmetry of the second form. They are important for the whole time period for Italy and Austria, while for Germany, the Netherlands, Portugal and Greece this was only the case in the seventies and eighties.

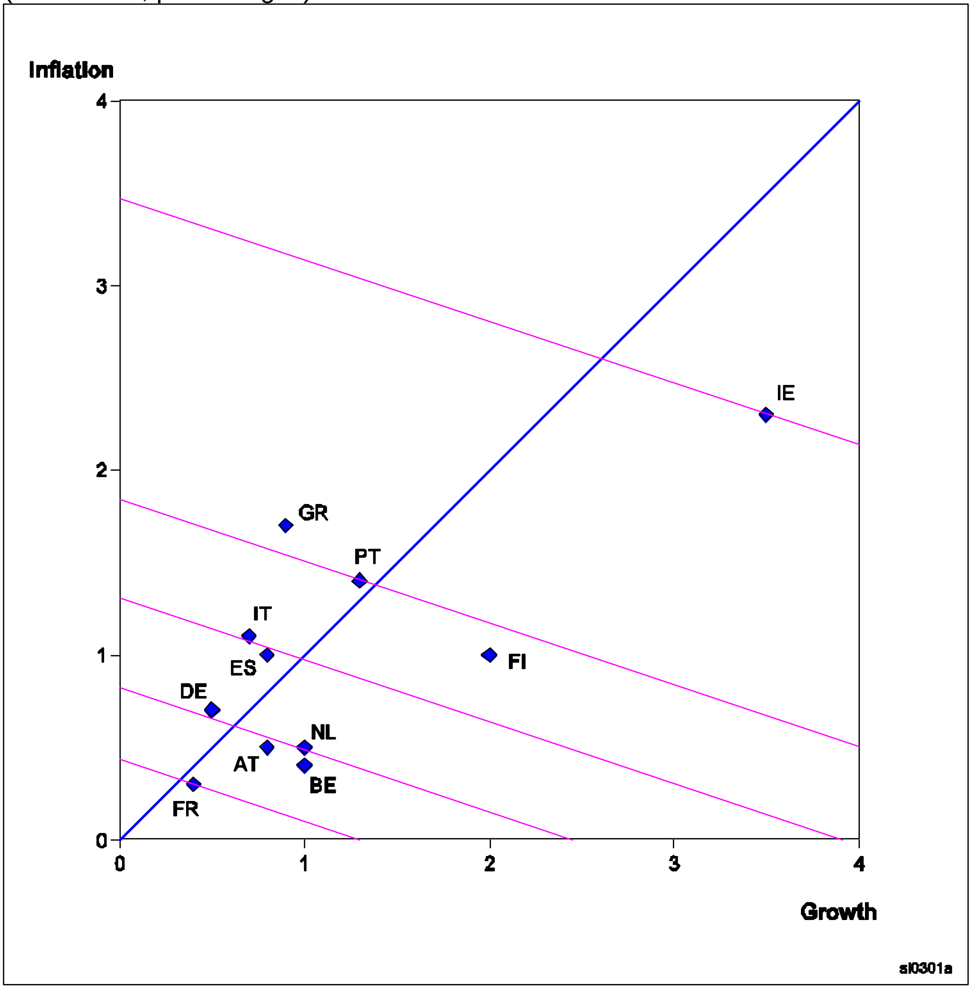
Criterion 3: The differences in synchronization of reactions to symmetric shocks are on the whole quite small except for some countries in the seventies. The average shows a slightly higher value for the last sub-period compared with the eighties, but nonetheless remains low. Synchronization difference was nevertheless at the root of the second form of asymmetry in Ireland and Finland.

So with regard to inflation developments, we noted that asymmetric shocks were more important than symmetric ones. When we compare table 3a (right panel) and table 3b, it is therefore not surprising that genuine asymmetric shocks dominate asymmetries. Over time, their impact diminished but was still at 1 percent on average over the last sub-period. The impact of asymmetric shocks was the highest in Portugal, Ireland and Greece, while it was rather small in Belgium, Germany, France, the Netherlands and Austria. Spain, Italy and Finland were average countries.

The ranking of countries in terms of inflation is broadly in line with the one found for growth, as can be seen from figure 9. If backward sloping curves weighting growth and inflation asymmetries are drawn on figure 9, several groups of countries can be isolated[11]. The least asymmetric group consists of a single country, France, which is quite similar to

Figure 9 - Impact of asymmetric shocks on growth and inflation

(1993-2000, percentages)



[11] The weight on inflation asymmetries is three times the weight on growth asymmetries, mimicking the Taylor rule weighting. However the results would not change with even weights. The exercise should be taken with some caution since growth and inflation developments are not independent: the prevalence of either demand or supply asymmetric shocks will imply positive or negative correlations between these developments.

the euro area. The second group is made up of Germany, Austria, Belgium and the Netherlands. Then follow Italy and Spain. Finland, Portugal and Greece share a high level of asymmetry for different reasons. Finally, Ireland forms the last group. It is the most asymmetric. The notions of core and periphery that we used in the previous section now look rather artificial. One could just as well speak of a continuum of countries along a line going from less asymmetric to more asymmetric. The divergences between the so-called core countries are sometimes important and many of these countries are not immune to the occurrence of significant asymmetric shocks.

4. CONCLUSION

In this paper, we discussed the scope of asymmetries in growth and inflation developments in the euro area over the 1971-2000 period. A preliminary analysis of some indicators suggested that the economies of Belgium, France, Germany, Italy, Spain and Austria were less likely to suffer from important asymmetries with respect to the euro area. The Netherlands were very close to this "core" group. However, the weighting of indicators is hazardous. Their importance may vary or they may be interrelated. Some may be missing. Moreover, it is not clear how to draw the line between countries and whether the core-periphery dichotomy is appropriate.

In order to get a quantitative measure of asymmetries over time, we estimated SVAR models that make a distinction between symmetric shocks affecting the whole euro area and asymmetric country-specific shocks that are not present at the euro area level. Both may have asymmetric consequences, since the reaction to symmetric shocks in a given country may differ from the reaction of the euro area as a whole, both in amplitude and in timing. We introduced measures to assess the importance of all these forms of asymmetries. The analysis is not confined to growth fluctuations, but also deals with inflation fluctuations.

As far as growth is concerned, symmetric shocks were the main cause of fluctuations in a majority of countries. But most countries showed few differences with the euro area when their reaction to these symmetric shocks, both in amplitude and synchronization, was examined. Hence, asymmetric shocks were invariably the most important factor underlying the asymmetries in growth patterns. The effect of asymmetric shocks has somewhat decreased over time, all the more so when excluding Ireland and Finland. As expected, large countries are less exposed to asymmetric shocks.

Asymmetric shocks were the main source of inflation fluctuations in many countries. Hence, it is no surprise that asymmetric consequences of symmetric shocks, mainly due to differences in amplitude, were on average smaller than the consequences of asymmetric shocks. There was a marked decrease in the impact of asymmetric shocks on inflation over the years, a phenomenon that was present but less pronounced for growth.

Growth and inflation are important determinants of economic policy. Asymmetric shocks (mainly) or asymmetric responses to symmetric shocks (less likely) could put pressure on the single monetary policy. If the years 1993-2000 can be used to evaluate the current period, asymmetric shocks, although decreasing, are still not negligible, neither for growth nor for inflation, with an average impact of around 1 percentage point in both cases on an annual basis. This result is independent of steady diverging patterns in growth or inflation that would be due to structural factors such as catching-up or Balassa-Samuelson effects. The small countries from the periphery seem to be more affected, but several countries thought to belong to the core do not seem to be immune to significant asymmetric shocks, either. The core-periphery dichotomy is ill-suited to account for this reality. Countries are in fact spread along a line going from close similarity to the euro area to extensive asymmetry. Only France may pretend to closely replicate the euro area.

Moreover, although the importance of symmetric shocks has decreased over time, one cannot be sure that this will continue to be the case in the future. If not, it could revive symmetric shocks as a source of asymmetry. In the opposite direction, reactions to symmetric shocks could be evolving over time, with more similarities between countries due to better integration or better co-ordination of economic policies. Further reforms in goods and labour markets would also add to the flexibility of the economies and lower the adjustment costs linked to the shocks (if not their impact).

Table 2a - Criterion 1: impact of symmetric versus asymmetric shocks on annual growth
(= first form of asymmetry)
(absolute impact of the symmetric or asymmetric shocks, percentages, average per sub-period)

	Symmetric shocks			Asymmetric shocks		
	1971-1980	1981-1990	1993-2000	1971-1980	1981-1990	1993-2000
BE	**1.9**	**1.3**	**1.1**	1.1	0.9	1.0
DE	**1.9**	1.0	**0.9**	0.9	1.0	0.5
FR	**1.4**	**0.9**	**0.9**	0.5	0.7	0.4
IT	1.4	**1.1**	**1.2**	**1.8**	0.9	0.7
ES	**1.9**	**1.2**	**1.0**	1.5	0.8	0.8
NL	**1.7**	1.0	0.8	1.0	**1.2**	**1.0**
PT	**2.5**	**2.1**	**1.5**	1.8	1.4	1.3
AT	**1.7**	0.9	**0.9**	1.3	**1.1**	0.8
IE	0.7	0.5	0.4	**1.8**	**1.9**	**3.5**
FI	0.7	0.6	0.5	**2.5**	**1.4**	**2.0**
GR	1.2	**1.7**	**1.3**	**2.1**	1.5	0.9
Euro area	1.6	1.0	0.9	0.0	0.0	0.0
Average:						
all countries	*1.6*	*1.1*	*0.9*	*1.5*	*1.2*	*1.2*
all countries except FI and IE				*1.3*	*1.0*	*0.8*

Table 2b - Asymmetric impact of symmetric shocks on annual growth
(= second form of asymmetry)
(absolute difference between the impact of the symmetric shocks on a country and the impact of the symmetric shocks on the euro area, percentages, average per sub-period)

	1971-1980	1981-1990	1993-2000
BE	0.4	**0.5**	0.2
DE	0.4	0.3	0.3
FR	0.3	0.2	0.1
IT	0.4	0.3	0.3
ES	**0.8**	0.4	0.2
NL	0.4	**0.5**	0.4
PT	**1.1**	**1.1**	**0.6**
AT	0.4	0.2	0.2
IE	**1.0**	**0.6**	**0.6**
FI	**1.0**	**0.6**	**0.6**
GR	**1.1**	**0.9**	**0.6**
Average	**0.7**	**0.5**	0.4

of which

	Criterion 2: Differences in amplitude (absolute value of the difference between the table 2a impact of symmetric shocks on the country and on the euro area)			**Criterion 3: Differences in synchronization** (second form of asymmetry minus difference in amplitude)		
	1971-1980	1981-1990	1993-2000	1971-1980	1981-1990	1993-2000
BE	0.3	0.3	0.2	0.1	0.1	0.1
DE	0.3	0.0	0.0	0.1	0.3	0.2
FR	0.2	0.1	0.0	0.1	0.1	0.1
IT	0.2	0.1	0.3	0.2	0.2	0.1
ES	0.3	0.2	0.1	**0.5**	0.2	0.1
NL	0.1	0.0	0.1	0.3	0.4	0.3
PT	**0.9**	**1.1**	**0.6**	0.2	0.0	0.0
AT	0.1	0.1	0.0	0.3	0.2	0.2
IE	**0.9**	**0.5**	**0.5**	0.1	0.1	0.1
FI	**0.9**	0.4	0.4	0.2	0.2	0.1
GR	0.4	**0.7**	0.4	**0.8**	0.2	0.2
Average:	0.4	0.3	0.2	0.3	0.2	0.1

Table 3a - Criterion 1: impact of symmetric versus asymmetric shocks on annual inflation
(= first form of asymmetry)
(absolute impact of the symmetric or asymmetric shocks, percentages, average per sub-period)

	Symmetric shocks			Asymmetric shocks		
	1971-1980	1981-1990	1993-2000	1971-1980	1981-1990	1993-2000
BE	1.3	**1.3**	**0.6**	**1.4**	1.0	0.4
DE	**0.7**	**0.6**	0.3	0.5	0.4	**0.7**
FR	**1.2**	**1.2**	**0.6**	0.5	0.5	0.3
IT	**2.6**	**2.7**	**1.5**	1.5	0.9	1.1
ES	1.2	0.9	0.5	**2.8**	**1.3**	**1.0**
NL	0.7	**0.8**	0.3	**0.8**	0.7	**0.5**
PT	2.4	2.2	1.1	**3.0**	**3.0**	**1.4**
AT	0.5	0.6	0.2	**1.2**	0.6	**0.5**
IE	1.0	1.0	0.5	**2.6**	**2.0**	**2.3**
FI	1.4	1.0	0.6	**2.3**	**1.2**	**1.0**
GR	1.8	**2.8**	1.1	**2.0**	1.9	**1.7**
Euro area	1.2	1.3	0.7	0.0	0.0	0.0
Average:						
all countries	*1.3*	*1.4*	*0.7*	*1.7*	*1.2*	*1.0*
all countries except FI and IE				*1.5*	*1.2*	*0.8*

Table 3b - Asymmetric impact of symmetric shocks on annual inflation
(= second form of asymmetry)
(absolute difference between the impact of the symmetric shocks on a country and the impact of the symmetric shocks on the euro area, percentages, average per sub-period)

	1971-1980	1981-1990	1993-2000
BE	**0.5**	**0.5**	0.3
DE	**0.6**	**0.7**	0.4
FR	0.3	0.2	0.1
IT	**1.5**	**1.4**	**0.9**
ES	**0.8**	**0.5**	0.3
NL	**0.6**	**0.5**	0.4
PT	**1.5**	**1.0**	**0.7**
AT	**0.7**	**0.7**	**0.5**
IE	**1.0**	**0.5**	**0.5**
FI	**0.8**	**0.5**	**0.5**
GR	**1.3**	**1.5**	**0.7**
Average	**0.9**	**0.7**	**0.5**

of which

	Criterion 2: Differences in amplitude (absolute value of the difference between the table 3a impact of symmetric shocks on the country and on the euro area)			**Criterion 3: Differences in synchronization** (second form of asymmetry minus difference in amplitude)		
	1971-1980	1981-1990	1993-2000	1971-1980	1981-1990	1993-2000
BE	0.1	0.0	0.1	0.4	**0.5**	0.1
DE	**0.5**	**0.7**	0.4	0.1	0.0	0.0
FR	0.0	0.1	0.1	0.3	0.1	0.0
IT	**1.4**	**1.4**	**0.8**	0.1	0.0	0.0
ES	0.0	0.4	0.2	**0.8**	0.1	0.1
NL	**0.5**	**0.5**	0.4	0.1	0.0	0.0
PT	**1.2**	**0.9**	0.4	0.3	0.1	0.3
AT	**0.7**	**0.7**	**0.5**	0.0	0.0	0.0
IE	0.2	0.3	0.2	**0.8**	0.3	0.4
FI	0.2	0.3	0.1	**0.6**	0.2	0.4
GR	**0.6**	**1.5**	0.4	**0.7**	0.1	0.3
Average:	**0.5**	**0.6**	0.3	0.4	0.1	0.2

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