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Has Integration Promoted Business Cycle Synchronization in the Enlarged EU?

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Abstract

This paper examines whether European integration, manifesting itself in increased trade and FDI linkages, new specializations and economic policy coordination, contributed to the synchronization of business cycles in the enlarged EU. We estimate the effects on bilateral growth rate correlations in 1995-2008 in a simultaneous equations model which permits to model endogenous relationships and unveil direct and indirect effects. Trade and FDI prove to have a strong impact on synchronization, specifically between incumbent and new EU members. More coordinated fiscal policies and, particularly in EU 15, the alignment of monetary policies promoted synchronization. Nevertheless, flexible exchange rates remained important adjustment instruments for the new member states. Increasing manufacturing specialization is not counteracting synchronization. The achieved EU income convergence, a declared objective of EU policy, supported business cycle synchronization.

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1 Introduction

Over the past decade we watched an increasing synchronization of business cycles in the EU, among the incumbent EU members and also between EU15 and EU12 (the new members joining in 2004/07). At the same time, economic integration has been fostered significantly, in the past few years apparently most for the recently acceding countries.

The Single Market has manifested itself in a major increase of intra-EU trade and FDI in EU27. While these linkages have become intensive in EU15 already during the 1990s, EU12 countries have developed their trade and FDI relations with EU15 fairly fast since the end of the 1990s so that it has become their principal trading partner and investor. However, economic integration has developed further. The majority of EU countries have adopted a common monetary policy and introduced the Euro. Individual fiscal policies watch constraints imposed by the Stability and Growth Pact. Despite increasing economic integration and policy coordination the EU is, however, still facing important income disparities between its members, in particular since the 2004/2007 enlargement.

All these developments are factors that potentially influence the synchronization of business cycles. The issue of synchronization of business cycles is an important concern for EU policy makers since a co-movement is a prerequisite for a common monetary policy and determines whether a coordinated or a more individual fiscal policy is appropriate.

The recent economic crisis demonstrated that a strong synchronization of business cycles is present in the EU. The economic crisis has affected all EU15 members at practically the same time and with only a short delay the EU12. Thus the European Central Bank and EU economic policy makers had to face a fairly synchronized drop in GDP growth rates, although the magnitude of the recession varied.

A natural question that arises is to what extent economic integration has contributed to this synchronization. The key areas of integration are factors which have been identified by the business cycle literature as potential determinants of business cycle co-movement for other or similar countries:

- Trade between EU members is considered as a major channel of transmission of growth (Frankel and Rose, 1998). Trade integration is thus probably an important factor of business cycle synchronization. In the recent economic crisis, trade with the EU was largely considered responsible for the spread of the economic crisis to EU12. However, empirical findings suggest that the synchronizing effect of trade depends on the characteristics of

trade and its trading partners (Frankel and Rose, 1998; Kose et al., 2003).

- The extensive FDI linkages that have established in the EU15 and recently between EU15-EU12 may constitute another channel of transmission of growth and thus a source of business cycle synchronization according to the findings of Jansen and Stokman (2004) and Dées and Zorell (2011). While there are arguments that FDI, e.g. FDI in financial services and in production networks, may propagate shocks (e.g. Kröger et al., 2010), others propose that investors search to diversify risk which produces decoupling effects (Backus et al., 1992).

- A coordinated and common monetary policy may lead to similar developments in GDP growth - an effect often attributed to the EMS in the run-up stage of EMU (Artis and Zhang, 1997). However, in the case of poorly synchronized business cycles a common monetary policy may even increase diverging trends and individual exchange rate and monetary policies may better contribute to business cycle synchronization (Siedschlag and Tondl, 2011).

- A similar argument can be raised with coordinated fiscal policy. This fosters business cycle synchronization, but less policy coordination may also serve to bring diverging business cycles closer to each other. This point was made e.g. Clark and van Wincoop (2001).

- Different sectoral specialization may impede synchronization of business cycles due to different demand shocks. This argument is generally supported in empirical studies (Imbs, 2006; Siedschlag, 2010). It is, however, also possible that specialization represents complimentary productions so that this effect is not found (Clark and van Wincoop, 2001).

- Finally, the question arises whether economies with deep income differences mirroring differences in economic and institutional structures are less likely to show common business cycles.

While there is an elaborated literature on the empirical effects of trade, coordinated exchange rate policies and sectoral similarities on business cycle synchronization in the EU (see for example Clark and van Wincoop, 2001; Siedschlag and Tondl, 2011, for its enhancing effect on business cycle synchronization in the EU), the empirical literature has largely neglected the effects of FDI linkages, fiscal policy coordination, and income disparities. This study wishes to fill this gap in the literature and examine also the effect of these factors since they are particularly important

in the EU both as real achievements of integration as well as EU policy targets. Policy makers should know to which extent FDI linkages determine business cycle synchronization, whether the declared objective of EU's cohesion policy, income convergence, serves indirectly to achieve more synchronization, and if more coordinated fiscal policies are desirable in this context.

Our indicator of interest is the synchronization of bilateral business cycles within the EU27. Since we do not have long time series on growth rates we use as an indicator of business cycle synchronization the correlation of bilateral output growth rates for 5-year rolling windows as employed for example in García-Herrero and Ruiz (2008) and Darvas and Szapry (2008). Then we estimate the effect of bilateral trade and FDI, bilateral exchange rate volatility, bilateral differences in fiscal policies, dissimilarities in economic specialization and income differences on growth correlations. We conjecture that the relation between these factors and growth correlation differ among countries in EU15, EU15-EU12, i.e. a group comprising country pairs with one from EU15 and the other from EU12, and among country pairs in total EU27. While in EU15 we find fairly similar economies which have experienced economic integration for a considerable time, country pairs in EU15-EU12 are still less integrated and show considerable differences in economic development. The EU27 is confronted with both similar and quite dissimilar economies. Our period of investigation covers business cycle correlations in the period 1995-2008 which permits us to examine 351 cross-sections and almost 5000 observations in the full sample.

The hypothesized relations between business cycles synchronization and the indicated explanatory factors can be assumed to reveal simultaneity. For example, trade will foster growth correlation but, on the other hand, more synchronized growth will also foster trade between countries. This simultaneity may arise as well with further variables. Furthermore, the explanatory variables may be interdependent, e.g. trade may enforce specialization and vice versa. To account for the manifold and simultaneous relationships, we will use a model of simultaneous equations as applied in Imbs (2004), Fidrmuc et al. (2010), Siedschlag and Tondl (2011) and Dées and Zorell (2011). This permits us to observe direct and indirect effects of the explanatory variables, i.e. those running via another variable, as well as reverse causalities. In contrast to the existing applications we permit for a highly complex set of endogenous relationships including all our 7 variables. Thus we can find additional interesting indirect effects not yet discovered in the literature, given for example by the interdependence of FDI, trade, specialization and income disparities.

In our descriptive analysis we observe that growth correlations have grown in EU27 but are

still distinctly lower than in EU15. Our estimations show that the established trade integration is the key factor promoting the convergence of business cycles in EU27. In the second place, we find that FDI linkages have a strong impact as well. However, we will show that this applies for vertical FDI only. The limitation of exchange rate volatility, partly by EMU membership, has been the most important determinant of the achieved high business cycle synchronization in EU15. For some parts in the Union, in contrast, flexible exchange rates serve as an adjustment mechanism. The reduction of divergent fiscal policies has contributed to business cycle synchronization in EU27. Income disparities are paired with less synchronization. Among the most important indirect effects is the effect of FDI on business cycle synchronization via its stimulation of trade.

The rest of the paper is structured as follows: Section 2 proposes our hypotheses and discusses the findings in the literature. Section 3 gives the model specification for our estimations. Section 4 describes the variables, section 5 provides some empirical facts, section 6 presents the results and section 7 concludes.

2 Theoretical aspects, findings in the empirical literature and hypotheses

In the business cycles literature an important issue is to analyse whether business cycles are synchronised among economies. To examine synchronisation of business cycles one looks at the correlations of the cyclical components of output or the correlation of output growth. Since the period covered by our data stretches from 1995-2008 we cannot decompose the output into cyclical components. We will therefore look at the correlation of growth rates in 5 year rolling windows. We should also emphasize that we consider bilateral growth correlations and explain them by bilateral linkages and policy differences. This permits us to obtain richer information from the data set which is limited in its time coverage.[1]

The principal channel for the transmission of business cycles considered in the literature is trade flows. Frankel and Rose (1998) were among the first to argue that increased trade linkages resulting from economic integration would result in increased business cycle synchronization as trade links serve as a channel for the transmission of shocks across countries. Put differently, demand shocks are transmitted between countries via trade relations. Intensive trade relations

[1] An alternative possibility would be to look at the correlation of growth rates with the average EU growth as in Siedschlag and Tondl (2011). Evidently this provides far less observations.

among countries may lead to an export or import of business cycles caused by demand fluctuations, since changes in income in one country will typically also induce changes in demand for foreign goods. Among highly integrated economies like the EU, BC transmission through trade will be very important. In growth periods, demand spells to trading partners via stronger import demands. Contracting demand, in turn, affects the trading partner via decreasing imports. Clark and van Wincoop (2001) and Siedschlag and Tondl (2011) have verified the positive effect.[2]

Rooted in the ideas of McKinnon (1963), Frankel and Rose (1998) proposed the endogeneity of trade with respect to currency areas. Countries are more likely to intensify in trade and thus in BC synchronization if being members of a currency area, i.e. under fixed exchange rates. Siedschlag and Tondl (2011) found that trade in EU15 is enhanced through specialization.

Trade flows could induce increased specialization of production thus affecting business cycle correlation indirectly. If stronger trade linkages are associated with increased inter-industry specialization across countries, and industry-specific shocks are important in driving business cycles, then business cycle synchronization might be expected to decrease (Kose et al., 2003).

We propose that trade must have become a particularly important channel for business cycle transmission in the enlarged EU and that trade itself, apart from monetary policy coordination and specialization, is determined by FDI linkages between EU countries and similarity in income levels. Furthermore, we shall consider whether trade produces indirect effects on specialization and FDI. As an indicator for trade relations between countries we consider their bilateral trade flows related to their GDP.

Another channel for business cycle transmission may be given by the FDI linkages between economies. FDI takes place due to different motives. FDI may be of the type of market-seeking FDI in the EU. A financial services affiliate of a UK company operating in another EU15 country or in EU12 may serve as a typical example. This type of FDI wishes to exploit foreign markets in order to diversify the business. Companies may even search FDI destinations with a different growth trend to diversify risk. Following Devereux and Yetman (2010) we can argue that the performance of the affiliate will affect the mother company, either through registered profits or losses which will lead to more or less investment activity at home. A particular example is financial sector FDI. In case of a crisis and credit defaults in the host economy, the mother company may encounter solvency problems which in turn affect the credit volume in the home

[2]Fidrmuc (2004) and Fontagné and Freudenberg (1999) test explicitly the impact of intra-industry trade to promote BC synchronization.

country (Kröger et al., 2010). Thus FDI can propagate shocks. In summary, with market-seeking FDI the business activity of the mother company will be affected by the performance of the affiliate either with the same cyclical pattern or anti-cyclical depending on how synchronized economic growth is in the host economy. Consequently, market-seeking FDI either promotes or reduces business cycle synchronization. The second major type of FDI is vertical FDI. Here a part of the production process is transferred to another country in concern for labour costs and other costs. The affiliate and the mother company are linked intensively by trade flows of intermediates. Consequently, during the recent economic crisis, the decline in demand for automotives in Germany was translated into a falling demand for components produced in German owned affiliates in Slovakia. Vertical FDI may thus constitute a major channel for business cycle transmission. In a different vein, Backus et al. (1992) and Fidrmuc et al. (2010) argue that FDI can be based on the comparative advantage of the host country and thus enforce specialization which decreases synchronization.

The empirical literature on the role of FDI - and not other financial linkages - on business cycle synchronization remains limited and is rather indecisive. Jansen and Stokman (2004) look at synchronization of cycles in major OECD countries and find that FDI constitutes no channel for business cycle synchronization prior to 1995, which changes thereafter. Dées and Zorell (2011) show that it still remains difficult to disentangle a direct relationship between bilateral FDI linkages and output correlations. While no such significant direct relationship exists for the OECD countries, the relation becomes significantly positive for the EU25 countries. Imbs (2004, 2006) finds a positive direct relation between FDI linkages and output correlation in a worldwide sample. In addition, Imbs (2004) and Kalemli-Ozcan et al. (2003) found that FDI affects business cycle synchronization indirectly via its effects on specialization.

Given that FDI has become important within EU15 as well as between EU15 and EU12 and that there is few and inconclusive literature, we are interested in whether FDI has an impact on business cycle correlations in different country blocks of the EU. Furthermore, since the literature does not consider the endogeneity of FDI and since we wish to disentangle between the different types of FDI to shed light on the conflicting results in the literature, we shall model the determination of FDI and its indirect effects explicitly in our simultaneous equations approach. In particular we shall consider the effect of FDI on trade and specialization. As an indicator for FDI linkages we consider the sum of FDI stocks between a pair of countries related to their GDP.

The correlation of business cycles will also be influenced by a number of other factors:

coordination of monetary and fiscal policy, similarity of economic structures (Clark and van Wincoop, 2001; Inklaar et al., 2008) and - as we propose - the income differences which are representing an array of institutional differences.

Coordinated monetary policies, as within the European Monetary Union (EMU) or if central banks pursue similar interest rate policies, will introduce time-equivalent expansionary or restrictive effects on economic activity. Moreover, as argued in McKinnon (1963) and found in Rose (2000), with fixed exchange rates there will be the indirect effect that trade relations will evolve more smoothly. As an indicator for coordinated monetary policy we consider the exchange rate volatility between a pair of countries. Given that the members of the Eurozone have grown in number over the past decade, we will benefit from significant variation in the data both across our bilateral cross-sections as well as over time. We conjecture that monetary policy coordination promotes business cycle synchronization.

Similar fiscal policies, as imposed by the Stability and Growth Pact to EU members, or e.g. with similar fiscal promotion packages during the recent economic crisis and the common consolidation efforts thereafter, should support synchronization of business cycles. Economies pursuing similar fiscal policies are thus likely to have similar business cycles. In practice, we find a significant degree of variation in fiscal policies among EU members despite the stability and growth pact. Thus we are interested in whether this has a negative impact on business cycle synchronization. As an indicator for similarity of fiscal policies, we consider the difference in budget deficits between a pair of countries.

In accordance with the arguments of Kenen (1969), the business cycles literature has also highlighted the importance of sectoral similarity for synchronization (e.g. Imbs, 2004, 2006). Countries with similar economic structures are likely to be affected by similar demand shocks while countries with dissimilar structures will watch a different timing of demand shocks. Sectoral dissimilarity between countries is supposed to result in different business cycles. As found in Siedschlag and Tondl (2011), specialization has also an indirect positive effect via trade. Here we shall also examine its indirect effect on FDI. We shall look at the impact of manufacturing specialisation as well as specialisation including the service sector.

Finally, we are interested in seeing whether income differences in the EU have an effect on business cycle convergence. Countries with very different per capita incomes are likely to have different economic policies and different institutional frameworks. Empirically, this point has hardly been investigated. Louis and Tozman (2010) found that countries in the same income group are more likely to show similar business cycles. Since the reduction of income disparities

is a declared objective of the EU, pushed by its heavily funded regional policy, we are interested in learning whether the reduction of income disparities in the EU also contributes to business cycle synchronization. Furthermore, we expect income disparities to determine FDI flows, trade intensity and specialization and thus to produce indirect effects. We shall also explain income differences explicitly in our model and examine in a Heckscher-Ohlin spirit whether trade reduces income disparities and what is the role of government spending.

The effects of the direct and indirect channels will be evaluated according to the methodology discussed in the following section.

3 Model specification

We build on Imbs (2004) and follow Siedschlag and Tondl (2011) and estimate a system of simultaneous equations which, however, is far more complex than in the existing studies in the literature. The bilateral correlation of output growth is explained by 6 variables which are all considered to be endogenous so that each is modelled within the system separately. In this way we can examine a variety of diverse indirect effects, that is, those working through another variable. Since each variable is itself explained by two to six other endogenous variables plus exogenous variables, the variables are very well defined by this complexity. This is confirmed by a high explanatory power of the estimations, as we shall see below.

We estimate the proposed effects in the following simultaneous equations model in different samples: the EU15, EU15-EU12 and the full sample EU27.

$$
\begin{aligned}
CORRY_{ijt} &= \alpha_1 FDI_{ijt} + \alpha_2 TRADE_{ijt} + \alpha_3 GOVDEF_{ijt} + \alpha_4 EXCH_{ijt} + \alpha_5 SPEC_{ijt} \\
&\quad + \alpha_6 DGDPPC_{ijt} + \mu_{1ij} + \lambda_{1t} + \varepsilon_{1ijt} \qquad (1) \\
FDI_{ijt} &= \beta_1 CORRY_{ijt} + \beta_2 TRADE_{ijt} + \beta_3 SPEC_{ijt} + \beta_4 DGDPPC_{ijt} + \beta_5 I_{1ijt} \\
&\quad + \mu_{2ij} + \lambda_{2t} + \varepsilon_{2ijt} \qquad (2) \\
TRADE_{ijt} &= \gamma_1 CORRY_{ijt} + \gamma_2 EXCH_{ijt} + \gamma_3 SPEC_{ijt} + \gamma_4 FDI_{ijt} + \gamma_5 DGDPPC_{ijt} \\
&\quad + \gamma_6 I_{2ijt} + + \mu_{3ij} + \lambda_{3t} + \varepsilon_{3ijt} \qquad (3) \\
SPEC_{ijt} &= \delta_1 TRADE_{ijt} + \delta_2 FDI_{ijt} + \delta_3 DGDPPC_{ijt} + \delta_4 I_{3ijt} + \mu_{4ij} + \lambda_{4t} + \varepsilon_{4ijt} \qquad (4) \\
GOVDEF_{ijt} &= \zeta_1 CORRY_{ijt} + \zeta_2 DGDPPC_{ijt} + \zeta_3 I_{4ijt} + \mu_{5ij} + \lambda_{5t} + \varepsilon_{5ijt} \qquad (5) \\
EXCH_{ijt} &= \eta_1 CORRY_{ijt} + \eta_2 GOVDEF_{ijt} + \eta_3 DGDPPC_{ijt} + \eta_4 I_{5ijt} + \mu_{6ij} \\
&\quad + \lambda_{6t} + \varepsilon_{6ijt} \qquad (6) \\
DGDPPC_{ijt} &= \theta_1 TRADE_{ijt} + \theta_2 GOVDEF_{ijt} + \zeta_3 I_{6ijt} + \mu_{7ij} + \lambda_{7t} + \varepsilon_{7ijt}. \qquad (7)
\end{aligned}
$$

$CORRY_{ijt}$ is the correlation of GDP growth between a pair of EU countries i and j over t time periods. FDI_{ijt} refers to the bilateral FDI stocks of the two countries related to the sum of their GDP; $TRADE_{ijt}$ is the external trade between the two countries related to the sum of their GDP; $GOVDEF_{ijt}$ is the differential in general government deficit between the two countries as an indicator for fiscal policy coordination; $EXCH_{ijt}$ refers to the volatility of the bilateral exchange rate as an indicator for the presence or absence of a common monetary policy regime; $SPEC_{ijt}$ is an index showing the similarity in sectoral structures between the two countries (based on manufacturing sectors) and differences in economic development $DGDPPC_{ijt}$. The term μ_{ij} refers to the fixed effects relating to a pair of countries and λ_t to time-specific fixed effects.

Besides the principal equation, the system consists of 6 auxiliary equations which capture the simultaneity contained in equation (1). In equation (2), bilateral FDI is explained by $CORRY_{ijt}$, the correlation of growth, $TRADE_{ijt}$, the bilateral trade share, $SPEC_{ijt}$, differences in specialization, $DGDPPC_{ijt}$, the differences in per capita income, and a set of exogenous variables among them the interest rate differential ($SINT$), wage differences ($WAGE$) and the size of the market ($SGDP$). This should permit us to find out to what extent FDI follows the motives of risk diversification ($CORRY$ and $SINT$), whether it goes to differently developed markets ($DGDPPC, WAGE$), follows comparative advantages ($SPEC$) and is market-seeking ($SGDP$).

Equation (3) explains trade by the correlation of growth, the exchange rate volatility, the similarity of economic structures, the intensity of FDI linkages between partners, differences in economic development and a set of exogenous variables, among them the institutional variables differences in regulatory quality (REG) and rule of law (ROL). This should permit us to see whether the common monetary policy strengthens trade flows (negative coefficient of $EXCH$), whether trade is of inter- or intra-industry type (positive or negative coefficient of $SPEC$ and $DGDPPC$) and whether FDI is enforcing trade so that we can assume the presence of vertical FDI.

Equation (4) explains specialization by the bilateral trade share, the intensity of FDI linkages, differences in economic development and a set of exogenous variables, among them the sum of the income level of the partners ($SGDPPC$) and the differential of institutional quality indicators (POL, REG, ROL, ACC). We assume that specialization increases with trade intensity, that FDI enforces specialization, that specialization mirrors differences in economic development (positive coefficient of $DGDPPC$ and institutional differences and negative coefficient of $SGDPPC$).

Equation (5) explains government deficit differentials by the correlation of growth, differences in economic development ($DGDPPC$) and exogenous variables, among them the long term interest rate differential ($LINT$) and the differential in government efficiency ($GOVEFF$). We assume thus that large differences in fiscal policy in the EU are invoked by different business cycles, appear between partners with different lending costs, that they are more found with unequally developed EU countries and big differences in government efficiency. In other words, we expect that the poorer EU member states have higher government deficits.

Moving to Equation (6), the volatility of the bilateral exchange rate is explained by the correlation of growth, government deficit differentials, differences in economic development and an exogenous variable, the inflation differential ($INFL$). We expect that exchange rate volatility appears between countries with different business cycles, in countries with high government deficits, high inflation and poorer ones.

Finally, Equation (7) explains differences in economic development by the bilateral trade share, government deficit differentials and a set of exogenous variables containing institutional differences (POL, REG).

For the system to be identified it is necessary that for each endogenous variable in an equation an equal number of exogenous variables differently from the exogenous in the same equation is present in the other equations. Thus each equation requires a different set of exogenous variables

(Wooldridge, 2006).

4 Data and variables definition

We use national level macroeconomic data from various sources, among them Eurostat, the Ameco database, IMF and national central banks. All variables are bilateral and are constructed as rolling windows. The detailed definition of variables and its sources are given in Table 1.

Financial linkages between two partners are represented as the sum of bilateral assets (FDI stocks) related to the sum of GDP of the two countries, a measure also applied in Fidrmuc et al. (2010) and García-Herrero and Ruiz (2008). FDI was the most challenging variable because of the necessity to work with bilateral FDI stocks. We used in general data on FDI outward stocks. Since the data has missing data points due to confidentiality requirements we had to intra- and extrapolate the data starting from the trend observed in the series and extending according to the structure of higher level aggregates.

Among the various measures for bilateral trade linkages proposed in the literature we use the bilateral trade flows related to the sum of GDP of the partners as used, for example, in Frankel and Rose (1998), Fidrmuc (2004) and Siedschlag (2010) which we found more convincing than the measure relating bilateral trade of the partners to total worldwide trade of both partners as suggested in Imbs (2004) and Fidrmuc et al. (2010). Having the GDP sum in the denominator establishes a relationship with the size of the economies, while this would not necessarily hold when the measure of bilateral trade is related to the total trade volume.

For specialization, as in Imbs (2004) or Siedschlag and Tondl (2011), we use an indicator proposed by Krugman (1991). Our specialization index focuses on specialization in manufacturing based on 23 manufacturing industrial branches. Since we regard trade in goods it seems logical to base the indicator for specialization on manufacturing and not other branches.[3]

5 Empirical facts

Before turning to the results of our estimations, we will look at the trends of the main variables in the different subsamples, EU15, EU15-EU12 and EU27 in Figures 1 - 7. For simplicity the

[3]Other authors regard specialization with respect to all economic sectors, e.g. Siedschlag (2010) considers 6 sectors of the whole economy, Clark and van Wincoop (2001) uses an indicator with 8 non-manufacturing and 8 manufacturing industries.

time scale in these figures refers to 1997, 1998,..., 2006, representing however the 5-year averages corresponding to 1995-1999, 1996-2000, etc.

Figure 1 shows the development of correlations in GDP growth rates. Evidently, growth correlations are highest in the group EU15, reaching a correlation of 0.8 in 2004-2008 against 0.6 in the EU as a whole. Nevertheless, correlations in EU15 showed a decreasing trend for the observations 2000-2005 with a drop in the observation 2003, i.e. in the period 2001-2005. In contrast growth correlations showed a more constant increasing trend in EU15-EU12 and EU27. The decline of correlations in the 2003 observation appears as a distinct feature with all countries. A look at the data shows that growth after the 2001/2002 stagnation accelerated with a different timing, stagnated in some countries altogether and saw a second interim stagnation in a few of them. This explains the drop in growth correlations in the observation 2003. The impressive, steady increase of growth correlations in EU 27 from virtually nothing in 1995-1999 to 0.6 is particularly noteworthy.

Figure 2 shows that bilateral trade intensity (bilateral trade as share of both countries' GDP) is twice as high in EU15 than in EU27 and trading intensity between EU15-EU12 partners are only one fourth of that in EU15. Trade intensities, i.e. trade integration, shows a constant upward trend in all subgroups with similar growth rates.

Figure 3 shows that bilateral FDI linkages (bilateral FDI stocks as share of both countries' GDP) have rapidly increased in the period concerned. The increase was more pronounced until the observation 2002 than thereafter. Again the FDI linkages are most intensive among EU15 member states, being more than 4 times as high in EU15 than with EU15-EU12 partners.

Consequently, we see that in total EU27 bilateral trade and FDI linkages vary to a considerable extent, comprising country pairs with intensive and very weak linkages.

Figure 4 shows the differential in government deficits, our indicator for dissimilarity in fiscal policies. The trends of this indicator are opposed with countries in EU15 and in EU15-EU12. Differences in budget deficits have increased throughout the period in EU15, with a short period of stability with the observations 1999, 2000, 2001, the introductory stage of the Euro. In contrast, differences in budget deficits have increased between country pairs of EU15-EU12 until the observation 1999 and have decreased sharply thereafter, reaching in 2006 a distinctly lower level than in EU15. As a result, we watch in total EU27 a slow decline of differences in budgetary deficits since the observation 1999.

Exchange rate volatility (see Figure 5) has decreased in the EU over the whole period. It was three times as high in EU15-EU12 than in EU 15 in the period 1995-1999, but is only twice

as high since the observation 2000.

Manufacturing specialization has seen interesting changes in EU27 (see Figure 6). Manufacturing specialization has declined in the early part of our observation period in EU15-EU12 and EU27, and increased after a period of stability in the recent period. This indicates an important structural change in the new member states. First the old specialization was dissolved, then countries have specialized in new productions. In EU15 we observe a modest increase in manufacturing specialization with a strong increase in the last periods.[4] Figure 7 shows the differences in per capita income which are a multiple between countries in EU15-EU12 if compared within EU15. Income differences in EU15-EU12 and in total EU27 have declined in the period concerned while there was a slight increase in EU15.[5]

6 Results

Table 2 shows the results of our estimations for EU15, EU15-EU12 and for the EU27 as a whole. The results for Eurozone 12 are very similar to EU15 and are therefore not reported.

We find a positive and significant coefficient with trade linkages and specialization in all samples. Both factors have a positive impact on the correlation of growth, but trade is definitely the most important factor in the EU that promotes business cycle synchronization. It increases the correlation of growth by a factor of 0.8 in EU15, by a factor of one in EU27 and of 2.4 in EU15-EU12.

The impact of trade linkages on business cycle synchronization confirms the results found in the literature for EU15 (e.g. Clark and van Wincoop 2001; Siedschlag and Tondl 2011), OECD countries (e.g. Fidrmuc 2004) and worldwide samples (e.g. Imbs 2004; Calderón 2003). We can verify that this result also holds for the EU15-EU12 relation, being even particularly pronounced here. The positive effect of trade among EU15-EU12 members is most noteworthy. It indicates that trade integration of the new EU members in the course of enlargement has been a major source to get their business cycles more synchronized with the EU incumbents. This, however, explains also that the new EU members have suffered immediately from decreasing

[4] Alternatively, we have employed a specialization indicator with 6 industries including manufacturing and non-manufacturing industries based on Eurostat data. With that indicator, specialization is generally less pronounced. It is also distinctly higher in EU15-EU12 and EU27 than in EU15. Despecialization in EU15-EU12 followed by renewed specialization appears also with that indicator and specialization in EU15 increases smoothly over the period.

[5] Note that this picture appears as well if using GDP per capita in PPP as a basis of the indicator.

export demand in the EU15 during the recent crisis which translated into a drastic fall in GDP.

The equation on $TRADE$ shows that economies with higher correlated growth rates and intensive FDI linkages trade more with each other. The estimations show that FDI has a high trade enhancing effect in the EU. An increase in bilateral FDI intensity of one per cent translates into an increase of bilateral trade intensity by 0.2 per cent in EU15 and EU27 and by 0.5 per cent in EU15-EU12. This indicates that vertical FDI is particularly important between EU15 and EU12 countries. In each group several trade patterns appear. On the one hand we find that trade in the EU is not focusing on countries with big income differences. Furthermore, the negative coefficient of specialization in EU15 and EU27 indicates that countries with strong trade relations have similar sectoral structures. Thus one type of trade represents intra-industry trade between equally developed countries. On the other hand, the linkage of trade to FDI, the positive coefficient of specialization in EU15-EU12 and the positive coefficient of institutional disparities indicate that another part of trade takes place between unequally developed countries with different specializations. This type of trade can be interpreted as inter-industry trade. Finally, we see that exchange rate volatility discourages trade in EU15 and EU27 as a whole.[6]

In our system of simultaneous equations we can also observe the indirect effects of the channels and determinants of business cycle synchronization. With respect to trade, we see that trade affects both FDI and specialization (see equations FDI and $SPEC$). Thus we find indirect effects of trade via FDI and specialization. Trade has a negative effect on business cycle synchronization via FDI. It has a negative effect via specialization in EU15 and a positive in EU15-EU12 (see Table 3). However, the net effect of trade on business cycle synchronization remains positive and particularly strong with EU15-EU12.

The positive coefficient of sectoral specialization is opposite to the finding elsewhere in the literature (e.g. Imbs 2004; Siedschlag 2010), who find a negative relationship, and Clark and van Wincoop (2001), who find no significant relationship). One explanation for this is certainly the difference in the specialization indicator employed. Our indicator is based on 23 manufacturing branches whereas the other studies use a sectoral decomposition at a higher aggregation level.[7]

[6]This result corresponds with Frankel and Rose (1998) who suggest that decreasing exchange rate volatility encourages trade and argue that this indicates the endogeneity between trade and currency areas.

[7]Clark and van Wincoop (2001) use 8 manufacturing sectors and 8 non-manufacturing branches and Siedschlag (2010) uses 6 branches of the total economy for her specialization indicator. As mentioned in section 5, we used also an alternative specialization indicator covering 6 manufacturing and non-manufacturing sectors for robustness checks. In this case we found an insignificant coefficient of specialization. However, the specialization variable based on all sectors of the economy and not only on manufacturing sectors resulted in less clear results in the

Thus despite specialization, the dominant products produced in the two specialized countries may be complementary so that specialization does not imply specific demand shocks. Another explanation is that our investigation covers more recent data than the above studies.[8] Our indicator of specialization indicates increasing manufacturing specialization in these recent years (see section 5). Nevertheless, the size of the direct effect of specialization is not particularly large. As shown in Table 3, specialization increases business cycle synchronization by a factor of 0.04 in EU15, 0.02 in EU15-EU12 and 0.015 in EU27.

The equation on $SPEC$ gives more information on what explains specialization in the EU. Most pronounced is the effect of FDI linkages on specialization. We find a positive and significant coefficient in all samples, although the specialization impact of FDI is highest in EU15-EU12. Increasing FDI linkages between the two EU parts have evidently resulted in enforced manufacturing specialization. Also increased trade relations have resulted in higher specialization between the two regions. In contrast, our results indicate that countries with intensive trade linkages in EU15 do not show distinctly different specializations. As in Imbs (2004) we find a positive coefficient of income differences in EU15-EU12 and EU27. Specialization thus appears between unequally developed economies. The positive coefficient of institutional variables and the negative on the sum of income further supports this point. We find that specialization also has indirect effects on business cycle synchronization via FDI and trade. Specialization triggers FDI and thus results in a negative indirect effect (see Table 3). Furthermore, since trade involves largely countries with equal specialization in EU15, but with different specialization in EU15-EU12, we observe a negative indirect effect via trade in EU15 and a positive in EU15-EU12. In summary, the net effect of specialization on business cycle synchronization remains positive.

With respect to bilateral FDI linkages we find a negative coefficient with EU15-EU12 (and the Eurozone, not reported in the table) and EU27 and a negative but insignificant coefficient with EU15. This suggests decoupling effects arising from FDI in the EU. If considering the pure direct effect, FDI linkages do not lead to enforcing growth spillovers between the two partners, rather the opposite. FDI holdings may thus smoothen demand shocks.

How can we explain this decoupling effect? Looking at the auxiliary equation that explains bilateral FDI stocks, we see that there is a significantly negative coefficient of growth correlations

auxiliary equations and an unsatisfactory fit of the specialization equation.

[8] Clark and van Wincoop (2001) look at the period 1970-1993, Siedschlag (2010) investigates the period 1990-2003.

in explaining FDI stocks in all samples.[9] This indicates that FDI searches destinations which do not exhibit the same growth path, in other words much of this FDI searches to diversify risk and benefit from differently developing markets. This explanation is further supported by the positive coefficient of short-term interest rate differences. Moreover, FDI seems to search destinations with a different income level in EU27 and EU15. (The negative coefficient in EU15-EU12 suggests that FDI avoids the new member states at the lower income range). A significant part of FDI seems to search markets with a different income level and different growth forecasts. Thus we have evidence for a strong weight of market seeking, risk diversifying FDI. However, we also find in EU15 and EU27 that big wage differences discourage intensive FDI holdings. This indicates that some part of FDI takes place between equally developed partners. In EU15-EU12 a positive coefficient on the sum of GDP suggests that FDI linkages are much more developed between big economies in this group. Evidently, FDI linkages are higher between countries with strong established trade links, as the positive coefficient of trade suggests.

Finally, we find also a positive coefficient of specialization in the FDI equation of all samples. This suggests that in contrast to the market-seeking, risk diversifying FDI, FDI also follows competitive advantages of countries in certain sectors. This type of FDI would represent vertical FDI where a part of the production is transferred to another country. The fact that a part of FDI represents vertical FDI is confirmed by the throughout positive coefficient of FDI in both the TRADE and SPEC equation. Vertical FDI increases trade flows and enforces specialization - the latter result is also found in Imbs (2004). This is particularly pronounced in EU15-EU12. Thus we find positive indirect effects of FDI on the synchronization of business cycles. Looking at Table 3 we see that the indirect effects of FDI lead to a net positive effect of FDI in EU15-EU12 and EU27 which is particularly high in EU15-EU12. Several empirical studies found a positive direct impact of FDI on business cycle synchronization (Imbs, 2004; Jansen and Stokman, 2004; Dées and Zorell, 2011). While Jansen and Stokman (2004) looks at a set of 6 advanced OECD countries, Imbs (2004) covers 24 developed and developing countries and Dées and Zorell (2011) 25 EU countries. In contrast, García-Herrero and Ruiz (2008) investigate the synchronization of the business cycle of Spain with 109 countries worldwide and find a negative relationship. The studies finding a positive coefficient of FDI cover either older time periods and different samples than our study (Imbs 2004: 1980-2000, Jansen and Stokman 2004: 1982-2001) or have a simpler econometric specification which does not account for the endogeneity of FDI (Jansen and Stokman, 2004; Dées and Zorell, 2011). Furthermore, none of these studies consider the

[9]This is also true in the Eurozone. Results for Eurozone are not reported but are available upon request.

possibly important indirect effects of FDI via trade. Therefore their results are not comparable. Since we use a more suitable indicator for FDI linkages, account for the endogeneity of FDI and consider indirect effects, we think that our results are more reliable than those proposed by Dées and Zorell (2011) for EU25.[10]

With respect to differences in governments budget deficits we find a negative coefficient in the group EU15-EU12 as well as in total EU27 providing evidence that a decrease in government deficit differences (see Figure 4) has fostered growth correlations. In contrast we find a positive coefficient for differences in government deficits in EU15, suggesting that increasing differences in budgetary deficits in EU15 have not harmed growth correlation but rather supported synchronization of business cycles. In other words, increasingly individual fiscal policies since the 2003 observation seem to have been an important adjustment mechanism enabling EU15 economies to keep a similar growth path.[11] The auxiliary equation $GOVDEF$ reveals interesting factors that determine differences in fiscal policies. Government deficits are linked to countries with divergent business cycles in EU15-EU12 and EU27 whereas they appear also between countries with similar business cycles in EU15. Differences in deficits are not a matter of income differences (see the negative coefficient of $DGDPPC$) but reflect differences in government efficiency. Although the emergence of differences in deficits in EU15 is not primarily linked to different growth it produces a positive effect on growth cycle correlations. Nevertheless, differences in government deficits explain higher exchange rate volatility (see equation $EXCH$) and thus have an indirect negative effect on growth correlations in EU 15. Table 3 shows the magnitude of the indirect effects of government deficits via exchange rate volatility and income gaps in EU15 and EU15-EU12. They are negative in the former group and positive in the latter, leading to a net effect that is smaller than the direct effect but of equal sign.

The result that diverging fiscal policies have discouraged business cycle synchronization in EU27 is in line with Darvas et al. (2005) who found that fiscal convergence led to more synchronized business cycles in 21 OECD countries in 1963-2003. While we can confirm the result of Clark and van Wincoop (2001), who do not find any effect of differences in fiscal policy

[10]Dées and Zorell (2011) use the absolute volume of bilateral FDI stocks without relating it to the GDP of the countries involved as an indication for financial linkages. Since the same volume of FDI can represent either strong FDI linkages if existing between small economies or weak FDI linkages if with big economies, this measure is distorted.

[11]Since the coefficient of $GOVDEF$ is insignificant in the Eurozone estimates we conclude that diverging fiscal policies have been particularly an adjustment instrument in the non-Eurozone EU15 countries. Results not reported but available upon request.

on business cycle synchronization in EU15 in 1981-1997, for the Eurozone[12], this result does no longer apply for EU15 in the more recent period covered by our study.

Exchange rate volatility is an important negative factor impeding growth synchronization in EU15 which is in line with the findings of Siedschlag and Tondl (2011). This does, however, not appear in EU15-EU12 where we find a positive coefficient of exchange rate volatility. This suggests that exchange rate alignments within the latter group serve as an adjustment instrument. As long as such adjustment via exchange rate flexibility is required in the EU it will not discourage business cycle synchronization. In the auxiliary equation on $EXCH$ we find that exchange rate volatility is above all determined by inflation differentials and by differences in government deficits. The estimation further shows that the need for exchange rate volatility arises in EU15 and EU27 as a consequence of poor growth correlation. Within EU15 and EU15-EU12 also income differences play a role for exchange rate volatility. Exchange rate volatility leads to an additional negative indirect effect on business cycle synchronization via trade in EU15 (see Table 3) which was also found in Siedschlag and Tondl (2011).

Finally, our estimates find a statistically significant negative coefficient of income differences on business cycle synchronization in EU15-EU12 and EU27 as a whole, which is in line with the few findings in the literature on the effects of income levels (e.g. Louis and Tozman, 2010). Thus the decline in income disparities in those groups helped to synchronize business cycles. In contrast, the slightly increasing income disparities in EU15 did not harm growth synchronization. We find that income differences produce several indirect effects (see Table 3): via FDI which is encouraged or discouraged by large income gaps, via trade which is lower in the EU between countries with a highly different income level, and specialization.

The auxiliary equation explaining income disparities ($DGDPPC$) reveals further interesting findings. We find a negative coefficient with trade and government deficits differences in all samples. This indicates that income differences are lowered with increasing trade linkages and increasing differences in government budgetary policies. Evidently, trade integration in the EU had a throughout positive effect reducing income disparities. More individual budgetary policies permitting more flexible expenditures seem to have a positive effect on lowering income disparities. In other words, the reduction in income disparities achieved in the EU seems to be linked to public investment programs or other support. Furthermore, our estimations show that income differences are linked to differences in political stability or regulatory quality in all samples and are thus a matter of political and institutional differences.

[12]Results not reported but available upon request.

7 Conclusions

The aim of this study was to examine whether economic integration has supported the apparent synchronization of business cycles in the enlarged EU.

Indeed we observed that business cycles have become more synchronized in the EU, looking either at EU15, at country pairs including a member of EU15 and another from EU12, or at EU27 as a whole. Correlation of growth between EU15-EU12 country pairs has rapidly developed from virtually nothing in 1995-1999 to a level of 0.6 in 2003-2008. In EU15 the correlation is evidently higher with 0.8 but has seen some stagnation in the early 2000s.

In terms of economic integration, trade integration and FDI linkages have strikingly increased in EU27 in the period of concern. Nevertheless, trade and FDI integration are by far most advanced in the core of the EU. Differences in government deficits have declined substantially in EU27 but have increased in EU15. Exchange rate volatility has also significantly declined. After an early period of de-specialization in the manufacturing sector in the new member states, we can watch a modest but steady increase in manufacturing specialization in the whole EU. Income differences have constantly declined in EU27 attributable to the catching up in the new member states. In EU15 income differences have slightly increased.

The contribution of our study is twofold: First, aiming to examine the whole effect of integration on business cycle synchronization, we include determinants in our estimations which have largely been left aside in EU studies: FDI linkages, fiscal policy coordination and income disparities. Second, we extend the simultaneous equations approach used in the literature and use a complex model with 7 factors permitting a multitude of endogenous relations between them, for example between trade, specialization and FDI, or between trade and income disparities. As a result our model achieves a high statistical determination and we are able to better understand the character of multiple direct and indirect effects. From our estimations we conclude that trade integration is the major factor contributing to the convergence of business cycles in the EU. Its impact has been particularly important to achieve a closer co-movement of business cycles of the new EU members. In second place, FDI linkages show a positive net effect on synchronization, again, particularly between new and incumbent EU members. The positive effect is linked to vertical FDI where diverse manufacturing stages are located in different places in the EU following comparative advantages. This type of FDI has led to important trade flows, and enforced manufacturing specialization, which are responsible for the net positive effect of FDI. We find that another type of FDI in the EU produces decoupling effects: market-seeking

FDI which drives for rents and to diversify risk in markets with different growth paths.

Unlike most of the literature, we find that the increasing manufacturing specialization in the EU, particularly between new and incumbent EU members, does not harm business cycle synchronization, rather the opposite is true. Specialization of the new member states leads to complementary productions and is compatible with more correlated business cycles. The importance of specialization as business cycle determinant is nevertheless minor compared to other factors.

The coordination of monetary policies and the introduction of the Euro have to be considered as the most important source for business cycle coordination in the Eurozone and in EU15. Whereas, in the case of EU15-EU12 country pairs this does not necessarily apply. Here exchange rate flexibility between new and incumbent EU members has to be considered as a necessary adjustment mechanism to stabilize diverging growth. In our simultaneous equations model we can also explain the source of exchange rate volatility: differentials in inflation rates and government deficits.

The decline in differences in budgetary deficits in EU27 has promoted business cycle convergence. Interestingly, mounting differences in fiscal policies in EU15 have contributed to business cycle convergence. Individual fiscal policies in EU15 have been necessary to react individually to stagnating growth both different in time and level. The results obtained in our simultaneous equations system further show that differences in public deficits in the EU are linked to differences in government efficiency.

In summary, we find no support that perfect policy harmonization is wishful from the perspective of business cycle convergence.

Finally, we find clear evidence that income convergence has promoted business cycle convergence in the EU27. Income convergence in turn has benefitted from trade integration and is supported by individual fiscal policies that would permit poorer countries to promote development through public investment.

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Figure 1: Correlations of GDP growth rates (5-year rolling windows, group mean)

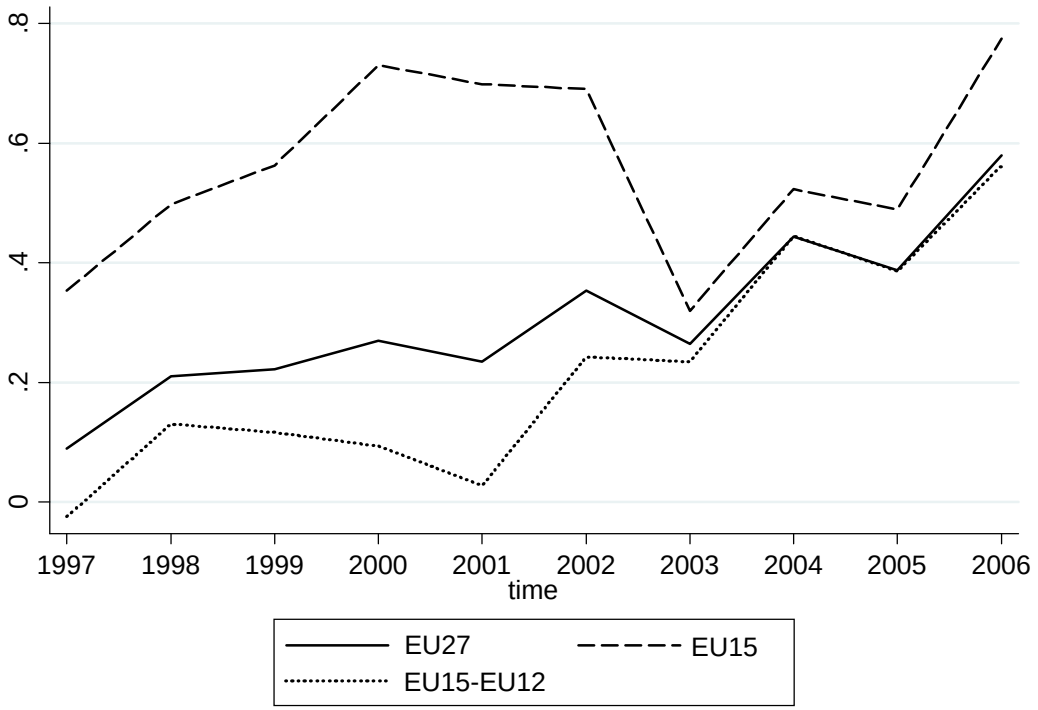


Figure 2: Bilateral trade intensity (5-year rolling windows, group mean)

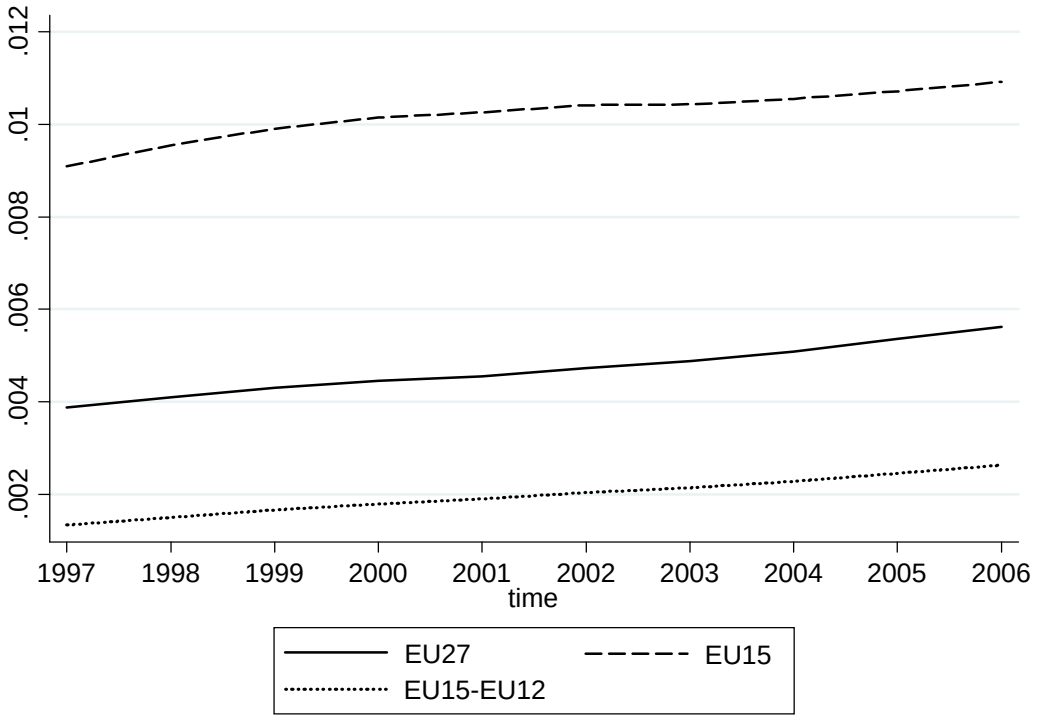


Figure 3: Bilateral FDI intensity (5-year rolling window, group mean)

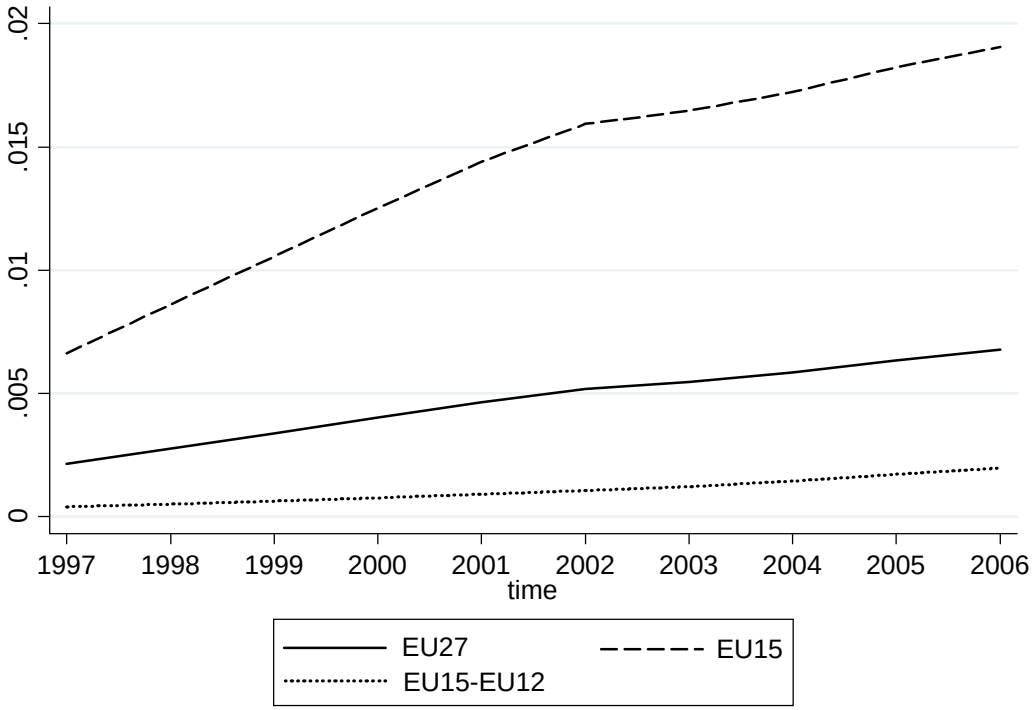


Figure 4: Bilateral differences in government budget balance (5-year averages, group mean)

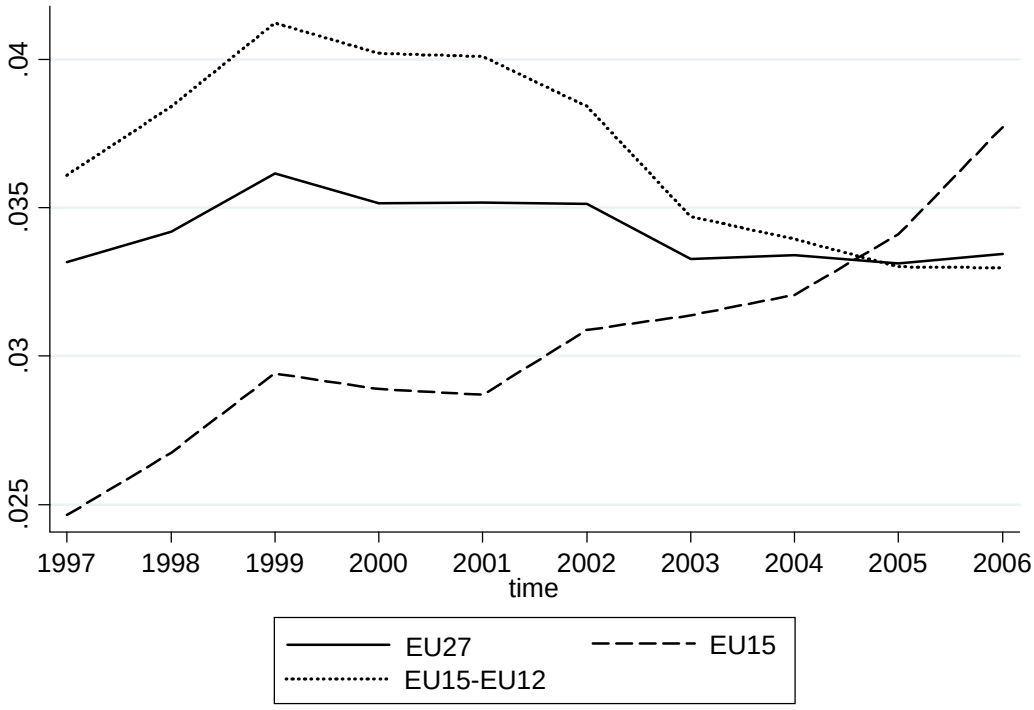


Figure 5: Bilateral exchange rate volatility (5-year rolling window, group mean)

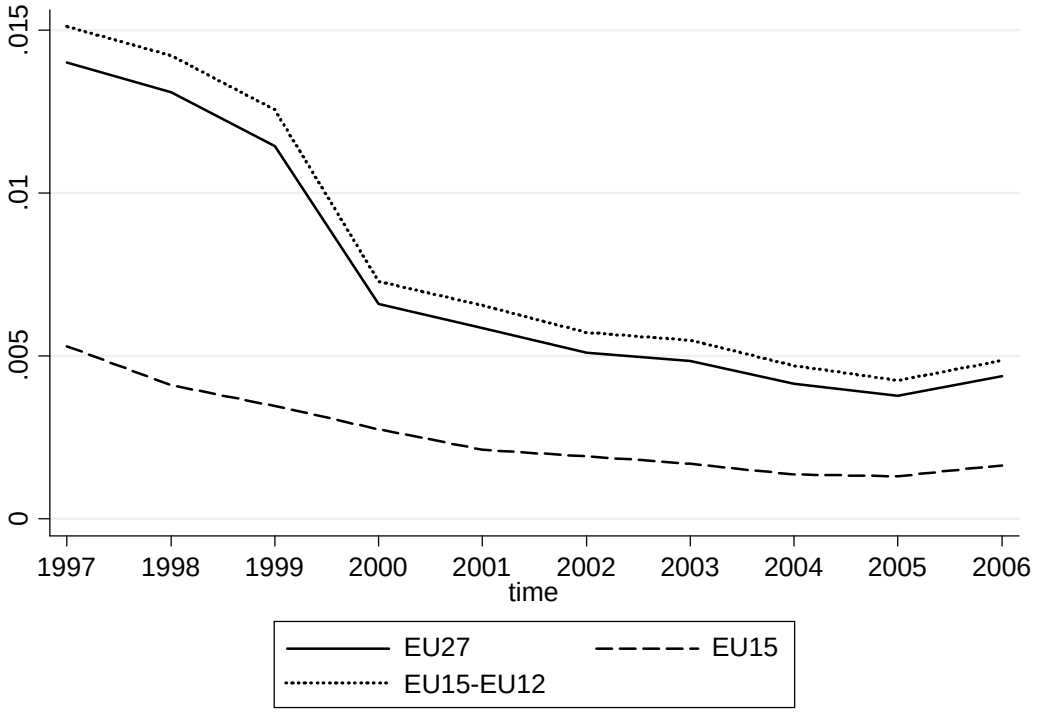


Figure 6: Bilateral sectoral dissimilarity (specialization; 5-year averages, group mean)

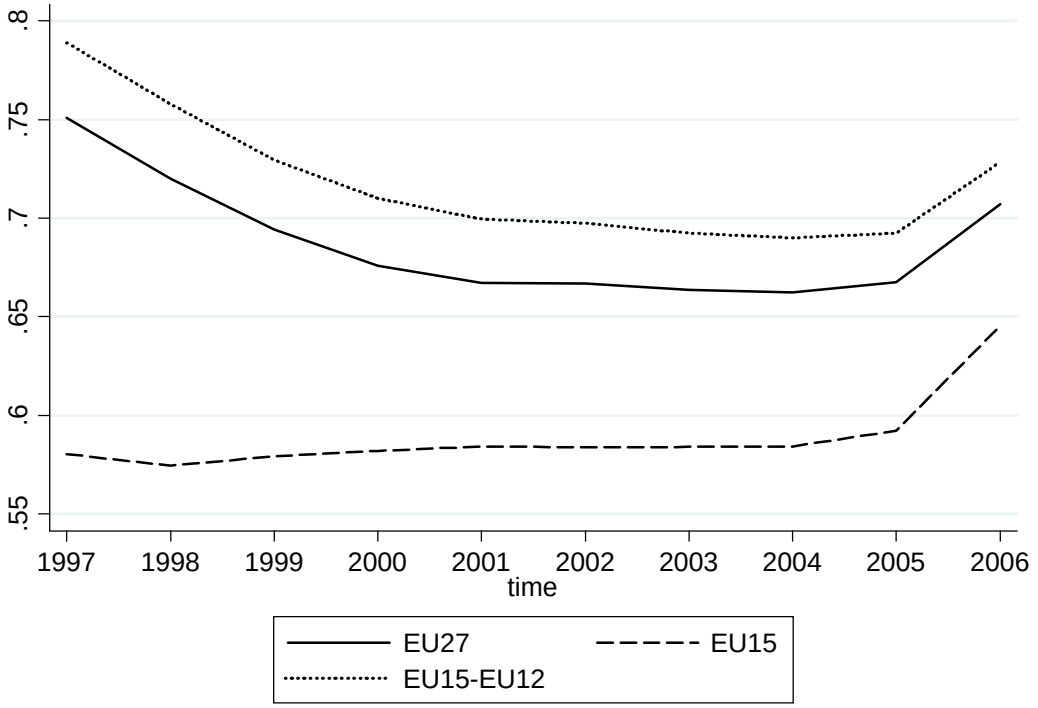
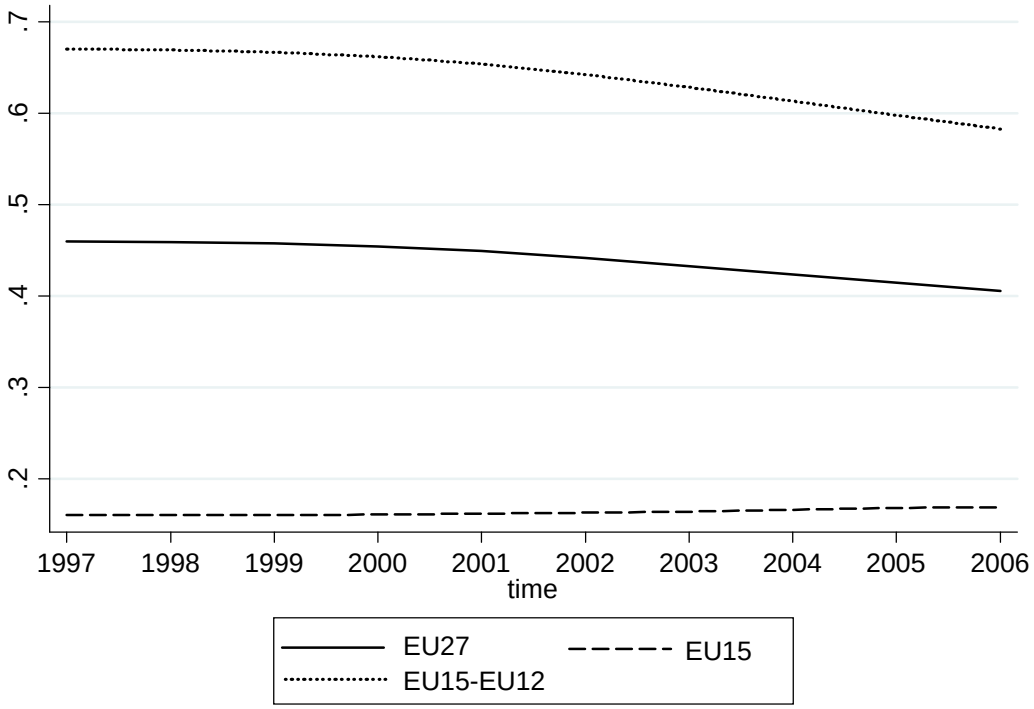


Figure 7: Bilateral per capita income differences (5-year averages, group mean)



Note: Difference of log of GDP per capita.

Table 1: Variable definitions and sources

Variable	Definition	Source
$CORRY_{ijt}$	Transformed Pearson correlations of annual real GDP growth rates between country i and j: $CORRY_{ijt} = \frac{1}{2}(\frac{1+CORRY\_Y_{ijt}}{1-CORRY\_Y_{ijt}})$	Authors' calculations based on AMECO data
$TRADE_{ijt}$	Sum of exports and imports (in Euros) of country i to country j divided by the sum of country's i and j GDP (in Euros) at market prices	Authors' calculations based on COMEXT, IMF DOTS and EUROSTAT data
FDI_{ijt}	Sum of outward position from country i to j and from country j to i divided by the sum of GDP in country i and j	Authors' calculations based on EUROSTAT, UNCTAD, OECD IDIS and National Bank Statistics data
$GOVDEF_{ijt}$	Difference of budget deficit (as a share of GDP) between country i and j	Authors' calculations based on EUROSTAT and CIA Factbook data
$EXCH_{ijt}$	Annual standard deviation of quarterly first difference bilateral log exchange rates between country i and j	Authors' calculations based on IMF-IFS data
$INFL_{ijt}$	Difference of annual average of quarterly inflation rate between country i and j	Authors' calculations based on IMF-IFS data
$LINT_{ijt}$	Difference of annual average of quarterly differentials of 10-year government bond yields between country i and j	Authors' calculations based on IMF-IFS and EUROSTAT data
$SINT_{ijt}$	Difference of annual average of quarterly differentials of money market rate between country i and j	Authors' calculations based on IMF-IFS and EUROSTAT data
$SPEC_{ijt}$	The industrial specialisation index is computed using gross value added disaggregated on the 23 branches of the UNIDO industry sectors (ISIC 2 digit, Rev.3). The specialisation index for country i and j is defined as follows: $SPEC_{ijt} = \sum_{n=1}^{N} \lvert s_{kit} - s_{kjt} \rvert$ s_{kit} is the share of sector k in country i and s_{kjt} is the share of sector k in country j. The index ranges from 0 to 2. A value equal to 0 indicates complete similarity of industrial structure, and a value equal 2 indicates total specialisation.	Authors' calculations based on UNIDO data
$WAGE_{ijt}$	Difference of log of monthly wage (in current Euros) between country i and j	Authors' calculations based on LABORSTA, UNIDO and IMF-IFS data
$SGDP_{ijt}$	Sum of log of real GDP (in billion Euros) in country i and j	Authors' calculations based on WDI World Bank data
$DGPDPC_{ijt}$	Difference of log of real GDP per capita between country i and j	Authors' calculations based on WDI World Bank data
POL_{ijt}	Political Stability & Absence of Violence/Terrorism (0-10 index) differential between country i and j in absolute terms	Authors' calculations based on WGI data
ACC_{ijt}	Democratic Accountability (0-10 index) differential between country i and j in absolute terms	Authors' calculations based on WGI data
$GOVEFF_{ijt}$	Government Effectiveness (0-10 index) differential between country i and j in absolute terms	Authors' calculations based on WGI data
REG_{ijt}	Regulatory Quality (0-10 index) differential between country i and j in absolute terms	Authors' calculations based on WGI data
ROL_{ijt}	Rule of Law (0-10 index) differential between country i and j in absolute terms	Authors' calculations based on WGI data

Table 2: Estimation Results of Simultaneous Equations

		EU15 1997-2006		EU15-EU12 1997-2006		EU27 1997-2006	
CORRY							
	FDI	-5.8852	(4.0398)	-82.4419^{***}	(20.4370)	-6.6324^{*}	(3.5974)
	TRADE	88.0276^{***}	(20.1380)	237.662^{***}	(30.1710)	105.5473^{***}	(12.1980)
	GOVDEF	25.7990^{***}	(2.7792)	-16.3361^{***}	(1.6782)	-10.2230^{***}	(1.3677)
	EXCH	-58.5157^{**}	(27.6040)	6.8167^{***}	(2.2463)	-0.0810	(1.8388)
	SPEC	4.7984^{***}	(0.6208)	1.7289^{***}	(0.2133)	1.5533^{***}	(0.1558)
	DGDPPC	6.7109^{***}	(1.4529)	-8.8746^{***}	(0.6402)	-6.3759^{***}	(0.4736)
	N	910		1680		3250	
	R^2	0.5607		0.2456		0.2598	
FDI							
	CORRY	-0.0004^{*}	(0.0003)	-0.0001^{***}	(0.0000)	-0.0002^{**}	(0.0001)
	TRADE	4.2102^{***}	(0.1178)	1.1436^{***}	(0.0286)	2.4989^{***}	(0.0492)
	SPEC	0.0397^{***}	(0.0050)	0.0014^{***}	(0.0003)	0.0048^{***}	(0.0008)
	DGDPPC	0.0466^{***}	(0.0121)	-0.0018^{**}	(0.0009)	0.0166^{***}	(0.0027)
	SINT	0.0266^{**}	(0.0133)	-0.0000	(0.0003)	0.0068^{***}	(0.0010)
	WAGE	-0.0179^{***}	(0.0065)			-0.0036^{**}	(0.0017)
	SGDP			0.0031^{**}	(0.0014)		
	N	910		1680		3250	
	R^2	0.4177		0.3173		0.2016	
TRADE							
	CORRY	0.0002^{***}	(0.0000)	0.0002^{***}	(0.0000)	0.0002^{***}	(0.0000)
	EXCH	-0.0669^{*}	(0.0381)	-0.0016	(0.0016)	-0.0089^{***}	(0.0025)
	SPEC	-0.0084^{***}	(0.0010)	0.0006^{***}	(0.0002)	-0.0011^{***}	(0.0002)
	FDI	0.1736^{***}	(0.0048)	0.4953^{***}	(0.0123)	0.2137^{***}	(0.0042)
	DGDPPC	-0.0135^{***}	(0.0023)	-0.0055^{***}	(0.0005)	-0.0034^{***}	(0.0007)
	REG	0.0007^{*}	(0.0004)				
	ROL			0.0003^{***}	(0.0001)	-0.0002^{*}	(0.0001)
	N	910		1680		3250	
	R^2	0.3259		0.3826		0.1990	
SPEC							
	TRADE	-7.4010^{***}	(1.0506)	18.6348^{***}	(3.4278)	-1.5497	(1.2970)
	FDI	2.0264^{***}	(0.2093)	10.3515^{***}	(2.3139)	1.1758^{***}	(0.3841)
	GDPPC	-0.0312	(0.0773)	1.2816^{***}	(0.0708)	1.1267^{***}	(0.0499)
	ROL	0.0267^{**}	(0.0107)				
	POL			0.0302^{***}	(0.0093)		
	REG					0.0367^{***}	(0.0134)
	ACC	0.0537^{***}	(0.0118)			-0.0839^{***}	(0.0107)
	SGDPPC	-0.3055^{***}	(0.1051)			-1.8486^{***}	(0.0900)
	N	910		1680		3250	
	R^2	0.0802		0.3157		0.2686	
GOVDEF							
	CORRY	0.0023^{***}	(0.0004)	-0.0026^{***}	(0.0003)	-0.0014^{***}	(0.0002)
	DGDPPC	-0.1329^{***}	(0.0162)	-0.0962^{***}	(0.0080)	-0.0413^{***}	(0.0060)
	LINT	0.2234^{***}	(0.0563)	-0.0143^{***}	(0.0043)	-0.0082^{**}	(0.0032)
	GOVEFF	0.0156^{***}	(0.0016)	0.0187^{***}	(0.0011)	0.0155^{***}	(0.0008)
	N	910		1680		3250	
	R^2	0.1866		0.2046		0.1183	
EXCH							
	CORRY	-0.0001^{**}	(0.0000)	0.0001^{**}	(0.0001)	-0.0001^{**}	(0.0000)
	GOVDEF	0.0093^{***}	(0.0032)	0.0390^{***}	(0.0044)	0.0200^{***}	(0.0031)
	DGDPPC	0.0029^{*}	(0.0017)	0.0053^{***}	(0.0015)	-0.0019^{*}	(0.0010)
	INFL	0.0690^{***}	(0.0076)	0.0560^{***}	(0.0003)	0.0556^{***}	(0.0002)
	N	910		1680		3250	
	R^2	0.6628		0.9527		0.9546	
DGDPPC							
	TRADE	-1.2343^{***}	(0.3383)	-12.1305^{***}	(1.0718)	-0.9168^{**}	(0.3715)
	GOVDEF	-0.6550^{***}	(0.0593)	-0.5520^{***}	(0.0732)	-0.1602^{***}	(0.0470)
	POL	0.0435^{***}	(0.0028)			0.0697^{***}	(0.0021)
	REG			0.0700^{***}	(0.0059)		
	N	910		1680		3250	
	R^2	0.2114		0.4098		0.3992	

Standard errors in parenthesis. ***, ** and * denote significance at 1% level, 5% level and 10% level, respectively. All estimations with time specific effects.

Table 3: Direct, indirect and net effects of business cycle determinants

				EU15			EU15-EU12			EU27		
				Direct effect	**Indirect effect**	**Net effect**	**Direct effect**	**Indirect effect**	**Net effect**	**Direct effect**	**Indirect effect**	**Net effect**
FDI		α_1				**0.2469**	-0.8244		**0.5191**	-0.0663		**0.1775**
	via TRADE		$\alpha_2 * \gamma_4$		0.1497			1.1645			0.2256	
	via SPEC		$\alpha_5 * \delta_2$		0.0973			0.1790			0.0183	
TRADE		α_2		0.8803		**0.5251**	2.3766		**1.7591**	1.0555		**0.8658**
	via FDI		$\alpha_1 * \beta_2$					-0.9398			-0.1657	
	via SPEC		$\alpha_5 * \delta_1$		-0.3552			0.3223			-0.0241	
GOVDEF		α_3		0.2580		**0.2089**	-0.1634		**-0.1120**	-0.1022		**-0.0920**
	via EXCH		$\alpha_4 * \eta_2$		-0.0054			0.0027				
	via DGDPPC		$\alpha_6 * \theta_2$		-0.0436			0.0488			0.0102	
EXCH		α_4		-0.5851		**-0.6467**	0.0682		**0.0682**	-0.0810		**-0.0904**
	via TRADE		$\alpha_2 * \gamma_2$		-0.0616						-0.0094	
SPEC		α_5		0.0480		**0.0383**	0.0173		**0.0176**	0.0155		**0.0141**
	via FDI		$\alpha_1 * \beta_3$		-0.0024			-0.0012			-0.0003	
	via TRADE		$\alpha_2 * \gamma_3$		-0.0074			0.0014			-0.0012	
DGDPPC		α_6		0.0671		**0.0194**	-0.0887		**-0.0621**	-0.0638		**-0.0467**
	via FDI		$\alpha_1 * \beta_4$		-0.0029			0.0015			-0.0011	
	via TRADE		$\alpha_2 * \gamma_5$		-0.0088			-0.0131			-0.0036	
	via GOVDEF		$\alpha_3 * \zeta_2$		-0.0343			0.0157			0.0042	
	via EXCH		$\alpha_4 * \eta_3$		-0.0017			0.0004				
	via SPEC		$\alpha_5 * \delta_3$					0.0221			0.0175	

Notes: Coefficients were transformed so that the effects are in percentage terms. Insignificant direct or indirect effects are not reported.