ASECU South-Eastern Europe Journal of Economics 2 (2019) 175-191 SEEJE

BUSINESS CYCLE SYNCHRONISATION WITH THE EURO AREA COUNTRIES AT TIMES OF CRISIS: DIFFERENCES BETWEEN SEE AND CEE COUNTRIES

VALERIJA BOTRIĆ[a]
TANJA BROZ[a*]
SAŠA JAKŠIĆ[b]

[a]The Institute of Economics, Zagreb, Croatia
[b]University of Zagreb, Faculty of Economics and Business, Croatia

Abstract
The aim of the paper is to analyse business cycle synchronisation patterns that the countries of the CESEE region have in relation to the original 12 Euro area member states. We focus on the turbulent times entailed in the latest economic crisis in order to examine whether the synchronisation patterns for the group of countries that have already established closer links to the EU differ from those in the countries pursuing the same path. Our analysis rests on the three well-established channels of business cycle synchronisation: trade, financial integration and sectoral specialisation. Given that the latest economic crisis was caused and transmitted by financial markets, we focus more on financial integration indicators. The results suggest that the synchronisation patterns differ between the two groups of countries and that the financial integration channel is important for the CEE countries, while synchronisation for the SEE countries is supported by the trade channel.

JEL Classification: F15, F36, E32
Keywords: Business Cycle Synchronisation, Determinants, Central, Eastern and South-Eastern Europe

Acknowledgement: We would like to thank Lea Rodić for her excellent research assistance.

*Corresponding Author: Tanja Broz, Department of Macroeconomics and International Economics, The Institute of Economics, Zagreb, Trg J. F. Kennedyja 7, 10 000 Zagreb, Croatia
E-mail: tbroz@eizg.hr

Introduction

Business cycle synchronisation is the cornerstone of the optimum currency area theory. The argument is that a common monetary policy will be effective if business cycles of (prospective) members are synchronised. In other words, if countries are at the same stage of a business cycle, then decisions taken by a central bank will have a similar impact on all countries.

Since the introduction of the Euro, synchronisation of business cycles between the original euro area members has increased (Böwer and Guillemineau, 2006). Similarly, business cycles of the new Euro area members have mostly converged with the cycles of the old members. However, it is not only the introduction of the Euro that aligns business cycles. Increased economic linkages before the Euro introduction, or even before joining the EU, might also increase synchronisation (Broz, 2018; Hildebrandt and Moder, 2015), which implies that synchronisation of business cycles is influenced by many factors. Trade integration is a well-established determinant of business cycle synchronisation. Sectoral specialisation, which captures the specific demand shocks a country's structural composition might be vulnerable to, is another channel. However, the importance of financial integration came into research focus with the latest economic crisis. Indeed, since the crisis originated in the financial markets, the initial assumption was that the crisis would not spread so easily into countries that are less integrated financially (te Velde, 2008). However, the evidence shows that both financially integrated countries and those lagging in financial integration were affected (Claessens *et al.*, 2010). Hence, the question is what impact financial integration has on business cycle synchronisation, especially in countries that are less integrated financially.

In this paper we analyse the business cycle synchronisation patterns the countries of the emerging Europe had in the 2004-2016 period in relation to the original 12 Euro area (EA) member states. Within the emerging Europe we further distinguish between South East Europe (SEE) and Central East Europe (CEE), the threshold being specified as whether the country joined the EU during the 2004 accession wave or not. The main contribution of this paper is that we analyse differences in business cycle synchronisation channels between European post-transition economies that are less developed (SEE countries) and more developed CEE countries.

The structure of the paper is the following. The following section briefly reviews literature on business cycle synchronisation determinants, section 3 presents an overview of data and methodology, while section 4 discuses results. The final section summarises the conclusions of the paper.

Literature review

The business cycle literature, ever since Long and Plosser (1983), suggests that fluctuations in one economic sector can have profound effects on a country's economic growth. Studies document that spillovers from the financial sector to the real economy are important in explaining the most recent global economic crisis (Ciccarelli *et al.*, 2012). It has been suggested that increase in trade and financial market integration have provided transmission mechanisms for the global spread of the crisis (Canova *et al.*, 2007; Canova and Ciccarelli, 2012).

Hence, the spread of the crisis across the world was possible due to the globalisation process. Globalisation helped increase trade, as well as financial linkages throughout the world (Dées and Zorell, 2011), causing increased synchronisation of business cycles not only in countries sharing the same currency (Artis and Zhang, 1997, Fatás, 1997). Increased business cycle synchronisation among EU members has been visible since the introduction of the exchange rate mechanism and boosted by growing links in trade and finance, while the introduction of the Euro accelerated the process (Böwer and Guillemineau, 2006; Darvas and Szapáry, 2008; Broz, 2010; Afonso and Sequeira, 2010)[1]. New EU member states in the early transition period had quite low synchronisation of their business cycles with the Euro area, but economic integration, especially through strong trade and FDI linkages, helped their business cycles to converge (Fidrmuc and Korhonen, 2003; Fidrmuc and Korhonen 2006; Mikek, 2009). Recently, more advanced new member states have business cycles more closely correlated to core EU members (di Giorgio, 2016). Countries of the southeast Europe that are not yet EU members are lagging in integrating with the EU (Botrić and Broz, 2016a). However, even these countries are recording an increase in business cycle synchronisation (Hildebrandt and Moder, 2015).

Relevant literature points to three channels of business cycle synchronisation, namely, trade integration, financial integration and sectoral specialisation. The trade channel seems straightforward, although its final effect depends on the nature of trade relationship. If countries have high intra-industry trade, then trade acts as a channel for transmitting shocks that affect all sectors. This means that increased trade leads to increased business cycle synchronisation (Frankel and Rose, 1998; Imbs, 2004; Imbs, 2006; Baxter and Kouparitsas, 2005; Calderón *et al.*, 2007; Inklaar *et al.*, 2008; Dées and Zorell, 2011). On the other hand, increased trade may lead to increased specialisation (Eaton and Kortum, 2002; Alvarez and Lucas, 2007), meaning that countries will specialise in the production of goods they have a comparative advantage on, which implies that increased trade leads to decreased business cycle synchronisation (Krugman, 1993; Kalemli-Ozcan, Sorensen and Yosha, 2001).

1. There are, however, opposing views concerning the direction of business cycle synchronization in the Euro area after the Euro introduction. Some authors argue that the process of convergence was halted after the Euro introduction in 1999 (e.g., Lee, 2013; Lehwald, 2013; Lee, 2012).

Another important determinant is sectoral specialisation. If countries have a similar economic structure, then sector specific shocks will affect countries similarly and, therefore, countries with more similar sectoral structures will have more synchronised business cycles (Imbs, 2004; Beck, 2013). However, not all studies, such as those by Baxter and Kouparitsas (2005) and Böwer and Guillemineau (2006) have found this determinant to be significant. It could also be argued that trading patterns are related to sectoral specialisation. However, countries with similar economic structure might develop different trading patterns with third economies, which leads to the empirical question of which channel dominates the business cycle synchronisation pattern.

The impact of financial integration on business cycle synchronisation is also ambiguous. While, on the one hand, financial integration might enhance global spillovers of macroeconomic fluctuations and, hence, increase business cycle synchronisation (Kose *et al.*, 2003), financial integration, on the other hand, might induce increased specialisation, which leads to lower business cycle synchronisation (Kalemli-Ozcan *et al*., 2003). The positive effect of financial integration on business cycle synchronisation is found, among others, by Imbs (2004), Imbs (2006), Dées and Zorell (2011) and Dinu *et al.* (2014), while García Herrero and Ruiz (2008) found a negative effect. Imbs (2004) proposes a simultaneous equation model that captures the role of trade, finance and specialisation on business cycle synchronisation for 24 developed and developing countries, not including countries of the CESEE region. Dées and Zorell (2011) follow Imbs' (2004, 2006) methodology, but increase the number of countries to 56 in order to reduce the probability that results are biased due to third-country effects. Dinu *et al.* (2014) use the Pearson correlation coefficient of seasonally adjusted and filtered real GDP series as the measure for business cycle synchronisation and focus on the seven new EU member states (Bulgaria, the Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia). Imbs (2006) focuses on synchronisation of consumption, rather than that of output and increases the number of countries in the analysis to 41, once again not covering CESEE countries.

Other determinants of business cycle synchronisation used in relevant literature include monetary union participation (Beck, 2013) and policy indicators, such as bilateral differentials in the short run real interest rate as a measure of the monetary policy stance, nominal exchange rate variations and differentials in fiscal deficits (Böwer and Guillemineau, 2006).

The accession of Central, Eastern and South-Eastern European (CESEE) countries to the EU brought attention to the patterns and drivers of synchronisation between industrialised and transition countries in Europe. Artis *et al.* (2008) and Babetskii (2005) suggest that the determinants of business cycle synchronisation between emerging markets and industrialised countries seem to be similar to those that dominate the synchronisation patterns of industrial countries. However, the most recent economic crisis revealed that trade is even more important in explaining business cycle synchronisation for the new EU member states as compared to the old members (Antonakakis and Tondl, 2011).

So far, not many studies have looked at the determinants of business cycle synchronisation between Southeast Europe and Euro area members, as well as the differences in determinants between SEE and CEE countries. Botrić and Broz (2016b) show that structural imbalances related to price and wage setting mechanisms are dominant determinant of business cycle synchronisation between CESEE countries and Euro area members, while trade becomes an important synchronisation factor only for the countries that became EU members during the period analysed. Hildebrandt and Moder (2015) analyse determinants of business cycle synchronisation between Western Balkan countries and EU members and argue that trade is the most important positive determinant, while FDI and remittances lead to business cycle divergence. Botrić and Broz (2016a), Palaşcă *et al*. (2014) and Gouveia (2014) analyse SEE and CEE countries, but their focus is solely on the relationship between business cycles and trade integration.

The approach taken in this paper investigates all three channels of business cycle synchronisation (trade, sectoral composition and financial inclusion) and seeks to identify differences between SEE and CEE countries.

Data and Methodology

There is no unique way of measuring business cycle synchronisation. Various methods proposed in the literature differ regarding 1) the measure, 2) the variables selected and 3) the techniques employed for cycle extraction. Business cycle synchronisation is usually measured using the correlation coefficient or concordance index. Variables employed for measuring business cycle synchronisation are the GDP, the industrial production index, inflation and other macroeconomic variables. A cyclical component is extracted using filters, such as the Hodrick and Prescott (HP) filter, the asymmetric Christiano-Fitzgerald filter, the Baxter-King bandpass filter and the Kalman filter. Other techniques for cycle extraction are also employed, such as the Beveridge-Nelson decomposition, the Blanchard-Quah decomposition, spectral analysis, the quadratic trend and simple year-on-year log-differences.

However, some methods require either longer time series or data measured at higher frequency (at least quarterly). As this paper analyses a set of countries for some of which data is only available on an annual level, a measure for the level of correlation between business cycles based on Cerqueira and Martins (2009) is employed in the empirical analysis. To be specific, this measure is suitable for annual data and captures time variability, but without the use of overlapping and rolling windows. The overlapping windows result in a variable that is autocorrelated. The rolling windows require a span selection, which causes loss of observational data and a possible distortion effect of a large shock throughout the entire window span. Cerqueira and Martins (2009) solved these issues by using a measure that distinguishes negative correlations due to episodes in single years, asynchronous behaviour in turbulent times,

and synchronous behaviour over stable periods. Hence, according to Cerqueira and Martins (2009), the following synchronisation indicator, which serves as a dependent variable, is considered in this paper:

$$synch_{ijt} = 1 - \frac{1}{2}\left(\frac{(g_{jt} - \bar{g}_j)}{\sqrt{\frac{1}{n}\sum_{j=1}^{n}(g_{jt} - \bar{g}_j)^2}} - \frac{(g_{it} - \bar{g}_i)}{\sqrt{\frac{1}{n}\sum_{i=1}^{n}(g_{it} - \bar{g}_i)^2}} \right)^2 \quad (1)$$

where g_{jt} is the real GDP growth rate of country j in time period t, and g_{it} is the real GDP growth rate of country i in time period t. $\bar{g}_j$ and $\bar{g}_i$ are the average real GDP growth rates over the analysed time period. Since the above index is asymmetric, in this paper we rely on its Fisher-type symmetric transformation explained in detail in Cerqueira (2013).

Business cycle synchronisation is related to financial integration, evolving trade patterns between countries, and structural differences (Imbs, 2004). Trade integration is captured by an indicator introduced by Deardorff (1998) and applied by Imbs (2004) and Dées and Zorell (2011) [2]. It is calculated as follows:

$$TI_{ijt} = \frac{(ex_{ijt} + im_{ijt}) \cdot Y_t}{GDP_{it} \cdot GDP_{jt}} \quad (2)$$

where ex_{ijt} represents total merchandise exports from country i to country j and im_{ijt} total merchandise imports to country i from country j. Y_t is world nominal output, while GDP_{it} and GDP_{jt} are the nominal GDP in country i and country j, respectively.

Two direct measures of financial integration are commonly used in relevant literature (Bai and Zhang, 2012). One is a restriction measure, such as the index of official capital controls on cross-border capital flows. The other one is an openness measure, in terms of either gross (or net) foreign flows or gross (or net) foreign positions. Furthermore, specific measures of financial integration have been used by different authors. Dinu *et al* (2014) rely on foreign direct investment, Flavin *et al.* (2002) and Cappiello *et al*. (2010) on stock markets. Other studies include money markets, bond markets or loan markets (Pungulescu, 2013; Enoch *et al.*, 2013). Imbs (2006) also relies on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. In an attempt to measure financial integration, ECB (2015) proposes a wide set of indicators in four main market segments: money, bonds, equity and banking markets.

2. Previous contributions also use different approaches when measuring trade intensity. For example, Dinu *et al.* (2014) rely on the ratio of the sum of bilateral exports and imports to the sum of the nominal GDPs of the two economies, while Hildebrandt and Moder (2015) use the ratio of the sum of bilateral exports and imports to the sum of total trade of the two economies.

This paper focuses on a much narrower set of variables and does not attempt to measure the degree of financial integration, but to infer on the basis of existing differences between indirect indicators of financial integration, in other words, how far from the financial integration stage the countries have found themselves during the period analysed. In the spirit of Schiavo (2008), the lending rates on loans to households for consumption with a floating rate and up-to-one-year maturity are added to the model as an indicator for the cost of borrowing[3]. This variable subscribes to the notion that evidence of existing financial integration is related to the validity of the law of one price. In other words, if the financial markets are integrated, the costs of borrowing should be equalised. Previous studies including (some of) the countries in our sample mostly relied on FDI as the main indicator for financial integration (Dinu et al, 2014, Dées and Zorell, 2011; Ševela, 2016; Antonakakis and Tondl, 2011). However, FDI, at least in SEE countries, concentrated in the service sector (Botrić, 2010) and was subject to sudden-stop phenomena during the latest economic crisis (Globan, 2015). Consequently, we believe that FDI is not an adequate indicator for financial integration in the case of the countries analysed during this period examined.

Sectoral specialisation is captured by the following expression (Imbs, 2004):

$$S_{ijt} = abs(s_{i,t} - s_{j,t}) \tag{3}$$

Where *s* denotes the sectoral share in value added within a specific country. The sectoral shares are computed using two-digit NACE value-added-data covering all sectors of the economy in all countries except Kosovo, where only one-digit value-added-data were available.

Sources for the variables employed in the empirical analysis are listed in the appendix.

A bilateral model (4) is then specified as follows:

$$synch_{ijt} = \beta_0 + \beta_1 synch_{ijt-1} + \beta_2 TI_{ijt-1} + \beta_3 FI_{ijt-1} + \beta_4 S_{ijt} + \varepsilon_{ijt} \tag{4}$$

where index *t* denotes the time period, while *i* and *j* denote bilateral country pairs. Synchronisation of the business cycle ($synch_{ijt}$) is the dependent variable, while independent variables include differences in trade integration (TI_{ijt}), absolute differences in lending rates between CESEE country and original Euro area member (FI_{ijt}), and specialisation patterns (S_{ijt}). ε_{ijt} are independent identically distributed idiosyncratic errors, $\varepsilon_{ijt} \sim IID(0, \sigma_\varepsilon^2)$. A lagged dependent variable is included to

3. Since there are relatively few studies dealing with this issue for SEE countries, we also investigate a set of additional indicators. Specifically, we use the number of automated teller machines (ATMs), the share of loans in GDP and the share of deposits in GDP. The number of ATMs is a proxy for financial inclusion (access to financial services for the general public). The shares of loans and deposits in GDP can be considered indicators of financial deepening.

investigate persistence patterns. Lagged values of specialisation patterns and trade intensity are included, because it is assumed that their effect on the synchronisation pattern is not simultaneous. Since we rely on annual data, a financial integration indicator is entered into equation without a lag, because of higher event frequency in financial markets in general.

Model (4) is estimated 1) for a group of CEE countries, and 2) for a group of SEE countries for the period from 2004 to 2016[4] in order to detect differences between groups. A group of SEE countries consists of countries that are either not yet members of the EU or did not join in the 2004 wave (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Kosovo, Macedonia, Montenegro, Romania and Serbia), while Slovenia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Malta and Cyprus comprise a group of CEE countries. The original Euro area (EA) members are Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, the Netherlands, Portugal and Spain.

Results and discussion

The initial assumption would be that CEE countries, due to their longer period of economic integration with EU countries, are more synchronised than SEE countries. However, the period of our analysis entails the recent global economic crisis, during which some previously established patterns may have been broken. Figure 1 indicates that after an initial increase of business cycle synchronisation, it decreased during the crisis period, the decrease being more pronounced for SEE countries. However, afterwards the business cycle synchronisation grew at a faster pace for SEE countries – this suggests that EU integration patterns influenced the spillover effects of the crises from the EU economies to the CEE countries to a greater extent than was the case in SEE countries. Then, the double-dip recession contributed to another decrease in the business cycle synchronisation. At the end of the period analysed, the evolution of business cycle synchronisation in both groups of countries is almost identical and reached the highest level.

In order to investigate which channels contributed most to such dynamics, we estimate equation (4). Due to the possible endogeneity of explanatory variables and the relatively short time period under analysis, we follow the system GMM approach proposed by Blundell and Bond (1998). It contains levels and differenced equations, treated as a single equation with the same linear relationship believed to hold for both (Roodman, 2009). The introduction of the equation concerning levels is explained by the argument that earlier changes of a dependent variable (as well as of potentially endogenous explanatory variables) are more predictive of current levels than the levels can be for future changes, when the series is close to the random walk. To

4. The sample we use is an unbalanced one.

obtain an estimator robust to heteroscedasticity and cross-sectional correlation, a two-step procedure is followed. Since this yields to downward biased standard errors, Windmeijer's (2005), corrections are presented. Furthermore, in order to control the number of instruments, endogenous variables are stacked in the instrument matrix. Thus, efforts have been made so that diagnostic tests would not be weakened by too many instruments.

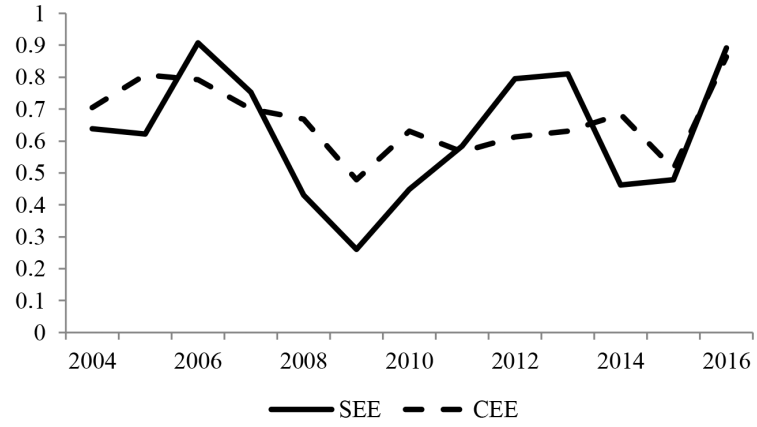

Figure 1. Synchronisation indicator, SEE and CEE countries' average (2004-2016)
Source: author's estimates

The diagnostics of the models estimated show that estimates for SEE countries are somewhat more reliable, because Hansen tests justify the validity of the instruments chosen. It is also worth noting that (some) time dummy variables were significant in both estimates, suggesting that, in specific years during the period analysed, disruption occurred in the established synchronisation patterns. These results are highly expected, according to well-documented literature on the impact of economic crisis (for example, Aizenman *et al.*, 2013).

Estimates show that there are differences in the business cycle synchronisation patterns between SEE and CEE countries. The financial integration variable turned out to be significant only for the CEE countries[5]. This suggests that, since these countries are closer to the EU and more integrated in their processes, financial integration played

5. Models using different proxies of financial integration available were also estimated (see Table A2 in the Appendix). However, only the coefficient on the share of loans in GDP turned out to be a significant determinant of business cycle synchronisation. The negative coefficient in this case implies that as financial deepening becomes more similar (the difference between shares of loans in GDP is decreasing), business cycle synchronisation is expected to increase.

an important role for the business cycle synchronisation pattern during the crisis. Furthermore, as Epstein (2014) claims, there has been a considerable percentage of foreign ownership in the banking sector during the economic crisis, which made financial institutions more interested in maintaining the value of their asset holdings. Our results are contrary to those by Dinu *et al.* (2014), who revealed an insignificant role of financial integration (by relying on FDI data) for CEE countries. Since our results imply that the higher the difference in lending rates between two countries, the higher the synchronisation of their business cycles, our findings corroborate the argument that, in a situation without cross-border financial restrictions, differences in prices of financial instruments will support cross-border capital transactions, creating closer links between the respective economies.

Table 1. Estimation results, dependent variable growth rates synchronisation indicator

VARIABLES	1) CEE	2) SEE
Synch (-1)	-0.01 (0.22)	-0.34** (0.17)
TI(-1)	0.03 (0.04)	0.09* (0.03)
S(-1)	0.02 (0.01)	0.00 (0.02)
Fl	0.05** (0.02)	0.04 (0.06)
Constant	0.12 (0.71)	0.64 (0.93)
Annual dummy variables	Included	Included
Diagnostics		
Number of observations	1332	1206
Number of groups	120	108
Number of instruments	28	28
Wald chi2	73.94***	143.39***
Reporting p-values		
Arellano-Bond AR(1)	0.03	0.14
Arellano-Bond AR(2)	0.59	0.28
Sargan test	0.06	0.00
Hansen test	0.03	0.28
GMM instruments levels		
- Hansen test excl group	0.33	0.53
- Difference	0.01	0.12
IV instruments		
- Hansen test excl group	0.87	0.04
- Difference	0.02	0.51

Source: authors' estimates

Note: Robust standard errors in parentheses; corrected for the small sample bias.
, **, * denote statistical significance at 10%, 5% and 1%, respectively.*

For SEE countries, the pattern is different. It seems that, for these countries, persistence in synchronisation is significant, which implies that, for these countries, the path towards business cycle synchronisation is important. However, since the estimated coefficient is negative, this would suggest that synchronisation follows a learning curve – i.e., countries of the periphery or those catching up go through a period of adjustment.

Another important channel for SEE countries is trade[6]. Our results suggest that the higher the trade intensity between SEE and EA countries, the higher their business cycle synchronisation. The importance of trade relations between SEE and EA countries indicates to a core-periphery relationship. When demand in EA countries declines, trade decreases and, subsequently, economic growth in SEE loses momentum. This has been particularly evident during the period analysed (World Bank, 2015).

Even though our results indicate that financial channel is not significant for the business cycle synchronisation of SEE countries, this does not imply that indicators in SEE countries diverge from those in the EA. Indeed, average lending rates have significantly decreased during the period analysed, as revealed by the data in Figure 2.

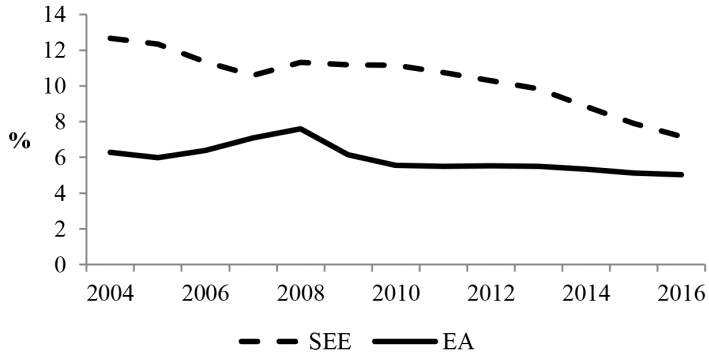

Figure 2. Average lending rates for SEE and EA countries (2004-2016)
Source: authors' estimates

Structural specialisation was not found to be a significant channel for either group of countries. This can be attributed to the different paths each country chose in their specialisation pattern, implying that there is still too much heterogeneity between these strategies to enable finding a common pattern.

6. Other models presented in the appendix (Table A2) also show that trade is an important channel for this set of countries.

For SEE countries, the process of convergence might still dominate the process of business cycle synchronisation, at least during the period analysed. Future research efforts should take into consideration that the period of economic crisis disrupted previously established synchronisation patterns and put additional effort into modelling period specificities.

Conclusion

This paper analysed the business cycle synchronisation patterns between the countries of the emerging Europe and the original 12 EA member states. Although business cycle literature relies on longer time series data, we have tried to contribute to the literature on synchronisation patterns of the less developed, European, post-transition economies, for some of which there are no longer time series data available.

Emerging Europe countries were divided into two distinct groups, namely, CEE and SEE countries, the former group consisting of countries that joined the EU during the 2004 accession wave. The emphasis was on three channels of synchronisation: foreign trade, financial integration and structural differences. Expectedly, the results for the two groups of countries differ. For the CEE group, already integrated in the EU processes, the most important channel for business cycle synchronisation was the financial channel. Analysis was focused on the period that entails the latest economic crisis, which, in both its origin and spillover method, was a financial one. Our results support the argument often heard during the crisis that more financially integrated countries, including the emerging markets region, would be more vulnerable (Mihaljek, 2010).

The importance of the factors analysed for a group of SEE countries, which can be considered a group of less developed, European, post-transition economies, is rather different. For these countries, the synchronisation path is statistically significant and negative, implying that synchronisation follows a learning curve – i.e, there is a period of adjustment for the countries catching up. Alignment of the business cycle for this group of countries was also achieved through an increased international trade channel.

The analysis clearly revealed that synchronisation decreased during times of crisis, and that, for SEE economies, there was a clear double-dip in the pattern. Since some previously established patterns might have been dissolved during this turbulent period, future research efforts should apply careful modelling of the specificities during the time of crisis.

References

Afonso, A. and Sequeira, A. (2010), Revisiting business cycle synchronisation in the European Union, ISEG Working Papers, No. 2010/22.

Aizenman, J., Jinjarak, Y. and Park, D. (2013), Capital Flows and Economic Growth in the Era of Financial Integration and Crisis, 1990-2010, *Open Economies Review*, 24 (3), 371-396.

Alvarez, F. and Lucas, R. E. (2007), General equilibrium analysis of the Eaton–Kortum model of international trade, *Journal of Monetary Economics*, 54, 1726–1768.

Antonakakis, N. and Tondl, G. (2011), Has Integration Promoted Business Cycle Synchronization in the Enlarged EU?, FIW Working Paper, No. 75.

Artis, M. J., Fidrmuc, J. and Scharler, J. (2008), The transmission of business cycles, The Economics of Transition, 16 (3), 559–582.

Artis, M. J. and Zhang, W. (1997), International Business Cycles and the ERM: Is There a European Business Cycle?, International Journal of Finance and Economics, 2, 1–16.

Babetskii, I. (2005), Trade integration and synchronization of shocks, *Economics of Transition*, 13 (1), 105–138.

Bai, Y. and Zhang, J. (2012), Financial integration and international risk sharing, *Journal of International Economics*, 86 (1), 17-32.

Baxter, M. and Kouparitsas, M. (2005), Determinants of business cycle comovement: a robust analysis, *Journal of Monetary Economics*, 52 (1), 113-157.

Beck, K. (2013), Structural Similarity as a Determinant of Business Cycle Synchronization in the European Union: A Robust Analysis, *Research in Economics and Business: Central and Eastern Europe*, 5 (2), 31-54.

Blundell, R. and Bond, S., (1998) Initial Conditions and Moment Restrictions in Dynamic Panel Data Models, *Journal of Econometrics*, 87 (1), 115-143.

Botrić, V. (2010), Foreign direct investment in the Western Balkans: privatization, institutional change, and banking sector dominance, *Economic Annals*, LV (187), 7-30.

Botrić, V. and Broz, T. (2016a), Bilateral Trade and see–Eurozone Countries Growth Rate Alignment, *Managing Global Transitions*, 14 (2), 137–155.

Botrić, V. and Broz, T. (2016b), Exploring CESEE-EMU synchronisation patterns, *Amfiteatru Economic*, 18 (42), 255-268.

Böwer, U. and Guillemineau, C. (2006), Determinants of business cycle synchronisation across euro area countries, ECB Working papers, No. 587.

Broz, T. (2010), Introduction of the euro in CEE countries - is it economically justifiable? The Croatian case, *Post-Communist Economies*, 22 (4), 427-447.

Broz, T. (2018), Should the EMU Stop Enlarging?, *Panoeconomicus*, 65 (4), 459-477.

Calderón, C., Chong, A. and Stein, E. (2007), Trade Intensity and Business Cycle Synchronization: Are Developing Countries Any Different?, *Journal of International Economics*, 71 (1), 2-21.

Canova, F. and Ciccarelli, M. (2012), ClubMed? Cyclical fluctuations in the Mediterranean basin, *Journal of International Economics*, 88, 162-175.

Canova, F., Ciccarelli, M. and Ortega, E. (2007), Similarities and Convergence in G-7 Cycles, *Journal of Monetary Economics*, 54, 850-878.

Cappiello, L., Kadareja, A. and Manganelli, S. (2010), The Impact of the Euro on Equity Markets, *Journal of Financial and Quantitative Analysis*, 45 (2), 473-502.

Cerqueira, P. (2013), A closer look at the world business cycle synchronization, *International Economics and Economic Policy*, 10 (3), 349-363.

Cerqueira, P. and Rodrigo M. (2009), Measuring the determinants of business cycle synchronisation using a panel approach, *Economic Letters*, 102 (2), 106-108.

Ciccarelli, M., Ortega, E. and Valderrama, M. (2012), Heterogeneity and cross-country spillovers in macroeconomic-financial linkages, ECB Working Papers, No. 1498.

Claessens, S., Dell'Ariccia, G., Igan, D. and Laeven, L. (2010), Cross-country experiences and policy implications from the global financial crisis, *Economic Policy*, 25 (62), 267–293.

Darvas, Z. and Szapáry, G. (2008), Business Cycle Synchronization in the Enlarged EU, Open Economies Review, 19, 1–19.

Deardorff, A. (1998), Determinants of Bilateral Trade: Does Gravity Work in a Neo-Classical World?, in J. Frankel (ed.), *The Regionalization of the World Economy*, Chicago: The University of Chicago Press, 7-32.

Dees, S. and Zorell, N. (2011), Business Cycle Synchronisation: Disentangling Trade and Financial Linkages, ECB Working Paper, No. 1322.

Di Giorgio, C. (2016), Business Cycle Synchronization of CEECs with the Euro Area: A Regime Switching Approach, *Journal of Common Market Studies*, 54 (2), 284–300.

Dinu, M., Marinas, M., Socol, C. and Socol, A-G. (2014), Testing the Endogeneity of Trade and Financial Integration and Sectoral Specialization in an Enlarged Euro Area, *Journal for Economic Forecasting*, 17 (1), 86-104.

Eaton, J. and Kortum, S. (2002), Technology, geography and trade, *Econometrica*, 70, 1741-1779.

ECB (2015), Financial Integration in Europe, https://www.ecb.europa.eu/pub/pdf/fie/ecb.financialintegrationineurope201705.en.pdf?a334429f9addfeff5cf9be4aeba36c8a

Enoch, C., Everaert, L., Tresselm, T. and Zhou, J. (2013), *From Fragmentation to Financial Integration in Europe*, Washington: International Monetary Fund.

Epstein, R. A. (2014), When do foreign banks 'cut and run'? Evidence from west European bailouts and east European markets, *Review of International Political Economy*, 21 (4), 847-877.

Fatás, A. (1997), EMU: Countries or regions? Lessons from the EMS experience, *European Economic Review*, 41, 743-751.

Fidrmuc, J. and Korhonen, I. (2003), Similarity of supply and demand shocks between the euro area and the CEECs, *Economic Systems*, 27, 313–334.

Fidrmuc, J. and Korhonen, I. (2006), Meta-analysis of the business cycle correlation between the euro area and the CEECs, *Journal of Comparative Economics*, 34 (3), 518-537.

Flavin, T., Hurley, M. J. and Rousseau, F. (2002), Explaining stock market correlation: A gravity model approach, *The Manchester School*, 70, 87-106.

Frankel, J. A. and Rose, A. K. (1998), The Endogeneity of the Optimum Currency Area Criteria, Economic Journal, 108 (449), 1009-1025.

García-Herrero, A. and Ruiz, J. (2008), Do trade and financial linkages foster business cycle synchronization in a small economy?, Banco de España Working Papers, No. 0810.

Globan, T. (2015), From Financial Integration to Sudden Stops? New Evidence from EU Transition Countries, *Finance a* úvěr–*Czech Journal of Economics and Finance*, 65 (4), 336-359.

Gouveia, S. (2014), Business cycle correlation between the Euro area and the Balkan countries, *International Journal of Economic Sciences and Applied Research*, 7 (1), 33-49.

Hildebrandt, A. and Moder, I. (2015), Business cycle synchronization between the Western Balkans and the European Union, *Focus on European economic integration*, Q3/15, 8-25.

Imbs, J. (2004), Trade, Finance, Specialization, and Synchronization, *Review of Economics and Statistics*, 86 (3), 723-734.

Imbs, J. (2006), The real effects of financial integration, *Journal of International Economics*, 68 (2), 296-324.

Inklaar, R., Jong-A-Pin, R. and De Haan, J. (2008), Trade and business cycle synchronization in OECD countries – A re-examination, *European Economic Review*, 52 (4), 646-666.

Kalemli-Ozcan, S., Sorensen, B. E. and Yosha, O. (2001), Economic integration, industrial specialization, and the asymmetry of macroeconomic fluctuations, *Journal of International Economics*, 55 (1), 107-137.

Kose, M. A., Prasad, E. S. and Terrones, M. E. (2003), How Does Globalization Affect the Synchronization of Business Cycles?, *American Economic Review*, 93 (2), 57-62.

Krugman, P. (1993), Lessons of Massachusetts for EMU, in F. Torres and F. Giavazzi (eds.) *Adjustment and Growth in the European Monetary Union*, New York: Cambridge University Press, 241-266.

Lee, J. (2012), Measuring business cycle comovements in Europe: Evidence from a dynamic factor model with time-varying parameters, *Economics Letters*, 115 (3), 438–440.

Lee, J. (2013), Business Cycle Synchronization in Europe: Evidence from a Dynamic Factor Model, *International Economic Journal*, 27 (3), 347-364

Lehwald, S. (2013), Has the Euro changed business cycle synchronization? Evidence from the core and the periphery, *Empirica*, 40 (4), 655-684.

Long, J. B. and Plosser, C. (1983), Real Business cycles, *Journal of Political Economy*, 91 (1), 39-69.

Mihaljek, D. (2010), The Spread of the Financial Crisis to Central and Eastern Europe: Evidence from the BIS Data, in: Matousek R. (eds) *Money, Banking and Financial Markets in Central and Eastern Europe*, Palgrave Macmillan Studies in Banking and Financial Institutions. London: Palgrave Macmillan, 5-31.

Mikek, P. (2009), Shocks to New and Old Europe: How Symmetric?, *Journal of Common Market Studies*, 47 (4), 811–830.

Palaşcă, S., Eneab, S.-F., Jabac, E. and Ţigănaş, C. (2014), Is Trade a Vector of Business Cycles Synchronization? A Fuzzy Cluster Approach of Globalization, *Emerging Markets Queries in Finance and Business*, 15, 247 – 253.

Pungulescu, C. (2013), Measuring financial market integration in the European Union: EU15 vs. New Member States, *Emerging Markets Review*, 17, 106-124.

Roodman, D. (2009), How to Do xtabond2: An Introduction to Difference and System GMM in Stata, *Stata Journal*, 9 (1), 86-136.

Schiavo, S. (2008), Financial integration, GDP correlation and the endogeneity of optimum currency areas, *Economica*, 75, 165-189.

Ševela, M. (2016), Role of Foreign Direct Investment Stock in Business cycle synchronization, Procedia - Social and Behavioral Sciences, 512 – 506 ,220.

Te Velde, D. W. (2008), The global financial crisis and developing countries, Overseas Development Institute, Background Note, October.

Windmeijer, F. (2005), A Finite Sample Correction for the Variance of Linear Efficient Two-Step GMM Estimators, *Journal of Econometrics*, 126 (1), 25-51.

World Bank (2015), South East Europe Regular Economic Report: Growth Recovers, Risks Heighten, No. 8, Fall 2015, Washington DC: World Bank.

APPENDIX

A1. Data sources

Variable	Description	Source
lr	Differences in lending rates on loans to households for consumption with a floating rate and maturity up to one year, between an original Euro area member and a CESEE country	ECB, IMF, WB, DNB, NBS, LB, LiTB
dep	Differences in share of deposits in GDP between pairs of countries	IMF Financial Access Survey
loans	Differences in share of loans in GDP between pairs of countries	IMF Financial Access Survey
ATM	Differences in the number of ATMs per 1000km^2 between pairs of countries	IMF Financial Access Survey
TI	Differences in trade integration between pairs of countries	wiiw, WB World Development Indicators
ex	Total merchandise exports from a CESEE country to an EA country	wiiw
im	Total merchandise imports from an EA country to a CESEE country	wiiw
Y	World nominal GDP	WB World Development Indicators
GDP	Nominal GDP of individual country	WB World Development Indicators
g	GDP growth rate of individual country	WB World Development Indicators
structure	Differences in structural specialisation between pairs of countries	Eurostat, national statistical agencies of Kosovo and North Macedonia
s	The share of two-digit NACE sector in total value added in a specific country	Eurostat, national statistical agencies of Kosovo and North Macedonia

A2. Alternative GMM estimates

	Deposits/GDP		Loans/GDP		ATMs	
VARIABLES	1) CEE	2) SEE	1) CEE	2) SEE	1) CEE	2) SEE
Synch (-1)	-0.23 (0.22)	-0.23 (0.23)	-0.07 (0.30)	-0.40 (0.25)	-0.06 (0.35)	-0.19 (0.27)
TI (-1)	0.03 (0.03)	0.08** (0.03)	0.00 (0.03)	0.10** (0.04)	0.01 (0.04)	0.10*** (0.04)
S (-1)	0.01 (0.01)	0.01 (0.02)	0.00 (0.01)	0.02 (0.02)	0.00 (0.02)	0.01 (0.02)
Fl	-0.01 (0.01)	-0.01 (0.02)	-0.01** (0.00)	-0.00 (0.01)	-0.00 (0.00)	0.00 (0.00)
Constant	0.96 (0.77)	0.22 (1.23)	1.53* (0.88)	0.08 (1.15)	1.07 (0.90)	-0.21 (1.30)
Annual dummy variables	Included	Included	Included	Included	included	included
Diagnostics						
Number of observations	1440	1206	1440	1206	1390	1169
Number of groups	120	108	120	108	120	108
Number of instruments	28	28	28	28	28	28
Wald chi2	54.00***	204.09***	61.29***	146.79***	55.35***	141.63
Reporting p-values						
Arellano-Bond AR (1)	0.13	0.16	0.14	0.41	0.21	0.17
Arellano-Bond AR (2)	0.13	0.75	0.51	0.32	0.59	0.92
Sargan test	0.00	0.00	0.00	0.01	0.00	0.00
Hansen test	0.05	0.26	0.03	0.38	0.03	0.07
GMM instruments levels						
- Hansen test excl group	0.03	0.32	0.09	0.38	0.03	0.05
- Difference	0.40	0.24	0.06	0.37	0.19	0.35
IV instruments						
- Hansen test excl group	0.04	0.07	0.37	0.17	0.16	0.30
- Difference	0.10	0.41	0.02	0.44	0.03	0.06