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Macroeconomic Aspects of European Integration: Fiscal Policy, Trade Integration and the European Business Cycle

Jesús Crespo-Cuaresma, Michael Pfaffermayr,
Octavio Fernández Amador, Catherine Keppel

Abstract

We analyze the role of fiscal policy and intra-European trade in business cycle synchronization in the EU for the period 1995-2008. There is a broad consensus that the relationship between fiscal policy and business cycle comovements and between trade integration and cyclical synchronization are subject to endogeneity problems. We instrument fiscal budget surplus by means of (exogenous) political determinants of fiscal policy acknowledged by the literature, while trade integration is instrumented using covariates which summarize the integration status of countries in the sample, GDP per capita differences with respect to the EU and trade specialization within the EU framework. Our results show that both fiscal policy and trade integration are important determinants of cyclical synchronization. We can conclude that once a high degree of trade integration is reached by countries involved in the European integration process, the role of fiscal policy is particularly relevant and differences in fiscal shocks should be analyzed in detail as a source of coherence in cyclical comovements in Europe. Furthermore, fiscal deficits are shown to be an important potential source of idiosyncratic macroeconomic fluctuations, especially in the eurozone. Our results confirm the rationale of monitoring fiscal developments to assess the adequacy of potential future EMU countries and the need for a broad agreement concerning fiscal policy at the EU level.

Keywords: Monetary union, business cycles, synchronization, trade integration, fiscal policy
JEL-classification: E32, E62, F15

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Project Report

Macroeconomic Aspects of European Integration: Fiscal Policy, Trade Integration and the European Business Cycle

Project leaders:
Jesús Crespo Cuaresma (Vienna University of Economics and Business)
Michael Pfaffermayr (University of Innsbruck)

Project team:
Jesús Crespo Cuaresma (Vienna University of Economics and Business)
Octavio Fernández Amador (Johannes Keppler University, Linz)
Catherine Keppel (Vienna University of Economics and Business)
Michael Pfaffermayr (University of Innsbruck)

Executive Summary

Since the birth of the European Monetary Union, issues related to the nature of optimal currency areas have gained in importance both in the academic literature and in the economic policy discussion. Synchronization of business cycles appears as the most relevant measure to evaluate the degree of optimality of monetary unions and the evaluation of the determinants of cyclical synchronization informs policymakers about the potential economic policy challenges that Europe currently faces.

In our analysis we assess the importance of fiscal policy and trade orientation as factors driving cyclical comovements in Europe in the last decades. Trade and fiscal policy variables affect business cycle developments and are at the same time affected by the current cyclical stance. This is more the case in the framework of currency areas, where the endogeneity of optimal currency area criteria has been both predicted theoretically and documented empirically. Our econometric analysis recognizes such endogeneity and utilizes political and institutional determinants of public finance and trade as instrumental variables in order to quantify their effect on business cycle synchronization in the European Union.

Using newly-developed measures of business cycle comovement within economic areas, our results indicate that fiscal policy shocks and changes in intra-EU trade orientation are robustly related to the degree of synchronization that countries have within Europe. Countries running into budget deficits and with trade orientation towards areas outside the EU tend to have more asynchronous business cycle dynamics with respect to the rest of the European economies. Furthermore, a higher degree of synchronization of business cycles tends to happen in recessions as compared to expansionary phases.

The analysis has important consequences for the design of policy frameworks aimed at minimizing the costs of carrying out monetary policy in EMU. In particular, the results indicate that supervision and coordination of fiscal policy should play a central role in order to ensure the correct functioning of interest rate policy in EMU. This conclusion is more relevant in the framework of the effects of the financial crisis and the subsequent recession. An extra effort should be put in applying sustainable consolidation measures once that the fiscal impulses currently in place are considered sufficient to support improvements in the cyclical stance. Failure to implement such measures could lead to difficulties in the implementation of monetary policy in the euro area.

Zusammenfassung

Mit der Entstehung der Europäischen Währungsunion gewann die Theorie optimaler Währungsräume in der akademischen Forschung sowie in der wirtschaftspolitischen Diskussion an Bedeutung. Die Synchronisation von Konjunkturzyklen stellt eines der wichtigsten Maße zur Beurteilung der Optimalität einer Währungsunion dar. Die Untersuchung jener Faktoren, welche einen Einfluss auf den konjunkturellen Gleichlauf in Europa haben, ist für die wirtschaftspolitischen Akteure daher eine bedeutende Information in Hinblick auf die gegenwärtigen und zukünftigen Herausforderungen für die Währungsunion.

Unsere Analyse quantifiziert die Rolle von Fiskalpolitik und Handelsorientierung als Bestimmungsfaktoren der Synchronisation von Konjunturzyklen in Europa. Beide Faktoren beeinflussen und werden selbst von aggregierten Konjunkturschwankungen beeinflusst. Diese Endogenität der Kriterien eines optimalen Währungsraumes wurde von der Theorie diskutiert und empirisch gezeigt. Unsere ökonometrische Analyse berücksichtigt diese Endogenität und verwendet politische und institutionelle Variablen um die exogene Variation in der Fiskalpolitik und im Handel zu identifizieren. Damit kann der Effekt von diesen Variablen auf die Synchronisation der Konjunkturzyklen richtig quantifiziert werden.

Die Studie verwendet eine neue Methode zur Messung der Synchronisation von Konjunkturzyklen. Unsere Ergebnisse deuten darauf hin, dass fiskalpolitische Schocks und Handelsorientierung einen robusten Effekt auf die Synchronisation von Konjunkturschwankungen in Europa haben. Länder mit einem hohen Budgetdefizit und/oder einem relativen kleinen Anteil am internationalen Handel mit anderen EU-Ländern haben relativ asynchrone Konjunkturzyklen in der Europäischen Union. Generell sind Konjunkturzyklen in Europa während einer Rezession stärker synchronisiert als während einer Expansion.

Aus unserer Analyse können wichtige wirtschaftspolitische Folgerungen gezogen werden. Unsere Ergebnisse zeigen, dass die Überwachung und die Koordination von Fiskalpolitik in Europa eine zentrale Rolle spielen um eine einwandfreie Funktion der Geldpolitik zu ermöglichen. Diese Schlussfolgerung ist insbesondere für die Beurteilung der Auswirkungen der Finanzkrise und der daraus folgenden Rezession relevant. Sobald die fiskalischen Impulse zur Belebung der Konjunktur als ausreichend erachtet werden, ist eine nachhaltige fiskalische Konsolidierung notwendig, um die reibungslose Implementierung der Geldpolitik nach der Rezession sicherzustellen.

1 Introduction

The European Monetary Union (EMU) constitutes the most advanced status of association within the European integration process. Although under continuous debate, its performance hitherto has been considered to some extent noteworthy and the current common monetary policy is seen as a successful prototype of policy for more integration (see, Alesina and Perotti, 2004, for example). The implementation of the common monetary policy constitutes a difficult task in the context of the institutional framework of the European Union (EU) (see, De Neve, 2007, for an exposition on the complexity of the institutional architecture of the EU). The European Central Bank (ECB) implements monetary policy based on euro area aggregates for a heterogeneous group of countries, which in turn keep some stabilization power by means of their national sovereignty, in particular in terms of fiscal policy. Due to the structural heterogeneity in the economies forming the eurozone, as well as in the transmission mechanism of common monetary policy shocks, the conduct of monetary policy in EMU may be a potential source of asymmetric shocks in the economic area. Heterogeneity in monetary transmission mechanisms within euro area countries is fairly well documented in the empirical literature. There is evidence concerning differences in reactions to monetary shocks in countries in the eurozone (see, for example, Huchet, 2003, and Caporale and Soliman, 2009), as well as evidence on the heterogeneity in the interest rate channel in EMU countries (see, for example, Sander and Kleimeier, 2004, Sørensen and Werner, 2006, or Fernández-Amador, 2010). Nevertheless, the main problem of monetary policy in a single currency area is given by asymmetric shocks, much more than by the asymmetric transmission of common shocks. As highlighted by Mundell(1961), when asymmetric shocks hit the economies in a currency union, which have lost their exchange rate and monetary policies in favor of a supranational entity, there must exist a channel for adjustment towards a new equilibrium, namely wage flexibility and labor mobility. These are the aspects that were highlighted by Mundell (1961) in what became known as Optimum Currency Area (OCA) theory.

Together with wage flexibility and labor mobility, many economic aspects have been considered by the OCA literature in order to assess optimality of currency areas. Openness, financial integration, flexibility of prices, similarity of inflation rates, diversification in production and consumption, fiscal integration and political integration are some of these factors which have been explicitly assessed in the literature (see Tavlas, 1993, or Mongelli, 2002, or Dellas and Tavlas, 2009, for surveys). Strong integration in such OCA criteria is the condition for minimizing the costs from monetary union (loss of monetary and exchange-rate policies) and so, for optimality of the currency area. They are often summarized through synchronization of shocks/business cycles of the members forming the currency area. Insofar as shocks are less asymmetric or cyclical developments are more synchronized, common monetary policy will fit the interests of the members of the currency union. The more synchronized the business cycles of the members of the currency area, the lower the probability of asymmetric shocks, and the less dramatic the costs of the loss of monetary and exchange rate policy for the member country (see Afonso and Furceri, 2008, for a theoretical model).

Stylized facts of business cycle synchronization in EMU have been documented under a unified methodological framework based on sigma-convergence by Crespo-Cuaresma and

Fernández-Amador (2010). A period of convergence in cyclical patterns in EMU is present from the nineties (see also Angeloni and Dedola, 1999, Massmann and Mitchell, 2003, Darvas and Szápari, 2005, Afonso and Furceri, 2008) and some evidence of increasing heterogeneity during the recession of 2000-2002 (documented by Fidrmuc and Korhonen, 2004, as well). Secondly, a core group of EMU countries shows higher synchronization. Thirdly, some new EU countries of the recent enlargements of 2004 and 2007 present similar rates of comovement to those displayed by some of the periphery (EMU-12) members, as has been also documented by Artis et al. (2004), Fidrmuc and Korhonen (2004 and 2006), Darvas and Szápari (2005) and Afonso and Furceri (2008). Finally, the European differential existing during the nineties as compared with other industrialized economies has disappeared, diluting the European business cycle within a global cycle (see also Artis, 2003, and Pérez et al., 2007). One question arises from those stylized facts summarized here, which is the main research question in this study: what is the nature of the factors driving cyclical synchronization in Europe?

The empirical literature has highlighted some specific determinants of cyclical synchronization. In particular, trade has been put forward as one of the main drivers of comovement at the cyclical frequency (see, for example, Otto et al., 2001, or Baxter and Kouparitsas, 2005), but its effect does not seem to be robust for all levels of trade integration and other factors such as fiscal deficits and correlation of monetary policies are found to have a comparable effect on business cycle synchronization when trade integration is high (Inklaar et al., 2008). Endogeneity plays an important role when assessing the determinants of business cycle comovement. Many variables are likely to improve the degree of optimality of a currency area at the moment when the removal of borders from monetary integration takes place. A consequence of such endogeneities is that a country that *ex ante* does not satify the requirements for being an optimal member of a monetary union may accomplish those prerequisites *ex post* (Frankel and Rose, 1998). In this sense, several sources of endogeneity have been highlighted in the recent literature. In particular, those between business cycle synchronization and trade integration, and between business cycle synchronization and financial integration have been studied in depth (see De Grauwe and Mongelli, 2005, for an assessment of endogeneities of OCA-criteria). However, other sources of endogeneity arise between, for example, fiscal policy and business cycle, that have not received the same attention.

In this study, we analyze the effect of fiscal policy and trade integration as determinants of cyclical synchronization in the EU for the period 1995-2008. We make use of the business cycle synchronization indicator developed by Crespo-Cuaresma and Fernández-Amador (2010) and assess the role of those potential drivers of cyclical synchronization taking into consideration the endogeneity between them by using as instruments for fiscal policy and trade integration. We exploit the information on political determinants of fiscal stance (years remaining of term and share of government votes), and a combination of income per capita trends, geographical and institutional dummies (for periphery countries, EU and EMU/opting-out membership), and a measure of trade specialization in order to obtain instruments for our explanatory variables.

The next section reviews the literature on determinants of business cycle synchronization with a focus on the role of trade and fiscal policy. Section 3 analyzes the issues of the measurement of business cycle and business cycle synchronization and shows the estimates of our measure for the EU-25. In Section 4 we assess the role of fiscal policy and trade as a determinant of such a synchronization measure, dealing with the issue of potential endogeneity of fiscal and trade variables. Section 5 concludes.

2 Business cycle synchronization, trade and fiscal policy: a review

Many economic channels have been considered by the OCA literature to explain the potential mechanisms for equilibrium correction after a demand shock in the framework of a monetary union when asymmetric shocks are present. Strong integration in terms of those OCA criteria is the condition for minimizing costs from monetary union (loss of monetary and exchange-rate policies) and thus for optimality of the currency area. Those OCA criteria are labor mobility, economic openness, financial integration, flexibility of prices and wages, similarity of inflation rates, diversification in production and consumption, fiscal integration and political integration.Often, these variables are thought of as being summarized well by business cycle synchronization measures (see Tavlas, 1993, or Mongelli, 2002, or Dellas and Tavlas, 2009, for surveys). Among those OCA criteria, several authors have concluded that trade integration and fiscal policy are two of the most robust and important drivers of cyclical comovement.

McKinnon (1963) highlights that the more open an economy is, the more changes in international prices would impact (directly and indirectly) on domestic prices, reducing the potential for money or exchange rate illusion. Frankel and Rose (1998) assessed the empirical relationship between trade integration and cyclical synchronization under the "endogeneity of OCA" hypothesis, by which the structure and relations of the economies that join a currency area are assumed to change dramatically as a result of the effective participation in the currency area. Trade endogeneity, as analyzed by Frankel and Rose (1998), is theoretically ambiguous. The increase in trade after joining a monetary union may induce more synchronization in business cycles if intra-industry trade dominates over inter-industry trade (see European Commission, 1990) or, on the other hand, may induce business cycles to become more idiosyncratic if countries become more specialized as a result of the prevalence of inter-industry trade over the rest of effects (see Krugman, 1991). Frankel and Rose (1998) found evidence that international trade integration is positively related to more synchronized business cycles. Afterwards, Rose (2000) opened a door for supporting the idea of a positive effect of EMU on trade, although his research is subject to some drawbacks (see Baldwin, 2006) and several other authors have not been able to find such a robust EMU effect (see, for example, Baxter and Kouparitsas, 2005, or Inklaar et al., 2008).

With regard to fiscal policy, the relevance of the relationship between between the fiscal stance and business cycle synchronization has also been emphasized by the OCA literature. As a driver of business cycle synchronization, fiscal policy has several roles (see Mongelli, 2002). Firstly, fiscal policy has an stabilization role at a national level in the EU, helping

smooth the cycle within the institutional framework determined by the Stability and Growth Pact (SGP). Secondly, as a potential source of asymmetric shocks, convergence in terms of the fiscal policy stance could be related positively to cyclical comovement. Thirdly, fiscal policy could be used as a public risk-sharing mechanism when provided by a supranational power, a scenario which is not relevant in the current European Union. The first role mentioned allows us to recognize one potential source of endogeneity between business cycle developments and fiscal policy. Battaglini and Coate (2008) conclude that fiscal policy in US respond to booms and recessions, Darvas et al. (2005) document that convergence in fiscal balances is systematically linked to business cycle convergence, and that the relationship exists even when the potential endogeneity of fiscal policy responses is accounted for. Böwer and Guillemineau (2006) show that fiscal policy homogeneization has been one of the robust determinants of business cycle synchronization in EMU, and Akin (2006) provides evidence of the importance of similarity in idiosyncratic fiscal shocks as a determinant of cyclical convergence in a broader set of countries.

There is some theoretical foundation to expect that fiscal activism will increase after joining a monetary union due to the fact that the potential costs of running higher deficits for a country in the monetary union are lower than if monetary policy is independent. This is the case since the costs entailed by the increase of interest rates partly fall on other member countries (Onorante, 2004). Thus, a country experiencing large deficits and high debt-to-GDP ratios within a monetary union may create negative spillover effects for the rest of the currency area, increasing the interest rate of the monetary union and thus, the load of financing government debts in other members of the currency area (De Grauwe, 2007).[1] Theoretically, fiscal coordination appears as a necessary political framework in order to ensure some cyclical synchronization and the correct implementation of the monetary policy across the members of the monetary union. However, the way in which countries of a monetary union actually coordinate fiscal policies could condition the impact of fiscal policy on business cycle synchronization. Von Hagen and Mundschenk (2001) differentiate between two main ways of policy coordination: *narrow coordination*, focused on monitoring national policies and practices challenging price stability, leaving relative freedom to policy goals and instruments, and *broad coordination*, where explicit frameworks concerning common policy goals and strategies are developed in an agreement. In this line, Ferré (2008) shows in a game theoretical model that broad coordination in fiscal policy would be preferred to narrow coordination. In this broad coordination framework, the incentive to deviate from the agreement comes from the presence of supply shocks and different evolutions in competitiveness, whereas there is no incentive to deviate from the agreement under differential demand shocks, the most important from the point of view of stabilization policies. Recently, there is evidence that the shock-smoothing role of fiscal policy is enhanced in an enlarged EMU (Afonso and Furceri, 2008).

Our approach to the relationship between fiscal policy, trade integration and business cycle synchronization is quite different from the rest of the literature. We consider the business cycle synchronization measure put forward by Crespo-Cuaresma and Fernández-Amador (2010) as the relevant measure of cyclical synchronization. This measure, as opposed to

[1] See, for example, Silbert (1992), Levine and Brociner (1994) or Dixit and Lambertini (2001 and 2003) for theoretical models of the interaction between monetary and fiscal policy in monetary unions.

bilateral correlations, allows for a more detailed analysis of the dynamics of business cycle coherence and takes into account the role of each country within the particular group which is taken as a reference. In the next section, we define and analyze such a measure of cyclical comovement.

3 Measuring business cycle synchronization

Business cycle measurement is plagued with controversy. Measuring business cycles constitutes the first step in order to study them, but what the business cycle is seems to be an issue which far from being unanimously agreed upon. The empirical literature on business cycle measurement has produced several definitions and methods for measuring the economic cycle. Harding and Pagan (2005) classify most of these methods and Canova (1998) and Massmann and Mitchell (2003) emphasize the sensitivity of some results to the method employed in order to isolate the business cycle. The literature concerning the determinants of business cycle synchronization has focused on some specific filters when extracting the cyclical component of the main economic aggregate, real Gross Domestic Product (GDP). Frankel and Rose (1998) make use of fourth-differencing, linear detrending and Hodrick-Prescott (HP, 1997) filtering upon four aggregates representing real economic activity: real GDP, Industrial Production Index (IPI), total employment and unemployment rate; at a quarterly frequency. Otto et al. (2001) consider the growth rate of real GDP. Baxter and Kouparitsas (2005) focus on Baxter-King (1999) filter applied on annual real GDP. Inklaar *et al.* (2008) extract the cyclical component by using the Baxter-King (1999) filter for real GDP and IPI. After that, all these authors focus on (rolling-window) bilateral-country correlations of the cyclical components in order to measure cyclical synchronization.

In order to study the determinants of synchronization of business cycles, an estimate of the cyclical component of the variable of interest (in our case, quarterly real GDP) needs to be obtained. For this purpose, following Harvey (1989) and Harvey and Jaeger (1993), we decompose the GDP series of each of the 25 countries under study into unobservable trend, cyclical and irregular components. Let y_{it} be the (logged) level of GDP corresponding to country i in period t then

$$y_{it} = \tau_{it} + \phi_{it} + \varepsilon^y_{it}, \;\; \varepsilon^y_{it} \sim \mathbf{NID}(0, \sigma^2_{\varepsilon^y}), \tag{1}$$

where τ_{it} is the trend component, ϕ_{it} is the cyclical component and ε^y_{it} is the (white noise) irregular component. The trend component, in its most general specification, will be assumed to be a random walk with a drift, where the drift follows a random walk as well, that is,

$$\begin{aligned} \tau_{it} &= \tau_{it-1} + \beta_{it-1} + \varepsilon^\tau_{it}, \;\; \varepsilon^\tau_{it} \sim \mathbf{NID}(0, \sigma^2_{\varepsilon^\tau}), & (2)\\ \beta_{it} &= \beta_{it-1} + \varepsilon^\beta_{it}, \;\; \varepsilon^\beta_{it} \sim \mathbf{NID}(0, \sigma^2_{\varepsilon^\beta}). & (3) \end{aligned}$$

,
This specification of the trend component nests several interesting cases. It should be noticed that if $\sigma^2_{\varepsilon^\tau} > 0$ and $\sigma^2_{\varepsilon^\beta} > 0$, this component induces an I(2) trend on y_{it}. On the other hand, if $\sigma^2_{\varepsilon^\tau} > 0$ and $\sigma^2_{\varepsilon^\beta} = 0$, τ_{it} is a random walk trend with drift. The case $\sigma^2_{\varepsilon^\tau} = 0$ and

$\sigma^2_{\varepsilon^\beta} > 0$ defines a smoothly changing trend,[2] and $\sigma^2_{\varepsilon^\tau} = 0$ and $\sigma^2_{\varepsilon^\beta} = 0$ implies a deterministic linear trend.

The cyclical component is assumed to follow a damped stochastic sine-cosine wave, specified as

$$\begin{bmatrix} \phi_{it} \\ \phi^*_{it} \end{bmatrix} = \rho_i \begin{bmatrix} \cos\lambda_i & \sin\lambda_i \\ -\sin\lambda_i & \cos\lambda_i \end{bmatrix} \begin{bmatrix} \phi_{it-1} \\ \phi^*_{it-1} \end{bmatrix} + \begin{bmatrix} \theta_{it} \\ \theta^*_{it} \end{bmatrix}, \quad \begin{bmatrix} \theta_{it} \\ \theta^*_{it} \end{bmatrix} \sim \mathbf{NID}(\mathbf{0}, \mathbf{\Sigma}_\theta), \tag{4}$$

for $\rho_i \in [0,1]$, $\lambda_i \in (0,\pi)$ and $\mathbf{\Sigma}_\theta = \text{diag}(\sigma^2_\theta, \sigma^2_\theta)$, so the disturbances of the cyclical component are assumed independent and of equal variance. It can be easily shown that the specification given by (4) implies that the cycle follows an ARMA(2,1) process, and that the constraints on the parameter space given above restrict the roots of the lag polynomial to lie on the region of the parameter space that leads to pseudo-cyclical behaviour in ϕ_{it}.

The model specified by (1)), (2), (3) and (4) can be written in state space form in a straightforward manner and estimated using maximum likelihood methods via the Kalman (1961) filter and the prediction error decomposition. Once the estimates of the parameters in (1)-(4) are obtained, the cyclical component can be recovered as the smoothed estimate of ϕ_{it}, $\hat{\phi}_{it}$, which is given by $\mathsf{E}(\phi_{it}|\{y_{it}\}^T_{t=1})$.

The unobserved components model given by (1)-(4) is estimated for real quarterly GDP data corresponding to all EU countries, with the exception of Malta and Romania.[3]

Using such a structural unobserved components model has several important advantages with respect to other common filtering techniques. This is of special relevance in our research, since properties of measures based on filtered cyclical components could be sensitive to the filtering method employed. Firstly, as mentioned above, the model specified nests some other filters like the Hodrick-Prescott (1997) and linear detrending or first-differencing and thus offers more flexibility when extracting the components. Secondly, it implicitly specifies a band of frequencies which corresponds to the business cycle, removing the long-run and irregular information. However, in contrast to the Baxter-King (1999) filter, it does not specify *a priori* the band of frequencies.[4] Thirdly, it allows for a rationale underlying the signal-extracting procedure and makes parametric assumptions concerning the data generating process. The latter is of importance when tracking the business cycle especially for two reasons. Part of the economies considered in the sample are Eastern European economies

[2]The Hodrick-Prescott (1997) trend appears as a special case of the decomposition of a series into a smooth trend and an irregular component for specific values of $\sigma^2_{\varepsilon^\beta}/\sigma^2_{\varepsilon^y} = \lambda$, and $\sigma^2_{\varepsilon^\tau} = 0$ and $\phi_t = 0$, where λ is the smoothing parameter of the Hodrick-Prescott filter. When $\lambda \to \infty$, the Hodrick-Prescott filter approaches linear detrending. The Hodrick-Prescott estimate of the cyclical component is then simply given by the smoothed irregular component (see Harvey, 1989, and Harvey and Jaeger, 1993).

[3]GDP series of Bulgaria, Estonia, Greece, Latvia and Slovenia were seasonally adjusted using TRAMO-SEATS (Gómez and Maravall, 1996). Appendix A gives further details concerning the sources of GDP data, as well as the sample period used for the estimation in each country.

[4]Baxter and King (1999) quoted Burns and Mitchell (1946) when specifying the limits of 2 and 8 years for the cyclical frequencies. However, a careful reading of Burns and Mitchell's (1946) definition of what a business cycle is allows for a higher upper bound. In some cases, as in Portugal, this is important, since there is evidence of some longer cyclical swings.

which joined the EU in the 2004 and 2007 enlargement rounds. These countries are transition economies which experienced a particular type of crisis during the nineties, associated to a transition process where political constraints were of capital importance (Roland, 2002).[5] In addition to this, Aguiar and Gopinath (2007) conclude that shocks to trend growth rather than transitory fluctuations around the trend are the primary source of observed volatility in emerging markets. The unobserved components model allows us to take account of sharp drops in GDP series occurred during some periods of time, for example, in the case of the Finnish great depression in the nineties (see Conesa *et al.*, 2007, for an analysis of this case).[6] The proposed model can deal with these features by allowing a flexible estimation of movements in the trend component. We estimate the cyclical components of GDP series for all the countries considered using the Harvey and Jaeger (1993) model and the two most common filters found in the literature, namely the Hodrick-Prescott (1997) and Baxter-King (1999) filters.

Figure 3 presents the (smoothed) cyclical components of the quarterly GDP series corresponding to each one of the countries considered for the three filters proposed for the period 1995-2008. As can be easily seen the estimated components are quite similar. The synchronization among countries forming a group can be analyzed using the time series of the cross-country standard deviation of the (smoothed) cyclical component. Figure 3 plots the time series of the cross-country standard deviation of the cyclical component across EU-25 countries. The dynamics of the dispersion series is also quite similar and thus, we should not expect that our results are sensitive to the filter employed at this step. However, as in the estimation of the cyclical components, it is quite obvious that Hodrick-Prescott (1997) estimates are more volatile than Harvey-Jaeger (1993) and Baxter-King (1999) estimates, because the method does not explicitly isolate the cyclical component from the irregular component. In all the estimates, the trend of synchronization shows a period of convergence during the second half of the nineties until 2002, when a stable period appears, only reflecting some signs of divergence from 2007 onwards (2006 for the HP estimate).

We propose to analyze the degree of synchronization of a country i in the group Ω using an indicator which measures the relative difference in business cycle dispersion in the group of reference with and without the inclusion of the country. The indicator, put forward by Crespo-Cuaresma and Fernández-Amador (2010), is defined as

$$\text{synchro}_{it}|\Omega = \frac{\hat{S}_t|\Omega_{-i} - \hat{S}_t|\Omega}{\hat{S}_t|\Omega}, \tag{5}$$

where $\hat{S}_t|\Omega_{-i}$ is the cross-country standard deviation of smoothed cycles corresponding to the group Ω excluding country i and $\hat{S}_t|\Omega$ is the cross-country standard deviation of smoothed

[5] Campos and Coricelli (2002) characterized some stylized facts of transition economies during the nineties such as output fall, a dramatic decrease in the stock of physical capital, high geographic labor mobility, intense reorientation of trade towards the West, a change in the structure of the economy, a rapid collapse of institutions and a deterioration of social well-being (see also, Svejnar, 2002, and Foster and Stehrer, 2007, for characterizations of macroeconomic transitions during this period).

[6] Conesa *et al.* (2007) use the Finnish depression as a case study for great depressions methodology developed by Kehoe and Prescott (2002 and 2007), recognizing that such a depression does not fulfill the Kehoe and Prescott criteria, but comes close to them.

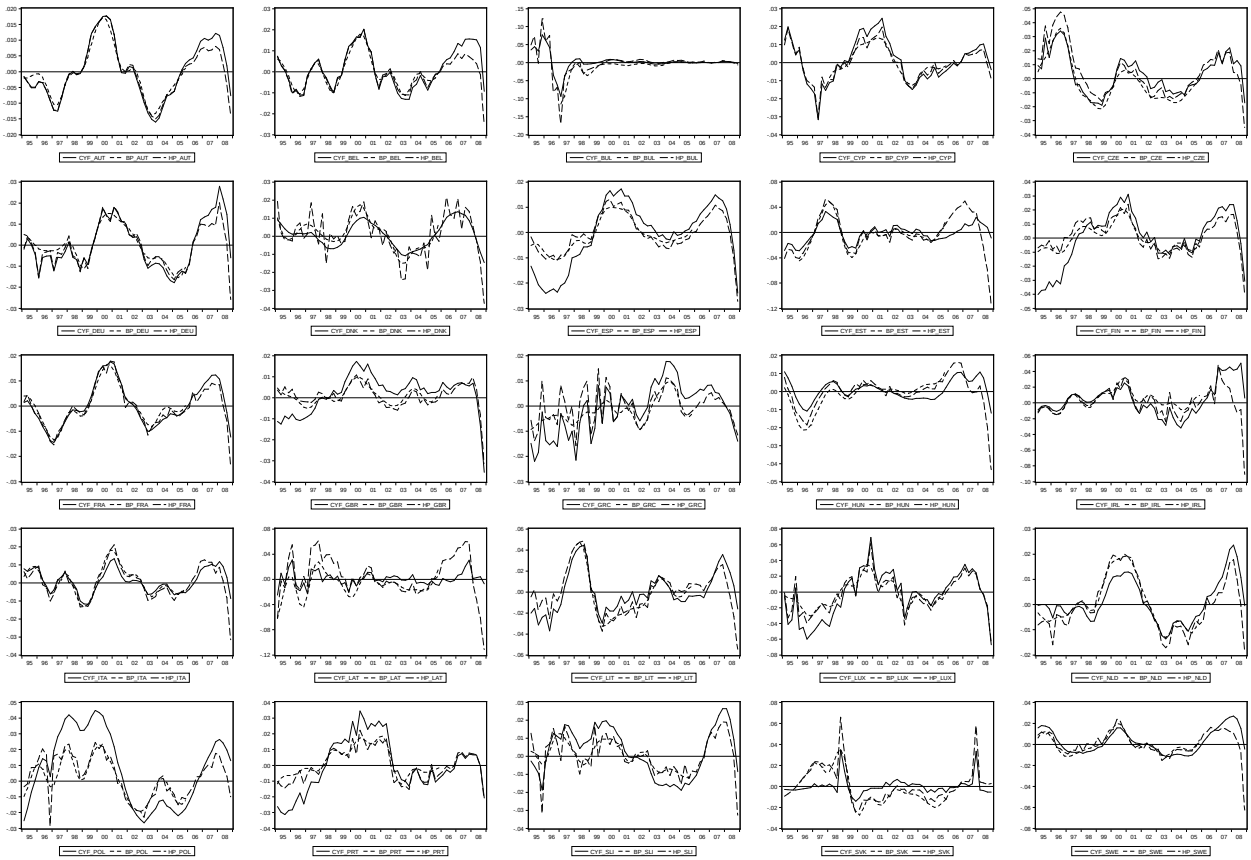

Figure 1: Cyclical component estimates for all EU-25 countries: Harvey-Jaeger, Baxter King and Hodrick-Prescott methods, 1995-2008

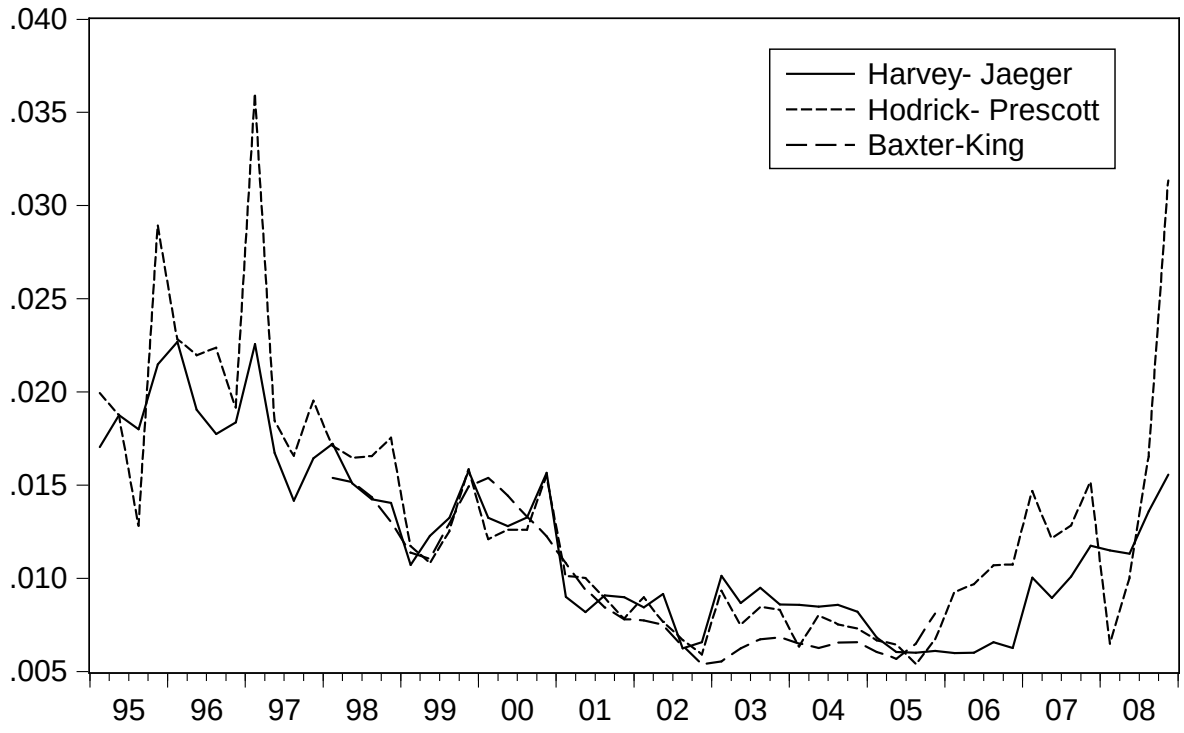

Figure 2: Standard deviation of the cyclical component estimates for EU-25 countries: Harvey-Jaeger, Baxter King and Hodrick-Prescott methods, 1995-2008

cycles for the group Ω including country i, both evaluated at time t. The indicator takes negative values when the standard deviation of the group increases as the country is included (that is, when the country induces cyclical divergence in the group), and positive values when the inclusion of the country induces a decrease in the dispersion (that is, when it induces cyclical convergence in the group).

We computed the measure of synchronization using the cyclical components estimated with the three different filters proposed and they are presented in Figure **??**. There are important differences in most of the countries considered. Due to the transformation induced by 5 to the cyclical components estimated, it is necessary for our purposes to rely on the less restrictive filter method, in our case the Harvey-Jaeger (1993) model. This indicator is the dependent variable in our econometric models and Table 1 presents the descriptive statistics of the synchronization measure for the sample used in the estimations, which ranges from 1995 to 2008. The original measure was estimated using quarterly data and averaged by year.

Table 1 reveals that the countries which tend to be desynchronized with the EU-25 in the period under study are in general peripheral economies (with the remarkable exception of Luxembourg). Furthermore, the correlation between the mean and the standard deviation of the synchronization measure across countries for the full period equals -0.9, which implies that the persistence of desynchronization periods is relatively limited. Figure 3 presents the scatterplot of the cyclical component of GDP against the synchronization indicator for the whole period being analyzed. Deviations from synchronization correspond with comparable

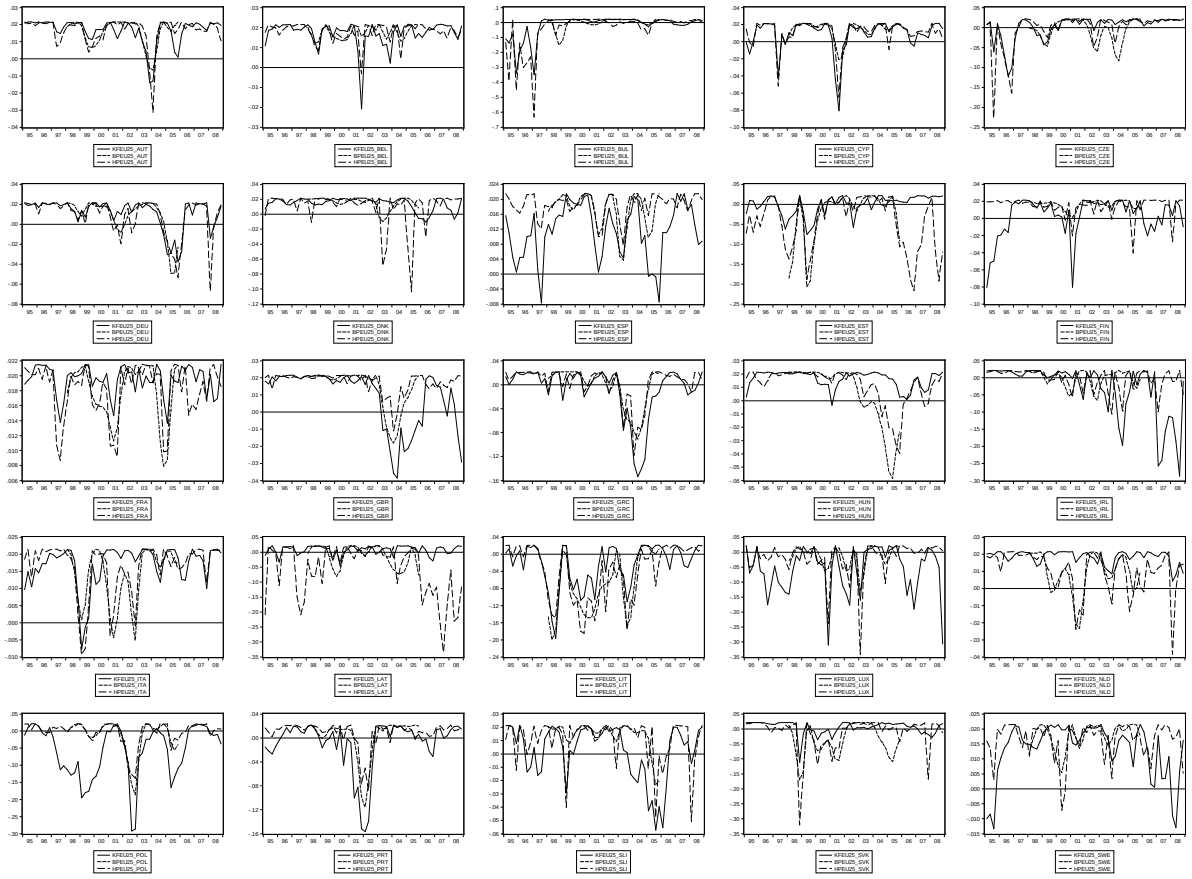

Figure 3: Synchronization measures: Harvey-Jaeger, Baxter King and Hodrick-Prescott methods, 1995-2008

Table 1: Synchronization measure: Descriptive statistics, 1995-2008

Country	Mean	Stand. dev.	Maximum	Minimum
AUT	0.017	0.005	0.021	0.005
BEL	0.017	0.004	0.021	0.007
BGR	-0.020	0.063	0.021	-0.166
CYP	0.009	0.014	0.020	-0.033
CZE	0.002	0.026	0.020	-0.079
DEU	0.011	0.013	0.021	-0.028
DNK	0.015	0.007	0.021	-0.004
ESP	0.011	0.006	0.020	-0.002
EST	-0.001	0.020	0.020	-0.054
FIN	0.003	0.020	0.020	-0.051
FRA	0.019	0.001	0.021	0.017
GBR	0.009	0.016	0.021	-0.027
GRC	-0.008	0.042	0.019	-0.138
HUN	0.016	0.005	0.021	0.006
IRL	-0.030	0.070	0.021	-0.192
ITA	0.017	0.005	0.021	0.002
LTU	-0.024	0.043	0.019	-0.134
LUX	-0.056	0.047	0.010	-0.118
LVA	0.007	0.008	0.020	-0.008
NLD	0.018	0.003	0.021	0.009
POL	-0.056	0.067	0.017	-0.178
PRT	-0.008	0.034	0.018	-0.086
SVK	0.005	0.013	0.021	-0.015
SVN	0.002	0.017	0.019	-0.044
SWE	0.013	0.008	0.021	-0.006

frequency to country-year observations which are in recessive periods (bottom-left quadrant of the Cartesian plane in Figure 3) as compared to expansive periods (bottom-right quadrant). 41 country-year observations correspond to a desynchronization episode in recession while 49 take place when the country has a positive output gap estimate. The symmetry of the raw relationship between these two variables is visible in the fit of the third-order polynomial regression line shown in Figure 3. On average, episodes of desynchronization and adjustment to the common cyclical behavior of European economies appear to happen in a similar fashion when the deviant country is in expansion as when it is in recession.

The average synchronization and cyclical component in the EU-25 group are presented in Figure 3 for the period 1995-2008. EU economies tended to be in expansionary phases when the average degree of synchronization was highest, although the recessionary phase of the beginning of the millennium was accompanied by an increase in the synchronization measure, which falls at the end of our sample in parallel to the beginning of the global recession of 2008. To the extent that cyclical dynamics in Europe are partly driven by common shocks, Figure 3 is not particularly informative about the driving factors of cyclical coherence at the country level. A deeper statistical analysis is required to assess the nature of the factors driving synchronization of cycles and, in particular, the role played by fiscal policy and trade integration in the process.

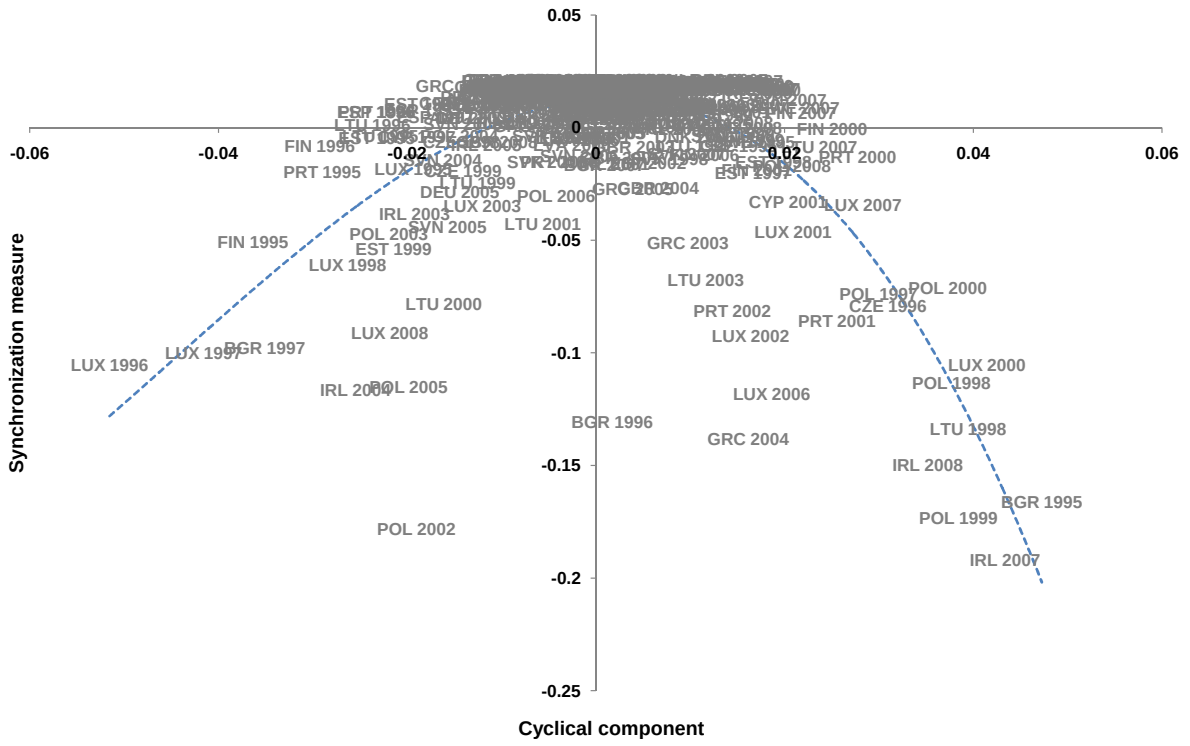

Figure 4: Cyclical component estimate against synchronization measure, EU-25 countries 1995-2008

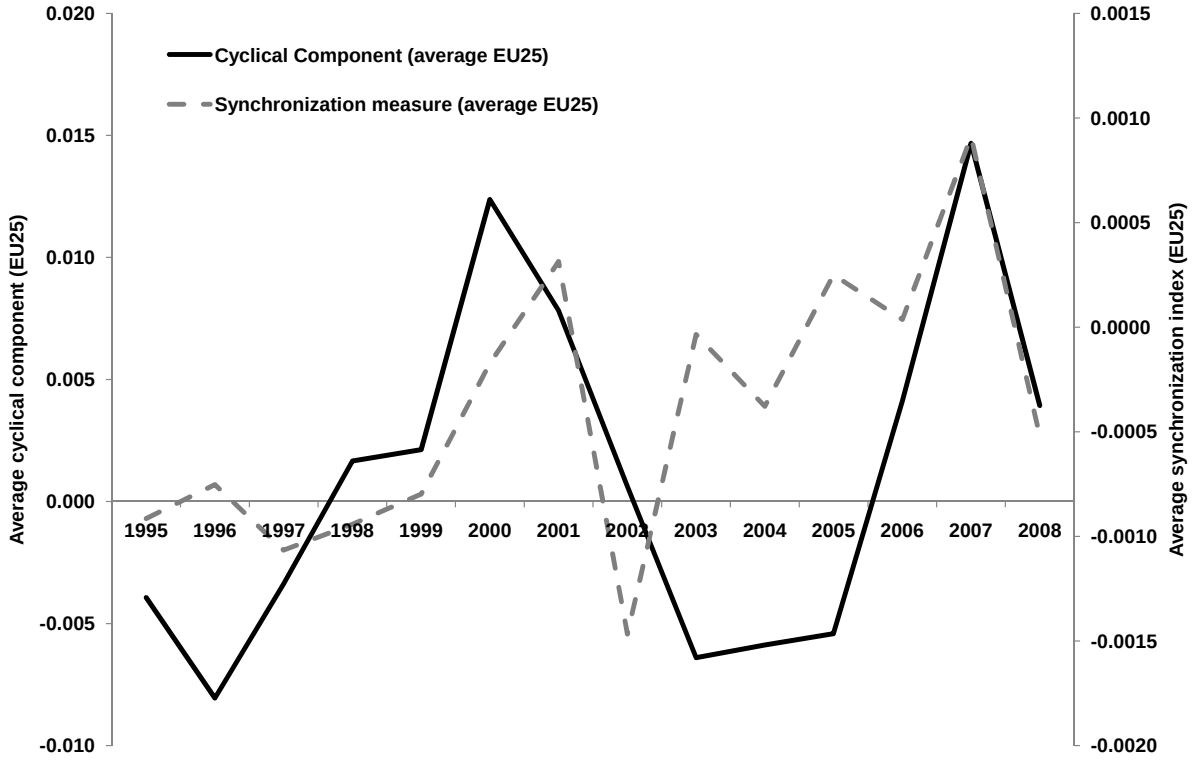

Figure 5: Cyclical component estimate against synchronization measure, EU-25 countries 1995-2008

4 What drives business cycle synchronization in Europe?

4.1 Fiscal policy, trade and business cycle synchronization: A first assessment

In this section we study the role played by fiscal policy and trade integration as a determinant of business cycle synchronization in Europe. The basic econometric specification we are interested in is given by

$$\text{synchro}_{it} = \beta \text{F}_{it} + \theta \text{T}_{it} + \rho \text{Z}_{it} + \varepsilon_{it}, \tag{6}$$

where F_{it} is a vector of fiscal variables, T_{it} is a vector of variables related to the degree of trade integration of country i in Europe and Z_{it} is a group of other controls. The error term ε_{it} is assumed to be composed by a country and a year fixed effect. We start by estimating specification (6) without considering endogeneity of our explanatory variables, in order to grasp the partial correlations existing in the data. Table **??** presents the results of the estimations of several models with different explanatory variables.[7] Column 1 shows the results of the regression of the synchronization measure on the cyclical component. The estimated parameter corresponding to the cyclical component variable is negative and highly significant, which indicates that countries tend to synchronize more with the European cycle in recession periods. If we add the budget surplus as an additional explanatory variable, it enters significantly and with a positive parameter estimate. At the individual country level, business cycle synchronization in Europe over the last decades has thus taken place following fiscal consolidation episodes. This partial correlation is mostly driven by the consolidation process that took place in the run up to the European Monetary Union in the framework of the Maastricht Treaty. If we split the sample into two periods delimited by the birth of EMU, the coefficient associated to the fiscal surplus is highly significant only in the pre-1999 subsample and the estimated parameter is more than twice higher than that of the full sample.

We turn to the effect of trade integration on our dependent variable. Our first measure of trade intensity is a modified version of the measure used by Frankel and Rose (1998) and subsequently by others such as Inklaar et al. (2008),

$$\text{TS}^1_{it} = \sum_k \left[\frac{X^k_{i-eu} + M^k_{i-eu}}{X^k_{eu} + M^k_{eu}} \right], \tag{7}$$

where the total trade of a country i with the EU at period t is scaled by the total intra-European trade of the EU-25. Clark and Van Wincoop (2001) advocate and make use of this type of scaling to avoid size-dependency. Another measure of trade intensity with the EU considered here is the share of European trade related to total trade of country i,

[7] In spite of the fact that endogeneity plays an important role and is dealt with below in detail, we impose a causal structure in the temporal sense by lagging all explanatory variables in our specifications one year.

$$\mathrm{TS}_{it}^{2} = \sum_{k} \left[\frac{X_{i-eu}^{k} + M_{i-eu}^{k}}{X_{i}^{k} + M_{i}^{k}} \right]. \tag{8}$$

Data on imports and exports for computing those indexes are available from UN COMTRADE. We use annual data for the period 1995-2008 to compute (7) and (8).[8]

Column 3 in Table 2 shows the results of the regression including trade of country i as a percentage of intra-European trade. This variable enters significantly with a positive sign, confirming the idea that trade integration induces more synchronization among countries and therefore, reduces the costs associated to potentially forming a currency area. This result is robust to the inclusion of other variables as it is shown in columns 4 to 7. In particular, column 4 considers the inclusion of our second measure of trade intensity, trade with other European countries as a percentage of total trade. This measure of European focus of trade activity does not enter significantly in the specification and so, the share of European trade in total trade of a country does not seem to affect the degree of cyclical synchronization with the EU. This is consistent with the hypothesis of a trade channel in the transmission of shocks, that is, that shocks imported by countries with small European trade-orientation but considerable share of European trade are transmitted to the rest of the EU. Furthermore, the trade channel hypothesis would be consistent with the stylized fact that there is a dilution of the European cycle within a world-wide cycle in the recent years documented by Artis (2003), Pérez et al. (2007) and Crespo-Cuaresma and Fernández-Amador (2010). In order to assess the common role of the cyclical stance and the fiscal policy stance, we add the interaction of the cyclical component with the fiscal surplus as an additional covariate to our model. The inclusion of the interaction does not change the significance and sign of the cyclical stance and fiscal surplus variable, and enters with a marginally significant positive parameter. In our sample, countries which exercise anticyclical fiscal policy are thus on average more synchronized to the European cycle.

In the last specification of Table 2 we enlarge the specification by including a lag of the synchronization measure. The lagged dependent variable accounts for the persistence of our synchronization indicator, to the extent that it is not explained by other controls of the model. Since the dynamic structure of the model and the relatively short time dimension of our panel would lead to biased estimates due to the induced correlation between the lagged dependent variable and the error term, we use the GMM method proposed by Arellano and Bond (1991) to estimate the model.[9] The results indicate that there is no significant persistence above that explained by the independent variables and the use of this specification does not change our conclusions concerning the importance of trade orientation and fiscal stance on business cycle synchronization.

The natural reaction of the budget surplus to business cycle dynamics through the action of automatic stabilizers calls for a more detailed analysis of the changes in fiscal positions

[8] Data for Belgium in the period 1995-1998 are sourced from the National Bank of Belgium (Foreign Trade Statistics).

[9] We only instrument the lagged dependent variable for the estimation. Below we deal explicitly with the endogeneity of the other variables in the model.

that can be attributed to shocks which are exogenous to economic activity. While the endogeneity caused by automatic stabilizers appears obvious at first sight, it is not the only argument put forward from a theoretical perspective to rationalize the feedback effect of business cycle volatility on fiscal variables. Rodrik (1998) notes that if governments aim at stabilizing cyclical dynamics, economies with higher volatility in economic activity would choose larger governments to stabilize their cycles. As mentioned above, endogeneity of cyclical synchronization and trade integration is accepted both theoretically and empirically. The endogeneity of fiscal and trade integration variables in 2 leads to potentially biased estimates of the effect of changes in the budget surplus and trade integration on our synchronization measures.

Table 2: Determinants of business cycle synchronization, OLS and GMM estimates, EU-25 1995-2008

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cyclical component	-0.691***	-0.573**	-0.671***	-0.671***	-0.551**	-0.465**	-0.222
	[0.243]	[0.223]	[0.235]	[0.234]	[0.205]	[0.167]	[0.215]
Budget surplus		0.296*			0.273*	0.253*	0.343**
		[0.154]			[0.149]	[0.143]	[0.161]
Trade with EU as % of trade in the EU			0.0120**	0.0120**	0.0106**	0.0102**	0.0171*
			[0.00452]	[0.00457]	[0.00469]	[0.00456]	[0.00965]
Trade with EU as % of total trade				0.000136			
				[0.000652]			
Cyclical component × Budget surplus						5.427*	3.922
						[3.121]	[4.843]
Lagged synchronization							0.0325
							[0.0753]
Observations	325	302	325	325	302	302	278
Number of countries	25	24	25	25	24	24	24
R-squared	0.07	0.08	0.09	0.09	0.09	0.10	-

Robust standard errors in brackets. * (**) [***] stands for significance at the 10% (5%) [1%] level. Dependent variable: business cycle synchronization measure. Regression includes year dummies which are not reported. GMM estimation using Arellano and Bond's (1991) GMM method in the last column.

4.2 Exogenous shocks in fiscal policy: Political determinants of budget deficits in Europe

The potential endogeneity problems discussed above require instrumental variables to account statistically for the fact that a positive correlation exists between shocks to business cycle synchronization and fiscal shocks. There is a vast empirical literature dealing with the political determinants of the fiscal stance which can serve us as a guide for the search of reasonable instruments for the budget surplus in (2). Political variables such as the timing of elections, the relative importance of the government versus the opposition or the political ideology of the government have been put forward as determinants of the observed differences in budget deficits across countries. Alesina and Perotti (1995) presents a survey summarizing the empirical literature on the role of institutional and political factors as determinants of fiscal outcomes. While the literature has mostly dealt with explaining differences in public deficits among OECD economies, Woo (2003) presents evidence for a broader sample of developed and developing countries and reaches the conclusion that political variables are robustly related to deficits at a global level, and not only in the developed world.

We assess the importance of political determinants of budget deficits in the EU sample in order to obtain potential instruments for the fiscal variable in our main model for business cycle synchronization. The econometric analysis also helps us test hypotheses of the literature concerning how the characteristics of the political sphere affect fiscal policy in Europe. We construct an econometric model that, in addition to economic variables which have been proposed as determinants of public deficits, we include two political variables: the number of years left from the current term of the government and the share of votes obtained by the government in the corresponding election. These variables account for two complementary theories which have been proposed as explanatory hypothesis for the role of politics on fiscal deficits. The years left from the current term of the government accounts for the influence of elections on fiscal outcomes, and thus tests for the existence of so-called *political cycles* in Europe (see Nordhaus, 1975 and Hibbs, 1977, for basic references on this issue). The assumption behind the use of the variable is that governments make use of policy instruments prior to elections in order to influence economic outcomes and benefit politically in terms of the likelihood of being reelected. Empirical studies assessing the impact of elections on economic variables are existing for Europe (see for example Sapir and Sekkat, 2002, or Breuss, 2008) and for broader samples of countries (see Mourao and Goncalves Veiga, 2010 for a recent contribution to the literature).

On the other hand, a related strand of literature relates differences in fiscal deficits to the relative political power of the government with respect to the opposition. The so-called *weak government hypothesis* is based on a theoretical setting put forward by Alesina and Drazen (1991), which predicts that the difficulties associated to reducing budget deficits are larger in coalition governments as compared to single-party governments. From an empirical point of view, the weak government hypothesis implies that governments formed by single parties (or coalitions where one party has a dominant position) would be more prone to reduce deficits than coalition governments. Roubini and Sachs (1989), Corsetti and Roubini (1991) and De Haan et al. (1999) are some examples of empirical work finding evidence of this effect in

developed countries.

The inclusion of our political variables intends to account for both of these effects as factors driving budget deficits in Europe. The number of years left of the current term should account for political cycle effects related to the timing of elections, while the share of votes obtained by the governing party should give us information about the potential existence of weak government effects in the European sample. Additionally, we include other economic determinants of budget deficits: GDP growth, the share of public debt over GDP and population over 65 years of age (to account for demographic pressure on public finance through pension payments). These variables are lagged one year so as to ensure a Granger-causal structure in the model. Since fiscal deficits tend to be relatively persistent over time, we estimate a dynamic panel data model including one lag of the dependent variable. The model is estimated using Arellano and Bond's (1991) Generalized Method of Moments estimator, which uses lagged levels of the dependent variable to instrument the endogenous lagged variable in a first-differenced version of the model.

Table 3: Determinants of fiscal surplus, EU-25 1995-2008

Variable	(1)	(2)	(3)	(4)	(5)
Lagged fiscal surplus	0.435***	0.344***	0.332***	0.383***	0.374***
	[0.117]	[0.112]	[0.108]	[0.119]	[0.111]
Debt as a share of GDP		0.0755***	0.0711***	0.0718***	0.0683***
		[0.0286]	[0.0273]	[0.0273]	[0.0265]
GDP growth		0.0832	0.0768		
		[0.0929]	[0.0931]		
Population over 65		-0.273		-0.226	
		[0.350]		[0.458]	
Years left in current term	0.00109*	0.000943*	0.000911*	0.00102*	0.000991*
	[0.000639]	[0.000548]	[0.000544]	[0.000560]	[0.000555]
Government, share of votes	0.0229***	0.0164**	0.0158**	0.0151*	0.0150*
	[0.00883]	[0.00764]	[0.00802]	[0.00776]	[0.00806]
Observations	302	294	296	294	296
Number of countries	24	24	24	24	24

Robust standard errors in brackets. * (**) [***] stands for significance at the 10% (5%) [1%] level. Dependent variable: fiscal surplus. Regression includes year dummies which are not reported. GMM estimation using Arellano and Bond's (1991) GMM method.

The results of several different specifications are presented in Table 3. In the first column of Table 3 we present the result of a simple regression model where only the lagged dependent variable and the two political covariates are used as explanatory variables. The budget surplus variable presents positive autocorrelation and our political variables appear to be significant determinants of fiscal outcomes. Furthermore, the estimated parameters for the political covariates provide evidence of political cycles and weak-government effects in Europe. On the one hand, budget surpluses tend to decrease as elections approach (that is, as the variable measuring years remaining in power decreases). On the other hand, strong governments (in terms of the shares of votes of the government party) tend to have smaller

budget deficits (or higher surpluses) than weaker governments. These results are robust to the inclusion of other economic variables such as the ones mentioned above, as can be seen in columns (2) to (5) in Table 3. The only variable which appears robustly related to fiscal surpluses is the level of debt. The results indicate that countries whose debt levels increase tend to carry out fiscal consolidation measures. This result is strongly influenced by the experience of the subsample of countries which, in the run-up to EMU, successfully implemented consolidation measures in the framework of the Maastricht Treaty.

4.3 The determinants of intra-European trade

Endogeneity between trade integration and business cycle synchronization is the most popular source of endogeneity of OCA criteria. Since Frankel and Rose (1998) it has been assessed by using a gravity model. In its origin, the gravity model states that opennes to trade is a function of income, population and transportation cost variables (Anderson, 1979). Traded-goods shares of total expenditure of a country with a partner are hypothesized to increase with income per capita and decrease with country size, and to be negatively affected by remoteness to trade partners (Anderson and Van Wincoop, 2003). At the same time, trading shares are considered to respond to country-specific preferences. When considering the relationship between trade and business cycle synchronization, several variables have been included in order to instrument via exogenous variables such a relationship. Those variables are related to the gravity equation, and include variables representing sources of trade barriers or trade costs as tariffs and taxation in general, exchange-rate system, institutional agreements, geographic characteristics (adjacency, distance), cultural factors (common language) or level of development of the countries involved in the trading relationship (see Anderson and Van Wincoop, 2004, for a comprehensive analysis of trade costs).

Given our endogenous variable, the problem modeled here is slightly different to the typical problem assessed by the literature (Frankel and Rose, 1998, Baxter and Kouparitsas, 2005, or Inklaar et al., 2008, for example). Many of the variables typically used in bilateral analysis and, in particular, some variables from gravity equations cannot be utilized as instruments if aggregated trade data are considered in the analysis, while some others are identified in the fixed country effect from the panel regression specification. Adjacency, distance, common language, or whether a pair of countries belong to the same development status, cannot be considered in the analysis.

Integration status variables:

Several dummy variables are constructed in order to account for formal steps in the process of integration of the countries in our sample. First of all, we will consider the effect of being a member of the eurozone through a dummy variable for euro-membership. Within the group of members of the EMU-12, we consider also the particular benefits to so-called periphery countries (Portugal, Ireland, Greece, and Spain) by means of another dummy variable. We also consider separately the potential effect for less-integrated economies by using another dummy variable for the new EU members from enlargement rounds in 2004 and 2007, taking a value one when the country becomes part of the EU and zero before that. Finally, we

consider the group of the opt-out countries (Denmark, Sweden and United Kingdom) with an additional dummy variable which takes value one from 1999 onwards, when the country is effectively opting-out for the third stage of EMU.

Trade-demand variables:

Two variables are considered in order to control for the demand for traded goods of a country in the EU: income per capita and the size of a country in the EU-25 group. The first one in this category is the logarithm of the trend of real GDP per capita of a country i with respect to the average trend-GDP per capita of the EU-25 in period t. Country-specific smoothed GDP-trends are used which correspond to those estimated via Kalman filter in the time series models used to extract the cyclical component of GDP. The use of such trends avoids any conceptual relationship with the concept of cyclical integration, since by definition those trends are estimated as contemporaneously uncorrelated with the cyclical components used in the computation of the endogenous variable. A second measure concerns the relative size of the country, defined as the logarithm of the population share of the EU group in the given year.[10]

International competitiveness and trade-specialization variables:

We also include in the model two variables can be related to trade competitiveness of a country in the EU framework. In the first place, the dynamics of price differentials are an important determinant of trade intensity and we consider the inclusion of the logarithm of the ratio of Consumer Price Index (CPI) of the country divided by the (mean) EU-CPI.[11] In the second place, we consider the following trade-specialization index:

$$\text{TSPE}_{it} = 1 - \sum_{k} \left[S^{k}_{ieu} - S^{k}_{eu} \right]^{2}, \tag{9}$$

where S^{k}_{ieu} is the share of trade on goods of the kth category as a share of EU-trade of all the groups of commodities. As well as in the case of trade intensity measures, data are available from UN COMTRADE. Groups considered are those of the *Standard International Trade Classification Revision 1* (SITC-Rev. 1): Food and live animals; Beverages and tobacco; Crude materials, inedible, except fuels; Mineral fuels, lubricants and related materials; Animal and vegetable oils and fats; Chemicals; Manufact goods classified chiefly by material; Machinery and transport equipment; Miscellaneous manufactured articles; Commodities and transactions not classified according to kind.

[10]Data on population are sourced from *Eurostat*.

[11]Data on CPI are available from *Eurostat*. Price differentials seem to be a direct measure of price-competitiveness. We make use of price differentials instead of real exchange-rates since the latter is more exposed to endogeneity with cyclical comovements than the former.

Table 4 displays the results of several specifications of European-trade share variable, TS^1, on different combinations of covariates.[12] As can be seen in Table 4, integration-status variables show significant effects on trade intensity. Agreements are partly able to explain differences in intra-European trade. However, not all the status variables show the expected sign. It should be noted that the EMU effect is a negative one: being a member of the monetary union is related to a decrease in the share of European trade. This result is quite surprising and it should be considered with caution. It could capture trade orientation of new EU members towards EU partners during the period previous to the enlargements. This would decrease the share of old EMU members, which changed their European trade focus earlier, when the implementation of the European single market took place. Another finding that allows us to call for caution when reading that contradicting EMU negative effect comes from the negative effect of opting-out for EMU. The impact of joining the EU was significant and positive for trade in new member states, pointing out that trade orientation in the new members coincides in time with reforms implemented close to the date of the enlargement. Finally, the positive effect of being part of the periphery of the EMU is most probably related to the effect of macroeconomic (exchange rate) stability gains of those periphery countries on their trade activity.

GDP per capita shows a positive link with trade, confirming propositions from the gravity literature (see, for example, Anderson, 1979). Population share does not show a significant relationship with trade intensity. If population is considered without the inclusion of GDP per capita (not shown in Table 4), its sign is negative. However, significance is restricted to specifications with a very small number of regressors. Price differentials show a positive relationship with trade intensity when significant. The role of trade specialization is significant in all the specifications considered. Its relationship with trade points out that more specialization induces a gain in European trade participation.[13]

[12]The second European-trade intensity measure defined in (8) was also considered as endogenous variable in this step. However, given the lack of significant impact on our synchronization measure in OLS regressions as those in Table **??** we do not focus on this second measure of trade intensity.

[13]We also included a variable comprising participation in ERM-II and a dummy variable accounting for the geographic advantage of older EMU members close to Eastern Europe, but they were not significant in our relevant specifications. We do not show the results including these variables here but they are available from the authors upon request.

Table 4: Determinants of trade intensity, EU-25 1995-2008

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EMU membership	-0.2648***			-0.1622	-0.0557	-0.1102	-0.1912*	-0.2161**
	(0.0948)			(0.1062)	(0.0941)	0.0912	(0.1038)	(0.0983)
EU enlargement	0.4995***			0.4199***	0.4210***	0.4843***	0.4832***	0.4558***
	(0.0850)			(0.1051)	(0.1057)	(0.1022)	(0.0924)	(0.1016)
Opt-out countries	-0.4500***			-0.3134**			-0.3373**	-0.3802***
	(0.1383)			(0.1481)			0.1470	(0.1394)
EMU Periphery	0.3014***			0.2020	0.1764	0.2128*	0.2337*	0.2283*
	(0.1216)			(0.1250)	(0.1252)	(0.1248)	(0.1226)	(0.1236)
Trend GDP per capita		1.3656***	1.1752***	0.4202	0.5103	0.6816**		0.4992
		(0.3088)	(0.2924)	(0.3333)	(0.3324)	(0.3248)		(0.3284)
Population share		-0.992459						
		(0.9251)						
Price differential			1.1177***	0.4688	0.7233**		0.5483	
			(0.3159)	(0.3534)	(0.3342)		(0.3480)	
Trade specialization			-7.1991***	-7.7708***	-7.9815***	-8.8189***	-7.2833***	-8.2057***
			(2.5909)	(2.5563)	(2.5689)	(2.5548)	(2.5293)	(2.5383)
Observations	350	350	350	350	350	350	350	350
Number of countries	25	25	25	25	25	25	25	25

* (**) [***] stands for significance at the 10% (5%) [1%] level. Dependent variable: trade intensity (TS^1) . Regression includes fixed country effects and year dummies which are not reported. 2-way OLS estimation method.

4.4 The role of fiscal policy and trade integration in business cycle synchronization

The results of the previous sections allow us to identify a set of variables that can be used as instruments in order to account for the endogeneity of trade integration and fiscal policy in our main specification. In particular, we consider the following variables as potential good instruments for these variables: trade specialization, income per capita trends, geographical and institutional dummies (for periphery countries, EU, opting-out, and EMU membership in enlargement rounds) and the political variables which appeared as important determinants of the fiscal policy stance (years remaining of term and share of government votes). The results of the instrumental variable estimation are presented in Table 5.

Table 5: Determinants of business cycle synchronization, IV estimates, EU-25 1995-2008

Variable	(1)	(2)	(3)	(4)
Cyclical component	-0.709***	-0.669***	-0.566***	-0.536*
	[0.206]	[0.225]	[0.218]	[0.320]
Budget surplus	1.224**		0.460**	0.346***
	[0.532]		[0.204]	[0.129]
Trade with EU as % of trade in the EU		0.013**	0.018*	0.023***
		[0.007]	[0.007]	[0.007]
Cyclical component × Budget surplus				0.384
				[9.856]
Observations	302	325	302	302
Number of countries	24	25	24	24

Robust standard errors in brackets. * (**) [***] stands for significance at the 10% (5%) [1%] level. Dependent variable: business cycle synchronization measure. Regression includes country fixed effects and year dummies which are not reported. Instrumental variables estimation with the instruments described in the text.

First of all, the parameter associated to the cyclical component variable is negative and highly significant, pointing out that countries are generally more synchronized during recession periods. The persistent magnitude of this covariate across all the specifications reflects the relevance of cyclical state effects. Secondly, budget surplus shows a positive, significant impact on cyclical synchronization of a country with respect to the EU. Therefore, it is possible to assert the relevance of fiscal consolidation in the SGP framework and the case for fiscal rules limiting national discretionality in fiscal policy measures. Thirdly, trade integration has a positive significant impact on synchronization of a country within the EU context. Moreover, we should remark the magnitude of the effects of fiscal surplus and trade intensity. A change in one standard deviation in the fiscal variable changes the synchronization measure by roughly the same amount as a change in one standard deviation in our trade intensity variable. The interaction term of the budget surplus and the cyclical component loses its significant effect once endogeneity is explicitly addressed. Our results conclude thus that both fiscal policy and trade integration are robust an important determinants of cyclical synchronization in Europe. The importance of fiscal policy coordination and consolidation as a prerequisite for the proper functioning of monetary policy in EMU is further reinforced by our analysis.

4.5 Scenarios for the Austrian economy

Using the estimated model, we turn to analysing different scenarios for the Austrian economy. For that, we create benchmark settings by extrapolating the variables in our model using the average annual growth rate of the fiscal surplus, trade integration and the cyclical component of GDP. Since the period covered by our data includes the first years after joining the EU, we calculate two benchmark scenarios using growth rates which were calculated upon the information of two different periods: 1995-2008 and 2000-2008.

We then construct two counterfactual scenarios, whose deviations with respect to the benchmarks are presented in Table 6. The first one works on the hypothesis of a sharp change in the trade integration indicator. We materialize such a change by assuming that the trade integration measure in 2009 takes the value which would correspond to 2013 in the extrapolation based on in-sample growth rates. The results indicate that the resulting decrease of 0.5% in the economic integration measure would imply a 1% decrease in the synchronization of Austria with the EU. A second hypothesis we are interested in is how the synchronization of the Austrian economy can be affected by changes in the fiscal deficit. In order to answer this question, we consider an increase of 3% in the deficit with respect to the last value in our sample. In this case, the synchronization measure suffers a decrease of 1%.

Table 6: Synchronization scenarios for Austria

Benchmark (average annual growth rate)	1995-2008	2000-2008
Fiscal surplus	0.0038	0.0013
Trade integration	-0.0306	0.0112
Cyclical component	0.0005	-0.0015
First scenario: Change in trade integration		
Percentage change in trade integration	-0.5701	0.2323
Expected percentage change in synchronization	-1.0684	0.4448
Second scenario: Change in fiscal deficit		
Percentage change in fiscal policy	-2.9981	-2.9993
Expected percentage change in synchronization	-1.0408	-1.0412

5 Conclusions

In this piece of research we analyze the role of fiscal policy and intra-European trade in business cycle synchronization in a sample of 25 countries of the EU for the period 1995-2008. There is a broad theoretical framework pointing towards the fact that the relationships between fiscal policy and business cycle comovements and between trade integration and cyclical synchronization are subject to endogeneity problems. We instrument fiscal budget surplus by means of (exogenous) political determinants of fiscal policy acknowledged by the literature, while trade integration is instrumented using covariates which summarize the integration status of countries in the sample, GDP per capita differences with respect to the EU and trade specialization within the EU framework. Our results show that both fiscal policy and trade integration are important determinants of cyclical synchronization. Follow-

ing the arguments in Inklaar et al. (2008), we can conclude that whenever a high degree of trade integration is reached by countries involved in the European integration process, the role of fiscal policy is particularly relevant and differences in fiscal shocks should be analyzed in detail as a source of coherence in cyclical comovements in Europe.

There are some caveats to our analysis that should be taken into consideration. The analysis of cyclical synchronization is plagued with the problem of model uncertainty. Although we have concentrated our analysis on relatively simple models, the literature offers a large number of OCA criteria which could be used accounting for potential sources of synchronization, although finding successful instruments would become a more difficult task as the number of explanatory variables increases. As the number of potential explanatory variables increases, there is more uncertainty about the combination of covariates that would explain better the comovement at cyclical frequencies and methods which are robust to model uncertainty should be preferred for such applications.

There are several important policy implications from our research, in particular in the context of the recent financial crisis. Fiscal deficits are shown to be an important potential source of idiosyncratic macroeconomic fluctuations, specially in the eurozone. To the extent that fiscal objectives are focused on national priorities, their potential harmful effects in the proper performance of the monetary policy could turn the latter into another source of asymmetric shocks. Concerning future enlargements of EMU, our results confirm the rationale of monitoring fiscal developments to assess the adequacy of potential future EMU countries. Although the reformed SGP envisages special conditions under periods of intense recession or crisis, some control upon the national budget developments must be taken into serious consideration in the form of broader fiscal coordination steps in Europe. A proper fiscal harmonization policy should be reconsidered in order to provide a political framework for budget coordination and consolidation, and steps towards a risk-sharing mechanism at the EU level should not be ostracized.

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Appendix A. Data sources

Table 7: **GDP series: Sample and sources**

Country	**Sample period**	**Source**
Austria	1960q1-2008q4	OECD
Belgium	1960q1-2008q4	OECD
Bulgaria	1994q1-2008q4	Eurostat
Cyprus	1994q1-2008q4	Eurostat
Czech Republic	1990q1-2008q4	OECD
Denmark	1966q1-2008q4	OECD
Estonia	1993q1-2008q4	Eurostat
Finland	1960q1-2008q4	OECD
France	1960q1-2008q4	OECD
Germany	1960q1-2008q4	OECD
Greece	1960q1-2008q4	OECD
Hungary	1991q1-2008q4	OECD
Ireland	1960q1-2008q4	OECD
Italy	1960q1-2008q4	OECD
Latvia	1990q1-2008q4	Eurostat
Lithuania	1995q1-2008q4	Eurostat
Luxembourg	1960q1-2008q4	OECD
Netherlands	1960q1-2008q4	OECD
Poland	1965q1-2008q4	OECD
Portugal	1960q1-2008q4	OECD
Slovenia	1992q1-2008q4	Eurostat
Slovak Republic	1993q1-2008q4	Eurostat
Spain	1960q1-2008q4	OECD
Sweden	1960q1-2008q4	OECD