

# **Growth Differentials in the EMU: Facts and Considerations**

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## 1. Introduction

Has the process of monetary unification in Europe led to economic convergence or economic divergence in the Eurozone since 1999? This is a key issue that needs to be discussed and analyzed as the long-run performance and success of the EMU depends on whether economic convergence or divergence will occur.

Before the formation of EMU there were long debates on whether or not the Eurozone was an optimal currency area. The economic criteria for a successful monetary union were widely debated in principle. Now several years after the formation of the monetary union (formally started in 2002 but already effectively in place since 1999) there is enough economic data to make a preliminary assessment of the success of the monetary union.

It is useful to go back to some of the conceptual criteria for a successful monetary union and then test whether the economic performance of EMU has been consistent with such criteria.

Here is a concise overview of the economic criteria that make a currency or monetary union desirable:

- a) There are little asymmetries in shocks and in macroeconomic transmission so that business cycles (per capita output levels and growth rates) are not widely and persistently divergent across countries;
- b) Consumption risk is sufficiently diversified across borders. In other terms, international financial markets work efficiently, so that agents can easily smooth consumption via risk sharing and international borrowing and lending across time.
- c) Fiscal policy – at the national and union level - can help stabilize national economies given asymmetric shocks;
- d) Prices and wages are sufficiently flexible so that relative prices (including real exchange rates) can adjust sufficiently even in the absence of a domestic currency;
- e) Factors are sufficiently mobile also in the short run, at low private and social costs.

The empirical literature analyzing the Eurozone performance since 1999 takes place within this framework.<sup>4</sup> In this paper we will focus on the points above to explore the degree to which different member countries are able to compensate for the absence of country specific monetary stabilization policy and a flexible exchange rate.

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<sup>4</sup> There is already a broad literature that has analyzed various aspects of EMU. We cite and refer to specific contributions in the various sections of this paper.

In the literature four broad macroeconomic channels are observed through which member countries respond to asymmetric or common shocks in ways that are stabilizing (or destabilizing) of economic convergence:

- The “risk sharing” channel based on national income / consumption smoothing via cross-border asset holdings and access to credit markets. This takes the form of a credit channel and a capital market channel;
- The “fiscal federalism” channel that allows fiscal policy to absorb national/asymmetric shocks;
- The “competitiveness” channel operating via the real exchange rate and the tradable sector that allows countries that have lost competitiveness to regain it via a real exchange rate depreciation;
- The “real interest rate channel”, operating via domestic inflation expectations and the non-tradable sector; this channel is in principle pro-cyclical (see the “Walters Critique”) and a potential source of propagation of divergence rather than convergence.

In this paper we present a systematic overview of the evidence on economic convergence or divergence within the EMU: we reconsider the criteria for a successful monetary union and consider how the channels discussed above have operated in practice. We concentrate on current Eurozone members and leave aside the issue of when and whether recent EU accession countries should join the EMU.

In summary we find that,

- There is only little evidence of per capita GDP convergence (in PPP terms), with Ireland being the only true example of standard of living catching up. Portugal, Greece and Spain do not show evidence of per capita income catching up. Italy shows a decline in the standard of living.
- Based on some measures there has been some decrease in growth dispersion within the EMU countries. Whether the recent pick up in growth in the Eurozone will continue this trend is still an open issue.
- Financial channels (credit and capital markets) provide only very modest degrees of smoothing of national shocks in the EMU, especially compared to their role within the United States. Only 7% of shocks were absorbed during the full sample. However, this risk-sharing channel via the financial channels and the fiscal channel has significantly improved over time in the Eurozone and during the EMU period. 36% of the idiosyncratic shocks are now smoothed via these channels across the Eurozone. This is consistent with the evidence that the degree of financial integration has increased over time in the Eurozone.
- The role of the financial channel is larger than the one of the fiscal channel; even in the most recent EMU period only 9% of asymmetric shocks are absorbed by the fiscal channel (as opposed to 1% for the full sample period). In the most recent EMU period the financial and credit channel smooth 27% of shocks.

- The real exchange channel provides a mixed picture: there is some evidence of mean reversion, especially in Germany; but there is also evidence of persistent loss of competitiveness in countries such as Italy, Spain and Portugal.
- Finally, the real interest rate channel is also ambiguous in its effects: based on trends in housing markets and other variables differences in real interest rates may have exacerbated financial and asset price bubbles in some economies with the risk of a boom-bust cycle. This is what happened to Portugal and to the Netherlands and what could happen to Spain.

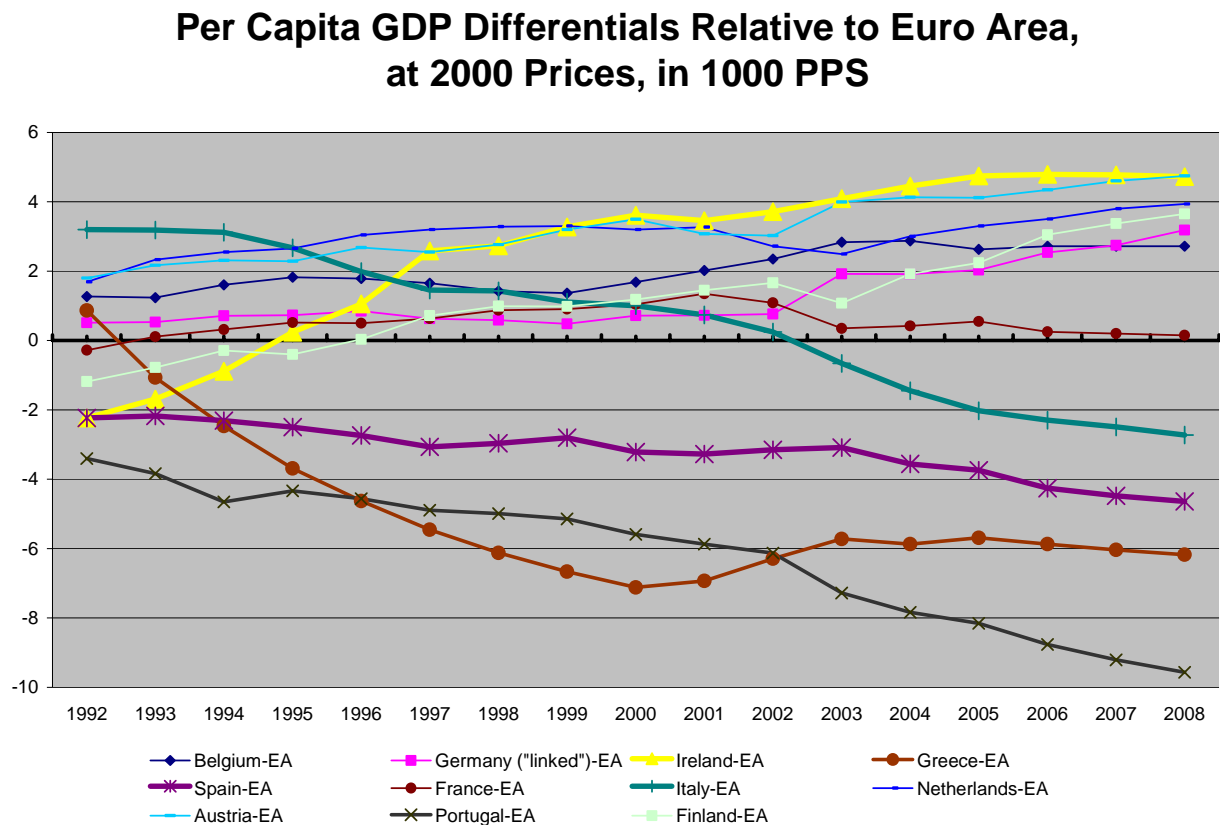
The paper is structured as follows: section 2 presents the evidence on whether economic growth within EMU has converged or diverged since 1999 and discusses the cyclical and structural factors in these growth trends. Section 3 analyzes whether and how much the financial channel and the fiscal channel have been able to absorb idiosyncratic national shocks, both before and after EMU. Section 4 analyzes whether the competitiveness channel has been working properly. Section 5 considers the operation of the “real interest rate channel” and looks at the data that proxy for the adjustment provided by this channel. Section 6 provides our conclusions and ideas for future research.

## 2. Output Growth Dynamics in the Eurozone

This section examines output trends in the 12 Eurozone countries (excluding Slovenia) since 1980. We will focus on developments in GDP per capita levels, growth dispersion, growth differentials, growth trends, and output gaps in particular. All of these variables are the topic of extensive research in the literature and this section's main contribution will be to provide an updated overview.

### 2.1. GDP per capita levels

Chart 2.1



Source: Own computations based on European Commission data.

Giannone, Reichlin (2006) analyze the empirical question if gaps in living standards persist and whether countries have changed their relative position relative to the euro area average over time. They observe per capita GDP at constant prices and PPP in order to adjust for price level and exchange rate movements that distort volume comparisons of relative purchasing power among countries over time.

The time series in Chart 2.1 confirm the result that the only genuine “catching-up” story since the early 1990s is Ireland. In effect, the country moved from the group of laggards to leader of the Euro-11 group within a decade (Luxembourg is excluded from the

calculations as it is a powerful outlier on the upside, largely due to factor income from its position as international financial center.) Finland's upswing largely reflects its recovery from the 1992 crisis.

On the other hand, Portugal, Greece, and Spain do not show signs of catching-up towards the Euro-11 average, whereas Italy displays a picture of slow but steady decline since the early 1990. In any case, most countries largely maintained their position within the group.

## **2.2. Output Growth Differentials and Dispersion Across Eurozone Countries**

The ECB (2006, 2007) argues that the current degree of differentials in output growth across the Eurozone countries is not large, either by historical standards or by comparison with the U.S. This is shown by computing the dispersion of real GDP growth rates across the Eurozone countries up to 2005. Chart 2.2 extends this same measure of dispersion, i.e. the standard deviation in unweighted<sup>5</sup> terms, to the latest European Commission forecasts (2008).

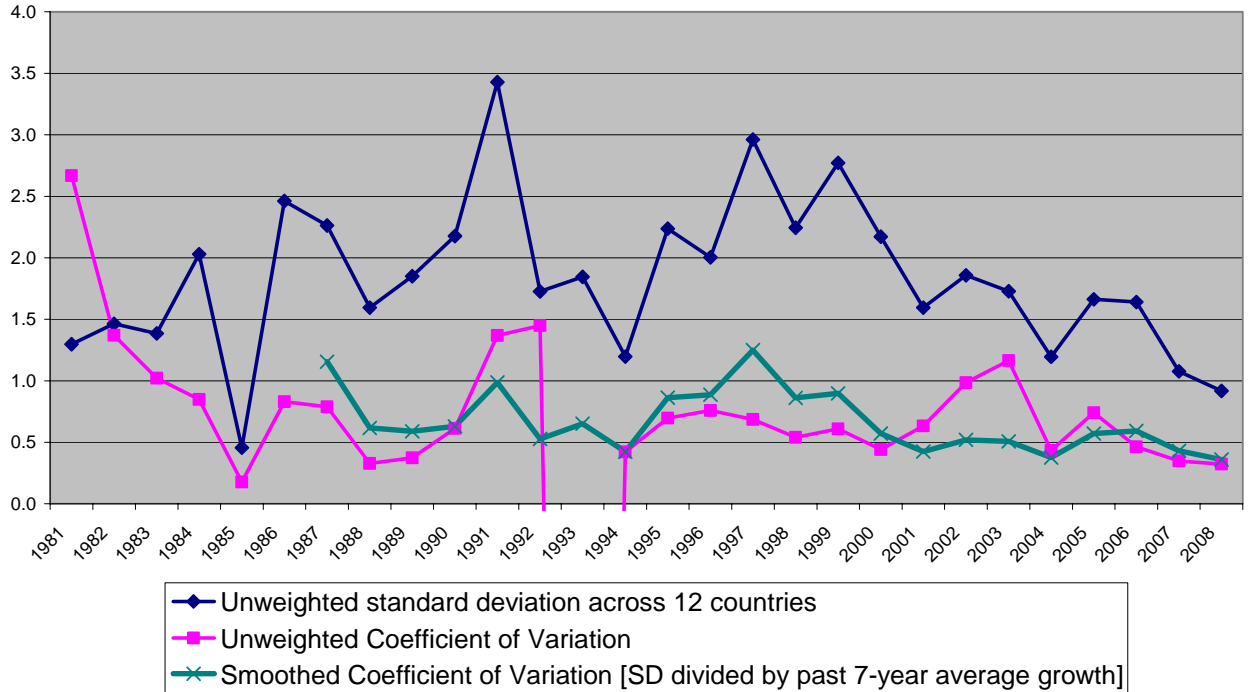
As can be seen, the downward trend – in growth differentials – observed by the ECB for the first six years of the currency union since 1999 is projected to continue into 2007 and 2008. However, the average Eurozone growth rate fell too in the years after 2001. This lower mean implies that the standard deviation around it, even if unchanged in percent terms, would be lower too. One should therefore look at the coefficient of variation (i.e. the standard deviation divided by the mean growth rate) to get a more accurate measure of actual growth dispersion. This measure, along with smoothed versions of it in order to adjust for noisy behavior when the average is close to zero as in 1992/3, is also shown in Chart 2.2.

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<sup>5</sup> The term 'unweighted' means that each country's growth rate enters the equation with equal weight, regardless of its GDP size.

Chart 2.2

### Dispersion of Real GDP Growth Rates Across Euro Area Countries, in percent [unweighted growth rates]



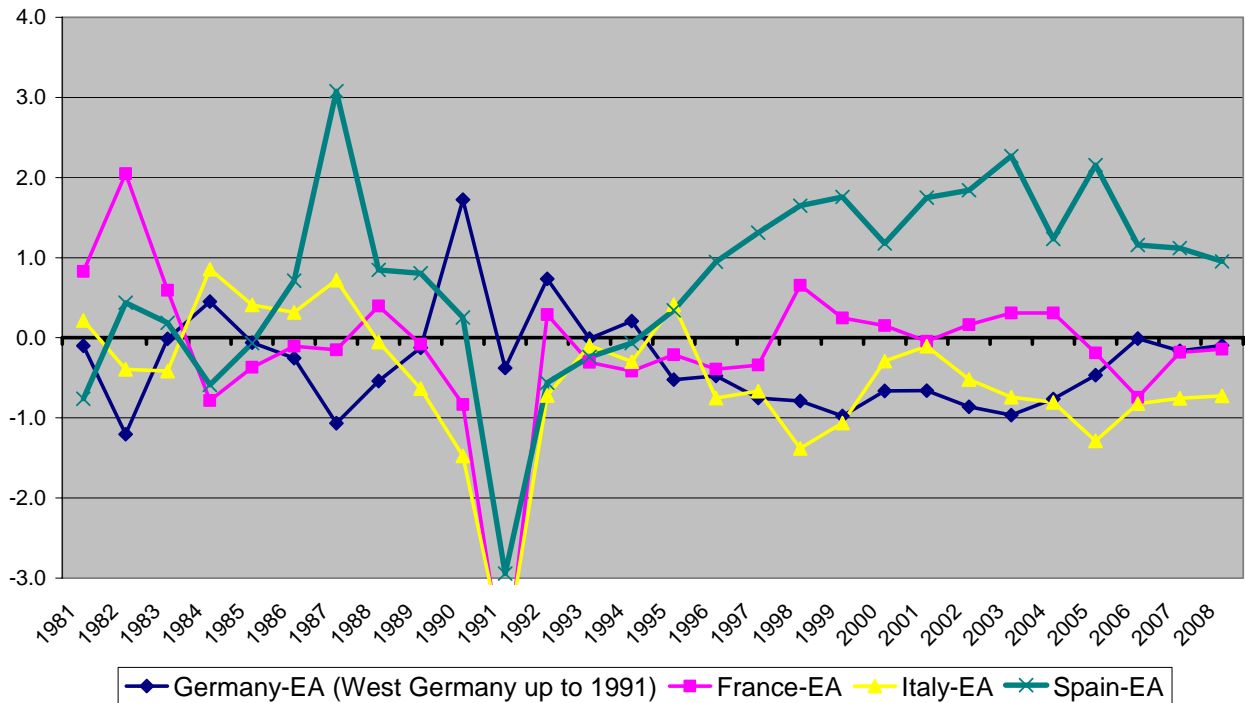
Source: Own computations based on European Commission data.

As can be seen, the unweighted coefficient of variation displays a slight downward trend forecast to continue in 2007 and 2008 which points to a convergence in growth rates across the Eurozone since its inception in 1999.

Chart 2.3 shows the growth rate differential of the 4 largest Euro area countries, i.e. Germany, France, Italy, and Spain, relative to the Euro-12 average.

Chart 2.3

### Real GDP Growth Rate Differentials Relative to Euro Area, in percent [unweighted growth rates]



Source: Own computations based on European Commission data (AMECO database).

The growth pattern of individual countries shows a fair amount of persistence since the inception of the currency union in 1999. In line with ECB findings, Chart 2.3 shows that Spain (together with Ireland, Luxembourg, and Finland, not shown in the chart) has been growing persistently and significantly above the euro area average since the mid-1990s, while Germany and Italy have been persistently lagging behind. Since 2006, however, Germany’s growth performance is matching the Eurozone average while Spain is showing signs of cooling off.

### 2.3. Trend Versus Cycle

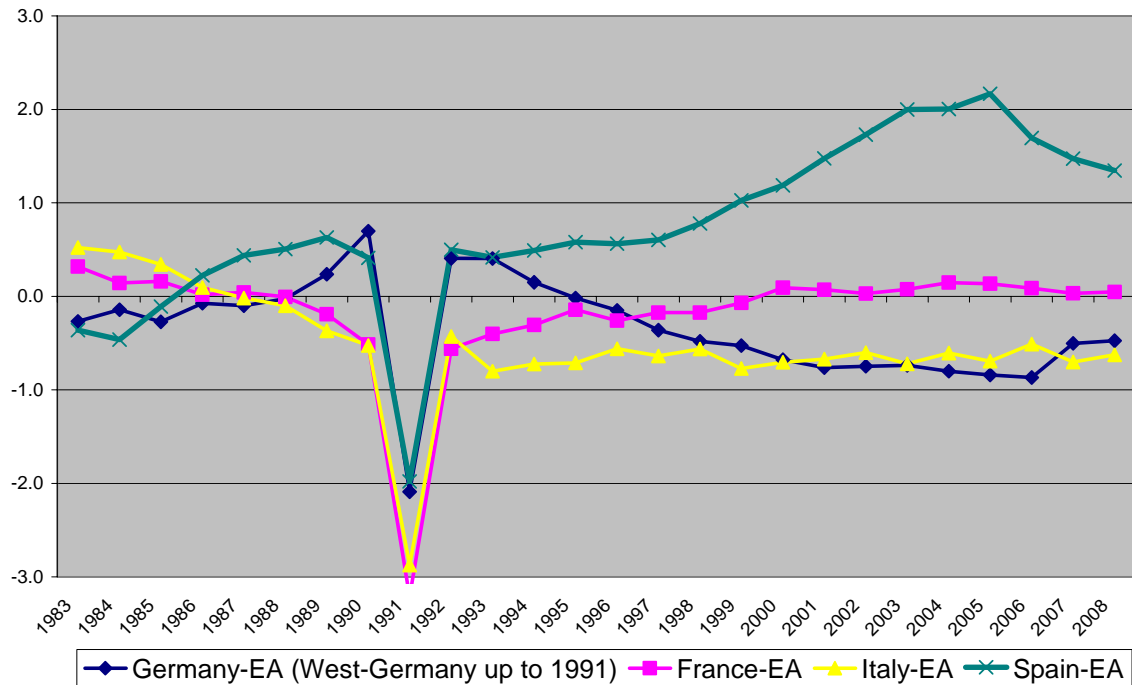
The ECB (2006) computes a trend-cycle decomposition in order to establish if the growth rate dispersion across countries is driven by differences in trend output growth or if the dispersion is due to cyclical divergences<sup>6</sup>. They find that “the dispersion of real GDP growth rates across the Eurozone countries has largely reflected lasting trend growth differences and, to a lesser extent, cyclical differences.” This result is also confirmed in Giannone, Reichlin (2006). Indeed, the ECB is careful to specify that any trend-cycle decomposition is model-dependent and particularly uncertain for the most recent period.

<sup>6</sup> ECB (2006) use a Baxter King band pass filter over the period 1960-2008, including European Commission forecasts of real GDP for the period 2006-08.

Chart 2.4 shows potential growth rates based on the real potential GDP series as computed by the European Commission<sup>7</sup> made available in the AMECO database for the 4 largest countries. Chart 2.5 shows the unweighted dispersion dynamics across all 12 countries.

Chart 2.4

### Real Potential Growth Differentials Relative to EA Potential Growth, in percent

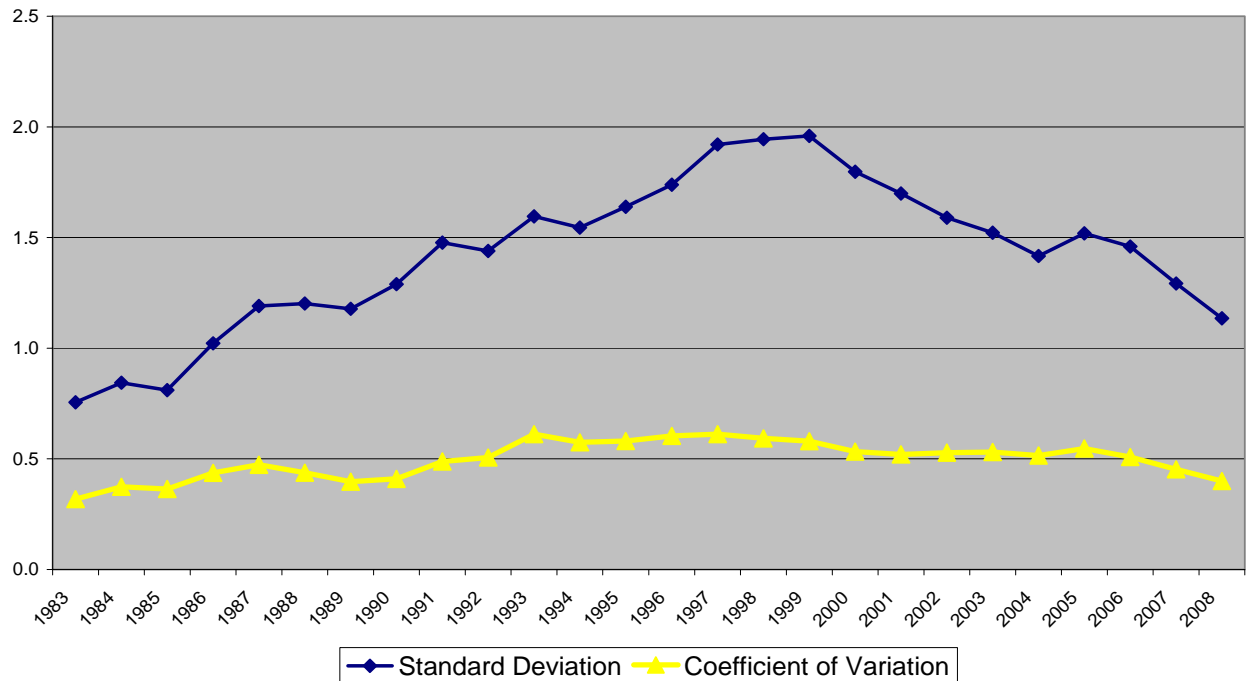


Source: Own computations based on European Commission data (AMECO database).

<sup>7</sup> For detailed information see the biannual ECFIN documentation 'Cyclical Adjustment of Budget Balances', and: Cécile Denis, Kieran Mc Morrow and Werner Röger: 'Production function approach to calculating potential growth and output gaps - estimates for the EU Member States and the US', European Economy, Economic Papers, No 176, September 2002; European Commission, Brussels.

Chart 2.5

### Real Potential Growth Dispersion, in percent [unweighted growth rates]



Source: Own computations based on European Commission data (AMECO database).

Computations of potential growth rates relative to the Eurozone average based on the European Commission trend-cycle decomposition confirm the notion of growth dispersion being largely driven by differences in trends rather than differences in cyclical patterns since the mid-1990s. Indeed, the unweighted standard deviation in Chart 2.5 matches the downward trend of the real GDP standard deviation across all 12 countries as shown in Chart 2.2.

Moreover, the unweighted coefficient of variation in Chart 2.5 also signals a movement towards potential growth rate convergence since 2006. Bearing in mind the warning issued by the ECB regarding the reliability of data for the latest period, it might be too early to conclude about the cyclical or permanent nature of the latest Euro area wide upswing since 2006.

#### 2.4 Output Gap Analysis and Business Cycle Synchronization

The degree of business cycle synchronization across countries is important given the common monetary policy. As observed in Billmeier<sup>8</sup> (2004), “the (unobservable) output gap reflects the cyclical position of an economy.” Potential growth and output gap

<sup>8</sup>Billmeier, A. (2004); “Ghostbusting: Which Output Gap Measure Really Matters?”, IMF, <http://www.imf.org/external/pubs/ft/wp/2004/wp04146.pdf>

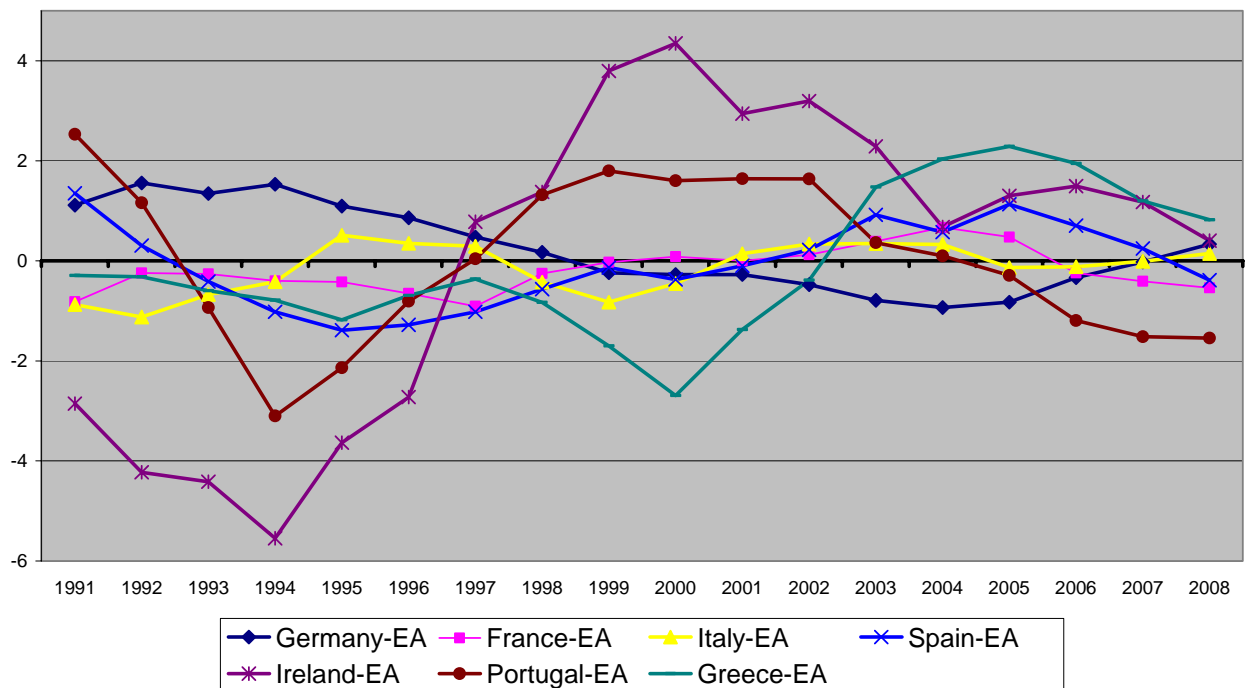
calculations are two sides of the same coin and therefore equally model dependent as the previous trend growth calculations. In fact, in the literature various authors reach different conclusions and a consensus on the important issue of business cycle synchronization is yet to be reached.

ECB (2006) for instance, following their own trend-cycle decomposition, calculate pairwise 8-year rolling correlations of output gap across Eurozone countries and then compute the unweighted average of these correlations. According to this measure, “the degree of synchronization of business cycles across the euro area countries seems to have increased since the beginning of the 1990s. Indeed, the measure suggests that the degree of synchronization is currently at historically high levels.”

Alternatively, the European Commission’s output gap series is shown in Chart 2.6 for selected countries.

Chart 2.6

### Output Gap Differential Relative to Euro-12 average, percentage points

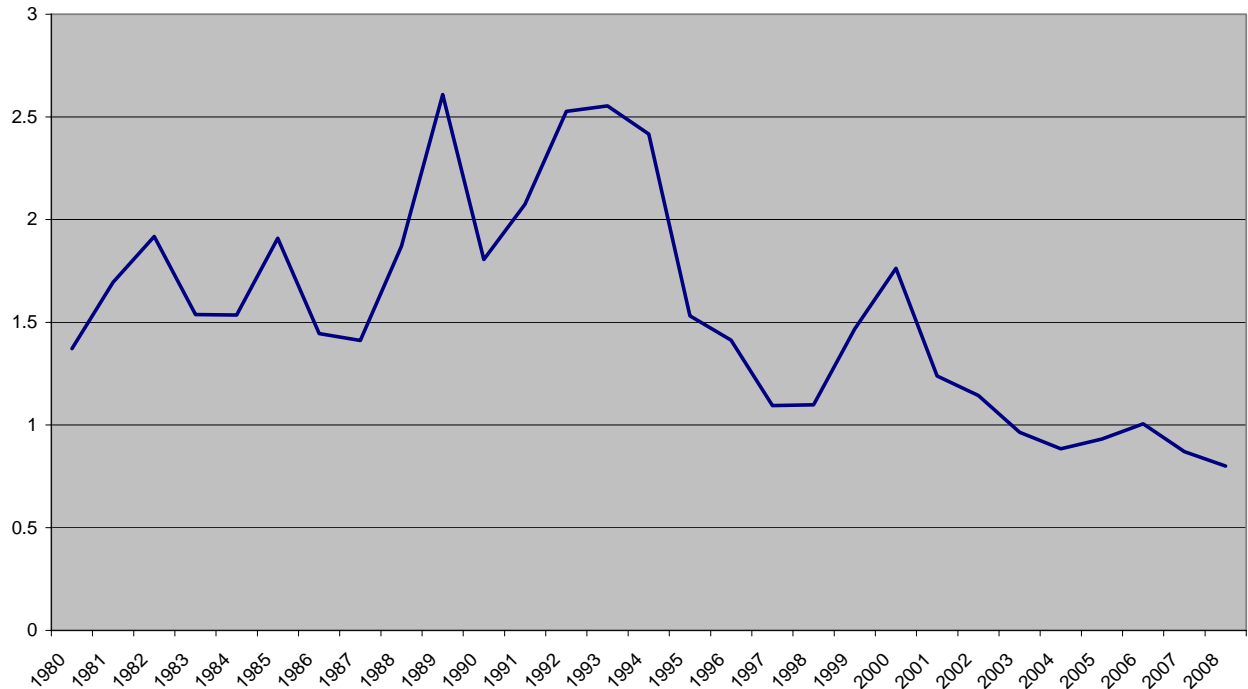


Source: Own computations based on European Commission data (AMECO database).

The output gap patterns of the selected countries relative to the Eurozone in Chart 2.6 do not seem to follow a uniform pattern. However, when measuring the unweighted standard deviation across the 12 countries, the pattern is one of steady convergence towards the mean output gap starting in the mid-1990s.

Chart 2.7

### Output Gap Dispersion, Standard Deviation, in percent of real trend GDP [unweighted]



Source: Own computations based on European Commission data (AMECO database).

The EEAG European Economic Advisory Group at CESifo<sup>9</sup> (2007) takes a different approach than the output gap to analyze how well the common monetary policy suits each country's needs. Following the approach developed by Clarida et al. (1998), EEAG calculates *country-specific stress indicators* based on the difference between the actual monetary policy and the monetary policy preferred by individual member countries<sup>10</sup>.

Without going further into detail (see Appendix - Section 2), the EEAG finds that “assuming the ECB had conducted monetary policy for Ireland alone, it would on average have set the interest rate 1.2 percentage points higher. At the other extreme is Germany, where the interest rate would have been on average almost 0.4 percentage points lower. Belgium and Italy are the countries with the lowest absolute levels of such structural stress in the euro area.”

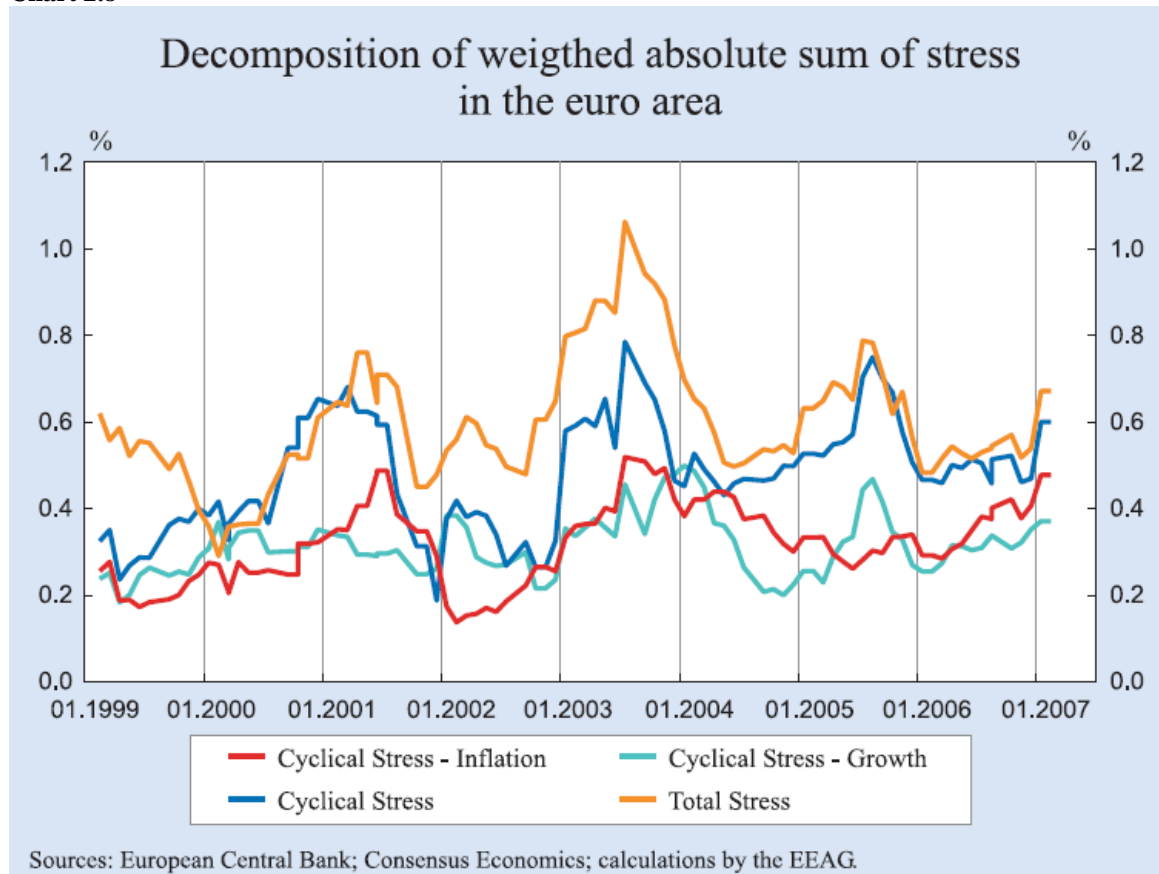
Importantly, their measure of aggregate stress equals 0.6 percentage points on average and it does not show any clear trend over time (see Figure 2.8 sourced from the report.)

<sup>9</sup> EEAG Members: Lars Calmfors, Seppo Honkapohja, Giancarlo Corsetti, Michael P. Devereux, Gilles Saint-Paul, Hans-Werner Sinn, Jan-Egbert Sturm, Xavier Vives

<sup>10</sup> For details see EEAG (2007), Chapter 1, p. 41: *How well does “one size fit all”?* and Box 1.3 “Computing stress” reproduced in Appendix 1.

“Hence, these results do not suggest that the degree of business cycle synchronization has steadily increased during the past eight years. This speaks against the argument that the monetary union would automatically reduce differences in cyclical developments among the member countries.”

**Chart 2.8**



Taking account of the conflicting signals stemming from output trend analysis and cyclical patterns, Giannone and Reichlin (2006) ask the question: Should we worry about it? After all, what matters for welfare is consumption rather than output. Increased financial market integration and cross-country ownership of financial assets should make it easier to smooth income and consumption. The analysis of financial integration in the Euro area is indeed the topic of the next section.

On a concluding note, Langedijk and Roeger (2007) raise important topics for discussion in their paper “Adjustment in EMU: A model-based analysis of country experiences”. They cite three origins of the divergences of the economic developments and their persistence that are considered in the literature:

- 1) Dissimilar supply conditions. By themselves, these do not stand in the way of a smooth functioning of the monetary union.
- 2) One-off adjustment effects caused by the adaptation to the monetary union;
- 3) The occurrence of asymmetric shocks.

### 3. Financial Integration and Channels of Interstate Risk Sharing In the Eurozone

In a monetary union, idiosyncratic shocks – shocks that hit only one or some of the members of the area and not the entire area – cannot be cushioned by monetary policy. The lever provided by the exchange rate when monetary policy was independent is not available anymore. The presence of idiosyncratic shocks creates asymmetry of gross state product<sup>11</sup> fluctuations. In a monetary union, this results in welfare losses to the state hit by the shock unless the channels that permit to achieve inter-state risk sharing – income insurance and consumption smoothing – are well functional (Kalemli-Ozcan, Sorensen, Yosha, 2004). In the long run, significant welfare losses can put the monetary union under serious pressure by making monetary independence more desirable for the individual members affected by losses.

A starting observation is that the ratios of the standard deviations of real per capita gross state products of each member state to the standard deviation of the Eurozone gross domestic product vary from 0.8 to 3, with an average of 1.25. This average goes down to 1 if we consider the period 1980-1998, and it increases to 1.5 for the period 1998-2007 (range 0.6-4.9). The fact that per capita state production is more variable than per capita Eurozone production creates motive for risk-sharing analysis.

In order to study the amount of risk sharing among the states of the Eurozone<sup>12</sup> we follow the analytical framework developed first for the United States by Asdrubali, Sorensen and Yosha (1996). Asdrubali, Sorensen and Yosha (1996) identify three channels through which risk sharing can occur. First, if capital markets are well developed, the members of the monetary union can share risk through cross-ownership of real and financial assets and thus smooth their income (GNP) stream relative to their output stream (GSP or GDP). Second, the fiscal channel can improve risk sharing further through transfers from the central fiscal authority to the member states<sup>13</sup>. Third, the members of the monetary union could achieve consumption smoothing by owning a diversified and actively managed asset portfolio and undertaking intertemporal borrowing and lending. These three channels can be labeled capital market channel, fiscal channel and credit market channel.

#### 3.2 Methodology

As in Asdrubali, Sorensen and Yosha (1996) we decompose the period-by-period, cross-sectional variance of the gross state product. We start from the following identity:

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<sup>11</sup> For consistency we will use the term “gross state product” when referring to the output of a member state. We will use “gross domestic product” when referring to the output of the entire monetary union (EMU). Output measures for the EMU before 1991 are computed as the average of the output of the member states

<sup>12</sup> We consider 12 Eurozone states: Belgium, Germany, Ireland, Greece Spain, France, Italy, Luxembourg, Netherlands, Austria, Portugal and Finland. Although Slovenia joined the EMU since January 1, 2007, it is not among the countries studied.

<sup>13</sup> Appendix Section 3 – The EU Structural and Cohesion Funds.

$$gsp^i = \frac{gsp^i}{si^i} * \frac{si^i}{dsi^i} * \frac{dsi^i}{c^i} c^i \quad (3.1)$$

where  $gsp$  denotes the gross state product,  $si$  is the state income (gross national income – i.e. dividends, interests, rental income and payments across state borders),  $dsi$  is the disposable state income, namely the state income at the net of transfers from the fiscal authority ( $si +$  transfers from the fiscal authority – taxes) and  $c$  denotes consumption. All the variables are expressed in per capita terms and  $i$  is a country index.

Full risk sharing implies that the income of each state ( $si$ ) is uncorrelated with their gross state product ( $gsp$ ). Namely, if a state is hit by a shock in presence of capital market smoothing, the state's income will not vary (co-move) with its production. If this channel does not achieve full risk sharing, then there is room for further risk sharing through the fiscal channel. In other words, in presence of a shock  $dsi$  should not co-move with  $gsp$ . The third channel, if full insurance is not achieved through the first two, is the consumption channel. Consumption smoothing through the adjustment of portfolio assets – for example – achieved by borrowing and lending in the international markets – will result in consumption  $c$  being uncorrelated with  $gsp$ .

In order to obtain a simple measure of smoothing it is useful to decompose the cross-sectional variance of the  $gsp$  as follows<sup>14</sup>:

$$\begin{aligned} \text{var}\{\Delta \log gsp\} = & \text{cov}\{\Delta \log gsp, \Delta \log gsp - \Delta \log si\} \\ & + \text{cov}\{\Delta \log gsp, \Delta \log si - \Delta \log dsi\} \\ & + \text{cov}\{\Delta \log gsp, \Delta \log dsi - \Delta \log c\} \\ & + \text{cov}\{\Delta \log gsp, \Delta \log c\} \end{aligned} \quad (3.2)$$

Dividing (3.2) by the variance of  $\Delta \log gsp$  we obtain:

$$1 = \beta_K + \beta_F + \beta_C + \beta_U \quad (3.3)$$

where  $\beta_K$ ,  $\beta_F$  and  $\beta_C$  can be interpreted as the percentage amount of smoothing achieved by the capital, fiscal and credit channel respectively.  $\beta_U$  is the percentage of the idiosyncratic shock which is not smoothed by the three channels. In other words, full risk sharing is reached when  $\beta_U = 0$ .

As in Asdrubali, Sorensen and Yosha (1996), we run the following panel regressions using generalized least squares (GLS):

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<sup>14</sup> This expression can be obtained from (3.1) by taking logs and differences, multiplying both sides by  $\Delta \log gsp^i$  and taking expectations.

$$\begin{aligned}
-\Delta \log si_t^i &= v_{K,t} + (\beta_K - 1) * \Delta \log gsp_t^i + \mu_{K,t}^i \\
\Delta \log si_t^i - \Delta \log dsi_t^i &= v_{F,t} + \beta_F \Delta \log gsp_t^i + \mu_{F,t}^i \\
\Delta \log dsi_t^i - \Delta \log c_t^i &= v_{C,t} + \beta_C \Delta \log gsp_t^i + \mu_{C,t}^i \\
\Delta \log c_t^i &= v_{U,t} + \beta_U \Delta \log gsp_t^i + \mu_{U,t}^i
\end{aligned} \tag{3.4}$$

where  $v_{.,t}$  is a time fixed effect. The main result in Asdrubali, Sorensen and Yosha (1996) is that in the United States, during the period 1964-1990, 39 percent of the shocks are absorbed via capital market smoothing, 13 percent are absorbed via the fiscal channel and 23 are absorbed by the credit market channel (consumption smoothing); that adds up to 75% of the shocks being smoothed by these three channels. Thus, for the United States only 25 percent of the shocks are not absorbed. Using an analogous methodology, Sorensen, Yosha (1998) analyze risk sharing patterns among EU and OECD countries for the period 1966-90. Kalemli-Ozcan, Sorensen, Yosha (2004) update some of the empirical results up to the end of the 1990s.

We update the empirical analysis further considering the period 1980-2007 and dividing it into sub-periods in order to analyze the changes of the last decade, after the start of the EMU.

### 3.3 Results and Further Considerations

Table 3.1 displays the empirical results. We start by running the regressions using the full period of data, 1980-2007. We find that 88 percent of the shocks to the gross state product are not insured and this number is clearly significant (standard deviations for the coefficients are in brackets). We therefore reject the hypothesis of full risk sharing. Capital markets, government and credit markets only smooth 3, 2 and 7 percent of the shocks respectively.

**Table 3.1 Estimates of Income and Consumption Smoothing**

	1980-2007
<b>Capital markets:</b> $\beta_K$	0.03 (0.01)
<b>Government:</b> $\beta_F$	0.02 (0.01)
<b>Credit markets:</b> $\beta_C$	0.07 (0.02)
<b>Not smoothed:</b> $\beta_U$	0.88 (0.22)

In table 3.2 we show the results obtained for the various sub-periods considered. Again, full risk sharing is rejected for every sub-period considered. However, the results for the

last decade show improvement. While for the period between 1980 and 1998 92 percent of the shocks were not insured, during the last decade the percentage of unsmoothed shocks decreased to 64 percent. Risk sharing in the EMU has increased over time. As our results show, in the last decade all of the three channels improved their role in providing insurance against state specific shocks (table 3.2).

Risk sharing in the EMU is still significantly lower than in the United States, but the improvement of the last decade implies that the EMU is on the path of convergence towards the level of inter-state insurance observed in the United States. This is being achieved by means of a higher degree of financial integration and cross-county ownership of financial and productive assets<sup>15</sup>.

**Table 3.2 Estimates of income and consumption smoothing: sub-periods<sup>16</sup>**

	1980-1995	1995-2007	1980-1998	1998-2007
<b>Capital markets: <math>\beta_K</math></b>	0.004 (0.01)	0.13 (0.04)	0.01 (0.01)	0.13 (0.05)
<b>Government: <math>\beta_F</math></b>	0.01 (0.01)	0.04 (0.04)	0.01 (0.01)	0.09 (0.06)
<b>Credit markets: <math>\beta_C</math></b>	0.05 (0.03)	0.18 (0.05)	0.06 (0.02)	0.14 (0.06)
<b>Not smoothed: <math>\beta_U</math></b>	0.94 (0.03)	0.65 (0.03)	0.92 (0.03)	0.64 (0.04)

### 3.3.1 Cycle Asymmetries in the EMU

Kalemli-Ozcan, Sorensen, Yosha (2003) show how inter-country risk sharing induces higher specialization in production which in turn should turn into more asymmetry in the fluctuations of gross state product or, in other words, more idiosyncratic shocks. The logic behind their result is that as long as cross-ownership of assets is sufficiently diversified the single member states can be very specialized, and display potentially high gross state product volatility, while still having low volatility of income.

As said in the beginning, the presence of unsmoothed idiosyncratic shocks and asymmetry of gross state product fluctuations, in a monetary union, results in welfare losses to the state hit by the shock unless the channels that permit to achieve inter-state risk sharing – income insurance and consumption smoothing – are in place.

<sup>15</sup> For a recent overview of the state of financial integration in the Eurozone see ECB (2007) and the related charts in the Appendix – Section 3.

<sup>16</sup> We chose to start the second sub-period from 1998 as that was the year in which the rates of the currencies of the EMU countries were irrevocably fixed. Financial integration was already ongoing before then, the monetary union created an endogenous increase.

To compute the level of asymmetry in the EMU we refer to the framework set up by Kalemli-Ozcan, Sorensen, Yosha (2004). The indicator of asymmetry is constructed according to the following expression:

$$G^i = \frac{1}{\delta} * \left( \frac{1}{2} \sigma^2 + \frac{1}{2} \sigma_i^2 - \text{cov}^i \right) \quad (3.5)$$

where  $\sigma^2$  is the variance in growth of the gross domestic product per capita of the EMU in the given time period,  $\sigma_i^2$  is the variance in growth of the per capita gross state product of the member state under analysis and  $\text{cov}^i$  is the covariance between these two series of growth rates;  $\delta$  is a constant that describes the rate of discount set to 2 percent.

This formulation implies that the lower the covariance among the growth series of per capita gross state product and gross domestic product, the higher the indicator of asymmetry will be. High indicators of asymmetry imply higher gains from inter-state risk sharing. In fact, countries in which state output is countercyclical with respect to the union should provide insurance to other.

While Kalemli-Ozcan, Sorensen, Yosha (2004) find evidence that county-level specialization in the EU increased in the 1990s, they also find that asymmetry of output fluctuations has decreased with respect to the previous decade<sup>17</sup>; their result is at odds with the authors previous empirical findings – in Kalemli-Ozcan, Sorensen, Yosha (2003).

We find that in the period 1998-2007 the increased –with respect to 1980-1998 – level of risk sharing found above was accompanied by higher output asymmetry. This result is well in line with the logic in Kalemli-Ozcan, Sorensen, Yosha (2003). Therefore, the increase of risk sharing observed in the period 1998-2007 has been accompanied by an increase of output asymmetry – and possibly of product specialization.

However, given the limited level of risk sharing in the EMU, the asymmetry of income and consumption fluctuations is a more important indicator of the losses of welfare that could occur in a member state in presence of an idiosyncratic shock. We find that asymmetry of state income (and state disposable income), while at the same level as output asymmetry in the period 1981-1998, decreased substantially in the last decade. This result confirms, that, although the EMU is still far from displaying a level of risk sharing comparable to the United States for example, the presence of increased risk sharing is having positive effects on state income fluctuations reducing the welfare losses from idiosyncratic shocks.

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<sup>17</sup> This finding is at odds with Kalemli-Ozcan, Sorensen, Yosha (2001) who find a positive correlation between specialization in production and higher asymmetry in gross state product fluctuations.

**Table 3.3 Measure of output asymmetry**

	<b>1981-1998</b>	<b>1998-2007</b>
Belgium	0.04	0.22
Germany	0.10	0.16
Ireland	0.25	2.90
Greece	0.12	0.48
Spain	0.04	0.11
France	0.07	0.10
Italy	0.11	0.19
Luxembourg	0.07	2.68
Netherlands	0.09	0.45
Austria	0.03	0.16
Portugal	0.27	0.35
Finland	0.26	0.47
<b>Average EMU</b>	<b>0.12</b>	<b>0.69</b>

**Table 3.4 Measure of state/national income asymmetry**

	<b>1981-1998</b>	<b>1998-2007</b>
Belgium	0.05	0.01
Germany	0.09	0.01
Ireland	0.24	0.09
Greece	0.11	0.03
Spain	0.05	0.01
France	0.08	0.00
Italy	0.11	0.01
Luxembourg	0.07	0.15
Netherlands	0.09	0.04
Austria	0.03	0.01
Portugal	0.32	0.02
Finland	0.33	0.04
<b>Average EMU</b>	<b>0.13</b>	<b>0.03</b>

**Table 3.5. Measure of disposable state/national income asymmetry**

	<b>1981-1998</b>	<b>1998-2007</b>
Belgium	0.04	0.01
Germany	0.06	0.01
Ireland	0.20	0.08
Greece	0.13	0.03
Spain	0.04	0.01
France	0.07	0.00
Italy	0.11	0.01
Luxembourg	0.07	0.18
Netherlands	0.09	0.04
Austria	0.03	0.01
Portugal	0.29	0.02
Finland	0.30	0.04
<b>Average EMU</b>	<b>0.12</b>	<b>0.04</b>

#### 4. External adjustment, real exchange rates and competitiveness

In a monetary union movements of the real exchange rate depend on the nature of the shock hitting an economy (demand, supply, monetary) and on the degree of nominal/real flexibility of prices and wages. In the presence of exchange flexibility (no monetary union) asymmetric shocks, which in the presence of nominal rigidities would lead to a persistent change in output and employment levels, can be absorbed by movements of the nominal and, thus, real exchange rate that derive – in part – by the ability to follow a looser monetary policy.

For example, in the presence of a negative global demand shock for a country's export, a real depreciation is needed. If prices and/or wages are downward sticky, the required real depreciation occurs via a nominal depreciation. Instead, if the nominal exchange rate channel is not available because of a monetary union, the real exchange rate will become overvalued and the negative consequences of the demand shock on economic activity can be exacerbated: instead of a stabilizing real depreciation one may observe a destabilizing real appreciation.

As discussed in this section this is exactly the adjustment path that was experienced by Italy, Portugal, and Greece after EMU where a reduction in the global demand for their labor-intensive exports because of the emergence of China and Asia led to a disequilibrium real appreciation rather than an equilibrium real depreciation. This persistent misalignment of the real exchange rate is in contrast to the experience of the Eurozone countries before EMU when idiosyncratic shocks that led to an overvalued currency, loss of competitiveness and lower growth were undone through a nominal and real depreciation that restored competitiveness and growth. Repeated realignments during the EMS period allowed the adjustment of real exchange rate to occur via nominal currency movement, thus preventing destabilizing output and demand adjustments.

Even in cases where the economic shock leads to an equilibrium real appreciation (as opposed to a real appreciation reflecting a misaligned currency) in the presence of price/wage stickiness can be partly destabilizing. For example, a positive global demand shock – such as the one experienced by Ireland as global demand for high tech goods exported by that country increased – will lead to an equilibrium real appreciation. However, if price/wages are sticky, the short run effect of the shock is an overheating of the economy as the supply response is sluggish while demand is rising. And over the medium term the overheating can worsen as the delayed increase in prices and price inflation leads to a reduction in real interest rates and further increases in demand (some of which driven by the asset inflation – as in housing - that low real interest rates induce). This is the famous “Walters critique” of the European Monetary System (and of EMU) (see section 5 for more details and charts). Then, the real appreciation becomes excessive as the delayed increase in wages and prices puts pressure on competitiveness. Thus, an equilibrium real appreciation may end up in an overvalued currency and an excessive increase in economic activity that is unwound when the asset bubble is eventually reversed.<sup>18</sup>

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<sup>18</sup> See EEAG (2007) for further analysis.

In some cases a negative demand shock can be also associated with a Walters Critique effect when domestic inflation leads to both lower real interest rates and an overvalued currency. This appears to be the case of Spain where the negative effects on growth of an overvalued currency (because of the loss of competitiveness relative to China and Asia) has been hidden in the short-run by the temporary economic boom that low real interest rates have triggered via a housing price bubble and a construction boom. Once the housing bubble will burst the effects on Spain's growth will be more painful than for Ireland because of the loss of competitiveness that the former has experienced relative to the latter country.

Ideally in a monetary union with short-run nominal rigidities idiosyncratic shocks that lead to an overvalued real exchange rate should lead – over time – to a slowdown in wages or an increase in productivity growth that reverse – in due time – the initial currency misalignment. But this medium term adjustment is hampered if rigidities in labor market do not allow a slowdown in wage growth or if productivity growth is hampered by an overvalued currency that lead to lower growth and lower real investment. Then, the currency misalignment could persist over time and lead to greater loss of competitiveness and economic divergence.

In summary, whether various shocks have a stabilizing or destabilizing persistent effects on the real exchange rate, on demand and economic activity depends on the nature of the shock and how flexibly nominal variables as well as productivity can adjust to the shocks. It is thus interesting to analyze the experience of the EMU countries since the onset of the monetary union to test whether the competitiveness adjustment mechanisms has worked in a stabilizing or destabilizing manner.

To do that we consider the type of asymmetric shocks that hit different Eurozone countries since 1999 and consider the ensuing movements of the real exchange rate. We look at three separate measure of the actual real exchange rate: one based on relative prices across countries; another one based on relative unit labor costs within the 15 countries that were the original – i.e. pre-expansion – members of the EU; and a third one also based on unit labor costs that looks at the effective real exchange rate relative to all trading partners (i.e. not just inter-EU competitiveness).

We first consider the actual movements of these three measures of the real exchange rate; then assess whether such movements represent an equilibrium or a misalignment of the real exchange rate. These three measures are presented in Figure 4.1 to 4.3. With the exception of one country – Ireland – all three measures give for most countries a similar picture of the movements of the real exchange rate.

Specifically, since 1999, the real exchange rate of Italy, Spain, Greece and Portugal has appreciated while the one of Germany has depreciated. Using the IMF measure of real effective ULC based real exchange rates the degree of real appreciation of these countries is larger than the ULC measure based on inter-EU real exchange rates. The explanation is clear: these countries with traditionally labor-intensive or light manufacturing exports

have lost competitiveness relative to China and Asia where low wage costs and high productivity growth have led to a significant improvement in competitiveness. So the real appreciation in Italy, Spain, Portugal and Greece is larger if the ULC based real exchange rate includes all trading partner, not just the EU ones.

The reverse has happened in Germany where, since 1999, the real exchange rate has significantly depreciated regardless of which measure one considers. This real depreciation in Germany appears as a stabilizing mean reversion of the real exchange rate after the real appreciation and misalignment caused by German unification in the early 1990s. A moderation of wage growth – together with a pick-up in productivity growth – explains the real depreciation observed by Germany since 1999. This real depreciation restored the lost competitiveness, led to a sharp increase in exports and led to a growth recovery in Germany especially since 2005. Germany thus appears as a country where the external adjustment mechanism has evolved – however slowly - in a stabilizing way.

The only ambiguous experience is that of Ireland where both the price and ULC based measures of the real exchange rate relative to EU partners shows a significant real appreciation in the last few years; while the IMF measure of ULC based real exchange rate does not show a significant real appreciation since 1999. The reasons for the divergence in the Irish real exchange rate based on the measures used are not clear.

One way to distinguish whether a real appreciation is an equilibrium phenomenon or a misalignment is to consider the nature of the shocks hitting an economy and the response of unit labor costs and of real exchange rates based on ULCs.

It is clear that the club of “Med Countries” – i.e. Italy, Spain, Portugal, Greece – have been hit by a negative external demand shock since 1999 given the rise of China and Asia as major efficient producers and exporters of labor intensive goods. In these countries not only the real exchange rate based on relative prices but also the one based on relative unit labor costs suggests a sharp real appreciation. Thus, these are the countries whose traded sector has suffered the most from this change in the global demand for the country’s exports.

What are the causes of this loss of competitiveness? Because of rigid wages and labor market the loss of competitiveness due to the original global demand shock did not lead to a slowdown in wages. Instead wages grew at a sustained rate in Italy, Spain and Portugal – in some cases like Spain and Portugal sustained by the temporary growth that low real interest rates triggered after the beginning of EMU - while productivity growth was weak if not altogether negative. High wage growth cum low productivity growth led to an increase in unit labor costs that exacerbated the initial competitiveness loss. Thus, in Spain, Portugal and Italy the external adjustment mechanism has worked in destabilizing – rather than stabilizing ways: the misalignment of the currency has continued and become worse since the onset of the EMU.

In countries such as Portugal the competitiveness loss was initially hidden by the boom that low real interest rates after EMU triggered. But once this stimulus faded the loss of

competitiveness hit growth quite painfully. A similar cycle occurred – in smaller scale – in Italy. In Spain the significant external competitiveness loss is still hidden by the fact that the growth engineered by low real rates and a housing bubble has kept the growth rate of the country at relatively high levels. But once the housing boom goes bust – or even fizzles away – the sharp loss in external competitiveness will reemerge with painful effects on demand and growth. This boom and bust cycle of growth, asset bubbles followed by competitiveness loss and sharp growth slowdown was also experienced by the Netherlands in the 1990s and the 2000s.

Overall, the external adjustment mechanism has not smoothed asymmetric shocks but rather exacerbated them in Spain, Portugal, Italy and the Netherlands. In Germany the external adjustment has been stabilizing but it took a decade of overvaluation and slow growth – following the German reunification – to trigger reforms that increased productivity and reduced wage dynamics in ways that restored competitiveness since the beginning of EMU. So in this case the external adjustment mechanism worked in the right direction but very slowly over time.

In Ireland the real appreciation of the currency was initially an equilibrium phenomenon triggered by positive external demand shocks. But the ensuing overheating of the economy and housing bubble eventually led to an overvalued currency and excessive increase in unit labor costs. Whether the ensuing misalignment of the currency will be unraveled or not without an economic hard landing is an issue open to question.

In conclusion, the external adjustment channel has not worked in a stabilizing way during the EMU experience with the only exception being Germany. Misalignment of an overvalued currency has become a persistent problem in Italy, Portugal and Spain (and, possibly, even in the success story of Ireland). In these three countries the loss of competitiveness following a negative external demand shock has been exacerbated by the ensuing real appreciation that has persisted during the EMU period.

Chart 4.1

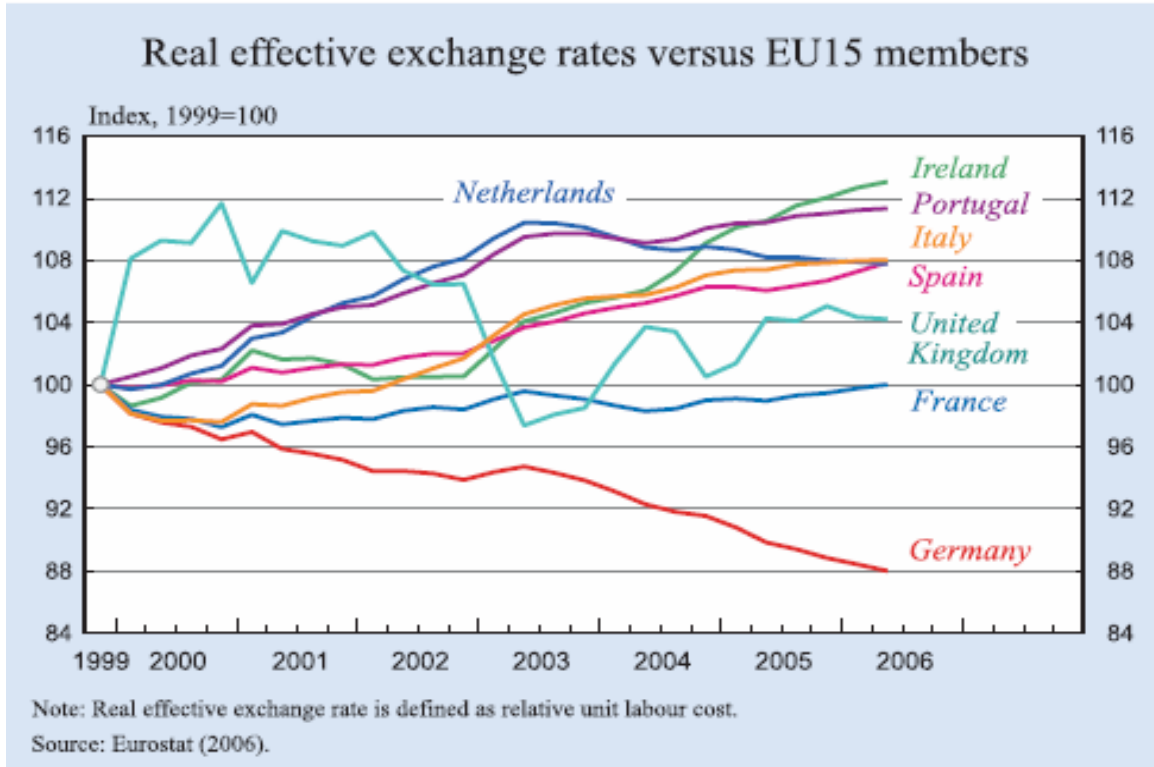


Chart 4.2

### Real Effective Exchange Rate Based on Relative Unit Labor Cost, with respect to rest of the world

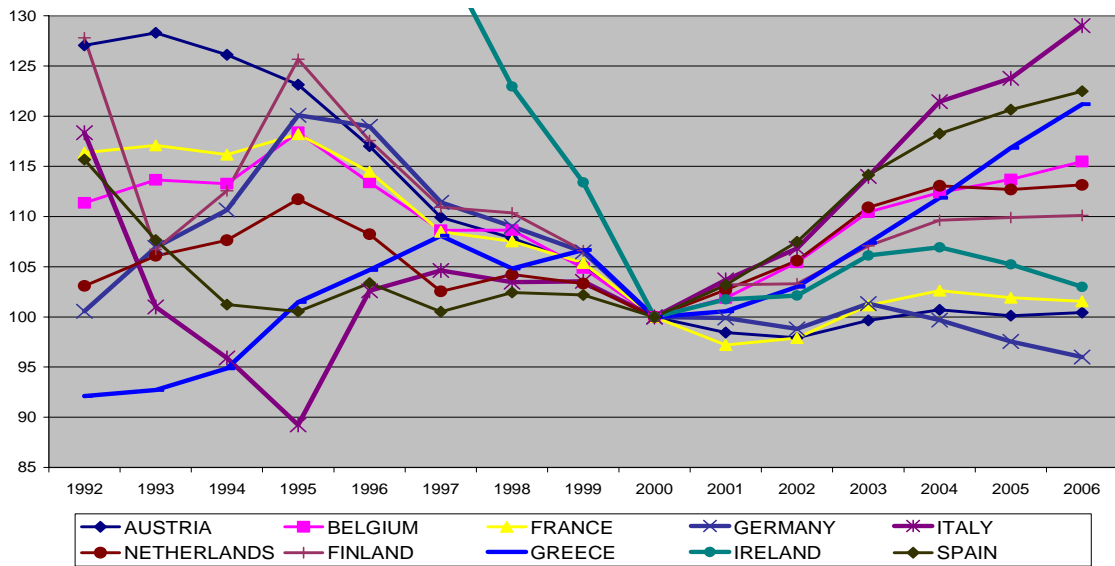
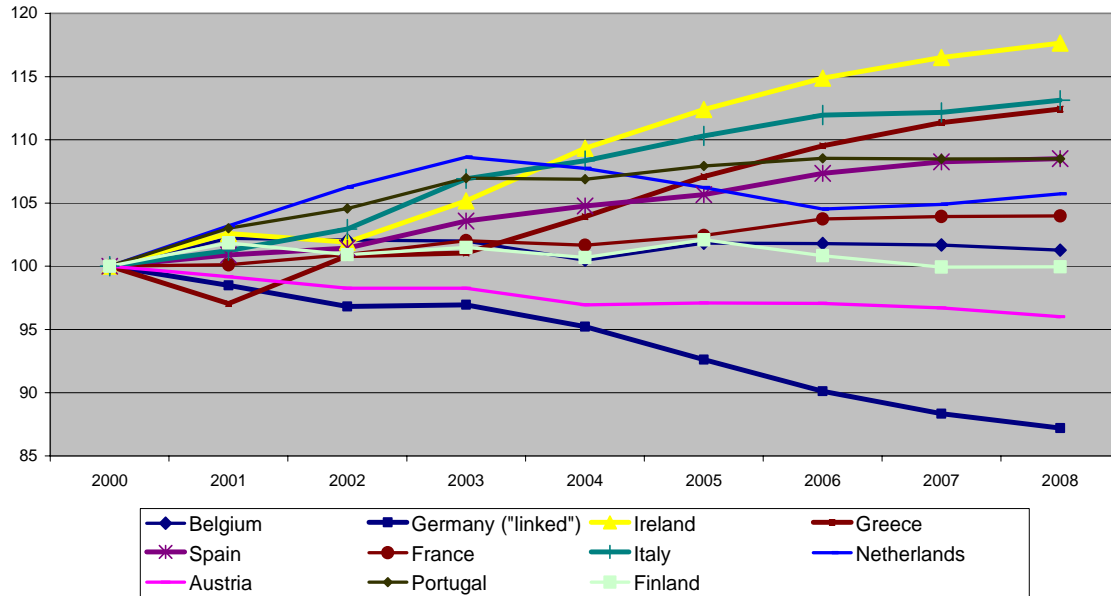


Chart 4.3

**Real effective exchange rates ; Performance relative to the rest of 14 EU countries (EU-15 excl. L): double export weights**



Source: European Commission data (AMECO database)

## 5. Temporary Adjustment Dynamics via the “Real Interest Rate” Channel

As reported in EEAG (2007), in an ideal union prices and wages are fully flexible. An asymmetric positive demand shock in one country, for example, leads to increases in the wage and price levels in both the tradable and the non-tradable sector, thereby strengthening both the real exchange rate (higher price level with respect to abroad) as well as the terms of trade (higher export prices relative to import prices). This results in a higher trade deficit in this country, higher external debt servicing costs over time, and a muted demand from abroad for more expensive domestic goods. Eventually, a deterioration in the country’s competitive position leads the domestic economy back to equilibrium. The same logic applies basically to supply shocks (see also Langedijk and Roeger 2007 for a detailed discussion of adjustment dynamics to various shocks.)

The adjustment dynamics change, however, in the presence of nominal price and wage rigidities. If prices and wages fail to convey the country’s deteriorating competitiveness over time, the temporary shock may well be perceived as persistent. This leads to an upward revision in price and wage expectations by economic agents instead of cooling the economy.

Given the EMU-wide nominal interest rate, higher inflation expectations in one country translate into a lower domestic real interest rate that stimulates investment and credit enhanced consumption. Moreover, higher wage expectations further stimulate consumption and import activity on top of the original temporary demand shock. Both effects operate in a pro-cyclical manner thus leading the economy to overshoot. At this point the economy is further out of step with the common monetary policy. Ultimately, however, a prohibitively high domestic price level, unit labor costs (assuming unchanged productivity patterns), and external debt service costs will prevail, thus potentially exposing the economy to protracted real contraction episodes.

Recent empirical evidence of the importance of this temporary, but inherently destabilizing adjustment channel due to sluggish prices and wages is provided in Blanchard (2007) (“rotating slumps” and description of boom-bust cycles); Hoeller and Rae<sup>19</sup> (2007) (persistent inflation differentials and housing markets), and Langedijk and Roeger<sup>20</sup> (2007) (model-based analysis of adjustment dynamics to different shocks.)

Based on the analysis performed in Section 4 one can argue that the real interest rate channel has lead to a destabilizing adjustment in Spain, Portugal, the Netherland, Greece and possibly Italy.

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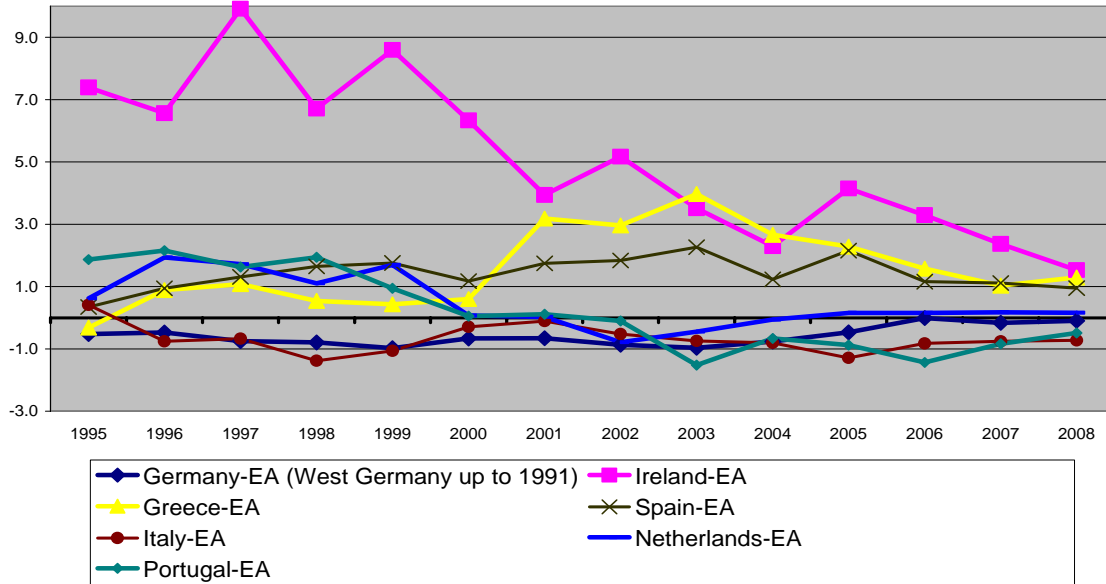
<sup>19</sup> Peter Hoeller and David Rae (2007); OECD; “Housing Markets and Adjustments in Monetary Union”.

<sup>20</sup> Sven Langedijk and Werner Roeger (2007); DG ECFIN; “Adjustment in EMU: A model-based analysis of country experiences”.

Real GDP and Current Account Dynamics for Selected Countries:

Chart 5.1

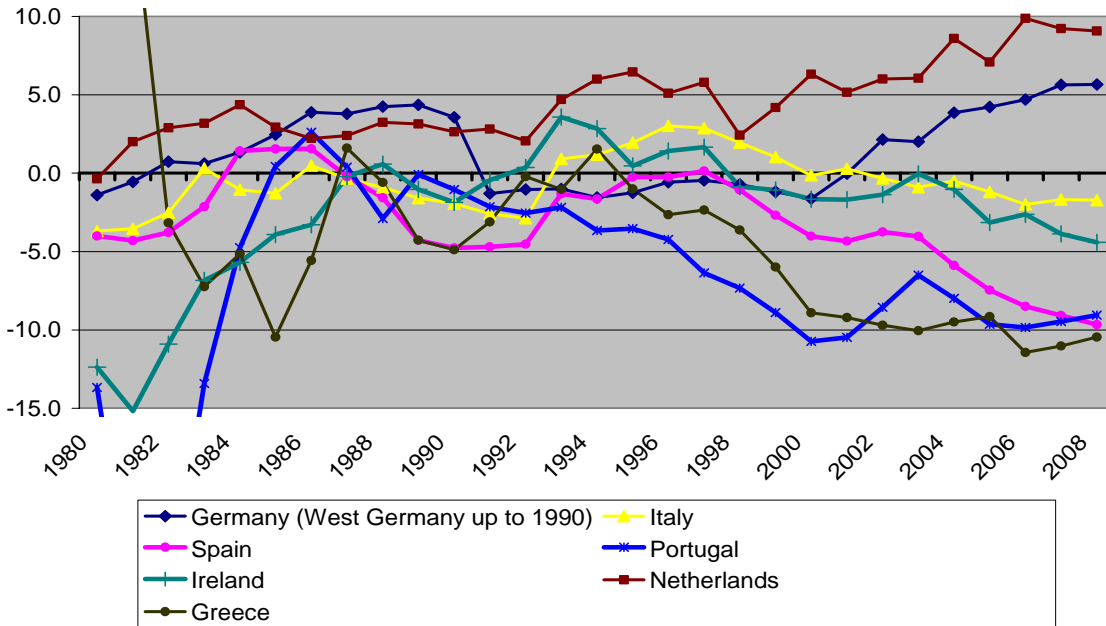
**Real GDP Growth Rate Differentials Relative to Euro Area, in percent**



Source: European Commission data (AMECO database.)

Chart 5.2

**Current Account in Percent of GDP**

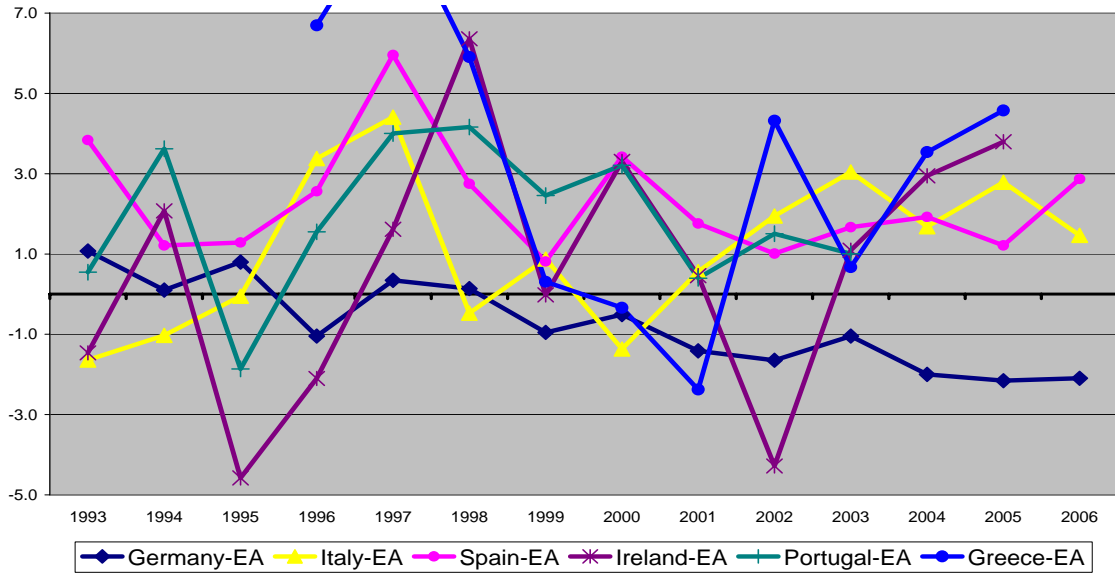


Source: European Commission data (AMECO database.)

Unit Labor Cost and Productivity Developments:

Chart 5.3

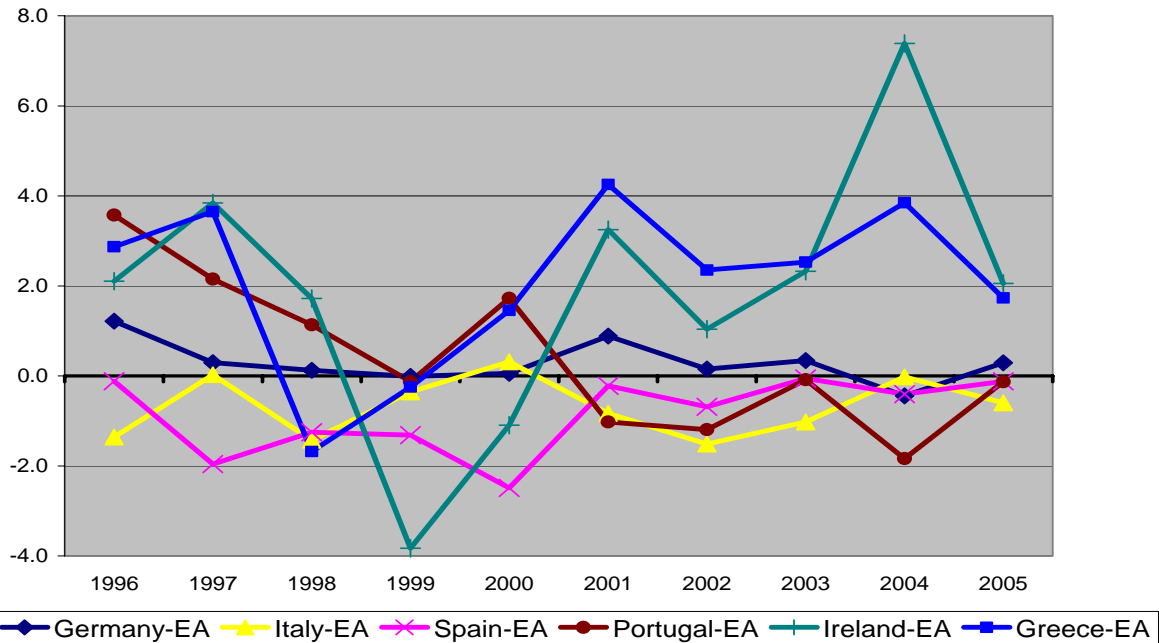
**Unit Labor Cost Growth Relative to Euro-12 ULC Growth Rate, based on OECD Output per hour data**



Source: OECD

Chart 5.4

**OECD Labor Productivity: Growth Differentials Relative to Euro Area, in percent, based on GDP per Hour**

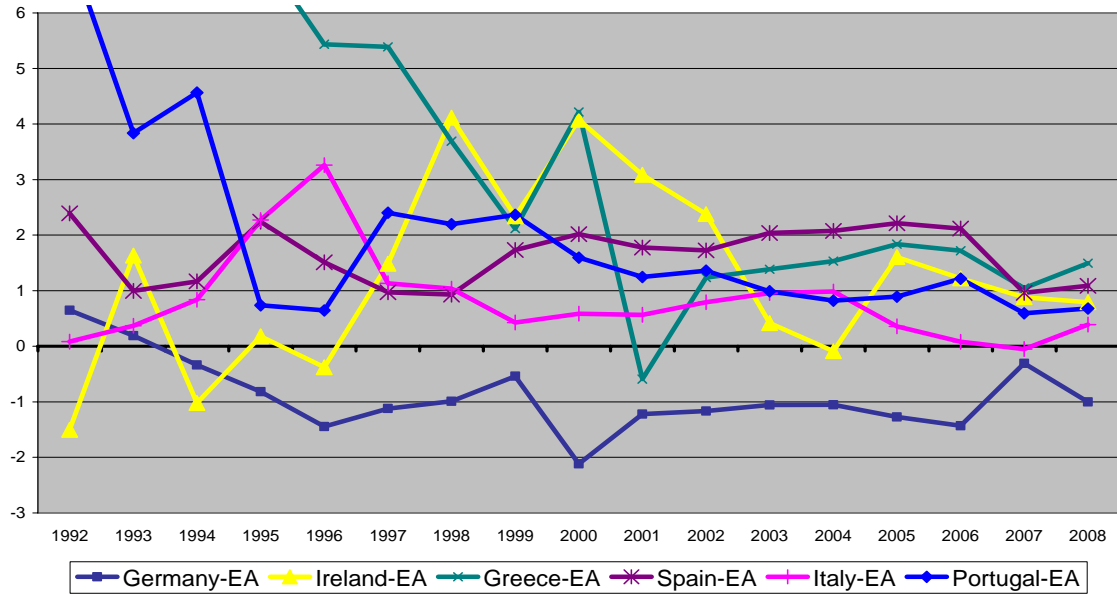


Source: OECD

Inflation Differentials and Housing Prices:

Chart 5.5

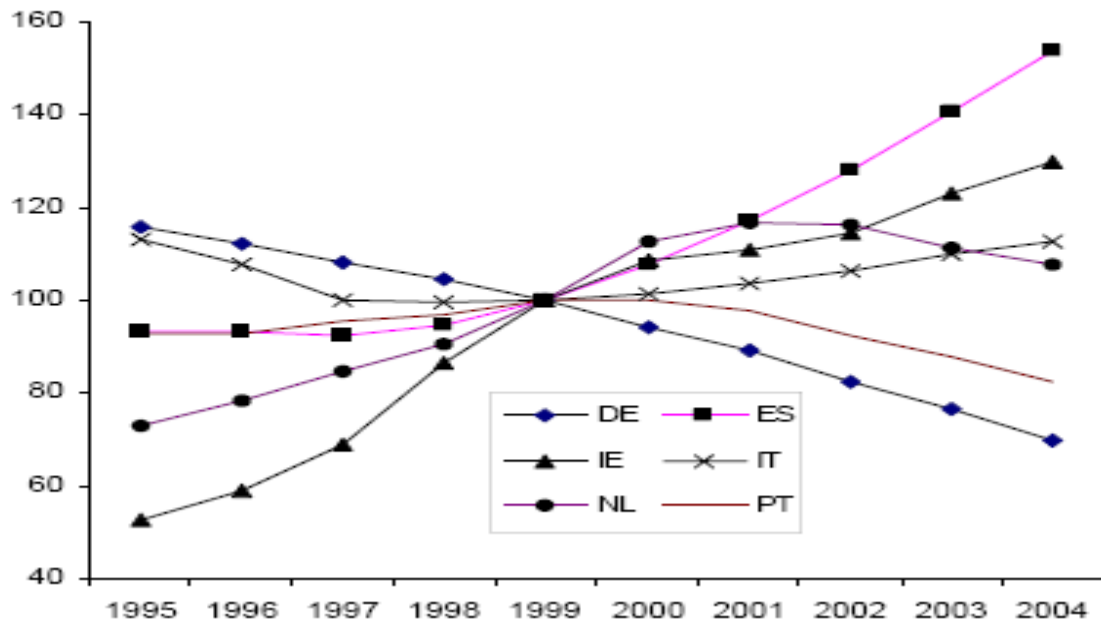
**GDP Deflator: Growth Differential Relative to Euro Area,  
in percent**



Source: European Commission data (AMECO database).

Chart 5.6

**Housing price index (1999=100; euro area = 100)**



Source: Langedijk / Roeger (2007).

## 6. Concluding Remarks

In this paper we present a systematic overview of the evidence on economic convergence or divergence within the EMU. Specifically, we reconsider the criteria for a successful monetary union and consider how the channels discussed in the literature - i.e. the “risk sharing”, “fiscal federalism”, “competitiveness”, and “real interest rate” channel - have operated in practice.

In summary we find that, first, there is only little evidence of per capita GDP convergence, with Ireland being the only true example of standard of living catching up over the past 20 years. Second, real growth dispersion has been on a declining trend since the start of the currency union, although growth differentials have been persistent over that time period. Third, there are ambiguous and conflicting empirical signals about the degree of business cycle synchronization since inception of the EMU and a consensus on the implications of this important issue for the conduct of a common monetary policy is yet to be reached.

Our empirical results on intra-EMU risk sharing through cross-border real and financial asset holdings and credit markets confirm previous results in the literature that indicate only very modest income smoothing to date, especially when compared the degree of financial integration and smoothing among U.S. states. The degree of interstate risk sharing, however, shows a steady increase into significant territory over the 1990s.

The analysis of the competitiveness performance of various Eurozone countries shows a mixed picture. Germany emerges as an example where a loss of competitiveness after the reunification boom was largely regained by painful labor market adjustments and corporate restructuring. Portugal, Italy, Greece and (potentially) Spain represent countries where real wage or productivity adjustments to a loss in competitiveness versus trading partners was or is being delayed at the expense of a potentially more protracted economic slowdown in the future. Ireland is the odd one out. Competitiveness measures with respect to EU trading partners show a more severe competitiveness problem than with respect to the rest of the world. The specific nature of the shock(s) affecting a country, the degree and direction of specialization, as well as migration patterns are important additional factors to take into account when analyzing the performance of individual countries.

The following are a few topics for future research:

- To what degree do dissimilar initial conditions matter when entering the EMU?
- Is the present focus on external competitiveness<sup>21</sup> (or “the ability of an economy to compete in international markets” according to Jean-Claude Trichet) always in line with efficient policies in the domestic non-tradable sector?
- Regarding the financial risk sharing channel: to what extent is intra-EMU income smoothing hampered by correlated asset price movements?

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<sup>21</sup> See for example the latest speech by Jean-Claude Trichet: Economic integration and adjustment processes in the euro area), June 13, 2007. See also Krugman, P. (1994); „Competitiveness – A Dangerous Obsession“, Foreign Affairs, for an in-depth discussion.

- We studied here how idiosyncratic risks are (on average) smoothed within in the EMU; the next step is to understand what the level of risk sharing within in each country is.

Overall, the results of this paper offer a mixed picture of the degree of economic convergence or divergence within the EMU: although according to some measure real GDP growth dispersion has decreased, per-capita income convergence has stalled; financial and fiscal channels are not yet strong enough to absorb idiosyncratic shocks to a country's output and consumption; the external adjustment mechanisms has not worked as expected while the real interest rate channel has, at times, led to destabilizing booms and bust. While economic growth – both potential and actual – is now recovering in the Eurozone after several years of sub-par growth it is not yet evident whether this growth recovery will be resilient and whether it will reduce the growth and economic performance disparities that have been experienced by the monetary union in the first years of its existence.

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# Appendix

## Section 2

### Box A2.1

#### Box 1.3

#### Computing stress

In theory, the unobserved optimal monetary policy rule for a country depends upon both structural and preference parameters. The former relate to how the economy works, whereas the latter summarise the preferences of the central bank. We assume that all EMU member countries voluntarily decided to participate, thereby signalling that in principle the institutional set-up of the ECB – and thereby the preference parameters as implied by the ECB – is preferred over the situation prevailing before the euro.<sup>a)</sup> However, at the same time, we also assume that the functioning of the economy, that is, the structural parameters, is basically the same across all member countries. As the ECB has to take into account developments on the aggregate European level, asymmetries in inflation and cyclical developments across countries will generate differences between the actual interest rate and the interest rate that would have applied if the same Taylor rule as that of the ECB had been applied on the national level, responding to national inflation and growth instead of to the euro area aggregates. We call the difference *country-specific stress*. Hence,

$$S = (i - i_j^*) = (i^* - i_j^*) + (i - i^*) = S_j^* + (i - i^*)$$
$$i_j^* = \bar{i}_j + \alpha(\pi_j^e - \bar{\pi}_j) + \beta(\Delta y_j^e - \Delta \bar{y}_j) = \bar{r} + \bar{\pi}_j + \alpha(\pi_j^e - \bar{\pi}_j) + \beta(\Delta y_j^e - \Delta \bar{y}_j),$$

where  $\alpha$  and  $\beta$  are taken from the estimated Taylor rule for the euro area as a whole and  $j$  indicates an individual euro area member. A negative value for  $S_j$  implies that – given the estimated ECB reaction function – actual monetary policy of the ECB for country  $j$  is more accommodative than what could be expected using country-specific data. If, on the other hand,  $S_j$  is positive, monetary policy appears too tight for country  $j$ .

Following Flaig and Wollmershäuser (2006), we analyse the development of the dispersion of expected real GDP growth and inflation across the euro area countries. Again we use consensus forecasts figures to capture the forward-looking aspect of monetary policy.<sup>b)</sup> We are able to decompose country-specific stress ( $S_j^*$ ) into, on the one hand, structural and cyclical components and, on the other hand, inflation- and growth-driven stress.<sup>c)</sup>

Structural stress is defined as the difference between the estimated neutral interest rate for the euro area and the implied neutral interest rate for the country in question. We split up the neutral nominal interest rate in the neutral real interest rate and the inflation target which we proxy for each country by its expected inflation average over the sample. We assume the neutral real interest rate to be the same across all European countries, that is  $\bar{i}_j = \bar{r} + \bar{\pi}_j$  where  $r$  is the real interest rate.<sup>d)</sup> Given this assumption, the difference between the neutral nominal interest rate for the euro area and that for a specific country is solely due to the long-run inflation differential.<sup>e)</sup> For the euro area as a whole the estimated nominal and real neutral rates are about 3 percent and 1.1 percent, respectively.

<sup>a)</sup> In implementing this concept, Flaig and Wollmershäuser (2006) take the optimal monetary policy rule to correspond to the policy rule that was adopted by the country in the pre-EMU period. They thereby take an extreme position. Besides keeping the structural parameters constant over time and country-specific, they also assume that the euro was forced upon the participating countries and that each individual nation would prefer a central bank with a similar behaviour as its own before the establishment of the monetary union. Hence, they keep the preference parameters in the policy rule constant over time and country-specific. For many countries the move to a more independent and thereby more credible central bank actually was (and still is) a strong motive for participating in the monetary union. This did not only apply for most southern European countries, which were in this way able to lower both their interest rates as well as their inflation rates substantially, but also for a country like Finland (see Section 5 in Chapter 4 of this report).

<sup>b)</sup> As Consensus Economics Inc. does not publish inflation and growth forecasts for Luxembourg, we are not able to include this country in our analysis. Given its GDP share of approximately 0.3 percent of euro area GDP, this will hardly affect the results.

<sup>c)</sup> We concentrate on the difference between the euro area optimal interest rate and the country-specific optimal interest rate, that is, we focus on  $S_j^*$  in the above equation and neglect the term  $(i - i^*)$  – the difference between the actual interest rate and the optimal interest rate for the euro area. This latter term is constant across countries and therefore irrelevant for a cross-country comparison.

<sup>d)</sup> Following Laubach and Williams (2003) or Giammaioli and Valla (2003), it would be possible to let the neutral real interest rate be a function of the trend growth rate. While the estimated ECB policy rule and the cyclical stress measures would not be affected by this, it would introduce a second structural source for stress, “stress due to different trend growth rates”, and therefore increase overall stress levels somewhat.

<sup>e)</sup> Hence, we allow target inflation rates to differ across countries and approximate these targets by the average expected inflation rate since 1999. Restricting the country-specific target inflation rate to be equal to the target inflation rate for the euro area implies that there are no longer any structural differences and inflation differentials are solely attributed to cyclical stress. Overall stress is only affected by such a change to a small extent.

## Dispersion of output and income relative to the Eurozone

Chart A2.1

### Standard Deviation of State GDP as Ratio of Standard Deviation of the Euroarea GDP (subperiod average)

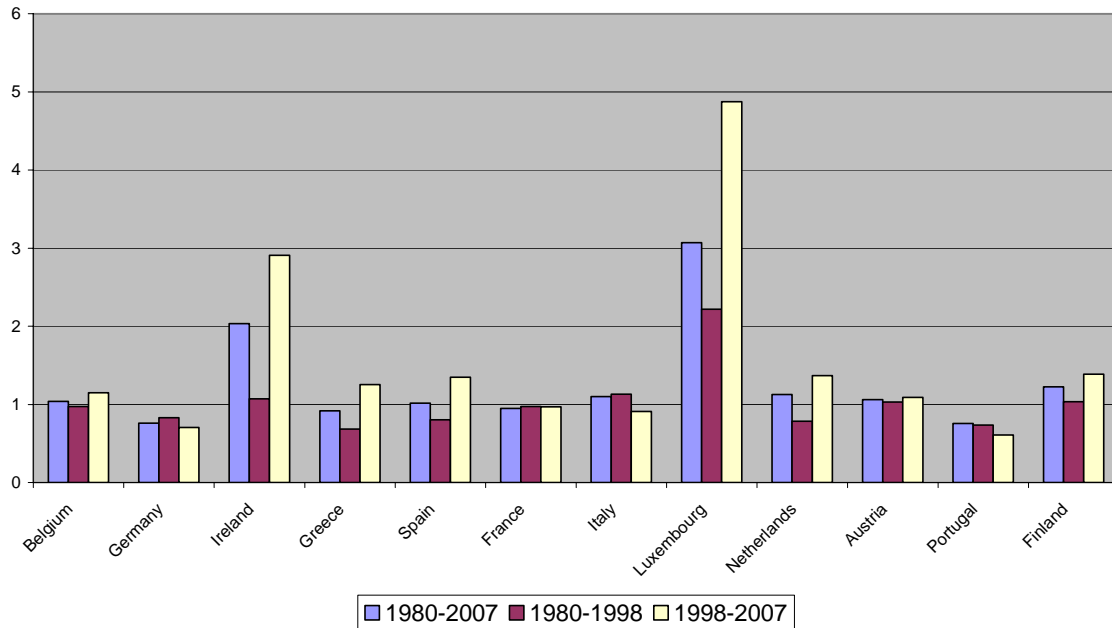


Chart A2.2

### Standard Deviation of State Income as Ratio of Standard Deviation of the Euroarea Income (subperiod average)

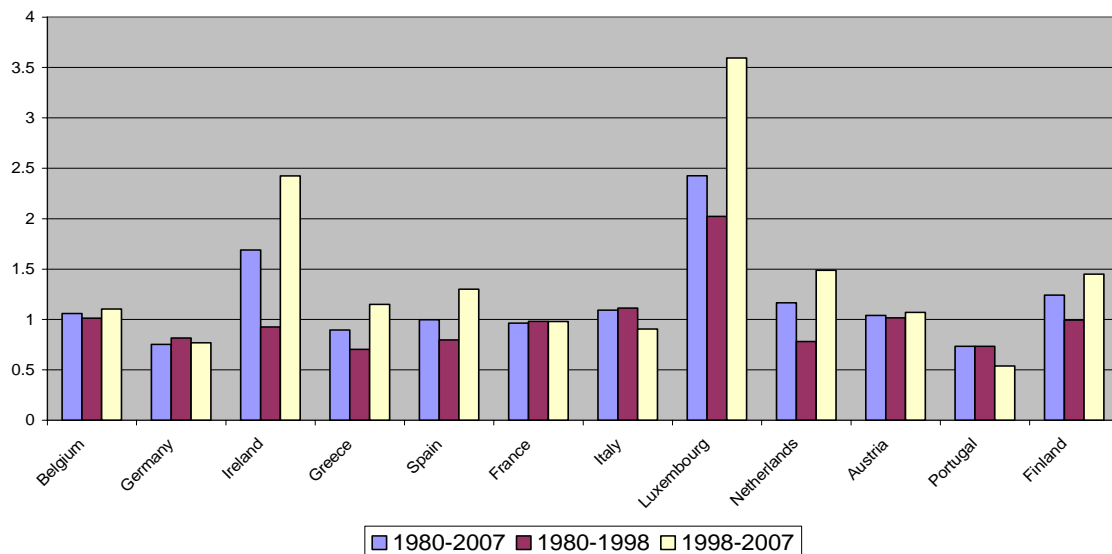
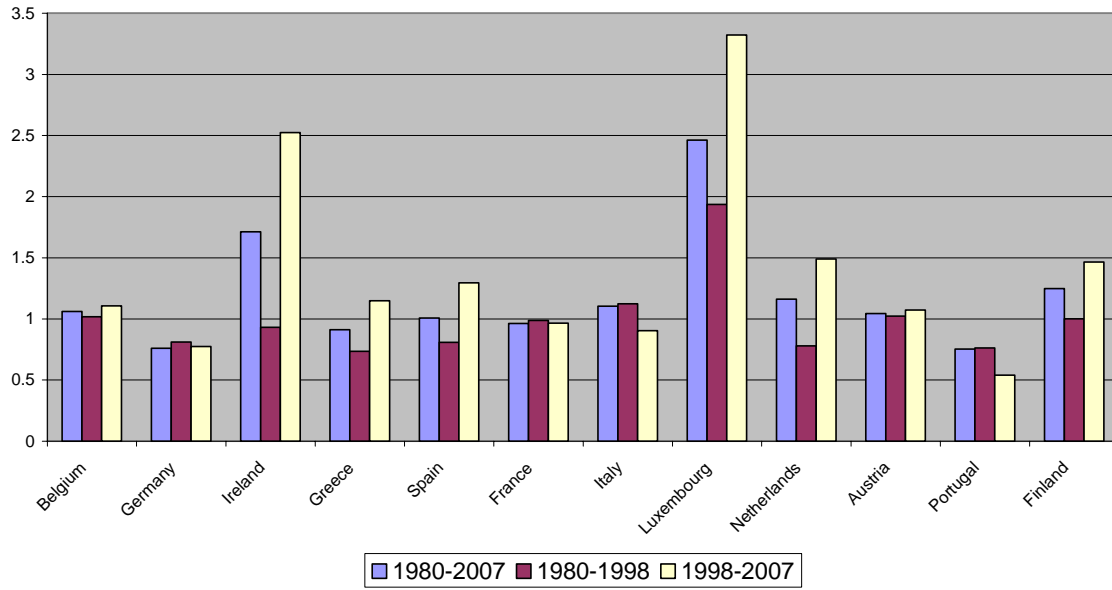


Chart A2.3

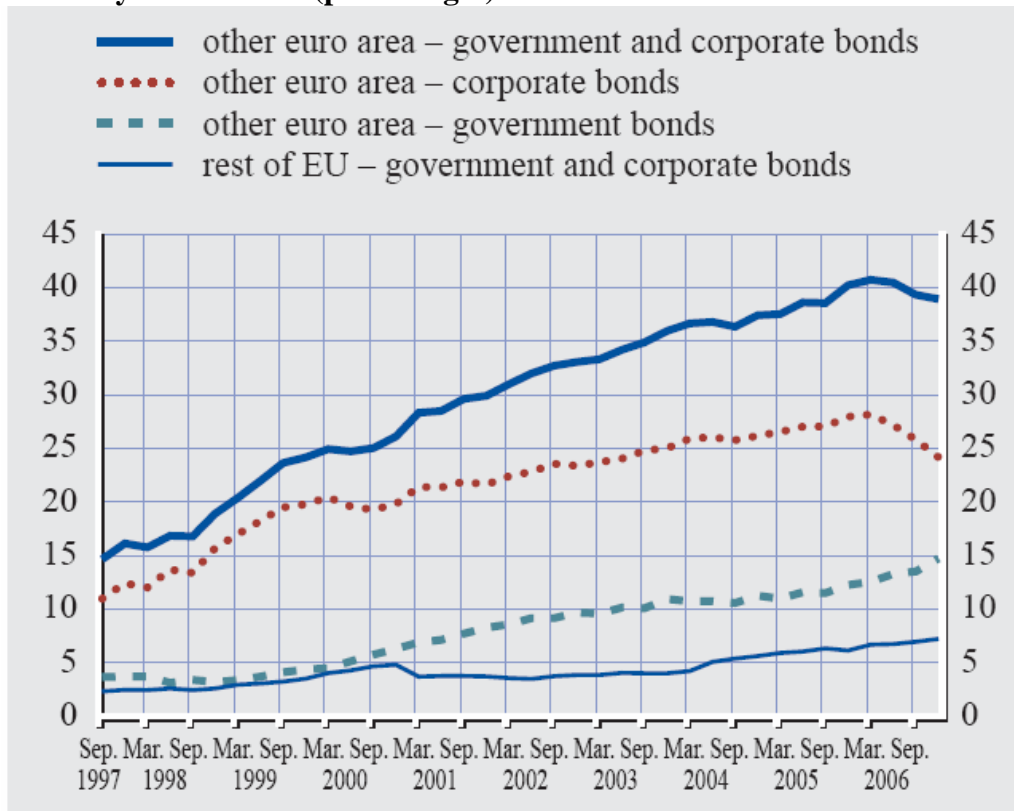
**Standard Deviation of Disposable State Income as  
Ratio of Standard Deviation of the Euroarea Disposable  
Income (subperiod average)**



### Section 3

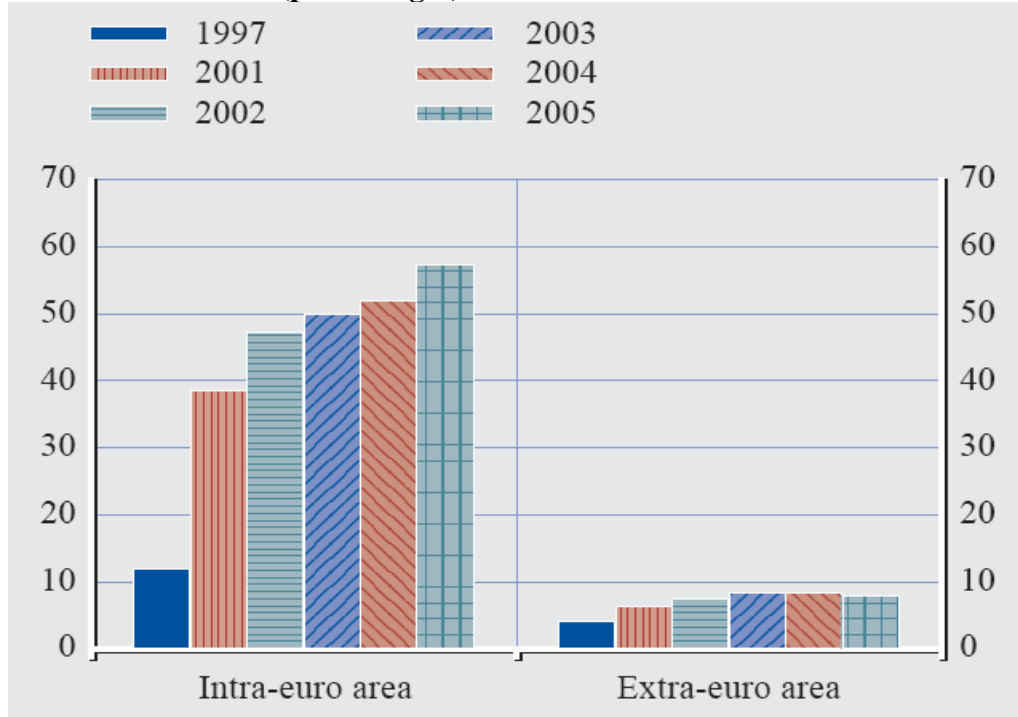
The source of the charts in this appendix is the ECB (Financial Integration in Europe, March 2007).<sup>22</sup>

**Chart A3.1. Share of monetary financial institutions (MFI) cross-border holdings of debt securities issued by Eurozone and EU non-MFIs: outstanding amount by residency of the issuer (percentages)**

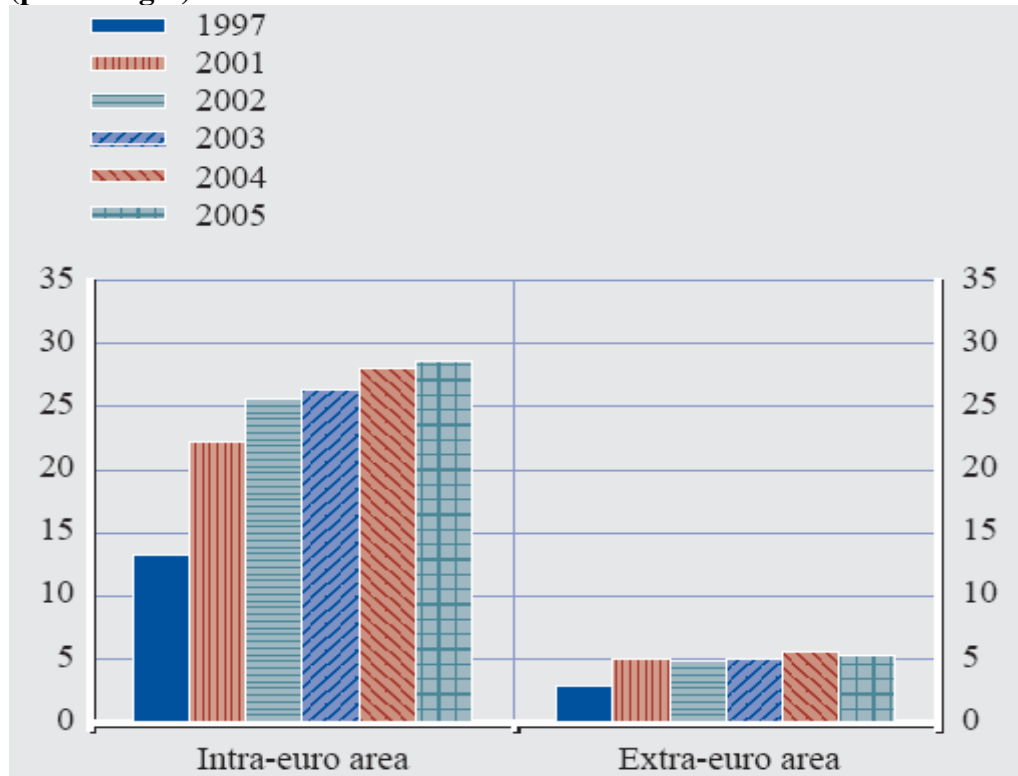


<sup>22</sup> Available online at <http://www.ecb.int/pub/pdf/other/financialintegrationineurope200703en.pdf>

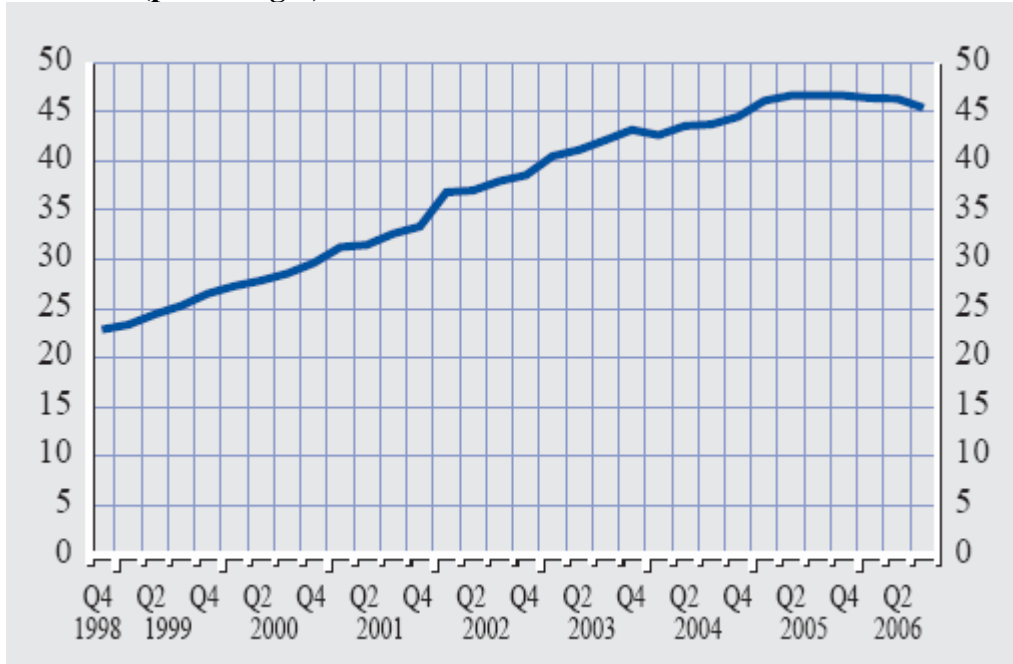
**Chart A3.2. Degree of cross-border holdings of long-term debt securities issued by Eurozone residents (percentages)**



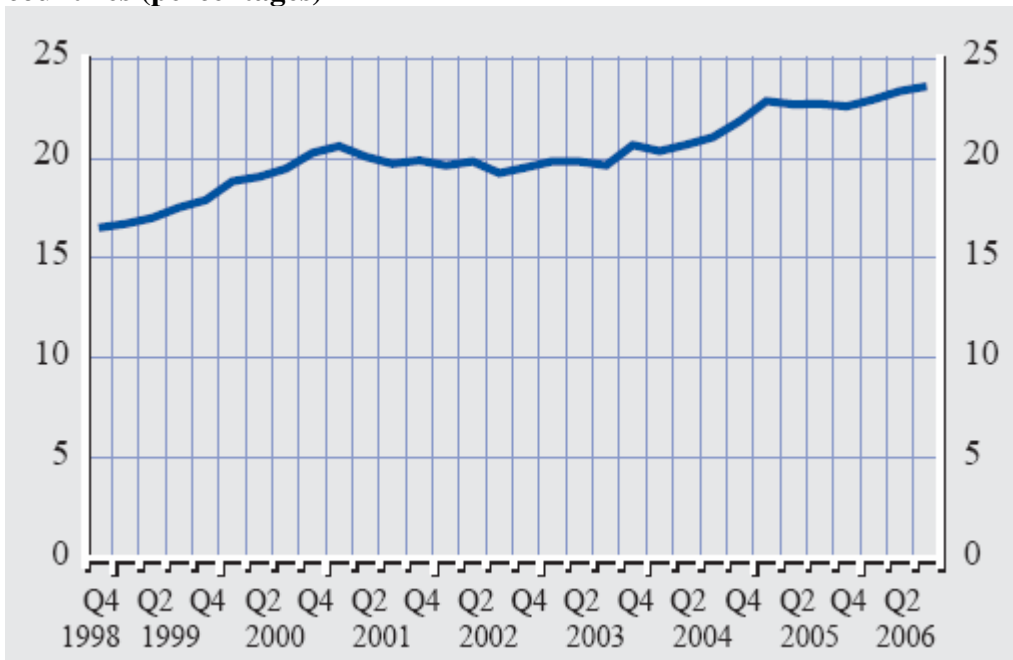
**Chart A3.3: Degree of cross-border holdings of equity issued by Eurozone residents (percentages)**



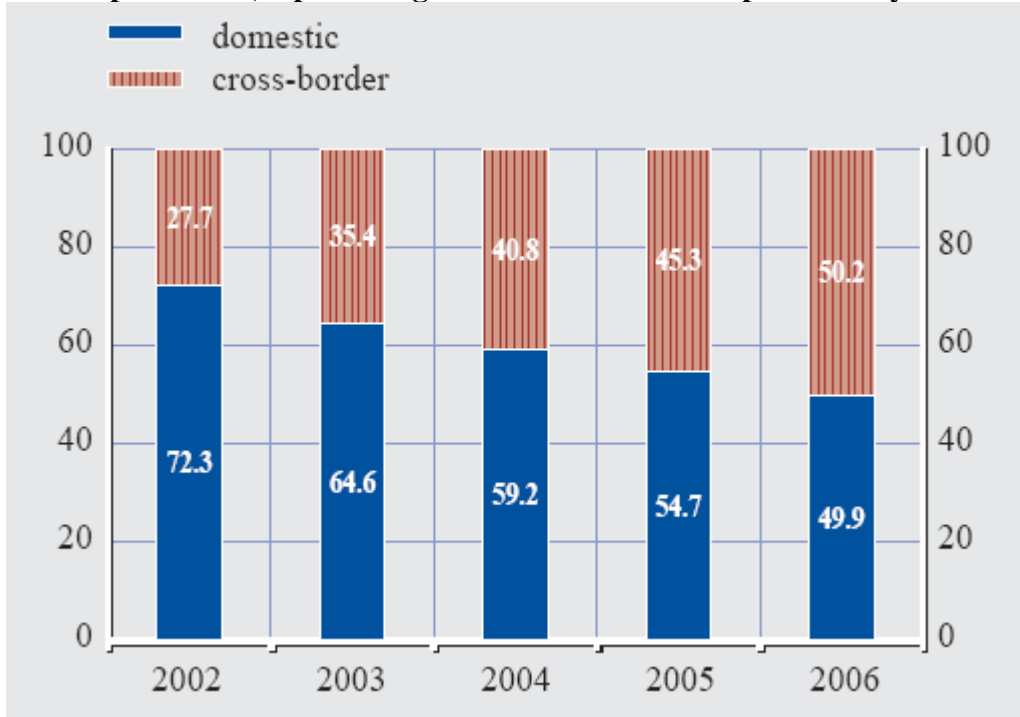
**Chart A3.4. Investment funds' holdings of debt securities issued in other Eurozone countries (percentages)**



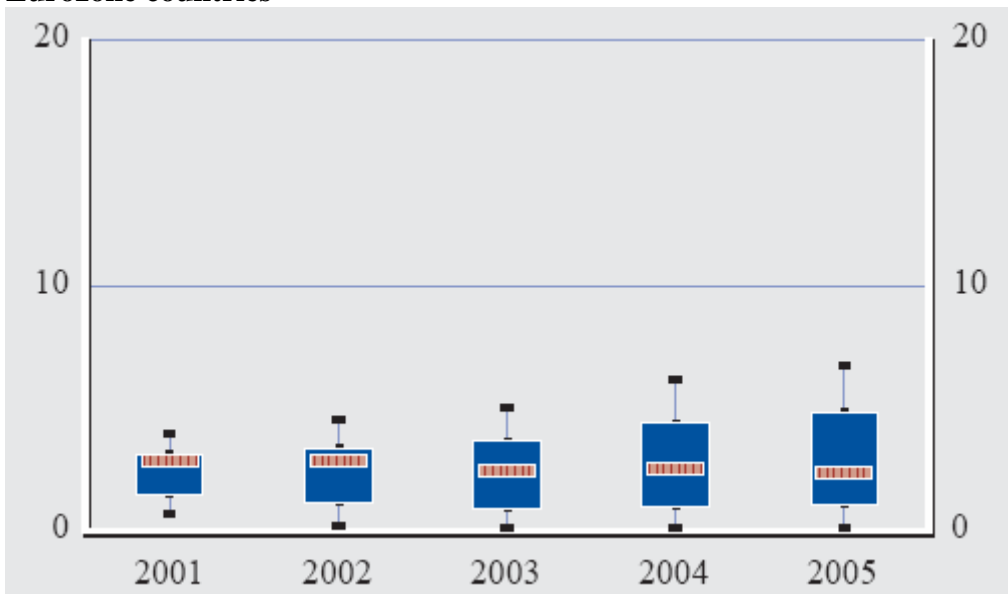
**Chart A3.5. Investment funds' holdings of equities issued in other Eurozone countries (percentages)**



**Chart A3.6. Share of domestic and cross-border collateral used for Eurosystem credit operations (as percentage of the total collateral provided by the Eurosystem)**



**Chart A3.7. Dispersion of the total assets of Eurozone bank branches across Eurozone countries**



## **The EU Structural and Cohesion Funds**

The European Union's Structural and Cohesion Funds compensate, to a certain extent, for the lack of fiscal transfers. The European Parliament approved the 2007-2013 structural funds package with objectives, financial resources available, and criteria for their allocation in an enlarged EU in May 2007.

The structural funds aim at increasing solidarity and reduce disparities between regions of the EU. Overall, around €308 billion - or 35.7 percent of the total EU budget - will now be available from 1 January 2007.

The **Cohesion Fund** increases from €18 billion (for the period 2000-2006) to €1.59 billion. Following the Union's enlargement on 1 May 2004, the Cohesion Fund applies to the 10 new Member States until the end of 2006, as well as to the three Member States eligible at the end of the 2000-2006 period (Greece, Portugal and Spain). To benefit from the Cohesion Fund, a Member State's per capita Gross National Income (GNI) must be less than 90% of the Community average National Income, which is the case for all the new Member States.

**European Territorial Cooperation** aims at furthering the balanced integration of the EU's territory by supporting cooperation between regions across land or sea frontiers. It will include actions to promote integrated territorial development and support for interregional cooperation and the exchange of experiences.

**European Social Fund:** the ESF addresses three major challenges: employment disparities, social inequalities, skills gaps and labor shortage in an enlarged Union; economic and social restructuring due to globalization and the development of the knowledge-based economy; demographic changes which have resulted in a shrinking and ageing workforce.

Within the **European Regional Development Fund**, housing expenditure will be eligible for the costs of social housing renovation aimed at energy efficiency and environmental protection. The general regulation will lay more emphasis on environmental, accessibility issues, as well as on the "partnership principle" that governs the whole policy.