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Continuing Integration in Europe: Some empirical evidence on European industrial production cycle

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Abstract

Petr Rozmahel, Nikola Najman**: Continuing Integration in Europe? Some empirical evidence on European industrial production cycle.**

The paper deals with assessing the common trends in business cycle similarity and convergence in Europe. The main goal of the paper is to identify common cyclical co-movements and trends in convergence among the European countries so that the emerging European business cycle could be identified. Concerning the factors of business cycle, the research question of the paper is based on assumption that the integration effects are so dominant to bring the European cycle into existence. Also a potential influence of a global crisis on European and world business cycles is examined in the paper. The industrial production index is used to approximate business cycles. Hodrick-Prescott filter, Christiano-Fitzgerald filter and first differencing were used to dissect the cyclical components and identified the cycles in the data. The common co-movements, trends of convergence and divergence are identified using correlation analysis. Particularly, actual cross correlation and historical correlation in separated subsequent periods is applied in the analysis. The results do not provide an evidence of emerging European business cycle contrary to US cycle. The global economic crises was identified as a kind of negative symmetric shock pushing all major economies towards the recession phase of the cycle und thus increasing similarity. The results also shed some light on an influence of different detrending techniques when dissecting the cycles from the input macroeconomic time series.

Key words

business cycle, correlation, convergence, Eurozone, industrial production

JEL: E32, F15, F44

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Introduction

There is a vast variety of literature dealing with measuring business cycle similarity and shock asymmetry in relation with integration processes in Europe. The classical approach of the Optimum Currency Areas Theory (OCA) described in the pioneering article by Mundel (1961) defines characteristics for countries wishing to make an optimum currency union. Later the New OCA literature including papers by Mongelli (2002), McKinnon (2004), Fidrmuc and Korhonen (2006), Darvas and Szapary (2008) and others completes the traditional OCA lists with business cycle similarity and shock asymmetry. The aim of those papers was to assess the actual level or convergence of business cycle similarity of the Eurozone member and candidate countries in order to asses whether there is an optimum currency area in Europe. In the following phases the literature focused on testing conditionality of OCA criteria. Particularly, the endogeneity hypothesis of OCA becomes a frequent subject of research interest. In extremely influential paper Frankel and Rose (1998) assumes increasing business cycle similarity with rising intensity of international trade within the common monetary union.

The OCA endogeneity hypothesis developed the idea of emerging European business cycle representing strong cyclical co-movements within the monetary union due to increasing integration. Artis and Zhang (1997, 1999) in their papers provided evidence on emerging European business cycle comparing rising correlation coefficients in subsequent time periods within 1965-1995 of European monetary integration process. Their findings confirmed existing association of high degree in business cycle synchronisation with lower volatility in exchange rates. Using Kendal coefficients and correlation analysis they discovered that *"...a group specific European business cycle for the ERM countries during the ERM period follows the German cycle more closely and becomes more detached from the US cycle. Low rankings of the ERM countries with the US business cycle become high rankings with the German cycle and it appear that the European business cycle only emerges in the ERM period*."(Artis and Zhang, 1999, p. 130).

As already mentioned the OCA literature mostly focuses on assessment of countries to form an optimum monetary union. However, there is a lot of criticism on the theory since it does provide neither unified methodological framework nor suggested limits for measured optimality. Thus studies on business cycle similarity measuring the same criteria with different methodology come out with different results, which are complicated to interpret clearly. Fidrmuc and Korhonen (2006) summarize the existing papers on that issues noticing a remarkable difference between

interpretation of results by academics and independent researchers and central bankers on the other hand. Having cited the influential papers on emerging European cycle by Artis and Zhang, one must mention a critical paper by Inklaar-DeHaan (2001) pointing out spurious methodology applied by Artis and Zhang. Using a simple modification of the main technique in the original papers the latter couple of authors received inverse results doubting the main findings by Artis and Zhang. A plethora of studies focusing on investigating the European business cycle followed the original paper by Artis and Zhang. Camacho et al. (2006) try to propose a comprehensive methodology to describe the business cycle co-movements across Europe. Applying the proposed measures of measuring business cycle convergence there did not find any European country to act as an attractor of other economies in the area. Similarly Mink et al. (2012) introduced a new measure of measuring output gaps coherence. De Haan (2008) et al. continued with their research on European business cycle focusing on two main issues: examining business cycle similarity and identification of factors driving the business cycle synchronization in Europe. Similarly to their first related paper published in (2001) they found time periods of convergence as well as divergence. The mixture of factors, particularly, the trade intensity, were indicated as drivers of business cycle synchronization in Europe. Kose et al. (2012) in very recent paper focus on examination of the global factor influence on business cycle similarity. Using data of 1960-2008 they found some evidence of business cycle convergence within the groups of industrial economies and emerging markets but divergence (decoupling) between them. In our paper we aim at contributing to existing literature on European and global business cycle literature focusing on Eurozone and CEEC countries using variety of techniques dissecting the industrial production cycles.

The main goal of the paper is to identify common cyclical co-movements and trends in convergence among the European countries so that the emerging European business cycle could be identified. Concerning the factors of business cycle the research question of the paper is based on assumption that the integration effects are so dominant to bring the European cycle into existence in a sense of results suggested by Artis and Zhang (1997, 1999). Also a potential influence of the global crisis on European and world business cycles is examined in the paper.

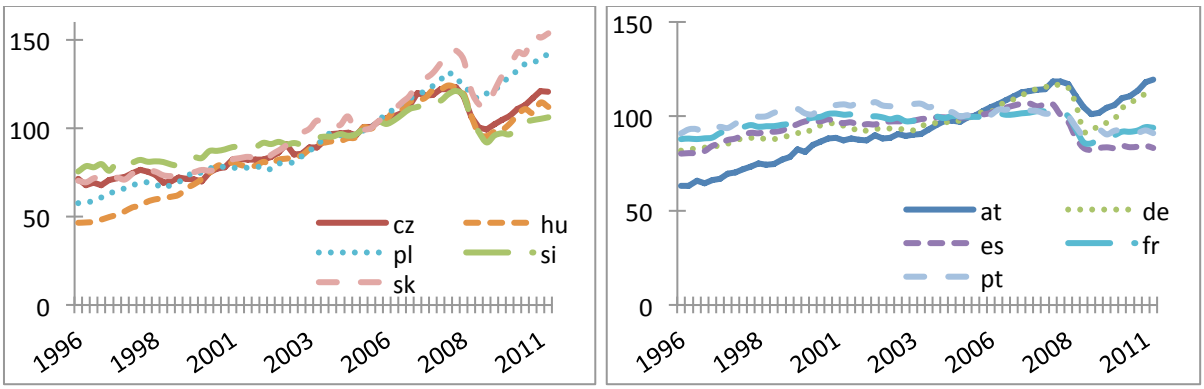
1 Material and Methods

Based on definition of business cycle by Burns and Mitchell (1946) suggesting the business cycle as more or less regular fluctuation in aggregate economic activity of a nation we approximate the business cycle with the Index of Industrial Production (IIP). Thus the industrial production cycles and business cycles are used as synonymous in the paper. The industrial production index sourced from the Main Economic Indicators Database of OECD in quarterly frequency contains subjects of

Production, Sales, Orders and Works started. Three detrending techniques including Hodrick-Prescot filter (HP), Christiano-Fitzgerald band pass filter (BP) and first differencing (FD) of logs of the data were applied to dissect the cyclical components in the input macroeconomic time series. The sample of old Eurozone member countries covering Austria, Germany, France, Portugal, and Spain were selected for the analysis. The sample was completed with selected Central and Eastern European countries (CEEC) of Czech Republic, Hungary, Poland and also with new Eurozone member states of Slovakia and Slovenia situated in Central and Eastern Europe. Two benchmarks of Eurozone average (EUR-17) and US economy representing the rest of the world were chosen in order to indicate the common European cyclical co-movements emerging contrary to the US cycle.

The common co-movements, trends of convergence and divergence are identified with using correlation analysis. Particularly, actual cross correlation and historical correlation in separated subsequent periods is applied in the analysis. Following the pioneering papers by Artis and Zhang (1997, 1999) and a critical paper by Zhang the emerging European cycle is indicated in two and also in four subsequent time span within the whole analyzed period of 1996Q1-2011Q2. Examination of the European industrial production cycle is based on identification of common trends in changes in correlation coefficients between individual time spans.

2 Results



Source: OECD

Note: 100=2005 (the base year)

Figure 1: Industrial production index in the Eurozone in the eurozone and CEEC (1996-2011)

The indicator of industrial production is more sensitive to economic performance changes than the aggregate of GDP. Also its volatility is higher. Figure 1 describes development of industrial production index covering industrial statistics of production, sales, orders and work started in selected Eurozone countries and CEEC. Despite some of the CEEC already adopted the Euro we analyse them as a part of

CEEC since most of examined period they acted as the Eurozone candidates. A sharp global decline is apparent during 2008 and 2009. Whereas all countries were hit considerably almost in the same moment with similar intensity, the recovery phase differs across the countries sample.

Table 1: Average quarterly growth [%] in IIP in selected time periods

countries	2007Q3-2008/Q2	2008Q3-2009Q2	2009Q3-2010Q2	2010Q3-2011Q2
at	1.07	-4.51	2.06	2.19
cz	0.95	-4.62	2.76	2.17
fr	-0.10	-4.79	1.77	0.55
de	0.81	-5.75	3.21	2.23
hu	1.21	-3.78	3.01	1.08
pl	1.39	-1.93	2.59	1.74
pt	-0.91	-4.13	0.58	-0.40
sk	2.98	-6.28	6.28	1.89
sl	1.64	-5.77	2.45	1.21
es	-1.39	-4.41	0.64	-0.32
us	-0.42	-4.39	1.59	0.93
ea	0.33	-4.90	2.27	1.05

Source: OECD + authors' calculations

As described in table 1 the average decline in the major crisis period in 2008Q3-2009Q2 in the Eurozone as -4.9%. Indeed, most of countries suffered with average quarterly decline around 4-5 percent. Two new Eurozone member countries Slovenia and Slovakia experienced deeper downswing among the examined group of countries. On the other hand both countries recovered very quickly. Slovakia even raised by the same amount of 6.28% as decreased at the crises year. Examining the industrial production development in following periods after the deepest crises period countries recovered in different intensity. The EU periphery countries Spain and Portugal does not seem to get out of the crises so far. The last time span of 2010Q3-2011Q2 might indicate continuation of production stagnation across Europe. Thus instead of expected "V" shape of the industrial activity development one might expect the "L" or "W" shapes suggesting prolongation in economic stagnation of Europe. This is actually also obvious when looking at figure 1.

The impact of global economic crises is surely an important factor of overall industrial production development. It also can play an important role in determining the business cycle similarity in

Europe. To shed some light on industrial business cycle similarity and its historical development we used correlation analysis of selected EU countries. We used the Eurozone-17 average and the US industrial cycle as benchmarks in order to provide with some evidence on emerging co-movements of industrial production cycles in Europe. As suggested by Artis and Zhang (1997, 1999) convergence of business cycles towards the European benchmark with simultaneous divergence or possibly stagnation in similarity towards the US might indicate emerging European business cycle.

Correlation coefficients in table 1 indicate actual business cycle similarity towards the Eurozone and US in whole analysed period of 1996-2011. Three detrending techniques were used when identifying the cyclical component of input time series. This rather static approach cannot reveal trends in changing similarity of the sample towards both benchmarks.

Still, the correlation matrix shows a slight border between the old Eurozone countries and CEECs. The difference is more evident when using the first differencing technique (growth rates) providing rather lower correlation coefficients. As explained in Canova (1998, 1999) and other studies, the rationale is emphasizing the higher frequencies of the spectra than the band pass filters. Czech Republic, Poland, Slovakia and also Portugal reveal relatively lower correlation with the Eurozone than the rest of a sample. There are no significant differences when comparing similarity of a sample towards the Eurozone and the US. Czech Republic, Portugal, Slovenia and Slovakia seem to be more correlated towards the Eurozone since their correlation to US is generally lower using all three filters. Austria, Germany and France reveal also lower correlation towards the US but it is still higher than 0.8 suggesting high level of business cycle association.

Table 2: Business cycle correlation of selected CEE and Eurozone countries to Eurozone and US economies in 1996Q1–2011Q2 (IP)

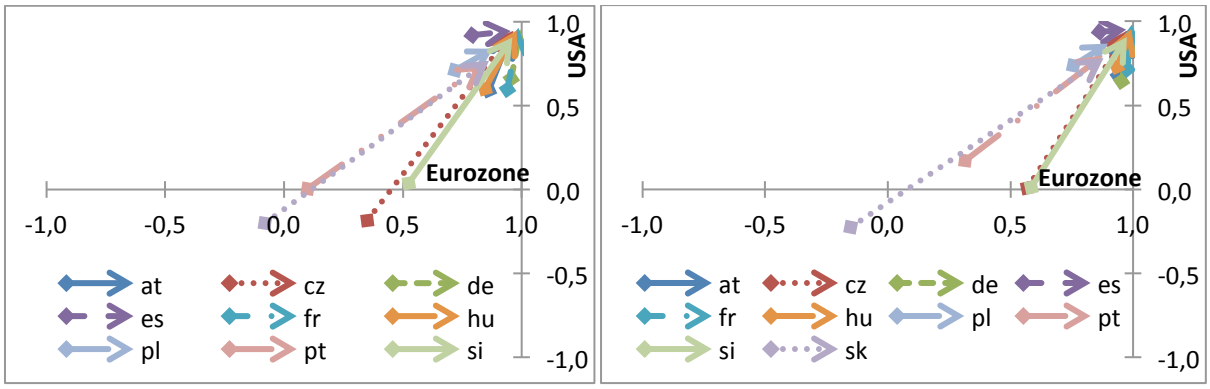
	Eurozone			**USA**		
Countries/filters	**HP**	**BP**	**FD**	**HP**	**BP**	**FD**
at	0.93***	0.96***	0.73***	0.85***	0.88***	0.66***
cz	0.85***	0.91***	0.60***	0.65***	0.73***	0.40***
de	0.99***	0.99***	0.95***	0.88***	0.90***	0.72***
es	0.94***	0.95***	0.80***	0.92***	0.94***	0.78***
fr	0.98***	0.99***	0.94***	0.88***	0.92***	0.79***
hu	0.95***	0.97***	0.81***	0.87***	0.90***	0.73***
pl	0.78***	0.82***	0.55***	0.79***	0.81***	0.46***
pt	0.73***	0.81***	0.54***	0.57***	0.67***	0.40***

si	0.92***	0.93***	0.73***	0.74***	0.74***	0.59***
sk	0.76***	0.76***	0.65***	0.58***	0.58***	0.43***
us|ea	0.90***	0.92***	0.81***	0.90***	0.92***	0.81***

Source: OECD + authors' calculations

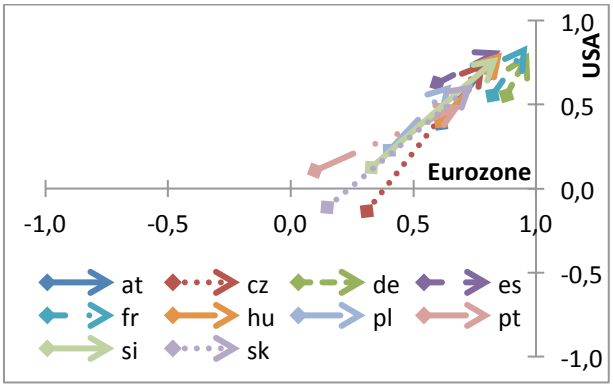
Note: *, **, *** denotes significance at 10%, 5% and 1% level.

Correlation measured in two subsequent time periods allows giving some evidence in changes in business cycle similarity of the examined sample towards both benchmarks. Figures 2 and 3 show changing correlation of examined national business cycles towards the Eurozone and US in two periods of 1996Q1-2003Q3 and 2003Q4-2011Q2. Corresponding values of correlation coefficients are included in tables 3-8 in the attachment. The starting point of the arrows refers to the correlation in the first analysed period. The sample countries revealed different levels of correlation towards both benchmarks. Czech Republic, Portugal, Slovakia and Slovenia were uncorrelated towards US in the first analysed period. Correlation of those countries to Eurozone was positive but also low and insignificant. Rest of countries in the sample revealed relatively high correlation to both benchmark. The situation differs when comparing it with the following sub-period. All countries in the sample sharply increase their similarity to the Eurozone as well as US cycles. This global cycle effect might be attributed to a global economic crisis in 2008-2010 which acts as highly influential negative symmetric shock. Such a shock put majority of economies in the phase of recession or stagnation and thus increased similarity of business cycles over the world. Measuring business cycle correlation in two subsequent time periods did not provide an evidence of emerging European industrial production cycle contrary to US cycle.



Source: OECD + authors' calculations

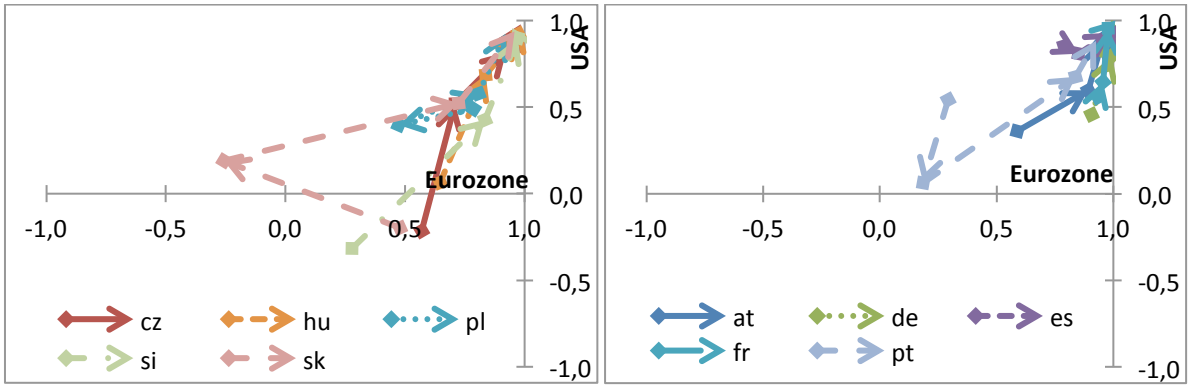
Figure 2: Correlation towards Eurozone and US economy 1996Q1–2003Q3 and 2003Q4–2011Q2 (HP filter, BP filter, IP)



Source: OECD + authors' calculations

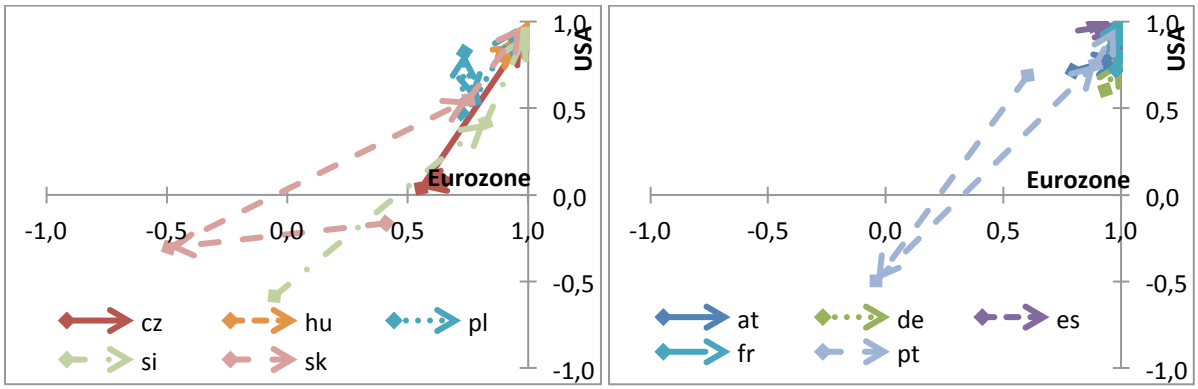
Figure 3: Correlation towards Eurozone and US economy 1996Q1–2003Q3 and 2003Q4–2011Q2 (FD, IP)

Following the procedure introduced by Inclaar-De Haan (2001) we divided the analysed time periods into four instead of two subsequent time spans. The resultant changes in business cycle similarity are illustrated at figures 4 and 5. Corresponding values of correlation coefficients are presented in tables 3-8. Assessing generally the correlation towards the Eurozone when applying all three filters all sample countries except from Slovakia and Portugal steadily converge towards the Eurozone cycle. This is obvious especially when analysing cycles identified with both band pass filters. Cycles detrended with first differencing does not provide so clear picture. Especially the correlation in the period of 2004Q1-2007Q4 is decreasing or insignificant at most of the sample countries. In case of measuring correlation towards the US the situation is very similar. All countries' cycles converge steadily towards the US cycle over the whole analysed periods. Except from Portugal and Slovakia all sample countries increase similarity of business cycles to the US cycle when using HP and BP filters. Unclear common trends can be found when measuring correlation of cycles identified with first differencing. After an overall increase of industrial production cycle correlation to the US between periods of 1996Q1-1999Q4 and 2004Q1-2007Q4 the coefficients fell down in 2004Q1-2007Q4. Considering the last period of 2008Q1-2011Q2, which basically covers the global crisis, all correlation coefficients increase sharply to levels of highly significant correlation using all three filtering techniques towards both benchmarks. Most likely this gives an evidence of an influence of global economic and financial crises as a common symmetric shock. Pressing the world economies' cycles down to the recession phase it increases the similarity across the European and world economy.



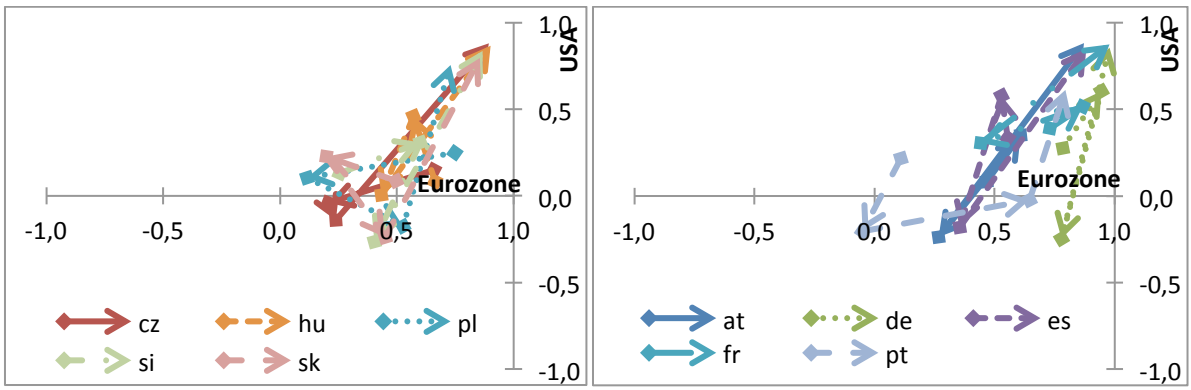
Source: OECD + authors' calculations

Figure 4: Correlation towards Eurozone and US economy in four consecutive periods (HP filter, IP)



Source: OECD + authors' calculations

Figure 5: Correlation towards Eurozone and US economy in four consecutive periods (BP filter, IP)



Source: OECD + authors' calculations

Figure 6: Correlation towards Eurozone and US economy in four consecutive periods (FD, IP)

Conclusions

Few major conclusions can be made when evaluating the results of the analysis. Firstly, the hypothesis of emerging European industrial production cycle should be rejected since all countries

converge steadily towards the Eurozone as well as US economy when comparing four subsequent time spans in the analysed period of 1996-2011. Secondly, the global economic crisis acting as a common negative symmetric shock pushed business cycles towards the recession phase across the world. This increased similarity of business cycles globally. Accordingly, business cycles of the sample countries converged rapidly towards both Eurozone and US cycle in the end of the analysed period. Nevertheless, the results did not provide a clear evidence of emerging European industrial production business cycle even when cutting off the crises time period from the analysis. The common trends of business cycle convergence are unclear in this respect. Assessing global economic crisis increasing business cycle similarity one should warn against technical interpretation of this finding from the OCA perspective. Despite the OCA theory defines the business cycle similarity as a necessary optimum currency area criterion; in case of global economic crises the rising correlation should be considered as a transitory effect. Such a transitory disturbance does not reflect log term and structural economic convergence of economies.

Finally, the results also shed some light on influence of different detrending techniques when dissecting the cycles from the input macroeconomic time series. The OCA theory does not provide an exact recommendation of what technique to use to identify the cycles and measure similarity. Applying three different filters we found common characteristics of two band pass filters representing by Hodrick-Prescott and Christiano-Fitzgerald filter. On the contrary, first differencing behaves as a high pass filter producing highly volatile cycles and lower correlation coefficients. Thus the resultant coefficients reveal often uncommon trends when comparing band pass filters and first differencing technique. Accordingly, our analysis provides arguments for careful interpretation of results related to applied business cycle similarity measure.

Summary

The Optimum Currency Areas (OCA) endogeneity hypothesis develops the idea of emerging European business cycle representing strong cyclical co-movements within the monetary union due to increasing integration. There is a vast variety of literature dealing with measuring business cycle similarity, shock asymmetry and common cyclical co-movements in relation with integration processes in Europe published in the past two decades. In accordance with the business cycle literature the paper deals with assessing the common trends in business cycle similarity and convergence in Europe. The main goal of the paper is to identify common cyclical co-movements and trends in convergence among the European countries so that the emerging European business cycle could be identified. Concerning the factors of business cycle, the research question of the paper is based on assumption that the integration effects are so dominant to bring the European cycle into

existence. Also a potential influence of the global crisis on European and world business cycles is examined in the paper. The quarterly industrial production index of selected European countries including the Eurozone members and CEE countries in 1996Q1-2011Q2 is used to approximate business cycles. Hodrick-Prescott filter, Christiano-Fitzgerald filter and first differencing were used to dissect the cyclical components and identify the cycles in the data. The Eurozone average and US economy were used as benchmarks to identify the convergence and divergence tendencies in a sense of emerging common European cycle. The common co-movements, trends of convergence and divergence are identified with using correlation analysis. Particularly, actual cross correlation and historical correlation in separated subsequent periods is applied in the analysis. The results do not provide an evidence of emerging European business cycle contrary to US cycle. The global economic crises in period after 2008Q1 was identified as a kind of negative symmetric shock pushing all major economies towards the recession phase of the cycle und thus increasing similarity. In the crisis period the correlation coefficients of all analyzed countries approach the value of 0.8-0.9 indicating strong correlation. In other periods the correlation trends in all countries differ to both benchmarks. The results also shed some light on influence of different detrending techniques when dissecting the cycles from the input macroeconomic time series.

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Attachment

Table 3: Business cycle correlation of selected CEE and Eurozone countries to Eurozone (HP filter, IP)

	1996Q1 2011Q2	1996Q1 2003Q3	2003Q4 2011Q2	1996Q1 1999Q4	2000Q1 2003Q4	2004Q1 2007Q4	2008Q1 2011Q2
at	0.93***	0.86***	0.96***	0.59**	0.89***	0.96***	0.96***
cz	0.85***	0.35*	0.96***	0.57**	0.71**	0.92***	0.98***
de	0.99***	0.96***	0.99***	0.91***	1.00***	0.99***	0.99***
es	0.94***	0.79***	0.95***	0.79***	0.85***	0.99***	0.97***
fr	0.98***	0.94***	0.99***	0.93***	0.96***	0.98***	0.99***
hu	0.95***	0.85***	0.98***	0.65***	0.84***	0.97***	0.98***
pl	0.78***	0.72***	0.88***	0.79***	0.47	0.81***	0.92***
pt	0.73***	0.10	0.84***	0.29	0.18	0.84***	0.93***
si	0.92***	0.53***	0.96***	0.28	0.83***	0.97***	0.96***
sk	0.76***	-0.08	0.86***	0.48*	-0.26	0.72***	0.96***
us	0.90***	0.72***	0.96***	0.55**	0.81***	0.94***	0.98***

Source: OECD + authors' calculations

Table 4*: Business cycle correlation of selected CEE and Eurozone countries to Eurozone (BP filter, IP)*

	1996Q1 2011Q2	1996Q1 2003Q3	2003Q4 2011Q2	1996Q1 1999Q4	2000Q1 2003Q4	2004Q1 2007Q4	2008Q1 2011Q2
at	0.96***	0.94***	0.97***	0.80***	0.99***	0.98***	0.97***
cz	0.91***	0.57***	0.99***	0.65***	0.56**	0.97***	0.99***
de	0.99***	0.95***	1.00***	0.93***	0.99***	1.00***	1.00***
es	0.95***	0.86***	0.97***	0.88***	0.91***	1.00***	0.98***
fr	0.99***	0.98***	0.99***	1.00***	0.98***	0.99***	1.00***
hu	0.97***	0.93***	0.99***	0.89***	0.96***	0.99***	1.00***
pl	0.82***	0.76***	0.90***	0.72***	0.74***	0.78***	0.95***
pt	0.81***	0.32*	0.88***	0.60**	-0.04	0.89***	0.98***
si	0.93***	0.59***	0.97***	-0.05	0.82***	0.99***	0.98***
sk	0.76***	-0.15	0.88***	0.41	-0.49*	0.75***	0.97***
us	0.92***	0.76***	0.97***	0.78***	0.83***	0.95***	0.99***

Source: OECD + authors' calculations

Table 5*: Business cycle correlation of selected CEE and* Eurozone *countries to Eurozone (FD filter, IP)*

	1996Q1 2011Q2	**1996Q1 2003Q3**	**2003Q4 2011Q2**	**1996Q1 1999Q4**	**2000Q1 2003Q4**	**2004Q1 2007Q4**	**2008Q1 2011Q2**
at	0.73***	0.61***	0.84***	0.47*	0.61**	0.27	0.87***
cz	0.60***	0.31*	0.79***	0.66***	0.21	0.24	0.90***
de	0.95***	0.88***	0.97***	0.78***	0.94***	0.78***	0.98***
es	0.8***	0.60***	0.86***	0.56**	0.53**	0.36	0.88***
fr	0.94***	0.82***	0.96***	0.73***	0.87***	0.44*	0.98***
hu	0.81***	0.61***	0.86***	0.66***	0.57**	0.43*	0.90***
pl	0.55***	0.40**	0.66***	0.75***	0.12	0.53**	0.73***
pt	0.54***	0.10	0.70***	0.11	-0.05	0.64***	0.80***
si	0.73***	0.33*	0.85***	0.25	0.60**	0.40	0.87***
sk	0.65***	0.15	0.74***	0.50*	0.20	0.45*	0.86***
us	0.81***	0.63***	0.88***	0.31	0.71***	-0.23	0.91***

Source: OECD + authors' calculations

Table 6*: Business cycle correlation of selected CEE and Eurozone countries to USA (HP filter, IP)*

	1996Q1 2011Q2	**1996Q1 2003Q3**	**2003Q4 2011Q2**	**1996Q1 1999Q4**	**2000Q1 2003Q4**	**2004Q1 2007Q4**	**2008Q1 2011Q2**
at	0.85***	0.59***	0.94***	0.36	0.60**	0.90***	0.96***
cz	0.65***	-0.19	0.95***	-0.21	0.52*	0.82***	0.98***
de	0.88***	0.66***	0.95***	0.46*	0.80***	0.94***	0.97***
es	0.92***	0.92***	0.94***	0.85***	0.81***	0.93***	0.95***
fr	0.88***	0.6***	0.96***	0.56**	0.64**	0.96***	0.98***
hu	0.87***	0.6***	0.95***	0.06	0.69**	0.92***	0.97***
pl	0.79***	0.71***	0.84***	0.49*	0.40	0.58**	0.92***
pt	0.57***	0.00	0.75***	0.54**	0.06	0.68***	0.88***
si	0.74***	0.04	0.91***	-0.32	0.43	0.90***	0.93***
sk	0.58***	-0.20	0.77***	-0.20	0.19	0.52**	0.94***
ea	0.9***	0.72***	0.96***	0.55**	0.81***	0.94***	0.98***

Source: OECD + authors' calculations

Table 7*: Business cycle correlation of selected CEE and Eurozone countries to USA (BP filter, IP)*

	1996Q1 2011Q2	1996Q1 2003Q3	2003Q4 2011Q2	1996Q1 1999Q4	2000Q1 2003Q4	2004Q1 2007Q4	2008Q1 2011Q2
at	0.88***	0.67***	0.95***	0.71***	0.79***	0.95***	0.95***
cz	0.73***	0.01	0.95***	0.08	0.04	0.90***	1.00***
de	0.90***	0.64***	0.97***	0.61**	0.77***	0.96***	0.99***
es	0.94***	0.94***	0.95***	0.98***	0.97***	0.94***	0.97***
fr	0.92***	0.71***	0.98***	0.80***	0.72***	0.97***	0.99***
hu	0.90***	0.73***	0.95***	0.80***	0.87***	0.95***	0.98***
pl	0.81***	0.74***	0.87***	0.47*	0.82***	0.55**	0.96***
pt	0.67***	0.17	0.80***	0.69***	-0.50*	0.75***	0.96***
si	0.74***	0.01	0.91***	-0.59**	0.42	0.93***	0.95***
sk	0.58***	-0.23	0.78***	-0.16	-0.30	0.55**	0.97***
ea	0.92***	0.76***	0.97***	0.78***	0.83***	0.95***	0.99***

Source: OECD + authors' calculations

Table 8*: Business cycle correlation of selected CEE and Eurozone countries to USA (FD filter, IP)*

	1996Q1 2011Q2	1996Q1 2003Q3	2003Q4 2011Q2	1996Q1 1999Q4	2000Q1 2003Q4	2004Q1 2007Q4	2008Q1 2011Q2
at	0.66***	0.38**	0.81***	0.08	0.35	-0.24	0.88***
cz	0.40***	-0.13	0.76***	0.15	-0.04	-0.14	0.88***
de	0.72***	0.55***	0.81***	0.28	0.61**	-0.25	0.85***
es	0.78***	0.63***	0.82***	0.34	0.58**	-0.18	0.85***
fr	0.79***	0.56***	0.85***	0.39	0.52**	0.31	0.87***
hu	0.73***	0.40**	0.81***	0.08	0.46*	0.01	0.87***
pl	0.46***	0.23	0.62***	0.25	0.11	-0.18	0.76***
pt	0.40***	0.11	0.49***	0.22	-0.20	-0.02	0.61**
si	0.59***	0.12	0.78***	0.13	0.31	-0.26	0.84***
sk	0.43***	-0.11	0.62***	0.09	0.23	-0.24	0.80***
ea	0.81***	0.63***	0.88***	0.31	0.71***	-0.23	0.91***

Source: OECD + authors' calculations