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PROCEEDINGS OF JUNE 2005 WORKSHOP ON WHAT EFFECTS IS EMU HAVING ON THE EURO AREA AND ITS MEMBER COUNTRIES?

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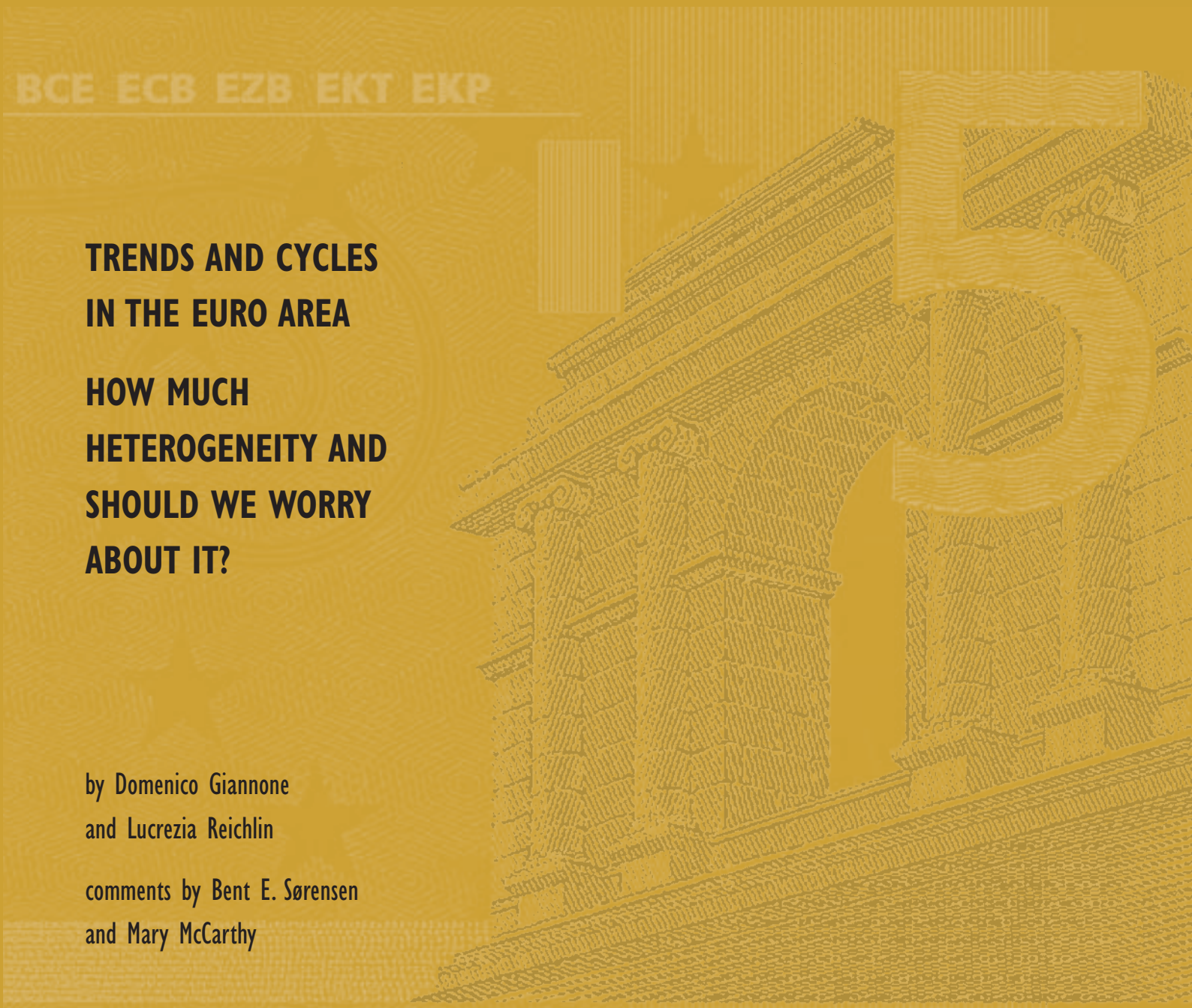

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In 2006 all ECB publications will feature a motif taken from the €5 banknote.

This paper can be downloaded without charge from http://www.ecb.int or from the Social Science Research Network electronic library at http://ssrn.com/abstract_id=886548

1 Paper prepared for the ECB Workshop "What effects is EMU having on the Euro Area and its member countries", held in Frankfurt, 17 June 2005. We wish to thank Fiorella De Fiore, Luca Dedola, Gabriel Fagan, Steve Nickell for helpful suggestions and our discussants Mary McCarthy and Bent Sorensen for helpful comments. The opinions in this paper are those of the authors and do not necessarily reflect the views of the European Central Bank..

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PREFACE

On 16 and 17 June 2005, the ECB has hosted a Conference on "**What Effects is EMU Having on the Euro Area and its Member Countries?"** One and a half decade after the start of the European Economic and Monetary Union (EMU) and more than six years after the launch of the euro, the aim of the conference was to assess what can be learned about the impact of economic and monetary integration and how it has benefited the euro area and its member countries.

The conference brought together academics, central bankers and policy makers to discuss the existing empirical evidence on changes brought about, either directly or indirectly, by EMU and, in particular, the introduction of the euro in five main areas:

Area 1. Trade integration;
Area 2. Structural reforms in product and labour markets;
Area 3. Financial integration;
Area 4. Business cycles synchronisation and economic specialisation; and
Area 5. Inflation persistence and inflation differentials.

Lead presenters for each of the aforementioned areas had been asked to put together - and interpret - all the available information, flag any open questions, and also discuss the implications in their respective field of expertise. With the benefit of hindsight, lead presenters and discussants have also addressed some initial presumptions with the evidence that has accumulated thus far.

In order to exchange information and ideas on the above effects, and increase mutual awareness of ongoing work in the diverse areas, we deemed it useful to issue the five leading presentations, together with the accompanying discussions, in the ECB Working Paper Series.

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CONTENTS

Abstract

Not so much and we should not, at least not yet.

JEL Classification: E32, C33, C53, F2, F43

Keywords: International Business Cycles, Euro Area, Risk Sharing, European Integration, Income Insurance.

Non Technical Abstract

November 15, 2005

The paper analyzes output dynamics in Euro area countries in the last thirty years. It establishes robust stylized facts on output differentials within the union, on the synchronization of recessions within the area countries and on similarities and differences with respect to the US case. Finally, it provides estimates of changes in the degree of risk sharing since the early nineties.

The paper finds that, since 1970, within the Euro area, gaps in levels of income per capita have been persistent. This implies that it is difficult to distinguish convergence patterns from persistent fluctuations around different means. However, these gaps are small and business cycle characteristics, when measured by levels of output, have been very similar across countries. Output variance, the paper finds, is mainly explained by common shocks with similar propagation mechanisms while idiosyncratic shocks, although persistent, are small. These characteristics are in line with what found for US regions.

An implication of this result is that policy should be concerned with the common characteristic of the European cycle. The next step of the analysis is then to compare the characteristics of the Euro area cycle with the US cycle. It is found that the two cycles are driven by a common world shock, but that the propagation of the shock differs across the two areas: the Euro Area lags the US and its cycle is more persistent, but less volatile. Low growth, persistence of shocks and low volatility are common characteristics of the Euro area and the gap with respect to the US has been stable over the last thirty years.

Facing these historical characteristics, the process of European integration, has however helped to smooth the cross-sectional correlation of consumption conditional on output. This finding supports the hypothesis that, since the early nineties, risk sharing has increased within the Euro Area.

1 Introduction

Recently, the policy discussion has focused on heterogeneity of economic performance of countries in the European Monetary Union (EMU). The mechanisms through which the lack of flexibility based on national exchange rate and monetary policy may exacerbate the effect of shocks is well known (see Mundell, 1961, and subsequent literature) and the potential effect of common monetary policy on increasing divergence of economic performance between countries belonging to the union have been widely debated in the late nineties.

Now, six years after the establishment of the monetary union, with some real observations to analyze and with the Euro Area facing unsatisfactory growth performance, the debate is having a second life. Heterogeneity is indeed the subject of this conference.

This paper looks at this issue from a narrow point of view. We analyze output dynamics in member countries in the last thirty years and try to establish robust stylized facts on output differentials within the union, the synchronization of recessions and the relation with respect to the US. Recent developments, we argue, have to be understood within the broader picture of the historical behavior of the European countries business cycle and their relation with the US. The ambition of the paper is to organize the results of a large empirical literature and bring some new evidence on our own to provide an understanding of the stylized facts.

This analysis leads us to the following results. Output differentials, both in term of levels and growth rate, have been remarkably stable over the last thirty years. However, the business cycle have shown a high degree of synchronization: recessions have occurred at similar dates and cross-country correlations have been stable and in line with those found amongst US regions.

An analysis of the shocks suggests that heterogeneity is explained by small, but persistent idiosyncratic shocks while output fluctuations are mainly explained by common Euro Area shocks with similar propagation mechanisms. This indicates that the roots of recent heterogeneity has to be found in national shocks, such as policies, for example, that have a long lasting effect, but that are small when compared with common forces of variation.

Our ambition is not structural here and this evidence is meant to provide food for thought for a deeper analysis. Any structural analysis will have to match these two facts: common dynamics and small and persistent idiosyncratic shocks. Persistence of gaps in output per capita is explained, for Euro Area core countries, such as Germany, France and Belgium by very long swings in the gap while for other countries, such as Ireland, by convergence effects. Given the short sample we base this analysis on, it is difficult to assess whether, since the early nineties, with the deepening of the European integration, convergence effects dominate.

When the Euro Area is analyzed as a whole and in combination with the US, it appears that the two currency areas have a large component of their output fluctuations in common. Fluctuations are generated by a world shock originating in the US, a shock that Europe absorbs with a lag and with a response which is less volatile, but more persistent. This is food for thought for a deeper understanding of international linkages: what explains the difference between growth performance of the Euro and the US does

not seem to be the nature of the shocks, but rather the propagation mechanism. This result is based on a more detailed analysis in Giannone and Reichlin (2005) and is in line with the literature that emphasized the importance of world shocks (eg. Kose et al., 2003; Canova et al., 2004). However, it qualifies that result showing US-Euro Area differences in the propagation mechanism to the common shocks.

In the last part of the paper, we turn to the analysis of recent changes and we ask whether, in faces of the output development just described, we have observed a higher degree of risk sharing and therefore a higher degree of consumption cross-country correlations conditionally on output. Our analysis follows Asdrubali et al. (1996) and Kalemli-Ozcan et al. (2004). It points to evidence of a higher degree of risk sharing which leads us then to conclude that EMU, and more generally European integration, seems to have worked in the right direction. Obviously, whether this process will eventually lead to higher growth in the aggregate is still unclear, but the understanding of this link should be in the research agenda.

2 Output heterogeneity within the Euro Area

2.1 Synchronization of output levels, growth rates and recessions

The literature has analyzed synchronization from different points of views: levels, growth rates, the unravelling particular episodes such as recessions, by using data filtered so as to capture business cycle frequencies. However, not much has been done to try to connect the findings from the different perspectives. In this section we will try to fill this gap.

Level gaps

A first natural measure of asymmetry can be defined looking at the difference between output per capita in a member country and the average in the Euro Area.

Define $y_t^i \times 100$ as the log of real GDP per-capita of country (region) i in year t (PPP adjusted). The gap with respect to an aggregate Euro Area wide (US wide), y_t^{AV},

$$\text{gap}_t^i = y_t^i - y_t^{AV}$$

is defined as the percentage deviation of real GDP per-capita of country (region) i with respect to the aggregate Euro Area (US) GDP per-capita.

The level gap is linked to growth differentials by the expression:

$$\text{Gap}_{t+h}^i = \text{Gap}_t^i + \sum_{s=1}^{h} + \Delta\text{Gap}_{t+s}^i$$

where

Table 1: *Per-capita GDP at PPP and 2000 prices: gap with respect to Euro Area*

	1970	1980	1990	1999	2003	AVE 70-03	AVE 70-89	AVE 90-03	AR1	
AT	6.32	13.13	12.88	16.49	15.67	13.18	11.90	15.01	0.81	*
BE	5.05	8.51	6.16	7.00	7.00	6.81	7.02	6.52	0.51	**
FI	-2.00	2.89	7.77	3.57	8.05	2.54	3.77	0.78	0.88	*
FR	10.76	9.81	7.92	4.83	5.05	8.38	10.35	5.56	0.98	
GE	5.54	4.55	5.04	3.63	1.53	4.47	4.15	4.92	0.90	
GR	-29.51	-21.33	-40.63	-41.28	-30.79	-31.85	-26.07	-40.12	0.94	
IE	-44.63	-40.13	-28.50	10.40	23.84	-25.72	-40.71	-4.30	1.07	
IT	1.74	4.94	5.91	2.86	2.26	3.88	3.69	4.14	0.93	
LU	34.23	25.07	47.79	65.91	72.24	43.60	31.86	60.37	1.04	
NL	17.73	10.73	6.47	11.85	8.58	10.38	11.47	8.82	0.90	
PT	-57.78	-50.34	-40.59	-33.55	-37.06	-45.04	-50.65	-37.01	0.92	
SP	-25.61	-27.73	-23.23	-17.25	-13.64	-22.65	-24.68	-19.75	1.01	
EU12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
DE	31.80	19.43	13.78	16.26	15.57	19.90	23.23	15.15	0.88	
SE	24.73	13.29	11.15	8.96	11.34	13.03	16.82	7.63	0.88	
UK	6.71	-2.64	0.90	4.27	7.59	2.26	2.00	2.65	0.84	
EU15	2.31	0.23	0.62	1.14	1.73	1.01	1.13	0.84	0.81	
US	36.31	30.35	31.95	35.54	35.48	33.38	33.62	33.04	0.66	**
CA	19.48	18.73	12.79	12.89	15.98	15.93	19.25	11.20	0.90	
JP	-4.04	0.20	12.35	7.20	6.79	5.20	1.46	10.54	0.92	
OECD	3.72	-0.13	0.84	1.58	1.94	1.43	1.70	1.04	0.61	**

The last column denotes the results from an ADL test for unit root.
*, **, and *** indicate if the Unit Root is rejected at 10% and 5 % and 1% level respectively

$$\Delta \text{Gap}^i_{t+s} = \Delta y^i_{t+s} - \Delta y^{AV}_{t+s}.$$

The gap observed today $(t+h)$ in a given country then depends on its initial (time t) relative condition and growth performance in the past years up to today $(t+1, ..., t+h)$.

We ask two main empirical questions. Do gaps persist in time? Have countries changed their relative position?

Table 1 reports the gaps for Euro countries in the last 30 years. We also report gaps for the US, Japan (JP), Canada (CA), and, respectively, the Euro twelve (EU12)[1], the European Union with the 15 members preceding the 2004 enlargement (EU15)[2], and the OECD countries for comparisons.

Table 2 reports the same gap statistics for the real personal income of US regions with respect to the US average.[3] We consider the following regions: New England (NE),Mideast (ME), Great Lakes (GL), Plains (PL), Southeast (SE), Southwest (SW), Rocky Mountain (RM), Far West (FW).

Table 1 shows that the gaps, with the exception of Ireland, have been remarkably stable in the last thirty years. These gaps are also very persistent and there is no clear sign of convergence to a common level of output per capita (again with the exception of Ireland).

[1]Austria (AT), Belgium (BE), Finland (FI), France (FR), Germany (GE), Greece GR, Ireland (IR), Italy (IT), Luxembourg (LU), Netherland (NE), Portugal (PT) and Spain (SP).

[2]EU12 plus Denmark (DE), Sweden (SE) and United Kingdom (UK).

[3]The use of personal income in Table 2 rather than GDP as in Table 1 will lead us to overestimate similarities between US regions and the US aggregates with respect to the European nations case.

Table 2: *Per-capita Personal Income: Gap of US region with respect to US aggregate*

	1970	1980	1990	1999	2003	AVE 70-03	AVE 70-89	AVE 90-03	AR1
US	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	8.45	4.97	15.37	17.03	19.02	11.50	7.98	16.53	1.00
ME	12.11	7.55	14.88	13.02	13.20	11.50	10.09	13.52	0.96
GL	2.61	1.70	-1.93	-0.08	-1.40	0.53	1.36	-0.67	0.94
PL	-6.18	-5.66	-7.17	-4.40	-3.15	-4.47	-4.21	-4.83	0.55
SE	-20.65	-15.65	-12.05	-10.99	-10.02	-13.61	-15.69	-10.64	0.92
SW	-12.56	-4.30	-13.26	-10.41	-10.69	-9.69	-8.60	-11.24	0.91
RM	-8.21	-3.04	-11.35	-5.83	-4.33	-6.59	-6.24	-7.07	0.93
FW	13.58	14.36	8.29	5.39	4.47	9.16	11.86	5.30	0.98

The last column denotes the results from an ADL test for unit root.
*, **, and *** indicate if the Unit Root is rejected at 10% and 5 % and 1% level respectively

A formal unit root test, whose results are shown in the last column, indicates that for most European countries we cannot reject the hypothesis that the gap is non-stationary and that therefore there is no common trend along which these economies move.

Persistence in the gaps is generated by low frequency cycles around different means and, in the case of Ireland by a convergence trend. Given the persistence of the gaps it is difficult to distinguish whether, since the EMU, countries such as Spain or Greece have been moving along a convergence path or are just in a phase of a long swing. In general, on the basis of data so far, there is no clear evidence that the EMU has modified the historical dynamics.[4]

To put these findings in a broader context, it is useful to look at the gap between the US and the Euro Area average (Table 1) and the US regions and the US aggregate (Table 2). From Table 2, we can see that the gaps between US regions and the US aggregate, like the gaps between Euro Area countries and the Euro Area average are non-stationary while, from Table 1, we had found that the gap between the US and the Euro Area is. This fact suggests that it is indeed more likely for large economic entities, which by virtue of size are well diversified, to move along a similar path over a period of thirty years. Averaging output over nations/regions "kills" idiosyncratic fluctuations, no matter whether they are persistent or not. To understand the economic importance of this finding, however, we need to estimate the size of this idiosyncratic dynamic. This is what we will do in the next Section.

Growth gaps

Contrary to the level gaps, the variance of growth rates gaps:

$$\mathrm{Var}(\Delta y_t^i - \Delta y_t^{EU})$$

[4] A separate literature has studied convergence dynamics within the Euro area (eg, Harvey and Carvalho, 2005) and proposed formal statistical tests. This analysis is not the focus of this paper.

have declined over time and, in the last ten years, has reached an historical low (see Table 3, column 1). This is not true, however, if we look at correlations between country's growth and Euro average growth, $\text{Corr}(\Delta y_t^i, \Delta y_t^{EU})$. Since, as observed by many studies (see Stock and Watson, 2005, for a review of the literature and an analysis based on the G7), the variance of output per capita has decreased everywhere, a phenomenon that has been labelled the "great moderation", correlations are more stable than the variance of the gaps.

Table 3 reports variances of GDP growth rates, variances of the growth gap and correlations between our selected countries and Euro Area GDP growth rates, for different sub-samples.

Table 3: GDP growth rate for OECD countries: descriptive statistics

	(1) $\text{Var}(\Delta y_t^i - \Delta y_t^{EU})$			(2) $\text{Var}(\Delta y_t^i)$			(3) $\text{Corr}(\Delta y_t^i, \Delta y_t^{EU})$		
	71-03	71-89	93-03	71-03	71-89	93-03	71-03	71-89	93-03
AT	1.24	1.96	0.38	2.86	3.56	1.32	0.76	0.68	0.84
BE	0.71	1.01	0.43	3.16	3.97	1.44	0.88	0.87	0.84
FI	7.31	3.57	1.17	8.46	3.79	2.18	0.38	0.43	0.68
FR	0.38	0.43	0.15	1.91	1.90	1.14	0.91	0.90	0.93
GE	0.71	0.64	0.06	2.91	2.79	0.94	0.87	0.88	0.97
GR	9.07	13.21	2.29	10.94	16.85	1.04	0.41	0.48	-0.20
IE	8.66	6.00	3.57	8.25	4.92	6.43	0.20	0.18	0.79
IT	0.88	1.19	0.26	3.21	3.97	0.82	0.85	0.84	0.85
LU	7.17	8.74	4.56	10.95	14.58	7.20	0.62	0.70	0.70
NL	1.03	1.01	0.90	2.49	2.69	2.69	0.78	0.80	0.87
PT	6.65	10.25	2.04	13.05	18.62	4.09	0.82	0.82	0.77
SP	2.00	3.15	0.24	4.05	5.71	0.87	0.71	0.67	0.86
EU12	0.00	0.00	0.00	2.05	2.29	0.86	1.00	1.00	1.00
DE	2.72	3.53	1.07	3.58	5.02	1.70	0.54	0.56	0.62
SE	3.32	3.50	0.52	3.36	2.13	1.82	0.40	0.21	0.86
UK	3.21	3.22	0.44	3.81	5.10	0.63	0.47	0.61	0.71
EU15	0.10	0.10	0.01	1.85	2.21	0.77	0.97	0.98	0.99
US	3.25	3.69	1.03	4.16	5.83	1.33	0.51	0.61	0.54
CA	3.68	2.59	0.96	4.57	4.31	2.13	0.48	0.64	0.75
JP	3.32	3.16	3.41	4.47	4.37	2.19	0.53	0.55	-0.13
OECD	0.85	0.85	0.48	1.90	2.60	0.68	0.79	0.83	0.69

To control for the effects of the German unification, we do not include the period 1990-1992 in the sub-samples.

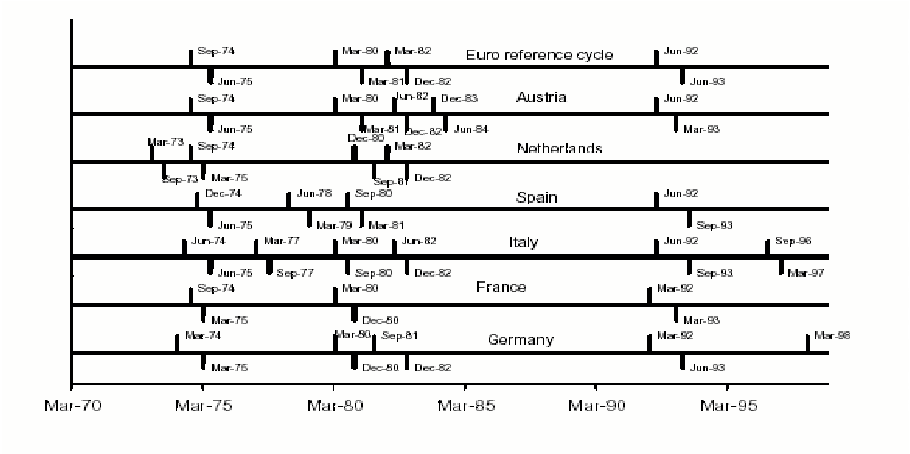
The table shows that cyclical co-movements, measured by correlations have been high and stable within the Euro Area and between the Euro Area and the rest of the world.

This finding is in line with Stock and Watson (2005) who analyze the international business cycle using different measures and with the literature on the world business cycle which has found that the international component of output fluctuations explain a large part of total volatility (e.g. Kose et al., 2003; Artis et al., 2004; Canova et al., 2004; Monfort et al., 2004). Simple correlation coefficients, however, show that co-movements within the Euro Area, are higher than between the Euro Area and the rest of the world. This indicates that the Area wide aggregate captures the bulk of national features and that we can identify specific characteristics of the Euro Area business cycle. This justifies the analysis of the aggregate European business cycle with respect to the US which we carry on in Section 4.

Recessions

Recessions are very informative events. In "normal times" volatility is relatively low while a recession is a major event, characterized by an unusual drop in output. Are Euro Area recessions synchronized? Harding and Pagan (2004) have recently proposed an adaptation of the automatic algorithm designed by Bry and Boschan (1971) to identify peaks and through of the European recessions of the last thirty years [5]. Figure 1 reports their resulting dating for the Euro area and its largest member countries.

Figure 1: Euro Area Classical Reference Cycle and specific cycles in GDP for individual Euro Countries (Source: Harding and Pagan, 2004)



The Figure shows that peaks and troughs of European countries business cycles are basically concomitant.

Summing up

An apparent paradox emerges from a first look at the economic performances of European countries: looking at levels of economic activity we would be led to think that differences between countries are persistent while looking at growth rates or at the chronology of the business cycle we find strong similarities. The explanation is that cyclical asymmetries when measured in terms of levels of output, although persistent, are small and in line with those between US regions.

In the next sub-section we will analyze the sources of asymmetries in more details.

[5] The Bry-Boschan algorithm is a non-parametric procedure deviced to identify local maxima and minima and it is widely used in business cycle analysis.

2.2 What drives asymmetries: shocks or propagations?

Heterogeneous dynamics can be explained either by the exogenous sources of variation, i.e. idiosyncratic, country-specific shocks, or by heterogenous responses to common shocks. Which is the explanation for the heterogeneity found within the Euro Area?

To analyze this question, we estimate a set of bivariate structural VARs on output per capita of country i and the Euro area average. The identification assumption is that the country specific shock affects the other member countries with a lag, one year, i.e. we assume that spillover effects take at least one year to manifest[6].

We will use the US as the usual benchmark and redo the exercise using regional output and US average.

The model is

$$\begin{pmatrix} y_t^{AV} \\ y_t^i \end{pmatrix} = \begin{pmatrix} \mu^{AV} \\ \mu^i \end{pmatrix} + \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} \begin{pmatrix} y_{t-1}^{AV} \\ y_{t-1}^i \end{pmatrix} + \begin{pmatrix} b_{11} & b_{22}p_i \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} u_t^{AV} \\ u_t^i \end{pmatrix}$$

where p_i is the relative size of country (region) i measured as the ratio between county (region) i population and the total population of the Euro Area (United States)[7]. As in Section 2, the superscript AV indicates Euro Area (US) aggregate measure and the u_t^{AV} is the Euro Area Wide (US wide) shock while u_t^i is the country (region) i specific shock[8].

To understand which shocks are responsible for the asymmetries we will look at the cumulative effects of country specific shocks on the growth gap, i.e. at the estimate of:

$$\frac{\partial \sum_{s=1}^{h} \left[\Delta y_{t+s}^i - \Delta y_{t+s}^{AV}\right]}{\partial u_t^i}, \quad h = 1, 3, 5$$

and at the cumulative effects of country specific shocks on the country output growth

$$\frac{\partial \sum_{s=1}^{h} \left[\Delta y_{t+s}^i\right]}{\partial u_t^i}, \quad h = 1, 3, 5$$

Euro Area

Table 4 below shows forecast error decompositions related to these two quantities for the Euro Area.

[6] A similar identification strategy has been used by Stock and Watson (2005) to identify country specific and world-wide shocks among G7 countries.

[7] We use average population over the sample period 1970-2003.

[8] The VAR is estimated in levels to be robust with respect to unit root issues. Impulse responses will be then computed for a medium run horizon.

Table 4: Percentage of forecast error due to country specific shocks

	$\sum_{s=1}^{h}\left[\Delta y_{t+s}^{i}-\Delta y_{t+s}^{EU}\right]$					$\sum_{s=1}^{h}\left[\Delta y_{t+s}^{i}\right]$			
	h=0	h=1	h=3	h=5		h=0	h=1	h=3	h=5
AT	0.91	0.92	0.93	0.92		0.42	0.30	0.17	0.11
BE	1.00	1.00	1.00	1.00		0.24	0.14	0.10	0.11
FI	0.99	0.99	0.99	0.99		0.87	0.87	0.85	0.84
FR	0.76	0.74	0.69	0.66		0.26	0.21	0.14	0.10
GE	0.96	0.96	0.96	0.96		0.48	0.46	0.42	0.39
GR	0.98	0.98	0.97	0.96		0.91	0.90	0.87	0.84
IE	0.98	0.98	0.99	0.99		0.86	0.85	0.83	0.82
IT	0.98	0.98	0.98	0.98		0.46	0.45	0.43	0.41
LU	0.78	0.76	0.71	0.67		0.43	0.41	0.38	0.36
NL	0.98	0.98	0.99	0.99		0.39	0.39	0.39	0.38
PT	0.70	0.69	0.67	0.65		0.38	0.35	0.31	0.27
SP	0.99	0.99	1.00	1.00		0.63	0.64	0.65	0.66

From the Table we can see that the gap is mainly explained by country specific shocks at all horizons. The latter, however, have had a limited role in explaining output fluctuations, particularly at medium term horizon. Three exceptions stand out: Greece, Finland and Ireland.

A further exercise is to run a counterfactual exercise and ask what would have correlation been in the absence of country specific shocks. Table 5 below provides the answer.

Table 5: Counterfactual correlations

	TRUE	Only Area Wide Shocks	Only Country specific Shocks
AT	0.76	0.94	0.20
BE	0.88	0.97	0.32
FI	0.38	0.96	0.07
FR	0.91	0.97	0.21
GE	0.87	0.88	0.35
GR	0.41	0.90	0.16
IE	0.20	0.34	-0.12
IT	0.85	0.98	0.31
LU	0.62	0.81	-0.11
NL	0.78	0.97	0.08
PT	0.82	0.99	0.15
SP	0.71	0.97	0.18

Clearly, correlations would have been quite high and stable if there had been only area-wide shocks which implies that asymmetries are explained by idiosyncratic shocks rather than heterogeneous responses to common shocks and that, therefore, area wide shocks propagate similarly across Euro Area countries (with the exception of Ireland).

Again we find that, although small, national factors have persistent effects. Common Euro Area shocks account for the bulk of business cycle fluctuations.

The US

Table 6 and Table 7 below report results for the US regions from the same exercises we performed for Euro Area's countries.

Table 6: Percentage of forecast error due to region specific shocks

	$\sum_{s=1}^{h}\left[\Delta y_{t+s}^{i}-\Delta y_{t+s}^{EU}\right]$					$\sum_{s=1}^{h}\left[\Delta y_{t+s}^{i}\right]$			
	h=0	h=1	h=3	h=5		h=0	h=1	h=3	h=5
NE	0.96	0.94	0.90	0.84		0.25	0.23	0.19	0.16
ME	0.93	0.94	0.96	0.96		0.20	0.19	0.16	0.14
GL	0.98	0.99	0.99	0.99		0.19	0.18	0.17	0.16
PL	0.99	0.99	0.99	0.99		0.36	0.28	0.18	0.14
SE	0.94	0.95	0.96	0.97		0.11	0.13	0.17	0.20
SW	0.95	0.94	0.94	0.93		0.47	0.45	0.42	0.38
RM	0.94	0.94	0.94	0.94		0.37	0.34	0.29	0.24
FW	1.00	1.00	0.99	0.98		0.22	0.19	0.14	0.11

Table 7: Counterfactual correlations

	TRUE	Only US Wide Shocks	Only Region specific Shocks
NE	0.85	0.97	0.03
ME	0.91	0.99	0.11
GL	0.93	0.99	0.11
PL	0.80	0.99	0.09
SE	0.96	0.98	0.15
SW	0.77	0.97	0.12
RM	0.81	0.99	0.08
FW	0.92	0.99	0.15

Results are similar to the European case, although in the US the size of idiosyncratic shocks is more homogeneous across regions than it is for nations within the Euro Area. Three results emerge: (i) the gaps are mainly explained by region specific shocks in particular at medium horizons; (ii) output fluctuations are mainly explained by the US wide shocks at all horizons; (iii) correlations would have been quite high and stable if there had only been US-wide shocks, suggesting that US wide shocks propagate similarly across US regions.

3 The Euro Area and the world

So far we have concluded that (i) the global component of the Euro area countries fluctuations is large, but that (ii) Euro Area countries seems to be more correlated amongst themselves than with the rest of the world.

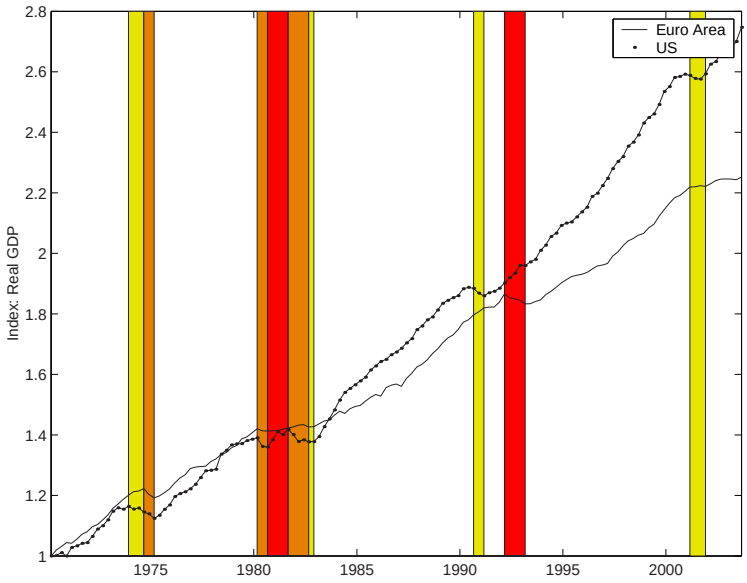
To explore further this point, in this Section, we will develop a simple statistical model to understand the relation between the Euro Area considered as an aggregate and the US as a whole. This analysis draws from Giannone and Reichlin (2005).

Let us first start with some descriptive statistics.

The National Bureau of Economic Research (NBER) and the Center for Economic Policy Research (CEPR) provide a chronology for, respectively, the US and the Euro Area business cycle. In both cases the chronology is established by informal inspection of a variety of key macroeconomic time series and it is not just based on GDP. The dates refer to what is typically called the classical cycle, i.e. the turning points in the *level* of economic activity. Figure 2 plots quarterly US and Euro Area GDP since 1970 (the first date for which aggregate euro statistics are available) and dates established by CEPR and NBER.

NBER and CEPR dating illustrate striking similarities between the cyclical characteristics of the two economies. In both economies, recessions are rare and of short duration if compared with expansions and they are roughly synchronized.

Figure 2: GDP since 1970



The light shadow corresponds to a recession in the US, the dark one to a recession in the Euro Area and overlapping recessions show with an intermediate shade

We will now compute some descriptive statistics on duration, amplitude and synchronization of cycles to document further similarities and differences between the two business cycles. Table 8 reports statistics for the two classifications of peaks and troughs: the informal CEPR and NBER classification (bold figures) and the dating resulting from the application of the automatic algorithm designed by Bry and Boschan (1971) to quarterly GDP[9] (in parenthesis). Amplitude is measured as the quarterly average growth rate of GDP during the sub-period, duration is measured in quarters while the concordance index is a measure of synchronization developed by Harding and Pagan (2004). Calling the log of US GDP as y_t^{US} and the log of Euro Area output as y_t^{EU}, the concordance index is defined as:

$$C_{ij} = \frac{1}{T}\sum_{t=1}^{T}[S_{y_t^{US}} S_{y_t^{EU}} + (1 - S_{y_t^{US}})(1 - S_{y_t^{EU}})]$$

where $S_{y_t^j}$ is a binary random variable that takes the values unity during recessions and zero during expansions. The concordance index ranges between 0 and 1.

The Table shows that, as suspected by inspection of Figure 2, there is high concordance between the two cycles. However, in the US cyclical amplitude is larger and

[9]For the BB algorithm, we have applied the parametrization suggested by Harding and Pagan (2002). We would like to stress that, following the tradition of Business Cycle dating, quarterly GDP is not in per-capita for our dating exercise.

Table 8: Business Cycle Statistics

	US	Euro Area
peak to trough amplitude	**-0.5658** (-0.6294)	**-0.2433** (-0.4979)
trough to peak amplitude	**0.9445** (0.9589)	**0.7653** (0.6254)
peak to trough duration	**3.4000** (3.4000)	**5.3333** (2.5000)
trough to peak duration	**23.25** (23.500)	**29** (35.00)
n. of recessions	**5.00** (5.00)	**3.00** (4.00)
Concordance Index	**0.8593** (0.8222)	

The business cycle statistics corresponding to the NBER and CEPR dating are in bold. We show in parentheses the same statistics, produced by the Bry-Boschan Dating Algorithm.

recessions are shorter than in the Euro Area. In general, the Euro area cycle seems to be smoother than the US one.

The analysis in terms of growth rates brings further insights on differences and similarities between business cycles. Since the growth of output is typically stationary, growth cycle characteristics can be illustrated by looking at volatility, persistence and dynamic correlations.

Volatility is typically measured by the variance of the growth rate of the series. This is an average of the variance at all frequencies and therefore captures short-run, medium/long-run and business cycle variance. The medium/long run, persistent component, can be measured in different ways. We will here define it as the centered 5-year average growth rate:

$$MA_5(\Delta y_t^i) = \frac{1}{5}\sum_{j=-2}^{2} \Delta y_{t+j}^i, \quad i = EU, US$$

Persistence can hence be measured as the ratio between the volatility of the medium/long run component and the total volatility. Table 9 reports the variance of the growth rates of output, the variance of the medium/long run component and the ratio between the latter and the former for both the Euro and the US economy. We can observe the following characteristics:

1. Total output volatility is higher in the US than in the Euro area.
2. Medium/long run output volatility is similar in the US and in the Euro Area.
3. The Euro cycle is more persistent than the US cycle. Persistence, as measured

by the ratio between the variance of the medium/long run component and the total variance, is larger in the Euro Area.

Table 9: Variance of the growth rate of output and of its 5 year centered moving average

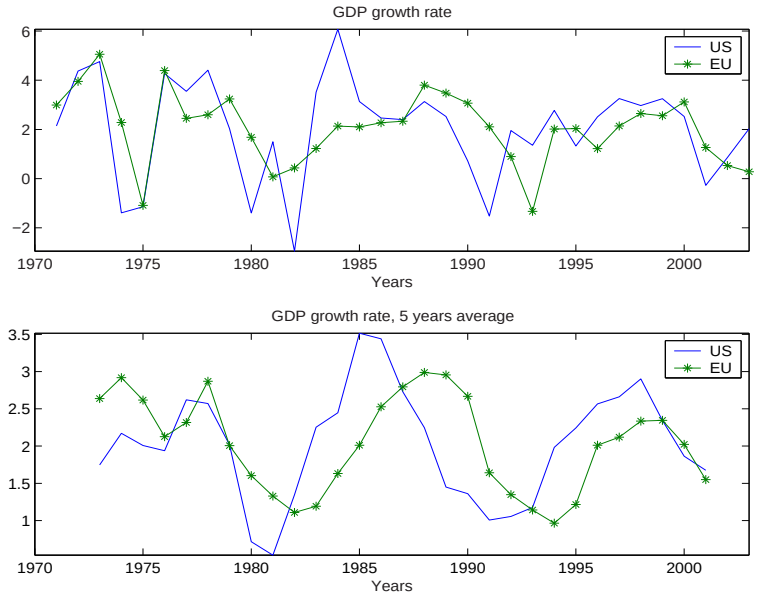
	US	Euro Area
(a) $var[\Delta y]$	4.50	2.00
(b) $var[MA_5(\Delta y)]$	0.55	0.40
(c)=(b)/(a) $\times 100$	12%	20%

Differences in volatility and persistence characteristics of growth cycles between the US and the Euro Area are the same as what observed for level cycles based on amplitude and duration statistics. Larger persistence in the Euro Area is not surprising, since recessions, as we have seen, are less pronounced, but last longer than in the US.

What about synchronization?

Figure 3 plots growth rates of GDP per-capita (upper quadrant) and its 5-years centered average (lower quadrant) corresponding. The plot shows the the Euro Area growth seems to "follow" the US's: the persistent component of output growth in the Euro Area is lagging the US analog.

Figure 3: GDP growth rates and potential growth



To understand whether this leading-lagging pattern implies a predictive relation between US growth and Euro Area growth, we run a simple Granger causality tests between growth rates of each area and the Euro Area-US gaps.

Table 10: *Granger causality test*

			F stat.	p-value
Δy_t^{US}	does not Cause	$y_t^{EU} - y_t^{US}$	0.16	0.85
Δy_t^{EU}	does not Cause	$y_t^{EU} - y_t^{US}$	0.40	0.67
$y_t^{US} - y_t^{EU}$	does not Cause	Δy_t^{US}	0.72	0.50
$y_t^{US} - y_t^{EU}$	does not Cause	Δy_t^{EU}	5.20	0.01**

The F-test does not reject the hypothesis that the Euro Area-US gap does not Granger-cause (and is not Granger-caused by) US output growth. In addition, the F-test does not reject the hypothesis that Euro Area output growth rate does not Granger-cause the Euro Area-US gap but it does reject the hypothesis of Granger causality of the gap on the Euro Area growth rate (results are reported in Table 10).

These results suggest a Euro Area - US dynamics whereby the Euro area rate of growth adjusts itself to the US growth while the US does not, suggesting that the US economy does not respond to shocks specific to the Euro Area[10].

More specifically, the stationarity of the Euro Area - US gap, which indicate that US output and Euro output are cointegrated, suggests a bivariate model on US and Euro output with one common permanent shock. In addition the Granger causality results suggest that the long permanent shock cannot affect contemporaneously the Euro Area while it can affect immediately the US. We can label this shock as US shock and suggest the following model (see also Giannone and Reichlin, 2005):

$$\begin{pmatrix} y_t^{US} \\ y_t^{EU} \end{pmatrix} = \begin{pmatrix} \mu^{US} \\ \mu^{EU} \end{pmatrix} + \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} \begin{pmatrix} y_{t-1}^{US} \\ y_{t-1}^{EU} \end{pmatrix} + \begin{pmatrix} b_{11} & 0 \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} u_t^{US} \\ u_t^{EU} \end{pmatrix}$$

On the basis of this model we can now compute impulse response functions of the two shocks (the permanent, US, shock and the long-run neutral shock) on US output, Euro Area output and Euro Area-US gap. Figure 4 plots the impulse responses while Table 11 shows the variance decompositions.

Results imply that after a worldwide shock the US adjusts immediately while Europe reacts slowly reaching the steady state after more than 5 years. Notice also that the other shock, the Euro Area one, is small and transitory. It explains less that 50% of the variance of forecast error at 1-year horizon and less than one-third at 3-years horizon.

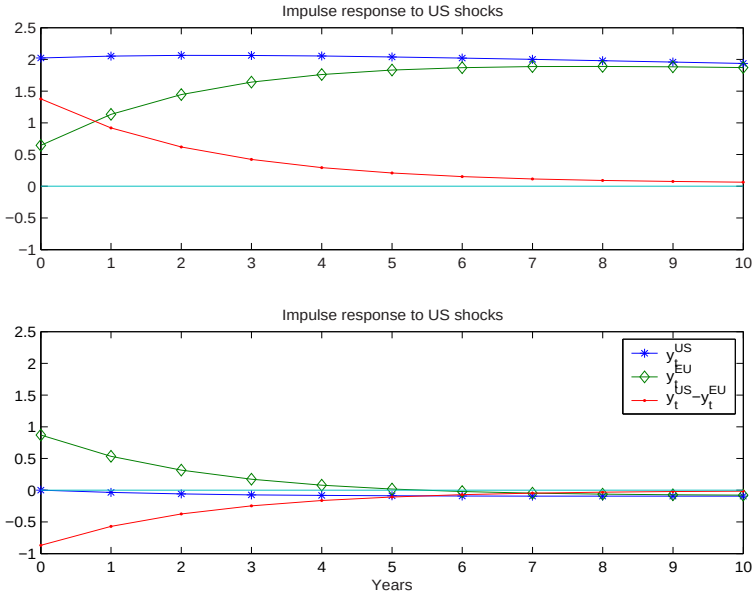
If the non-neutral common shock is interpreted as the world technology shock this result implies that the US economy has a higher ability to absorb technology faster than the Euro economy. The high rapidity with which technology is absorbed in the

[10] Giannone and Reichlin (2005) use the restriction implied by the Granger causality tests to simulate levels of output and verify whether it is possible to reproduce the properties of the dating of business cycle identified from the data (see Table 8). They find that the model reproduces them with a large degree of accuracy.

Table 11: *Real GDP per-capita: Forecast error decomposition% of forecast error variance explained by the Worldwide (US) shock*

	Forecast horizon				
	0y	1y	3y	5y	10y
y_t^{US}	1.00	1.00	1.00	1.00	1.00
y_t^{EU}	0.35	0.62	0.85	0.92	0.96
$y_t^{US} - y_t^{EU}$	0.71	0.72	0.72	0.72	0.72

Figure 4: Impulse responses



US seems to induce high short-term volatility. In the Euro Area, on the other hand, the bulk of the variance is in the long-run because it takes longer to absorb shocks. An alternative interpretation is that the world shock is in fact the US shock. The two hypotheses cannot be distinguished statistically, but the economic implication of the two alternative interpretations is the same.

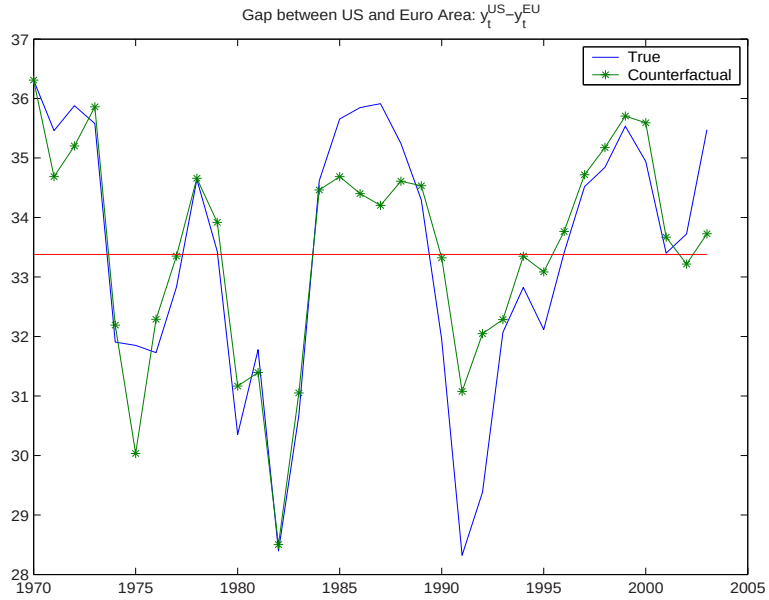
To complete the exercise, we ask counter-factually, what would have the gap been if there had only been worldwide shocks, and no Euro specific shocks. Results are reported in Figure 5.

We can see that the counterfactual and the actual gap are very similar. Moreover, the gap decreases in recessions and increases in expansion which further illustrate our characterizations of the two business cycles.

Collecting all results, we can conclude:

- The world-wide/US shock explains most of the fluctuations of the gap as already

Figure 5: US/Euro Area Gap



noticed by the literature on the world business cycle cited before.

- During recessions, the gap tends to close since Europe reacts slowly to the world-wide shock. The gap opens during the expansions. In the middle of the cycle it reaches its maximum, but then Europe starts caching up; and
- The Euro Area shock reduced the gap during the US recession of the 1990s, probably as a result of the German Unification. However, the Euro Area shock only postponed the European recession. Apart for this episode, the recent period is very much in line with past experience (the variance of European specific shocks has not increased); and
- There is a specific Euro Area cycle, which is different from the US cycle because of the different propagation mechanism. This qualifies the result by Canova et al. (2004) and by Monfort et al. (2004) by distinguishing between origin of the shock (worldwide) and propagation mechanism (Euro Area specific).

4 Business cycle asymmetries and risk sharing: should we care about output synchronization?

So far we have focused on the analysis of output and output per capita and we have not looked at changes in these characteristics during the process of European integration

and the establishment of the Euro. In fact, in terms of output there is no clear sign, or at least not yet, of changes in the cyclical characteristics of the Euro Area.

In this section we will ask the question of whether the cross-country correlations of consumption, conditionally on output have changed as the result of the deepening of the European economic integration. What matters for welfare is consumption rather than output. In principle, financial market integration, should make it easier for consumers, to insure against income risk through borrowing and lending and cross-country ownership of financial assets. Sorensen and Yosha (1998) found that less risk is shared in Europe than in the US while Kalemli-Ozcan et al. (2004) found that risk sharing through financial market has increased in the last decade thanks to financial integration.

Table 12 shows some descriptive statistics.

Table 12: Descriptive statistics on Real Individual Consumption

	$\mathrm{Var}(\Delta c_t^i - \Delta c_t^{EU})$			$\mathrm{Var}(\Delta c_t^i)$			$\mathrm{Corr}(\Delta c_t^i, \Delta c_t^{EU})$		
	71-03	71-89	93-03	71-03	71-89	93-03	71-03	71-89	93-03
AT	1.96	2.59	1.30	3.23	3.52	1.56	0.63	0.53	0.43
BE	1.10	1.74	0.41	3.25	4.53	0.65	0.82	0.81	0.65
FI	5.29	2.28	0.68	6.66	2.49	0.59	0.46	0.45	0.38
FR	0.70	0.67	0.41	1.49	1.69	0.75	0.78	0.80	0.69
GE	0.83	0.98	0.30	2.64	2.75	0.97	0.83	0.80	0.84
GR	4.24	6.59	1.52	5.91	9.11	0.53	0.53	0.54	-0.46
IE	8.75	9.27	2.98	9.74	12.48	5.00	0.33	0.54	0.79
IT	1.56	2.05	0.27	3.35	2.68	0.66	0.73	0.54	0.78
LU	4.49	0.86	1.44	5.50	1.78	1.75	0.44	0.75	0.43
NL	2.19	2.43	0.82	3.18	4.35	1.80	0.57	0.67	0.78
PT	10.27	16.55	1.49	13.36	20.50	2.98	0.51	0.49	0.81
SP	2.12	3.28	0.36	4.51	6.47	1.08	0.74	0.74	0.82
EU12	0.00	0.00	0.00	1.59	1.60	0.51	1.00	1.00	1.00
DE	3.59	3.65	2.71	2.83	4.01	1.72	0.19	0.39	-0.25
SE	3.63	3.83	1.42	4.63	4.54	1.80	0.48	0.43	0.46
UK	3.66	3.94	0.32	3.52	4.82	0.50	0.31	0.45	0.68
EU15	0.12	0.13	0.01	1.36	1.55	0.44	0.96	0.96	0.99
US	2.84	3.11	0.25	2.52	3.38	0.71	0.32	0.40	0.81
CA	2.86	2.40	0.67	3.55	4.18	0.53	0.48	0.65	0.36
JP	2.45	2.78	1.74	3.40	4.10	0.66	0.55	0.57	-0.49
OECD	0.76	0.69	0.21	1.16	1.58	0.35	0.73	0.78	0.77

Although the variance of consumption has been declining over time for all countries, the correlation of country consumption growth with the average has increased for some countries and decreased for others.

These numbers, however, cannot be simply interpreted: they are driven by many factors, such as taste shocks for example. A more interpretable measure of risk sharing can be obtained following Asdrubali et al. (1996), ASY from now on. We ask how much variance of output is smoothed by consumption via risk sharing at each period of time (see Sorensen and Yosha, 1998; Kalemli-Ozcan et al., 2004, for an analysis on European countries), i.e. how much the cross-country variance of consumption conditional on output has decreased over time. We consider the sample 1970-2004 and redo some of ASY's calculations on our data.

Let us define: c_t^i the log $\times 100$ of real individual consumption of country i in year t. We estimate (by OLS) the regression:

$$\Delta_h(c_t^i - c_t^{EU}) = \alpha_t + \beta_t \Delta_h(y_t^i - y_t^{EU}) + v_t$$

where Δ_h denotes the h-th differences $(1 - L^h)$. The regression coefficient β_t is interpreted as the amount of risk not insured, i.e. the percentage of the variance of GDP

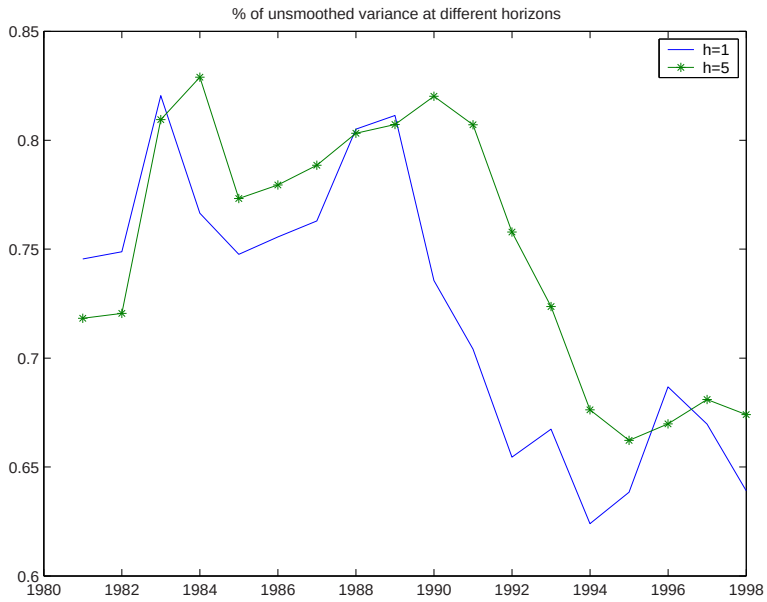
that is smoothed out through capital market, credit market and other channels.

Figure 6 plots a smooth version of β_t in time and for the EU12 countries excluding Luxemburg defined as $\tilde{\beta}_t$:

$$\tilde{\beta}_t = \frac{1}{2m+1} \sum_{j=-m}^{m} \left(1 - \frac{|j|}{2m+1}\right) \beta_{t+j}$$

and $m = 5$ years.

Figure 6: Risk not shared over time



Results show that the ability of sharing risk among European countries goes up in the early 90's when capital and good market integration has significantly accelerated in Europe.

Although the previous calculations provide an interesting rough descriptive statistics, a better measure of risk sharing should control for country heterogeneity in response to common, Area-wide shocks and for the effect of relative prices. The heterogeneity of the responses of countries output and consumption to common shocks could emerge in case of imperfect risk sharing[11]. In addition, relative prices fluctuations, whose nature has changed significantly with the EMU, could have provided an automatic smoothing of the effect of country specific shocks[12] (see for example Obstfeld,

[11]This approach to control for heterogeneity has been proposed by Giannone and Lenza (2004).

[12]We thank Luca Dedola and Fiorella De Fiore for having suggested us to include this control variable.

1994; Hoffmann, 2004).

To this end, we estimate the following panel regression for the whole sample and three sub-samples:

$$\Delta_h(c_t^i - c_t^{EU}) = \alpha_i + \beta_h \Delta_h(y_t^i - y_t^{EU}) + \gamma_i^c \Delta_h c_t^{EU} + \gamma_i^y \Delta_h y_t^{EU} + \gamma_i^R \Delta_h R_t^{i,EU} + v_t^i$$

where $R_t^{i,EU}$ is the real exchange rate between country i and the Euro Area as a whole[13] and Euro-area wide consumption is included as a regressor to control for common taste shocks.

We follow ASY and estimate it using weighted least square so as to downweight countries with a larger idiosyncratic component. We run the regression on all Euro Area countries, excluding Luxembourg. As an alternative, we also estimate the coefficients including in our panel only the six largest Euro Area countries (Germany, France, Italy, Spain, Netherlands and Belgium). Table 13 reports results.

Table 13: Panel estimates of β_h for selected subsamples

	EU 12 (excl. LU)			EU (Largest 6)	
	h=1	h=5		h=1	h=5
1970-2003	0.75 (0.05)	0.77 (0.03)		0.83 (0.07)	0.94 (0.04)
1970-1989	0.80 (0.08)	0.87 (0.04)		0.86 (0.09)	0.91 (0.05)
1990-2003	0.65 (0.07)	0.59 (0.03)		0.70 (0.10)	0.65 (0.08)
1993-2003	0.76 (0.10)	0.59 (0.03)		0.77 (0.12)	0.63 (0.15)

Results from the simple measure of risk sharing are confirmed: risk sharing has increased in the last decade. The result is particularly robust at long horizons, indicating that the increased ability of countries to smooth is particularly significant in response to persistent shocks to output. We should also stress that long horizons results should be more robust to endogeneity issues that may affect these types of reduced form regressions.

We take the results above as an indication that the process of European integration is working and we should worry less than before about asymmetries in output.

5 Conclusions

Six years of history of a monetary union are too short to identify new tendencies of output development since historically gaps GDP per capita have been persistent and it is difficult to distinguish trends from persistent fluctuations around different means. However, these gaps are small and cycles are synchronized.

Heterogeneity is generated by small and persistent idiosyncratic shocks while most output variation is explained by a common shock. A tentative implication of this finding

[13] $R_t^{EU,i} = P_t^{\$EU} - P_t^{\$i}$ where $P_t^{\$i} = \log\left\{C_t^{n,i}/C_t^{r,i}\right\} \times 100$, and $C_t^{r,i}$ and $C_t^{n,i}$ are the nominal consumption and the real consumption, respectively, in country i expressed in US dollars.

is that that national stabilization policy don't have a large role to play in smoothing output and, for the small part of variance generated by idiosyncratic shocks, they should be designed to address low frequency components rather than the business cycle which is mostly common.

What should be a concern for policy is the common characteristic of the European cycle. When the Euro Area is analyzed as an aggregate and compared with the US, it is found that, although a common world shock drives the two cycles, the propagation differs across the two areas: the Euro Area lags the US and its cycle is more persistent, but less volatile. Low growth, persistence of shocks and low volatility are common characteristics of the Euro area and the gap with respect to the US has been stable over the last thirty years.

Facing these historical characteristics, the process of European integration, has however helped to smooth the cross-sectional correlation of consumption conditional on output. This finding supports the hypothesis that, since the early nineties, risk sharing has increased within the Euro Area.

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Discussion of: "Trends and cycles in the Euro area: how much heterogeneity and should we worry about it?" by Domenico Giannone and Lucrezia Reichlin

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Giannone and Reichlin's (GR) paper analyzes output fluctuations and their persistence and transmission for EU and EMU countries over the last 30 years. GR also examine if output levels are converging and compare to U.S. state-level data. These are important questions for a monetary union. For example, if inequality were to increase, less fortunate countries might blame monetary policy and, as more universally discussed in the literature, fluctuations in output pose a challenge for economic policy if shocks are not synchronized ("asymmetric"). This is particularly true if shocks are persistent and if they are large—at least as long as they are not "insured" through international risk sharing. Therefore, GR further estimate the amount of macroeconomic risk sharing in the EU—that is, the degree to which a country's consumption is buffered from country-specific output shocks. (I refer to the difference between country-level and EU-level variables as "country-specific" or "idiosyncratic.")

The main results of the paper are as follows.

1. Output levels are not converging in Europe, with the exception of the remarkable catch-up of Ireland's output—but they are clearly not diverging either. U.S. regions display a similar pattern.

2. The variance of output growth rates has declined steeply and so has the variance of idiosyncratic growth rates.

3. Business cycles in Europe are more persistent but also more shallow than in the United States.

4. The U.S. business cycle leads the European business cycle.

5. The variance of consumption growth has decreased sharply.

6. Risk sharing has increased sharply starting in the early 1990s.

I will discuss the findings in turn.

1 Convergence of output

It is interesting that output convergence seems to have come to a halt in the EU as well as among U.S. states. The neoclassical model predicts that output levels should converge when capital markets integrate *ceteris paribus* as capital moves to the regions where it has previously been scarce. In particular, the *ceteris paribus* clause includes the restriction that labor is homogeneous and endowments and productivity levels are similar. Such convergence was going on in Europe (and in the United States) before the 1980s so an interesting issue is why it has stopped? My interpretation is that labor and endowments (very broadly interpreted) differ between between U.S. states. Kalemli-Ozcan, Reshef, Sørensen, and Yosha (2005) (KRSY) find that the behavior of U.S. state-level output and income is consistent with capital freely moving across state borders to states where it is most productive. It is less obvious if capital markets in the EU or EMU are integrated to the extent of within-U.S. integration, but the similar patterns of convergence are suggestive that this is the case. The behavior of the Irish economy appears consistent with the picture of an economy that is fully integrated in world capital markets, but it is still a somewhat open question if such is the case for the average EU country.

One serious complaint: income is not output as GR implicitly assume when they compare U.S. income convergence with European output convergence. The overall picture of convergence patterns likely doesn't change much although the difference between output and income can be *very* large for oil states, in particular Alaska. The difference also varies systematically with the business cycle. KRSY, in fact, show how the deviation of state-level income from output systematically change with state-level growth. This is clearly illustrated in Figure 1 (taken from KRSY) that displays growth rates and the ratio of output to income for U.S. regions. In the figure the growth rate and the output to income ratio are both displayed as the ratio to the U.S. average and

the U.S. average is normalized to unity such that a line above the unity line indicates a growth rate or a ratio higher than the U.S. average. Figure 1 shows how New England income consistently has been higher than output and how the difference declines during the period of high growth in the late 1980s. KRSY interprets this as evidence of fully integrated capital markets: if capital flows into New England from other states during the period of high growth, income will fall relatively to output as the return to capital now partly accrues to other states. The pattern of high growth being associated with a decline in the ratio of output to income is very robust. As another example, the pattern for the South West is more or less mirror-image to New England, but it is striking how much larger output is than income in this region: in the early 1980s output is about 20 percent higher than income, which means that the negative gap show in GR's Table 2 for this region would be a positive gap had they used output data.

2 Decline in output volatility

The decline in output volatility is striking. This decline, to the extent it is permanent, makes international risk sharing less important. Kalemli-Ozcan, Sørensen, and Yosha (2001) derive a simple expression for the potential welfare improvement from moving from no risk sharing to perfect risk sharing within a group of countries. While I refer the reader to this paper for the details it is intuitive that the gain from risk sharing is higher the higher is the idiosyncratic variance of output but the measure is also inversely related to the covariance of idiosyncratic output with aggregate output.[1] I present some numbers calculated using this measure of asymmetry in Table 1.

The interpretation of the numbers is that a value of, say, 5, implies that a representative EMU consumer would be willing to forego 5 percent of consumption in all future in return for the lower variance of output in the perfect risk sharing allocation. This number varies by country but Table 1 only displays the average across countries. The order of magnitude is dependent on parameters such as the coefficient of relative

[1]The perfect risk sharing allocation is a market allocation where a country with output that is negatively correlated with the aggregate gets a larger allocation due the "insurance" value that its output provides.

Table 1: Asymmetry of GDP in the EMU.

Sample	1974–1983	1984–1993	1994–2003
11 EMU countries	1.44	1.41	0.64
EMU minus Finland	1.32	0.84	0.44
EMU minus Greece	1.33	1.30	0.69
EMU minus Portugal & Greece	1.15	1.35	0.72
EMU minus Ireland	1.25	1.33	0.53

Note: Luxembourg is atypically small and is left out. The numbers can be interpreted as the percent of permanent consumption that an "average" resident of the EMU countries would willingly give up in order to obtain the reduction in variability associated with perfect risk sharing.

risk aversion and the discount factor and the results are only suggestive of orders of magnitude. The results are shown for a selection of subsets of EMU countries in order to highlight if average asymmetry is caused by certain countries. It is apparent that asymmetry is larger in the 1970s when Portugal and Greece are included as might be expected. Finland suffered very large declines in GDP after the break-up of the Soviet Union and Finland therefore impact very strongly on average asymmetry in the 1984-1993 period and to some extent still in the 1994-2003 period where the inclusion of Ireland also has a notable effect. Nonetheless, the calculations robustly confirm that asymmetry in the EU in the last decade has become much less of an issue implying that risk sharing between the countries in the EU is not a very important issue if this level of asymmetry persists. However, it may well not. GR leave out the period 1990–1992 from their calculations, a period where asymmetry was particularly high. GR argue that German unification might distort the numbers during this period, which was also a period of banking crises in Sweden and Finland. For a discussion of risk sharing, I think leaving out volatile periods is exactly what we should *not* do: risk sharing arrangements may not be important in "normal times" but may be of crucial importance during crisis periods. My time series of year-by-year (estimated) risk

sharing, displayed in the last section reveal that crisis periods often are periods where risk sharing is lower. (Meaning that a smaller fraction of output shocks are smoothed, although the absolute Euro-amounts involved may be larger in crisis periods.)

3 U.S. versus European business cycles

GR document, using time series methods, that EU business cycles have been longer and shallower than U.S. business cycles and that the U.S. business cycle seems to lead the European business cycle. I find the results informative although the fitting of a time series model is somewhat problematic because the volatility patterns discussed above indicate that the stochastic process governing output is changing over time, while the model assumes the process follows a distribution that is constant over time. It is a little hard to guess how much this affects conclusions. Probably not too much, but I still find it very good that GR consider a large selection of indicators, rather than solely relying on the time series model.

What worries me more are the details of GR's interpretation. For example, it is claimed that "shocks" to U.S. GDP propagate to EU countries with a lag; and occasionally GR even use the term "exogenous" shocks. It has to be kept in mind that the time series methods applied only identify temporal patterns and the test for Granger causality that GR apply only can identify whether U.S. GDP typically changes before European GDP but has nothing to say about causality. To take a simple parable. In Northern Europe rain usually moves in from the Atlantic. It therefore rains in England before it rains in France and a Granger causality test would show that "rain in England" causes "rain in France," but the reason for rain in France is really evaporation over the Caribbean and the movement of low pressure systems across the Atlantic. Why the United States tends to experience movements in GDP before Europe is not answered by GR's analysis. What is a "shock" to GDP as they measure it? The time series model simply "picks" as the "shock," the change in GDP not predicted by past variables. I think what drives the results *could* be something like this: technological advances (say, the internet) cause a wave of investment and growth, the United States has an

ability to raise capital and implement innovations faster, therefore U.S. GDP increases before that of Europe, but after a year or two, the new technology gets implemented in Europe. Much more research is needed to verify whether such a pattern is typical, but the point I am raising is this: such a model would lead to the time series pattern that GR interpret as "shocks occur in the United States and propagate to Europe" but in "my" story there was no "propagation," only a slower technology adoption in Europe. And, in the case where the United States suffers a literal shock due to, say, a major hurricane, then there may or may not be reason to believe that such a shock would actually "propagate." One could think of reasons why it might: spill-overs from demand, price-effects from changes in nominal exchange rates, etc. but, again, time series patterns such as those identified by GR cannot tell us.

Overall, I find the methods used by GR to measure temporal patterns in GDP useful and I studied the results with interest. My quibbles is simply with the language applied because GR's results are not very informative about causality or about whether changes in, say, U.S. GDP will propagate to Europe in the case where such shocks have different causes from those of the 1990s.

4 Risk Sharing

GR show that consumption risk sharing increased steeply from the 1980s to the 1990s. Their smoothed figure shows that the increase happened during the early years of the 1990s while a slight down-tick is visible in the late 1990s where financial markets were integrating fast. In my experience, consumption based measures of risk sharing a often noisy although such noise gets reduced by considering risk sharing over longer intervals and GR find quite similar patterns using 5-year intervals. I would like to supplement the picture with estimates of "income risk sharing," namely measures of how much country-level GNP is smoothed. Countries, like individuals, can smooth consumption for a period of time relying on borrowing and lending, but long lasting shocks cannot be hedged indefinitely through lending. If GNP is smoothed through returns on assets such as portfolio holdings and foreign direct investment, such smoothing is more likely

to be permanent. Sørensen and Yosha (1998) estimate that most risk sharing among EU countries in the 1980s was due to pro-cyclical saving of, in particular, governments while GNP was not smoothed.[2] In Figure 2, I show the evolution of GNP smoothing for some selections of EMU countries. Interestingly, GNP smoothing has increased from nothing to a significant amount only during the last decade and if Ireland is dropped from the sample even the most recent years display very modest smoothing of GNP. It is striking how the crisis in Finland in the early 1990s lead to negative income smoothing. Technically, this finding reflects that GNP in Finland fell even further than GDP during the crisis. Why this happened is not well understood. From Figure 2 it can be observed, as earlier alluded to, that risk sharing declined during the recessions around 1981, 1991, and 2001. (Actually, this seems to happen with a slight lag, for unknown reasons.) Overall, the trend in GNP-smoothing is clearly upwards and I believe that this is a direct result of the rapid diversification of international asset portfolios that started in earnest in the mid 1990s. Consistent with this, Sørensen, Wu, Zhu, and Yosha (2005) demonstrate that the degree of smoothing of GNP over time and across countries is highly correlated with the relative size of countries' international asset portfolios.

Figure 3 shows the corresponding figure for consumption smoothing. The numbers in this figure would be (approximately) equal to one minus the figures in GR's Figure 6 had the samples been identical. My figure, similarly to GR, reveals a large increase in consumption risk sharing around the beginning of the 1990s, but by including the 1970s we see that there is more to the story: consumption risk sharing was at its highest in the 1970s! This is a somewhat surprising finding and it probably reflects a non-recurring response of governments to the first oil crisis, although it will take me much too far afield to try and verify that conjecture. However, in my view it illustrates that consumption based measures of risk sharing can be temporarily "off" for a while.[3] Overall, the temporal pattern of consumption risk sharing is quite similar to that found

[2]Sørensen and Yosha (1998) find that pro-cyclical corporate saving provides significant consumption smoothing at the annual frequency but not at longer intervals.

[3]Asdrubali, Sørensen, and Yosha (1996) (ASY) find for U.S. states that the estimated amount of consumption smoothing changes in unexplained ways from decade to decade while the estimated amount of income smoothing monotonically increases as one would expect as financial markets deepen.

for GNP smoothing, in particular the strong impact of the Finish crisis in the early 1990s is clearly visible. The inclusion of Ireland seems to impact on the results mainly in the first years of the new millennium.

My final comment is about the last risk sharing regression performed by GR. GR regress the idiosyncratic change in consumption on the idiosyncratic change in output. This is the risk sharing measure suggested by ASY. They then include variables, such as aggregate EU output and the real exchange rate, on the right hand side of the regression. I find this hard to interpret: a positive coefficient to the exchange rate implies that a high exchange rate leads to high consumption growth. Interesting, but what has this to do with risk sharing? I think the regression that one might want to run is one where the amount of risk sharing is allowed to change with variables such as exchange rates. (Since neither regression is structural there is, of course, room for disagreement about what is more informative.) Using GR's notation, I have in mind a regression of the form

$$\Delta c_t^i - \Delta c_t^{EU} = \alpha_i + \beta_t \left(\Delta y_t^i - \Delta y_t^{EU} \right) + \epsilon_{it} \,. \tag{1}$$

If one wants to allow for risk sharing to depend on exchange rates, aggregate consumption, etc. one should, in my view, simply allow for β_t to be a time-varying coefficient, itself a function of the relevant variables. For simplicity, consider the case where β_t is suspected to vary with a variable X_{it} and with time. One can then simply let

$$\beta_t = \beta_0 + \beta_1 \left(t - \bar{t} \right) + \beta_2 \left(X_t^i - \overline{X}_t \right), \tag{2}$$

where $\overline{X}_t$ is the average of X over countries for fixed t. β_0 will then measure the average amount of risk sharing while, e.g., β_2 will be informative about whether risk sharing is a function of the variable X. Melitz and Zumer (1999) first suggested letting the risk sharing measure be a function of country-level variables and Sørensen, Wu, Zhu, and Yosha (2005) further extend this approach by letting the estimated risk sharing estimate vary across time and across countries. In my view, such a measure $(1 - \beta_t)$ has a "clean" interpretation as measuring risk sharing as a function of other variables,

while the specification used by GR seems less well motivated as it measures risk sharing after somehow subtracting the effect of certain regressors on the *growth* of idiosyncratic consumption.

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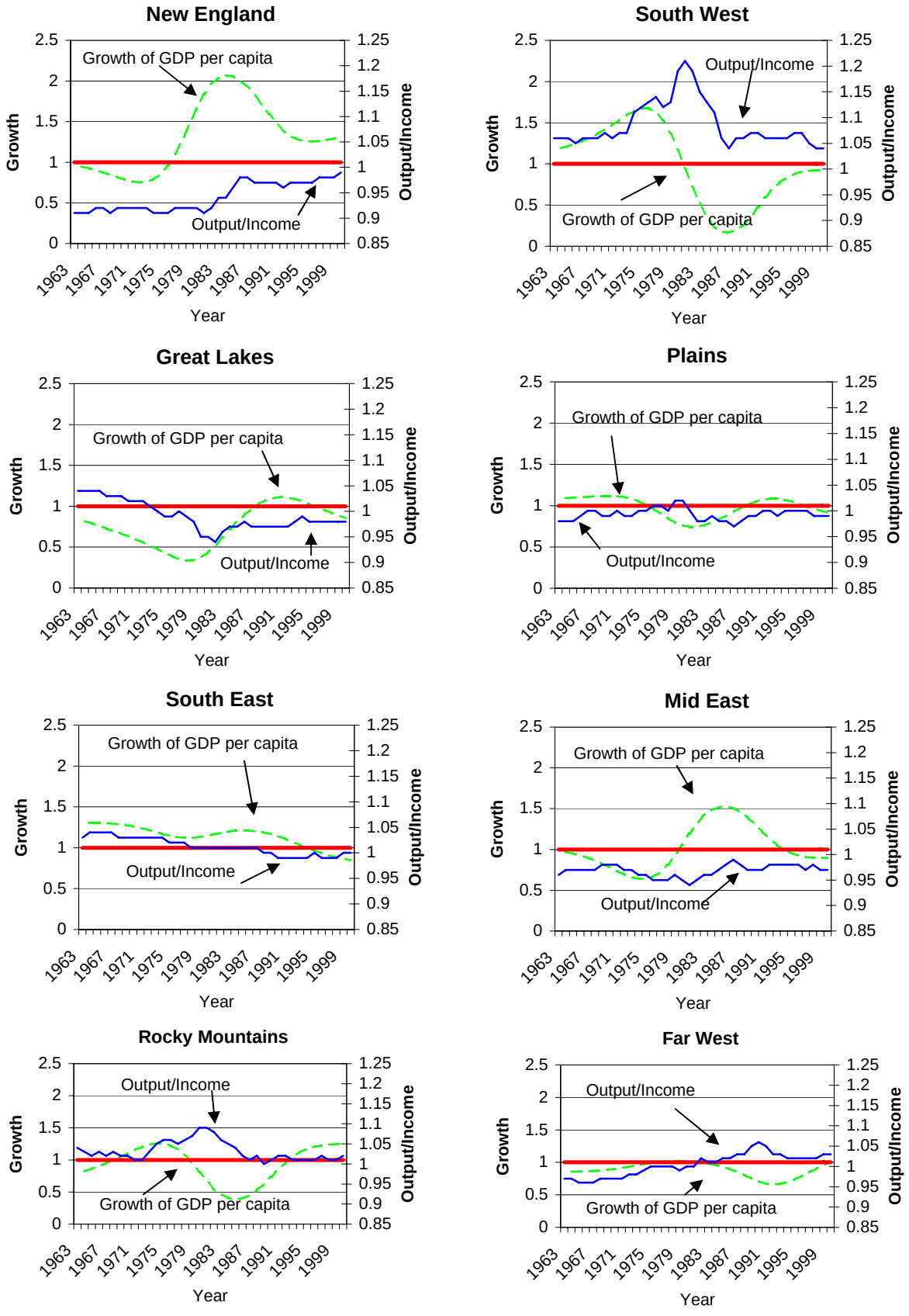
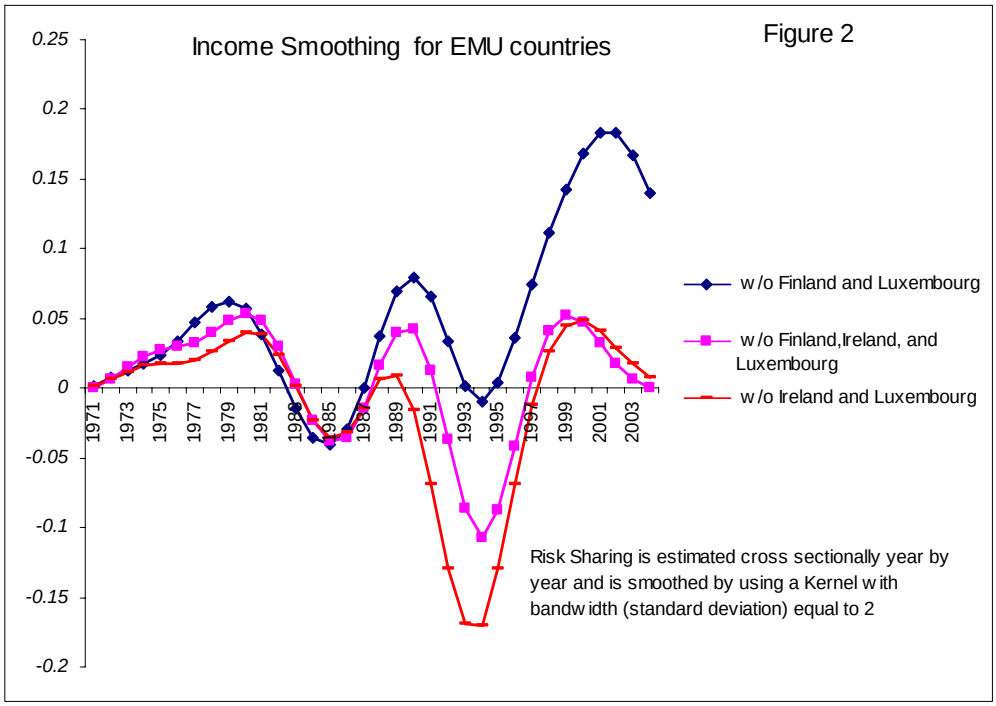
Figure 1


New England
Growth of GDP per capita
Output/Income
South West
Output/Income
Growth of GDP per capita
Great Lakes
Growth of GDP per capita
Output/Income
Plains
Growth of GDP per capita
Output/Income
South East
Growth of GDP per capita
Output/Income
Mid East
Growth of GDP per capita
Output/Income
Rocky Mountains
Output/Income
Growth of GDP per capita
Far West
Output/Income
Growth of GDP per capita
Growth
Output/Income
Year
1963 1967 1971 1975 1979 1983 1987 1991 1995 1999
0 0.5 1 1.5 2 2.5
0.85 0.9 0.95 1 1.05 1.1 1.15 1.2 1.25


Income Smoothing for EMU countries
Figure 2
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
1971
1973
1975
1977
1979
1981
1983
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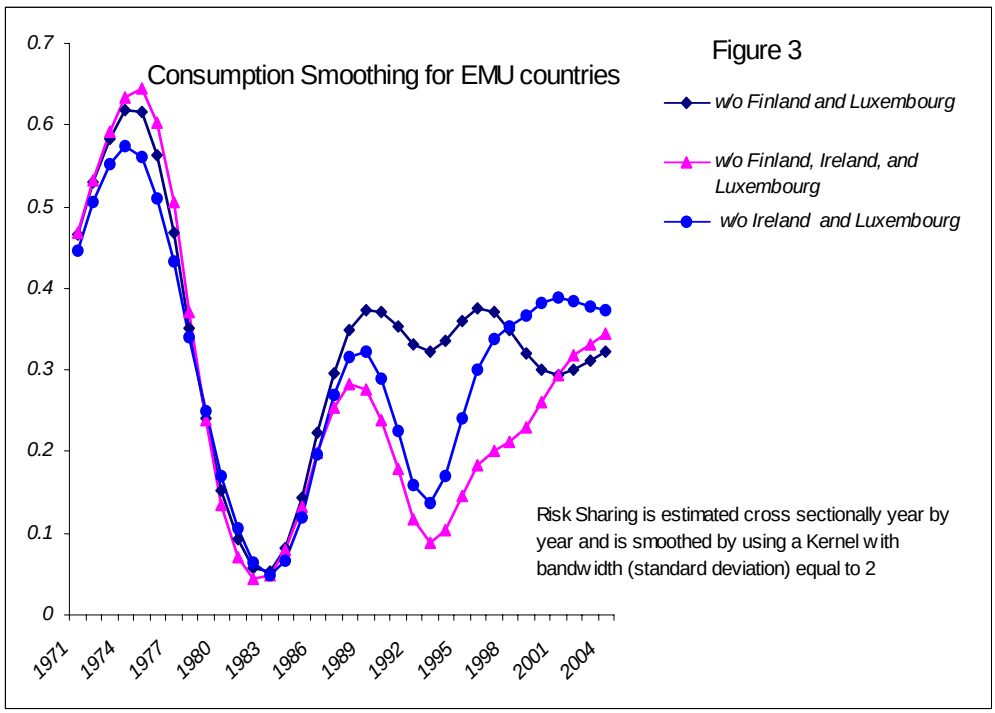
1987
1989
1991
1993
1995
1997
1999
2001
2003
w/o Finland and Luxembourg
w/o Finland,Ireland, and Luxembourg
w/o Ireland and Luxembourg
Risk Sharing is estimated cross sectionally year by year and is smoothed by using a Kernel with bandwidth (standard deviation) equal to 2


Consumption Smoothing for EMU countries
Figure 3
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
w/o Finland and Luxembourg
w/o Finland, Ireland, and Luxembourg
w/o Ireland and Luxembourg
Risk Sharing is estimated cross sectionally year by year and is smoothed by using a Kernel with bandwidth (standard deviation) equal to 2

Comments[1] the paper*: "Trends and cycles in the euro area: how much heterogeneity should we worry about? by D. Giannone and L. Reichlin* presented at the ECB Workshop "What effects is EMU having on the euro area and its member countries?", 16-17 June 2005

This paper raises many interesting issues, which I am sure will give rise to a stimulating discussion. In view of Bent Sørensen's focus on the comparison between euro-area and US business cycles and on risk sharing, I have opted to concentrate on the main findings of the paper in terms business cycle synchronisation across the euro-area Member States.

I shall begin by placing the paper's results in the context of the recent literature on business cycle synchronisation in the euro area, before turning to specific comments on these results.

There has been much discussion in theoretical and empirical literature on the linkages between economic integration and the degree of co-movement of business cycles. Economic theory is not clear on whether economic integration will lead to more or less synchronisation of business cycles. Some strands of international trade theory suggest that the removal of trade barriers leads to greater regional specialisation of economic activities (more inter-trade) and, accordingly, greater vulnerability to idiosyncratic shocks (less synchronisation). Others focus on increasing intra-trade, exposing countries to greater likelihood of a common shock and increased synchronisation. Yet other fields of theory focus on the financial channel rather than the trade channel. Under this channel, greater capital market integration would allow more specialisation in production structures and therefore less synchronisation of business cycles.

There is still no definitive answer on what determines or hinders co-movement. For example, an overview of various empirical papers presented at the ECFIN Research Conference "Business Cycles and Growth in Europe", in October 2004[2] reveals that there is no conclusive evidence of an increased synchronisation of business cycles across Member States with the creation of EMU or even including the pre-EMU "convergence phase" of the ERM. The results depend on various factors, including the type of data used (e.g. monthly industrial productions data or quarterly GDP data) as well as on the cycle-dating algorithms employed to isolate the stylized facts on business cycles (classical or growth-deviation identification of the cycles) and the various techniques used to evaluate the degree of synchronicity of cycles. And, indeed, where increased synchronisation of cycles among euro-area countries appears to be supported by the analysis, it is not clear whether this is due to a specifically euro-area business cycle or due to globalisation.[3]

Giannone and Reichlin, using per capita GDP data for euro-area countries for the period 1970-2003, present the following findings:

1) There is evidence of persistence of output-per-capita gaps of Member States vis-à-vis the euro-area average (data period: 1970-2003), with no change evident in the last decade (apart from Ireland and Spain, possibly due to convergence dynamics);

2) A similar picture prevails for the eight regions of the US, using data on personal income per capita (also 1970-2003);

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1 The author, Mary McCarthy, works in the Directorate-General for Economic and Financial Affairs of the European Commission. The views expressed are not necessarily shared by the European Commission.

2 See European Economy – Economic Paper 227 (vol. 1 and 2): Proceedings of the 2004 first annual DG ECFIN research conference on "Business Cycles and Growth in Europe" at http://europa.eu.int/comm/economy_finance/publications/economic_papers/economicpapers227_en.htm

3 See, for example, Artis (2005), which suggests that the euro-area grouping is not a distinctive one.

3) The gap between the euro-area aggregate and the US is sizeable but stationary and less persistent than the country-specific or regional gaps; and

4) Very similar cycles exist across the euro-area (based on the classical reference cycle).

They explain long-run asymmetries and cyclical symmetries across the euro area by reference to the following:

a) large and persistent effects of country-specific shocks on the gap of each country vis-à-vis the euro area;

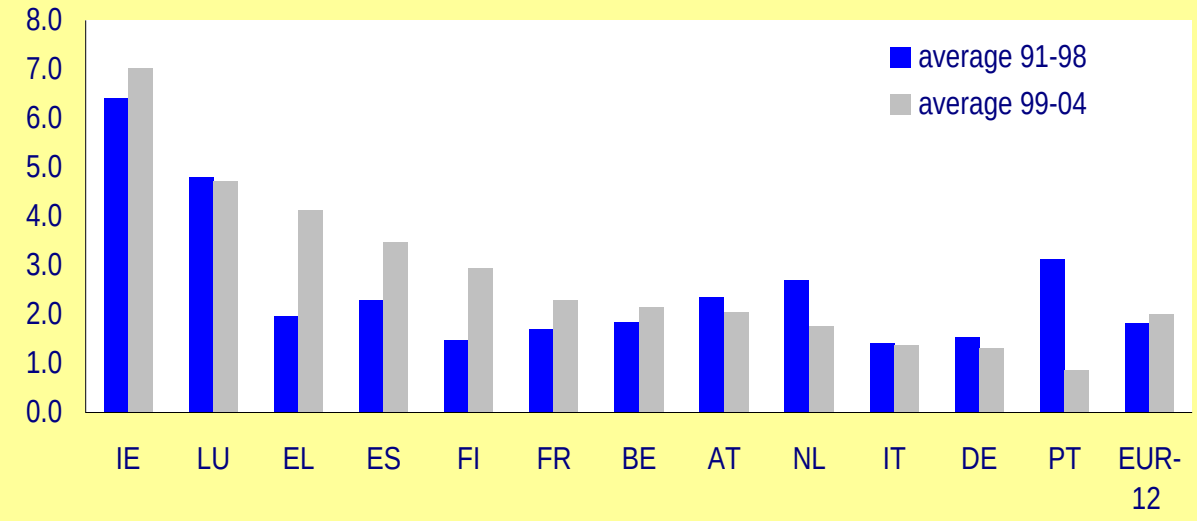
b) common euro-area shocks, which account for the major part of business cycle fluctuations; and

c) similar propagation mechanisms of area-wide shocks to individual countries.

Specific comments

1. The finding of persistent output-per-capita gaps to the euro-area average seems to be well supported by the evidence. An analysis of the ranking of euro-area countries by growth rate achieved over the past fifteen years reveals that the relative growth ranking of countries has remained fairly stable in the post-1999 period (chart 1), with some exceptions.

Chart 1: Average annual GDP growth (pre and post 1999)



Source: Commission services

In general, countries that were characterised by above-average growth in the last six years had usually been in this position already in the early or late 1990s. One can discern a few important changes that have influenced the relative ranking of countries and, accordingly, growth dispersion. One such example is Germany, where unification-boosted over-performance turned into underperformance. Another is France, which improved its position from below average to above average in the time frame considered. France also grew at a faster pace than Germany in every year since 1996, on average by nearly one percentage

point. In addition, both France and Germany have witnessed considerable differences in the source of growth over the last five years. Other changes in the ranking should also be noted. These include the movement of Finland from the bottom of the group in 1991-1998 to fifth from the top in the last six years. On the other hand, Portugal and the Netherlands have slipped from being well above average in the second half of the nineties to lagging behind most other countries in the past few years.

Apart from the reference to "convergence dynamics" as an explanatory factor for the performance of Spain and Ireland, the authors do not consider the reasons behind the persistence in output gaps to the euro-area average. Could the results be related to (the lack of) "structural reforms"? In view of the Lisbon Agenda, it would be interesting, from the policy viewpoint and for assessing whether "heterogeneity" matters (more below), to investigate whether the phenomenon could be linked to structural factors. It would also be useful to consider whether the results are any different for "cohesion fund" countries.

Analysis carried out by the research department of DG Economic and Financial Affairs[4] (European Commission) sheds some light on the sources of long-term growth differences across euro-area Member States. Table 1 shows the sources of potential GDP growth. The decomposition of the variance in potential output across Member States, inferred from this table, shows that variations in the labour input still constitute the most important factor explaining over 50% of differences in potential output across euro-area Member States, with total factor productivity in second place (35%).

Table 1: Sources of potential GDP growth

	1996-2000				2001-2005			
	Potential GDP growth	Contributions			Potential GDP growth	Contributions		
		Labour	Capital	TFP		Labour	Capital	TFP
BE	2.2	0.4	0.8	0.9	2.1	0.6	0.5	1.0
DE	1.5	0.1	0.7	0.7	1.1	0.2	0.4	0.5
EL	2.9	0.5	1.0	1.4	3.4	0.4	1.4	1.5
ES	3.0	1.7	1.2	0.1	3.3	2.0	1.3	0.0
FR	2.0	0.6	0.6	0.8	2.2	0.7	0.6	0.8
IE	8.1	2.8	1.7	3.5	6.6	2.1	1.7	2.7
IT	1.5	0.3	0.7	0.6	1.7	0.8	0.7	0.2
LU	5.2	1.1	1.9	2.2	4.4	1.1	1.8	1.5
NL	2.8	1.3	0.8	0.7	1.9	0.8	0.6	0.5
AT	2.3	0.3	1.0	1.0	1.9	0.3	0.8	0.8
PT	2.7	0.8	1.5	0.4	1.7	0.7	0.9	0.1
FI	3.2	0.6	0.3	2.4	3.3	0.7	0.4	2.2
Euro Area	2.0	0.6	0.8	0.6	1.9	0.7	0.6	0.6

Source: *Commission services*

2. Let me now turn to the issue of cyclical symmetries across euro-area Member States and some possibly counterfactual evidence (to stable synchronisation) in the recent cycle.

The title of this conference is "What effects is EMU having on the euro area and its member countries?" However, the time frame poses particular problems for the assessment of business cycle synchronisation since EMU, as we have only six years of evidence and approximately

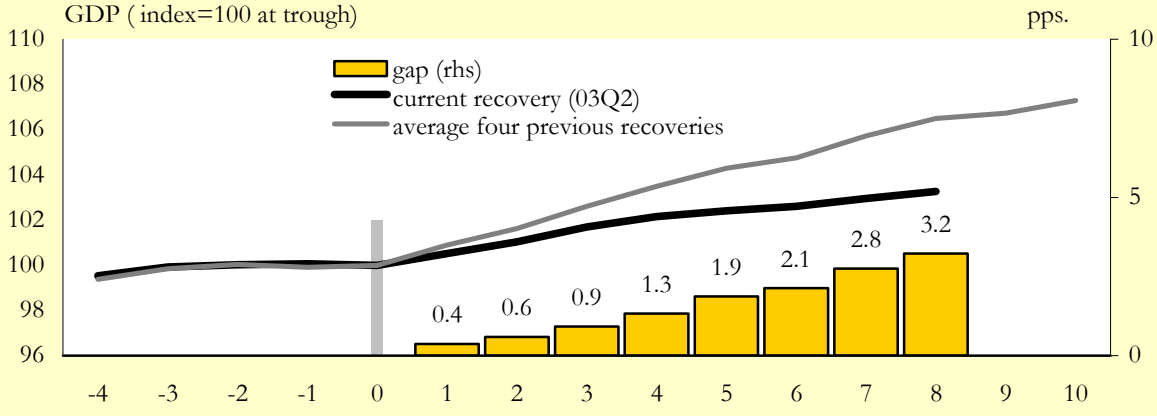
[4] See Denis et al. (2002) and (2005).

one business cycle to work with. In addition, most of the recent literature, including the present paper, uses data up to the end of 2003, i.e. barely into the expansionary phase of the current cycle. However, it is particularly the experience in the period since the turnaround in the middle of 2003 that has given rise to recent concerns about increased growth dispersion across Member States.

An analysis of the recent data[5] reveals the following results concerning GDP growth during different recoveries in the euro area:

- the current recovery appears to be weaker than the average of four past recoveries at the same stage of the cycle (chart 2);
- increased dispersion of quarterly growth rates (five largest Member States) in this recovery compared to previous recoveries (chart 3);
- increased dispersion of the output gap in the four largest Member States (chart 4); and
- increased dispersion in 2004 (chart 5).

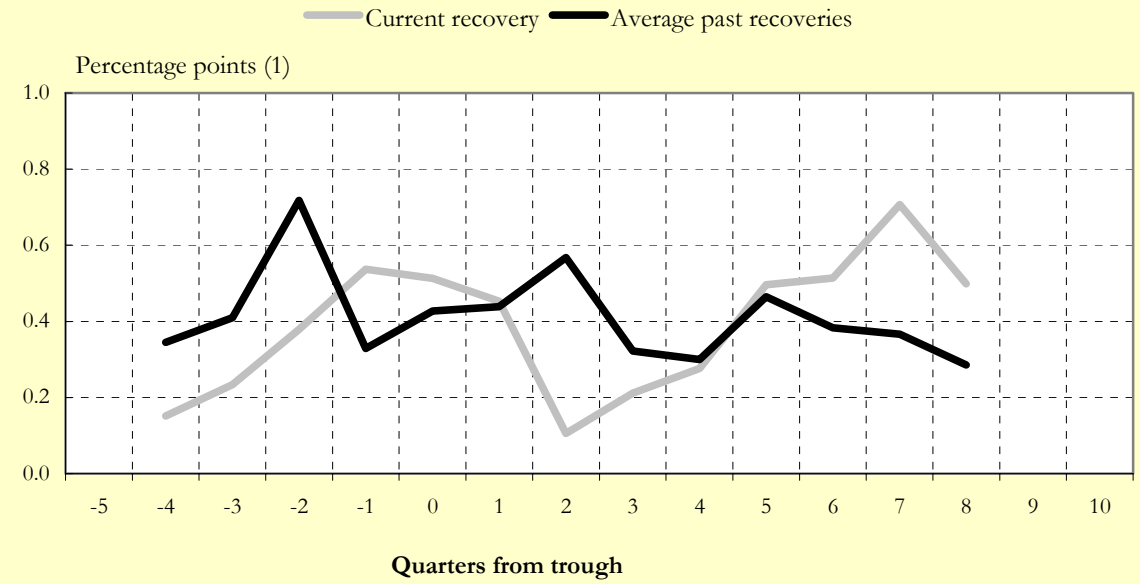
Chart 2: The evolution of GDP in the euro area during different recoveries in the euro area



Source: Commission services

[5] See Paternoster (2005).

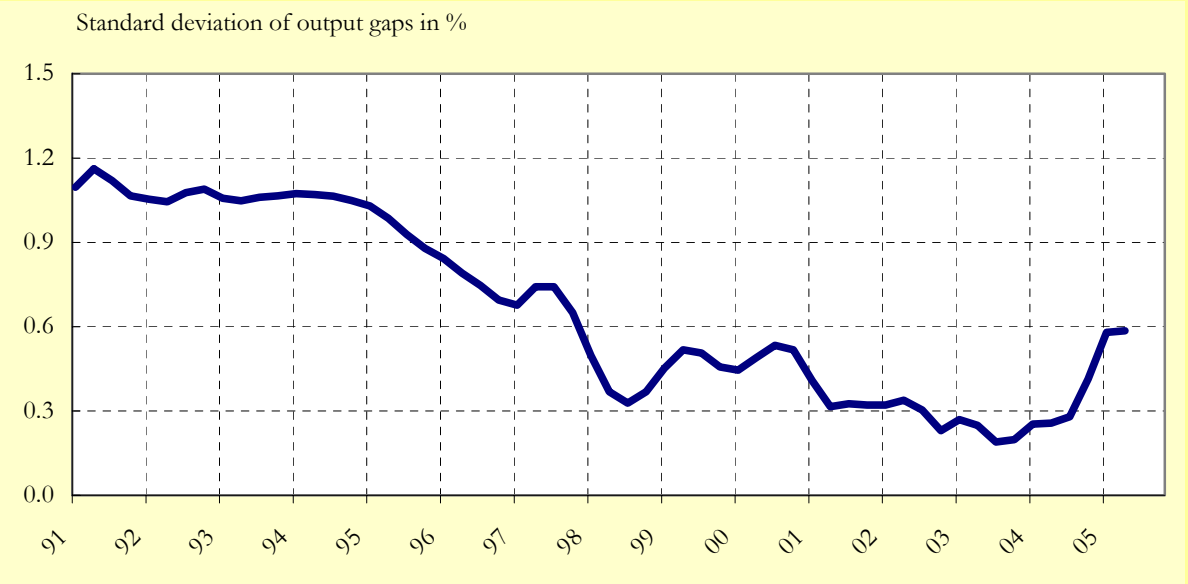
Chart 3: Dispersion of real GDP growth in the current and past recoveries (five largest euro-area Member States)



(1) Unweighted standard deviation

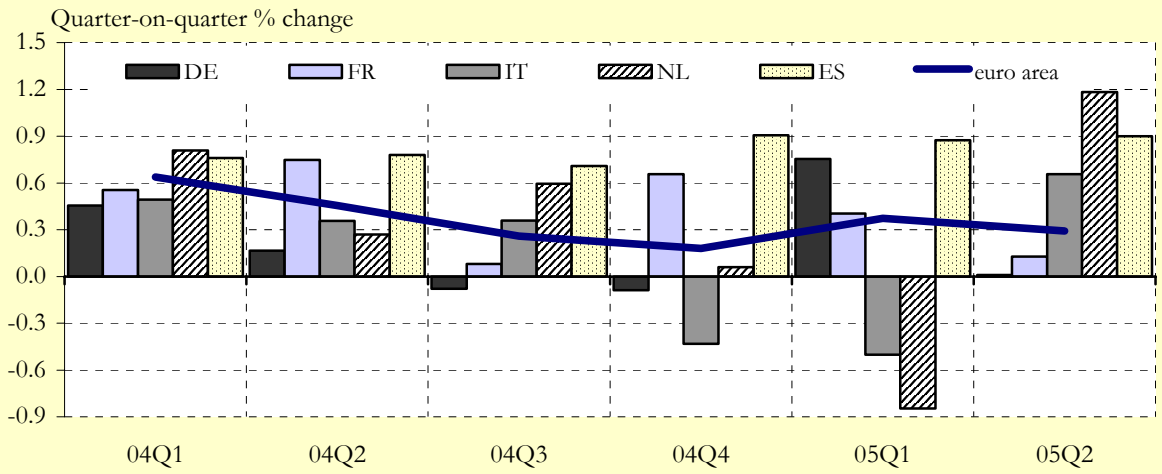
Source: Commission services

Chart 4: Output gap dispersion across the four largest Member States



Source: Commission services

Chart 5: Quarterly GDP growth since the first quarter of 2004



Note: swda data at constant (1995) prices

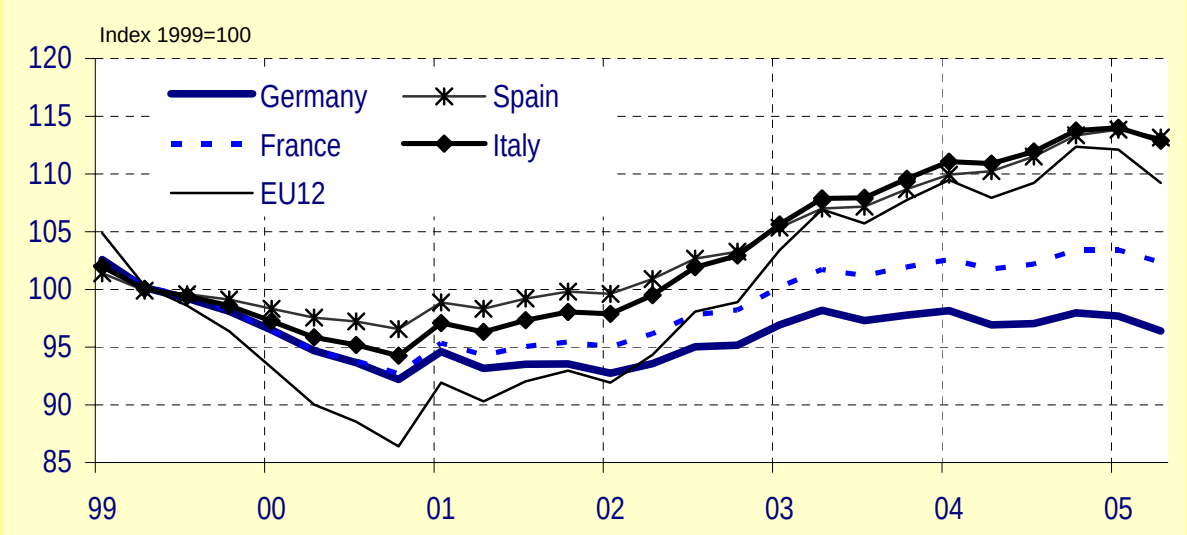
Source: Commission services

Analysis of data on quarterly growth rates reveals that, although cyclical dispersion has remained quite low in the past few years in the euro area as whole, disparities in cyclical positions between the (four or five) larger Member States have increased steadily. Output gap dispersion across Germany, France, Italy and Spain has increased markedly since 2003 and now stands at its highest level since the start of stage III of EMU in 1999.

Looking behind the diverging growth performances, we find disparities in the sources of growth across Member States. Until quite recently in this recovery, Germany has relied mainly on exports as the engine of growth, while domestic demand has stagnated. On the other hand, domestic demand has underpinned the robust economic performance in Spain and has been the main factor sustaining growth in France (also until recently).

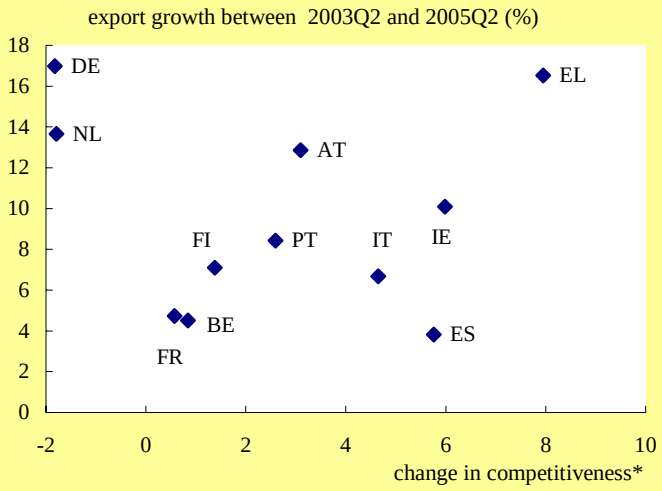
This leads us to consider developments in the competitive positions of Member States. Charts 6 and 7 highlight: the deterioration in competitiveness of Italy, Spain, France together with the gains made by Germany; and the cumulated loss in export market shares of Greece, Italy, Finland and France.

Chart 6: Real effective exchange rates vs. the rest of the IC24 (DE, FR, IT and ES - deflated by ULC)



Source: Commission services

Chart 6: Export performance and competitiveness



* change in the real effective exchange rate deflated by unit labour costs over the period 2003Q2-2005Q2 (in %)

Source: Commission services

Export market shares	
	Cumulated change 2001-2004
Greece	-24.8
Italy	-21.5
Fonland	-12.8
France	-11.5
Netherlands	-7.8
Ireland	-6.8
Belgium	-6.1
Spain	0.9
Germany	1.2
Austria	5.8
Euro area	**-6.4**

Source: Commission services

3. Should we be worried about heterogeneity and the apparent increase in dispersion in this upswing?

Under the Optimum Currency Area literature, the synchronisation of business cycles is necessary for the successful implementation of a common monetary policy. However, for a common policy, it is not only the synchronisation of the cycles that matters but also the amplitude of the cycles across Member States, since from the vantage point of the individual country, the policy intensity should be ideally tailored to the amplitude of the cycle. One also has to bear in mind the quite divergent sources of growth in individual Member States (mentioned above). This poses questions about the need for adjustment of real exchange rates in EMU, which could also have implications for the amplitude of the cycle.

In this context, it would be interesting to hear more from the authors about the evolution of amplitude of the cycle across individual Member States and the sources of any divergence in amplitude. Indeed, some empirical studies (Bergman, 2005) have argued that the dispersion in amplitude has increased since the creation of EMU.

Does this really matter for the euro area? I would argue that it depends on whether it is smaller countries or larger countries are the source of the problem. The four largest countries (Germany, France, Italy and Spain) account for almost 80% of the euro-area GDP. And at present, as the charts I have shown demonstrate, the largest growth dispersion has recently been between the largest Member States.

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