
II.2. Business cycle synchronisation in the euro area ⁽³³⁾

The initial global financial shock in 2008 and the subsequent collapse of global trade did not seem to affect the euro area countries asymmetrically, as all countries slipped into recession at the same time. However, the subsequent euro area sovereign crisis has propagated heterogeneously across euro area countries causing significant cross-country differences in domestic demand and resulting in large business cycle divergence between 2011 and 2013.

Differences in Member States' debt overhang can have a negative impact on business cycle synchronisation across euro area Member States during deleveraging periods, as they make euro area-wide shocks propagate heterogeneously. As a result, they can be a major source of asymmetries. While the impact is not likely to be permanent, a long-lasting deleveraging period in some Member States can lead to a protracted period of business cycle decoupling from the rest of the euro area, making the common monetary policy less effective for certain countries. Even though differences in growth in real GDP per capita between Member States and the euro area average recently returned to pre-crisis levels, risks of asymmetric shocks in the euro area will remain significant until the ongoing balance sheet adjustment period in both private and public sectors is completed. However, policies can contribute substantially to contain risks of divergence. Recent and planned institutional and structural changes, including the Banking Union, the Capital Markets Union and in structural reforms in Member States, have a key role to play in this respect.

Introduction

Business cycle synchronisation is a central issue when designing macroeconomic policies in a monetary union. Asymmetric shocks (or common shocks with asymmetric effects across countries) hamper the effectiveness of the common monetary policy and force Member States to embark on potentially painful adjustment processes in the real economy. In such cases, the lack of an independent monetary policy results in a loss of welfare. A reasonably high cyclical convergence is therefore a

necessary condition for economic and monetary union (EMU) to function smoothly.

Past analysis in this report pointed to the emergence in recent years of large business cycle differences in the euro area.⁽³⁴⁾ The global financial crisis tipped Member States into a highly synchronised recession, but the ensuing period of adjustment was associated with a phase of cyclical divergence. To better understand the drivers of this increased heterogeneity, this section revisits the issue of business cycle synchronisation in the euro area, both during the pre-crisis period and since the outbreak of the global financial crisis in 2008. It draws on a different econometric methodology from that used in past analysis. Unlike past research presented in this report, which was based on a breakdown of GDP into a trend (or potential GDP) and a cyclical component, the methodology used considers cross-country dynamic interactions in GDP per capita developments without statistically filtering the data. Stylised facts on the business cycle are known not to stand up well to different de-trending techniques.⁽³⁵⁾

Heterogeneity in growth rates in the euro area

To illustrate the cyclical divergence that has emerged since the global financial crisis, Graph II.2.1 shows cross-country dispersion of differences in growth in real GDP per capita between Member States and the euro area average over time. Countries are weighted according to their population size.⁽³⁶⁾

After reaching record highs between 2011 and 2013 the dispersion across euro area Member States has returned to the level prevailing in the pre-crisis years. The initial global financial shock in 2008 and the subsequent collapse in global trade do not seem to have affected the euro area countries asymmetrically, the dispersion during the

⁽³⁴⁾ Valdes Fernandez I. (2014), 'Growth differences between euro area Member States since the crisis', *Quarterly Report on the Euro Area*, Vol. 13, No 2.

⁽³⁵⁾ Canova, F. (1998), 'De-trending and business cycle facts', *Journal of Monetary Economics*, No 41(1998), pp. 475-512.

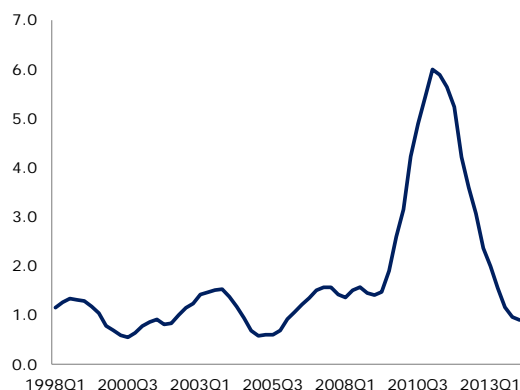
⁽³⁶⁾ The euro area is defined here as the 'EA-10' and includes the following Member States that were members of the euro area when it was launched: Germany, France, Italy, Spain, Portugal, Greece, Belgium, Austria, the Netherlands and Finland. Due to data not being available, Ireland and Luxembourg were not included in the sample. The dispersion measure is calculated as the weighted cross-sectional average of the quadratic mean of the gap of GDP growth between Member States and the euro area average. The measure is smoothed over by taking a centred moving average: $\sum_{i \in \text{EA10}} W_i [(1/2H+1) \sum_{h=-H}^H (\Delta y_{i,t+h} - \Delta y_{\text{ea},t+h})^2]$.

⁽³³⁾ Section prepared by Narcissa Balta.

2008-2011 period remaining almost flat. It was only during the second phase of the crisis that a pattern of heterogeneity emerged.

The statistic in Graph II.2.1 was chosen because it provides a simple economic interpretation of potential gains from complete risk sharing.⁽³⁷⁾ In the absence of risk sharing, members of a monetary union are fully exposed to asymmetric shocks: a fall in GDP is fully translated into a fall in consumption. With cross-border risk sharing (either via capital markets or a common euro area insurance system), consumption can be smoothed out and asymmetric GDP shocks are not fully reflected in fluctuations in consumption. As households value consumption stability their welfare is higher when risk sharing mechanisms exist.

Graph II.2.1: Dispersion of per capita GDP growth rate, EA countries⁽¹⁾⁽²⁾
(1998Q1 – 2014Q1)

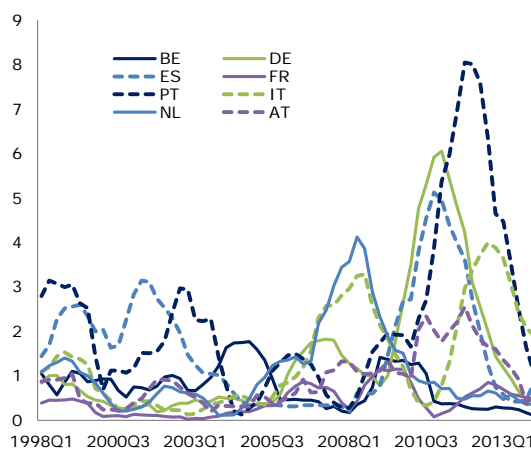


(1) Euro area average is defined as EA-12.
(2) The dispersion measure is calculated as the weighted cross-sectional average of the quadratic mean of the gap of GDP growth between 10 euro area Member States and the EA12. The measure is smoothed out by taking a centred moving average: $\sum_{i \in EA10} W_i [(1/2H+1) \sum_{h=-H}^H (\Delta y_{i,t+h} - \Delta y_{ea,t+h})^2]$.
Source: DG ECFIN, Eurostat.

Graph II.2.2 shows the growth differentials presented as averages in Graph II.2.1, only this time at country level. In this way country-specific divergence patterns can be identified. During the pre-crisis period, the growth differentials were smaller for the countries that were closer to each

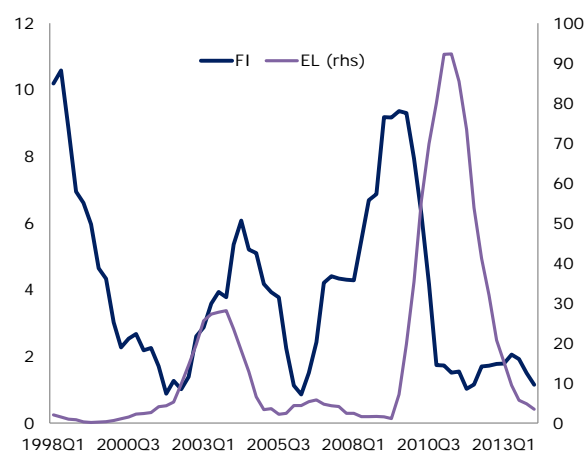
other in terms of GDP per capita when the euro was launched.

Graph II.2.2: Quadratic mean of growth differentials in real GDP per capita⁽¹⁾
(1998Q1Q1 – 2014Q1)



(1) The quadratic mean of the differential in GDP per capita growth in 10 euro area Member States compared with the EA-12.
Source: DG ECFIN, Eurostat data.

Graph II.2.3: Quadratic mean of growth differentials in real GDP per capita relative to EA-10: exceptions⁽¹⁾
(1998Q1 – 2014Q1)



(1) The quadratic mean of the differential in GDP per capita growth in 10 euro area Member States compared with the EA-12. Finland experienced a large idiosyncratic period of volatility in the 1990s, which was related to the banking crisis there in the early 1990s. Greece joined the euro area a year later than its inception.
Source: DG ECFIN, Eurostat data.

⁽³⁷⁾ For details on the structural model and the derived economic interpretation, see Kalemli-Ozcan S., B. Sorensen and O. Yosha (2001), 'Economic integration, industrial specialisation, and the asymmetry of economic fluctuations', *Journal of International Economics*, No 55 (2001), pp. 107-137. Under some assumptions, the dispersion measure is directly proportional to the potential gains from complete risk sharing at euro area level.

However, during the global financial and sovereign crises, heterogeneity increased significantly, irrespective of initial starting conditions, with cycles diverging in countries both in the periphery

and in the core. ⁽³⁸⁾ This is particularly true for the second phase of the crisis in 2011-2013, showing that the sovereign crisis was a major cause of divergence between euro area Member States.

Among the Member States that made up the euro area when the euro was launched, two countries displayed particularly large growth differentials compared with the euro area as a whole, both during the pre-crisis and the crisis periods (see Graph II.2.3). This is likely due to large idiosyncratic components in GDP per capita developments in those two countries.

Euro area-wide shocks and business cycle fluctuations

The main purpose of this section is to analyse the extent to which euro area-wide shocks have been driving euro area Member States' business cycle fluctuations since the launch of the EMU by looking at differentials in economic activity in a cross-country dynamic interaction model. A large system that models the joint dynamics of real GDP per capita in 10 euro area Member States and the euro area as a whole has been estimated for the period 1996Q1 — 2007Q4. Given the estimated past correlations (i.e. given the estimated parameters of the model), counterfactual paths for the Member States' GDP per capita growth rates were calculated for the entire period, i.e. 1996Q1 — 2014Q4, conditional on observed euro area real GDP per capita developments. The deviation of a country's observed growth rate from this counterfactual path can be interpreted as representing the country-specific component of the business cycle, as opposed to the common component of the business cycle driven by euro area growth developments. Therefore, the extent to which Member States deviate from their counterfactual paths gives a measure of business cycle heterogeneity. The variations in the country-specific components of the business cycle may originate either in idiosyncratic shocks or in heterogeneous reactions to euro area shocks. The more a country's growth rate dynamics are aligned with the average euro area growth dynamics, the smaller the country-specific components of the

business cycle and the higher its business cycle synchronisation with the euro area as a whole.

The dynamic correlations in the data have been estimated using a large Bayesian vector autoregression (BVAR) in levels and differences (see Box II.2.1 for details on the methodology).

Graphs II.2.4 and II.2.5 present the conditional forecasts of real GDP per capita growth for 10 euro area Member States, as can be inferred from the observed path of real GDP per capita in the euro area as a whole between 1998Q1 and 2014Q4. ⁽³⁹⁾ The green line in the graph shows the actual data as compared with the results obtained from the model; (i) the shades of orange show the distribution of the conditional forecasts in the BVAR in levels; and (ii) the solid blue line shows the point estimate of the median of the distribution of the conditional forecasts in the BVAR in differences. The model points qualitatively towards the same conclusions both in levels and differences.

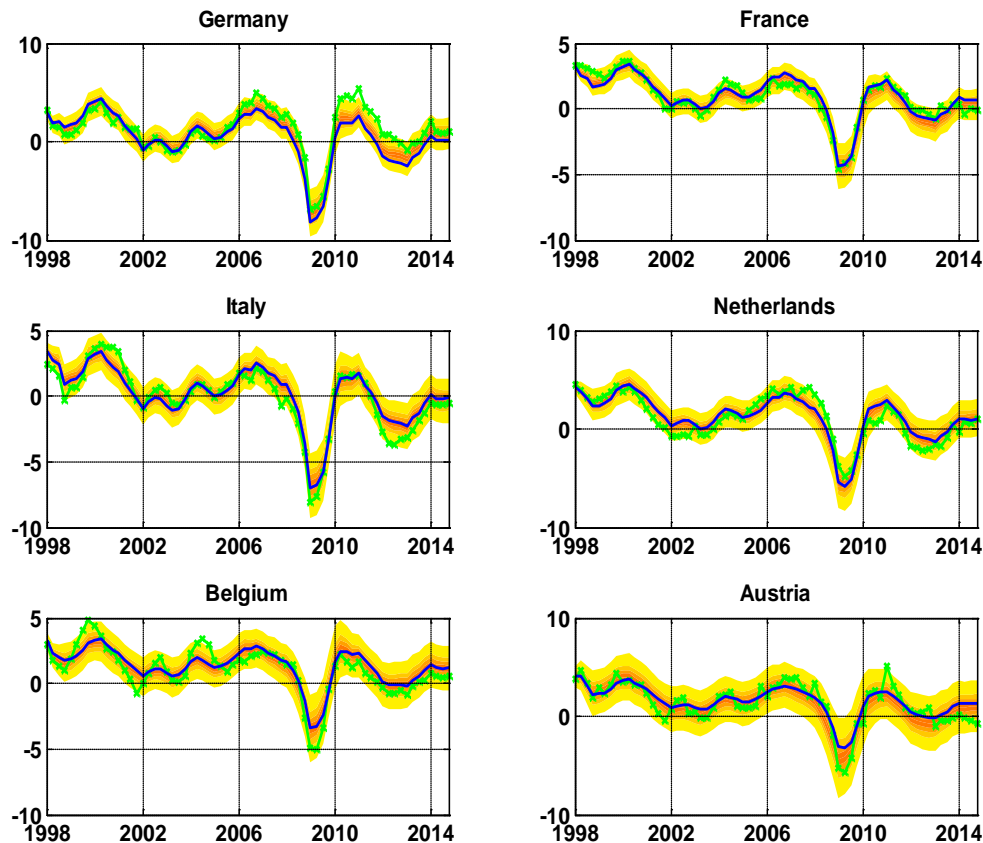
During the pre-crisis period, growth fluctuations in several euro area Member States were mainly driven by euro area-wide shocks, which propagated in the same way across the euro area. This is particularly true for the countries which had similar initial conditions in terms of GDP per capita levels at the launch of the euro: Germany, France, Italy, Belgium, Austria and the Netherlands (see Graph II.2.4). However, this is also true to a large extent for catching-up economies such as Spain for most of the pre-crisis period (see Graph II.2.5). Conditional on euro area-wide developments, Spain slightly underperformed in terms of GDP per capita growth only in 2006-2007, i.e. the years just before the crisis, while Germany and the Netherlands slightly over-performed during the same years. Otherwise, the actual growth rates of these countries lie very close to the centre of the distribution of conditional forecasts during the pre-crisis period. The relatively close cyclical synchronisation reflects the high degree of economic integration prevailing in the euro area notably in terms of trade.

In a context of generally high synchronisation, several euro area Member States registered

⁽³⁸⁾ For more insight into the correlation between initial starting conditions in terms of levels of GDP per capita and business cycle synchronisation in the euro area, see Giannone D., M. Lenza, and L. Reichlin (2009), 'Business cycles in the Euro area', *Europe and the Euro*, pp. 141-167, University of Chicago Press.

⁽³⁹⁾ The euro area is here defined as the EA-12, i.e. it includes all the Member States in the euro area when the euro was launched. Note that Greece joined the euro area a year later than its inception.

Graph II.2.4: **Conditional forecasts of growth in real GDP per capita: Member States synchronised with the euro area business cycle fluctuations**
(1998Q1 – 2014Q4, in %)



(1) Shades of orange: distribution of the conditional forecasts in the BVAR in levels, excluding the lower and higher 5 % quintiles. Solid blue line: point estimate of the conditional forecasts in the BVAR in differences, which is calculated as the median of the distribution of the conditional forecasts in this model. Green line with crosses: actual values. The variables are all reported in terms of annual percentage changes. Conditioning assumptions: real GDP per capita in the EA-12.

Source: DG ECFIN, based on the MATLAB codes replication files of the methodological paper (see Box II.2.1).

relatively large country-specific business cycle components before the crisis. This was particularly true for Portugal, Greece and Finland. The actual growth rates of those countries lie almost in the tail of the distribution of conditional forecasts during the pre-crisis period and/or cannot be closely tracked by euro area-wide GDP per capita developments (see Graph II.2.5).

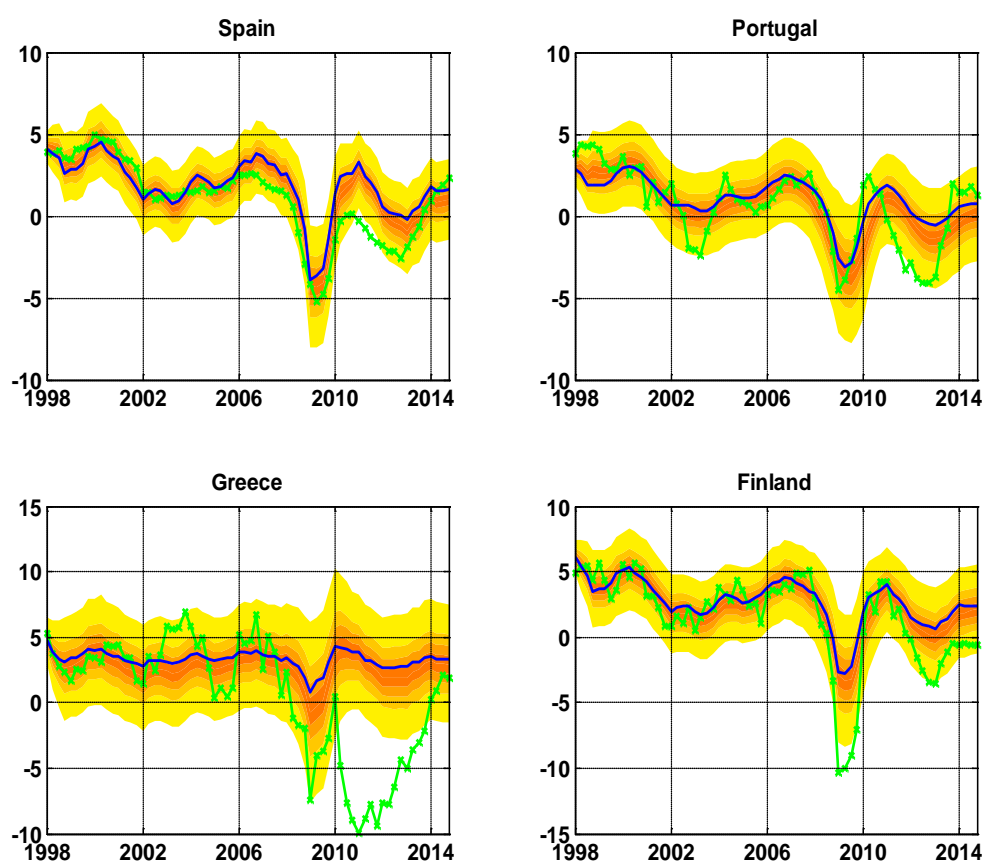
While shocks seem to have propagated relatively homogeneously across Member States during the pre-crisis period, they have started to propagate heterogeneously since the global financial crisis. The country-specific components of the business cycle have increased in all Member States since the

crisis, even those showing synchronised business cycle pattern in pre-crisis years. ⁽⁴⁰⁾

Zooming in on developments since the global financial crisis, some countries have performed better than what the euro area average would have implied, for example Germany and to some extent Austria. However, many countries have registered larger drops in GDP per capita growth than what euro area developments would have predicted. This includes Member States where country-specific

⁽⁴⁰⁾ It is important to stress that while in terms of growth rates convergence can be observed again at the end of the estimated period for most euro area Member States, in terms of GDP per capita levels, differences have not started to decrease. They are just not widening further. In other words, the cyclical divergence identified in some Member States turns out to be very persistent.

Graph II.2.5: **Conditional forecasts of growth in real GDP per capita: Member States with a large country-specific business cycle component**
(1998Q1 – 2014Q4, in %)



(1) Shades of orange: distribution of the conditional forecasts in the BVAR in levels, excluding the lower and higher 5 % quintiles. Solid blue line: point estimate of the conditional forecasts in the BVAR in differences, which is calculated as the median of the distribution of the conditional forecasts in this model. Green line with crosses: actual values. The variables are all reported in terms of annual percentage changes. Conditioning assumptions: real GDP per capita in the EA-12.

Source: DG ECFIN, based on the MATLAB codes replication files of the methodological paper (see Box II.2.1).

shocks were already comparatively more prevalent before the crisis (EL, FI and PT) but also countries which posted business cycles relatively well aligned with the euro area average in pre-crisis years (IT, ES, and NL). Divergences are particularly large for the second phase of crisis during the period 2011-2013.

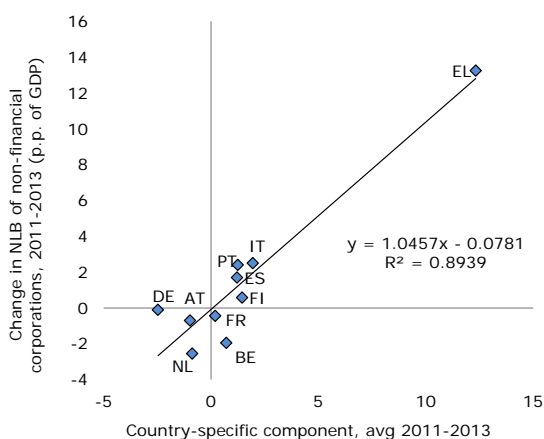
Cyclical divergences asymmetries may be due to a number of factors, including differences in economic structures (e.g. sectoral and trade specialisation), differences in domestic policies, different levels of structural rigidity and/or macroeconomic imbalances. Both the timing of the divergence observed in recent years (i.e. essentially during the sovereign crisis) and the countries which have underperformed below euro area average growth point to the central role of macroeconomic

imbalances accumulated before the crisis, notably in terms of private and public debt levels.

Graph II.2.6 illustrates the importance of debt and deleveraging in explaining cyclical divergences during the sovereign crisis. The graph shows the correlation between deleveraging efforts in the corporate sector, as expressed by the change in net lending/borrowing (NLB) and the country-specific components of the business cycles of selected euro area Member States, obtained using the model for the 2011-2013 period. The increase in NLB in the corporate sector was higher in the countries that registered larger drops in GDP per capita growth than what would have been expected based on euro area developments during that period (i.e. in the countries with large country-specific components of the business cycle).

Ascribing a central role to imbalances and deleveraging in the recent cyclical divergence raises the question of possible differences between periods of accumulation of imbalances and periods of adjustment to imbalances. Euro area-wide shocks seem to have propagated more symmetrically across Member States during the per-crisis period of accumulation of imbalances than during the ensuing period of adjustment. For example, Spain was remarkably synchronised with the rest of the euro area in pre-crisis years, while since the crisis the country-specific component of its business cycle has increased substantially. The asymmetry between leveraging and deleveraging phases can be explained by the existence of strong non-linearities during deleveraging periods which are frequently characterised by sudden stops in capital inflows, abrupt swings in investor behaviour and rises in risk premia. Leveraging tends to be much more progressive than deleveraging and in a world of rigid prices and wages, abrupt changes in balance sheets can have large effects on economic activity.

Graph II.2.6: Country-specific business-cycle component and corporate NLB (1)



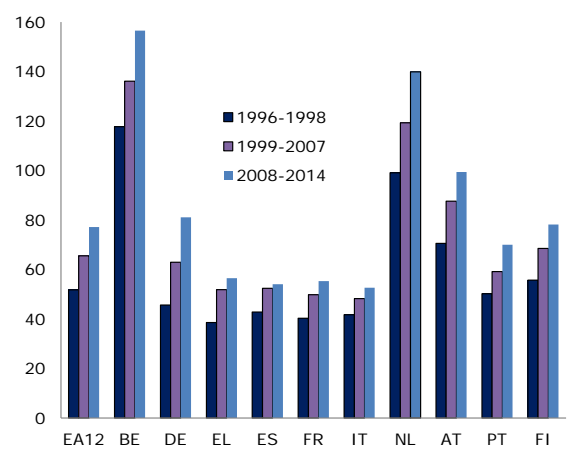
(1) Country-specific component is calculated as the growth differential between the point estimate of the median of the distribution of the conditional forecasts in the BVAR in differences and the actual data. Positive components indicate larger drops in domestic demand than what euro area developments would have predicted.

Source: DG ECFIN, Eurostat.

Graph II.2.8 shows that domestic demand has been the main source of increase in cross-country heterogeneity. The same model is used to estimate the dynamic interaction between domestic demand in each Member State and the euro area as a whole. As for GDP per capita growth, conditional forecasts are obtained for domestic demand in each Member State. Again, the largest deviations can be

observed in the countries that have undergone a deleveraging process both in the private and public sectors, in particular during the second phase of the crisis. While the impact is not likely to be permanent, a long-lasting deleveraging period can, as a consequence, lead to a protracted period of business cycle decoupling across euro area Member States, in particular between countries where balance sheets are still adjusting and the rest of the euro area. (41) This limits the common monetary policy's ability to support domestic demand, making the policy less effective for individual countries. In other words, a common monetary policy cannot address persistent differences in business cycle stabilisation needs across euro area Member States.

Graph II.2.7: Openness: selected euro area Member States(1)
(in % of GDP)



(1) Euro area includes EA-10. Openness defined as exports plus imports as % of GDP.

Source: DG ECFIN, Eurostat.

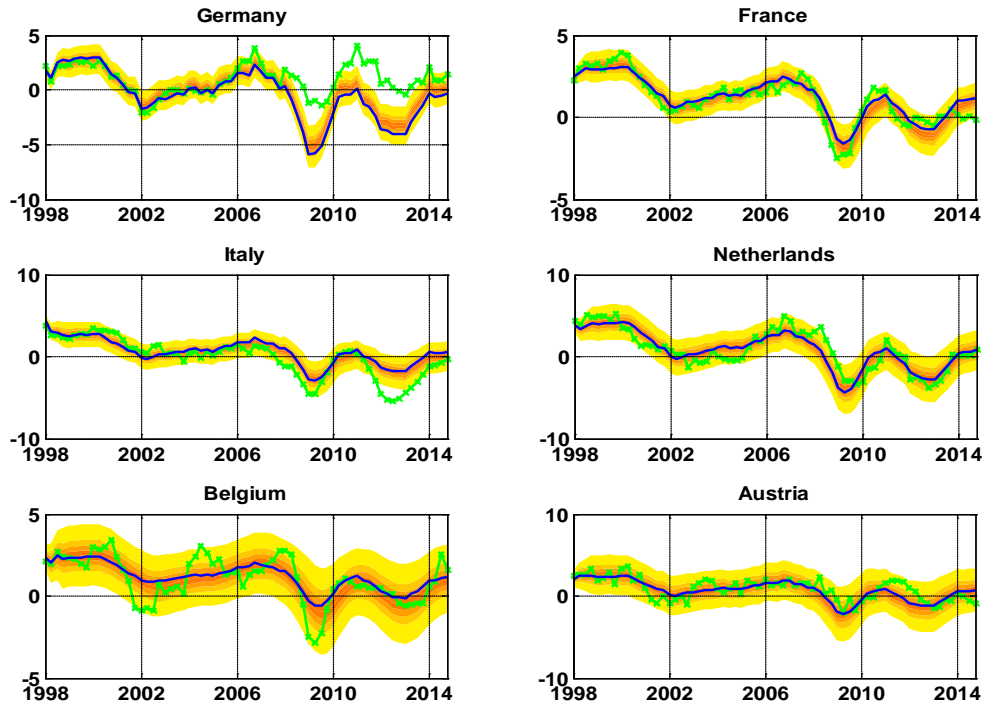
Finally, it is interesting to note that the recent phase of cyclical divergence seems to have happened despite a continued upward trend in trade openness in all countries during the same period, which should have supported the synchronisation of business cycles across euro area Member States (see Graph II.2.7). (42)

(41) The protracted nature of adjustment is consistent with the fact (stressed earlier) that we have recently seen tentative signs of renewed convergence in GDP growth rates but not yet in GDP levels. In other words, cyclical divergences have recently narrowed in terms of growth but not in terms of levels.

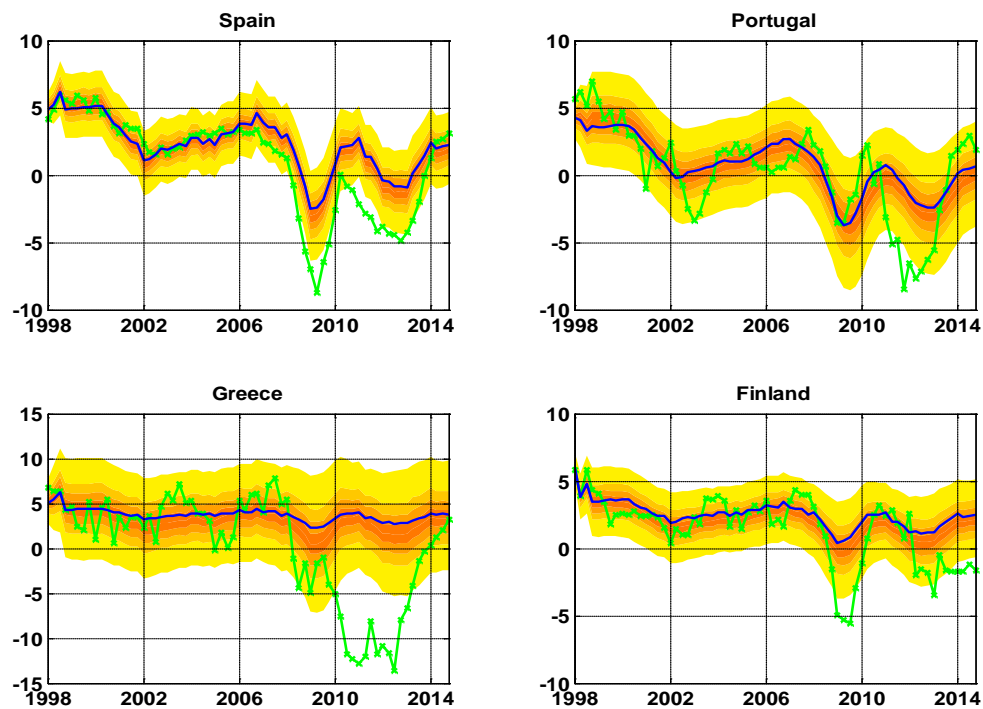
(42) Frankel, J.A. and A.K. Rose (1998), 'The Endogeneity of the Optimum Current Area Criteria', *Economic Journal*, Vol. 108, No 449, pp. 1009-1025.

Graph II.2.8: **Conditional forecasts of growth in domestic demand**
(1998Q1 – 2014Q, in %)

Member States synchronised with euro area business cycle fluctuations



Member States with a large country-specific business cycle component



(1) Shades of orange: distribution of the conditional forecasts in the BVAR in levels, excluding the lower and higher 5 % quintiles. Solid blue line: point estimate of the conditional forecasts in the BVAR in differences, which is calculated as the median of the distribution of the conditional forecasts in this model. Green line with crosses: actual values. The variables are all reported in terms of annual percentage changes. Conditioning assumptions: real domestic demand per capita in the EA-12.
Source: DG ECFIN, based on the MATLAB codes replication files of the methodological paper (see Box II.2.1).

Box II.2.1: Conditional forecasts of real GDP per capita in selected euro area Member States

The analysis is based on recent developments in the literature of vector autoregressions (VARs) tools for large data sets (Banbura et. al, 2015, Giannone et. al, 2014). VARs are considered to be a reliable tool for building empirical benchmarks as a complement to alternative representations such as dynamic stochastic general equilibrium (DSGE) models, which provide structural benchmarks more grounded in theory, at the cost of imposing more restrictions on the dynamic cross-sectional correlations in the data. The Bayesian VARs offer a solution to the curse of dimensionality in the VAR framework by adopting Bayesian shrinkage. The idea of this method is to combine the likelihood coming from a highly parameterised VAR model with a prior distribution for the parameters that is naïve but enforces parsimony. As a consequence, the estimates are “shrunk” toward the prior expectations.

The analysis will consider two versions of the BVAR – with data in (log-)levels and in (log-)differences. The dataset includes the euro area Member States at the launch at the euro and the euro area average defined as EA12. Ireland and Luxembourg were not included in the sample due to data availability. The sample covers the period from 1996Q1 to 2014Q4. Data comes from Eurostat, Quarterly National Accounts.

From each of the two models, forecasts of real GDP per capita for each country are generated conditional on the observed realised path of real GDP per capita in EA12. The conditional forecasts are generated over the period 1998-2014. The first two years in the sample are used as initial conditions. Thus the conditional forecasts for 1998-2007 can be considered as “in-sample” while those over 2008-2014 as “out-of-sample”. The conditional forecasts computed for the two models provide similar insights: (i) the “in-sample” part (1997-2007) of the conditional forecasts can be compared with the observed developments in order to gauge whether knowing only the time series of real GDP per capita of EA12 is sufficient to capture the salient features of the GDP per capita developments in the individual euro area Member States; (ii) by comparing the “out-of-sample” part (i.e. from 2008 onward) of the conditional forecasts with the observed developments, we can also assess whether the turmoil associated to the financial and the sovereign debt crises was reflected in a change in business cycle synchronisation between the individual countries and the euro area as a whole. A change in the business cycle synchronisation would likely lead to relevant inaccuracies of the conditional forecasts based on parameters representing the pre-2007 relationships (Graph II.2.4 and Graph II.2.5 in the text).

The conditional forecasts are close to the actual outcomes, in particular in the “in-sample” period for most countries. This fact suggests that real GDP per capita of EA12 is sufficient to capture the growth developments in most euro area economies. Turning to the “out-of-sample” evidence, there is a general similarity of the conditional forecasts across approaches. The results indicate that some differences appear between forecasts and observed developments for a few countries, indicating instability in the business cycle synchronisation of these countries with euro area as a whole. For example, notable differences appear for countries that accumulated macroeconomic imbalances in the pre-crisis period, and underwent a deleveraging process in both private and public sectors.

References

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Conclusions

The initial global financial shock in 2008 and the subsequent collapse in global trade do not seem to have affected euro area countries asymmetrically, as all of them slipped into recession at the same time. However, the subsequent euro area sovereign crisis has propagated heterogeneously across countries causing significant differences in domestic demand and resulting in large business cycle divergence.

The analysis presented in this section shows that the country-specific components of the business cycles increased in all euro area Member States during the sovereign crisis. Some countries performed better than what the euro area average would have implied, whereas countries which had accumulated macroeconomic imbalances during the pre-crisis period performed much worse in terms of GDP per capita growth.

Given the pattern of heterogeneity observed in growth differentials during the recent turmoil, there are large potential gains from risk sharing in times of financial crisis in the euro area for all Member States. The more the countries in the monetary union are able to share risk fully, the more only euro area-wide fluctuations matter and the less pain is caused by asymmetries in terms of loss of welfare.

Differences in Member States' debt overhang and domestic financial imbalances can have a significant negative impact on business cycle

synchronisation within the euro area during the deleveraging period, as they make euro area-wide shocks propagate unevenly.

While the impact is not likely to be permanent, a long-lasting deleveraging period in some Member States can lead to a protracted period of business cycle decoupling from the rest of the euro area, limiting the effectiveness of the common monetary policy for individual countries.

Furthermore, even though growth differences in real GDP per capita between Member States and the euro area have returned to pre-crisis levels, the risks of asymmetric shocks in the euro area will remain significant until the balance sheet adjustment process in both private and public sectors is completed.

Therefore, in cases where households' and firms' debt levels are not sustainable but their income and business models are deemed viable, structural reforms to help address non-performing loans, including debt restructuring and better insolvency arrangements, could help speed up the balance sheet adjustment process. These reforms, in conjunction with closer economic surveillance to prevent the build-up of imbalances and product and labour market reforms to facilitate the deleveraging processes, could decrease the likelihood of asymmetries in the propagation of euro area-wide shocks. The Banking Union and the future Capital Market Union have an important role to play in this respect.