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Integration of Central and Eastern European and the Euro-Area Financial Markets: Repercussions from the Global Financial Crisis

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Integration of Central and Eastern European and the Euro-Area Financial Markets: Repercussions from the Global Financial Crisis

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We examine integration of financial markets and banking sectors in Central and Eastern Europe and the euro area. We study co-movements between government bond and equity markets of Germany and those of Poland, Czech Republic, Hungary, as well as Slovenia and Slovakia (the two recent euro members). We assume that financial integration is essential for subsequent monetary convergence, as it will enable the euro candidates to mitigate systemic risk and avert potentially desta-bilizing shocks. Government bond yields of the Czech Republic and Poland show high correlation with German yields, in contrast to those of the remaining countries. Equity returns of Slovenia and Slovakia show no correlation with German returns, while those of the three euro candidates show high correlation. The banking sectors of the Czech Republic and Poland show higher integration with the euro area than do Slovakia and Slovenia, while Hungary, dominated by country-specific shocks, lags behind all the others.
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INTRODUCTION

Integration of financial markets within a common currency area has been rather downplayed in the classic optimum currency area literature. Yet, we believe that it is an important condition for survival of a unified currency system. Equally important is integration of aspiring financial markets with those in the common currency system. The effects of the recent global financial crisis, particularly the widening of sovereign risk premium within the euro area suggests that more scholarly research on integration and financial stability within the common currency system ought to be pursued.

Following this premise, our paper aims to investigate the transmission of shocks from the German government bond and equity markets, as a proxy for the euro-area markets, to the markets of Central and Eastern European (CEE) countries. We analyze the degree and the time pattern of these shocks. We also examine integration of the banking sectors in these countries with that in the euro area. Because of limited scope of this study, we leave behind other aspects of financial integration.

We focus mainly on financial markets of the CEE countries that joined the European Union (EU) as of May 2004. We divide them into two groups. The first group includes the euro candidates that are currently pursuing independent monetary policies with flexible exchange rates, namely, Czech Republic, Poland and Hungary. The second group consists of countries that have adopted the euro, that is, Slovenia and Slovakia, as of January 2007 and January 2009, respectively. We study the susceptibility of government bond and equity markets in these countries to shocks generated in German markets by applying vector autoregression (VAR) with impulse response functions. The same methodology is applied to examine vulnerability of their equity markets to shocks from the US Dow Jones Industrial Average (DJIA). We further investigate integration of banking sectors of the five analyzed countries with that of the euro area. Our guiding hypothesis is that a deeper integration of financial markets results in declining financial risk premia, particularly with respect to sovereign default risk and interest rate risk.

We further note that the recent financial crisis has disrupted integration in the examined region, particularly in the countries with weaker macroeconomic fundamentals (Hungary). The crisis did a little damage to financial integration of the countries pursuing more disciplined macroeconomic policies (Czech Republic and Poland). Further progress in financial integration is necessary to ensure future smooth adoption of the euro without increasing sovereign default risk and destabilizing the financial system and the real economy.

We begin our analysis with a review of the pertinent literature in the next section, followed by the investigation of the government bond markets in the

subsequent section. In the section after that we examine the susceptibility of the CEE equity markets to external shocks. Integration of their banking sectors is analyzed in the penultimate section. Our findings are summarized in the final section.

IMPORTANCE OF FINANCIAL MARKET INTEGRATION FOR MONETARY INTEGRATION

Integration of financial markets is proven to be among the primary conditions for monetary integration, that is, adoption of a single currency by participating states, as argued among others by Kenen (1969) in his version of the optimum currency area theory. Financial integration and stability achieved before entry to a monetary union is likely to help mitigate macroeconomic risk and allow for the national real economy to adjust more effectively to external shocks (Lama and Rabanal, 2012).

A debatable point in the literature is whether there is an *ex post* or an *ex ante* causal relationship between a currency union and financial stability (Bayoumi and Eichengreen, 1999; Pisani-Ferry, 2012). Specifically, it has been debated whether a currency union would engender gains in financial stability or whether financial stability should be accomplished before currency union. The recent literature on the euro area focuses mainly on its *ex posts* effects on financial stability (Obstfeld, 2013). Our study aims instead at the reversed causal impact. In our view, achieving financial stability and thus a low systemic and sovereign risk environment should be viewed as a prerequisite for adopting the euro.

There are some studies worth noting on this point. Among others, Kose *et al.* (2006) recognize that emerging market economies ought to establish sufficiently deep domestic financial markets for companies to be adequately well managed and for macroeconomic policy to be disciplined. With respect to monetary integration in Europe, several authors have demonstrated that the introduction of the euro alone does not result in a full convergence of bond yields and that harmonization of disciplined national macroeconomic policies plays a significant role. Bernoth *et al.* (2004) show that the debt and deficit indicators, primarily the debt-service ratio, significantly affect long-term interest rate risk premia in the euro area. They show that deeper fiscal deficits and higher public debt levels tend to increase long-term interest rates. In addition, the fiscal position has direct bearing on the default risk premium as it is reflected in the government credit rating. Before the recent global financial crisis, fiscal discipline gains in the euro area have contributed to the successful convergence of bond yields to historically low levels. Gjersem (2003) attributes the positive term spreads on treasury securities within the euro area to the

differences in governments' credit ratings and liquidity, as well as the country's issuance techniques. Danthine *et al.* (2001) and Hartman *et al.* (2003) also point to the prolonged segmentation of the government bond market across the euro area, which exacerbates liquidity risk in the smaller, more vulnerable markets and results in yield differentials across similar class of government issues. They provide evidence that further fiscal convergence, specifically in debt-to-GDP ratios, is indispensable for reducing yield differentials. Nevertheless, Pagano and von Thadden (2004) assert that in spite of their successful convergence during the transition to the euro, sovereign bonds in the euro area are not perfect substitutes. In more recent studies, Manganelli and Wolswijk (2009) show that government bond yield differentials are affected by changes in short-term interest rates, which in turn are driven by market liquidity, cyclical conditions and the investors' incentives to take risk. In addition, Beber *et al.* (2009) argue that in times of market distress bond investors chase liquidity and not credit quality. Such investors' preferences contributed to a rise in liquidity risk and, ultimately, to the widening government bond spreads in the euro area during the recent financial crisis (Monfort and Renne, 2013).

Other studies analyzing government bond markets emphasize the importance of harmonization of fiscal and monetary policies for mitigating sovereign risk in countries converging to the euro. Côté and Graham (2004) find evidence that currency risk premia declined gradually following the adoption of the Maastricht Treaty and were essentially eliminated by the time the euro was launched in January 1999. They argue that progress in macroeconomic policy harmonization was the prevalent driver of long-term bond yield convergence. According to their study, the introduction of a common currency had merely a secondary effect. Thus, they confirm the previous findings that convergence of national long-term yields results predominantly from the coordination of disciplined fiscal and monetary policies.

With respect to integration of sovereign bond and equity markets of the CEE countries that have become EU Member States as of May 2004, empirical studies show mixed results. On a skeptical side, Kim *et al.* (2006) argue that government bond market integration is weak, in spite of substantial progress in political and overall economic integration. The opposite evidence can be found in Orbán and Szapáry (2004), Orlowski and Lommatzsch (2005) and Orlowski (2003, 2005), all showing substantial progress in bond yield convergence between the new and the existing EU members before and shortly after the 2004 EU accession. This progress was achieved through effective preparations for accession, mainly through the interplay of two factors. The first one was the anticipation of entry to the euro (as stipulated by the EU accession conditions) that resulted in lower sovereign risk premia. The second factor was the improvement in macroeconomic fundamentals that stemmed in part from

harmonization of national macroeconomic policies. In addition, technological progress and more favorable regulatory framework for bond issuance contributed further to integration of sovereign bond markets (Orlowski and Lommatzsch, 2005). Nevertheless, integration was not fully achieved by CEE countries before their EU accession. Among factors deterring full integration was elevated exchange rate risk that stemmed from the shift in monetary policy from exchange-rate-based to autonomous inflation targeting policies with flexible exchange rates.[1] This argument follows Frankel *et al.* (2004) who show that international transmission of bond yields is slower and more staggered under flexible than under fixed exchange rates. In the aftermath of the recent financial crisis, the yield spreads between the new and the existing EU members have widened, mainly as a result of absorption of crisis-induced exogenous shocks by the euro candidates (Gabrisch and Orlowski, 2010).

The negative impact of spillover effects of the financial crisis on financial market integration between the new and the established EU Member States is confirmed in the recent literature. Among others, Jiménez-Rodriguez *et al.* (2010) and Gabrisch *et al.* (2012) show strong transmission of foreign shocks on the financial sector and the real economy in CEE. While equity and bond markets in the countries with more stable fundamentals and credible, independent monetary policies are more resilient to external shocks, the less stable new EU members are subject to elevated volatility. In addition, the euro candidates are adversely affected by the exchange rate risk. All this volatility results in pronounced tail risks, that is, much higher leptokurtosis in the distribution of time series of asset prices and interest rates (Orlowski, 2012; Gabrisch and Orlowski, 2011). It ultimately exacerbates sovereign default risk.[2]

In the next two sections we examine selected aspects of financial integration as reflected by co-movements between government bond and equity markets of CEE countries and those of Germany. Our analysis is conducted over three subperiods: 'pre-EU accession' (January 2001–April 2004), 'accession to crisis' (May 2004–August 2007) and 'crisis to recent' (August 2007–July 2013).

GOVERNMENT BOND YIELDS: CORRELATION AND SHOCK ABSORPTION

Government bond yields in the examined CEE countries show convergence to the euro area from the beginning of the preparatory period for the EU accession

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[1] See Golinelli and Rovelli (2005) and Orlowski (2005, 2008) for a detailed description of inflation targeting policies, their transmission mechanisms and repercussions for sovereign bond markets in CEE.

[2] See Gabrisch *et al.* (2012) for further evidence on the key drivers of elevated sovereign risk premia in the euro-periphery and the euro-candidate countries.

until the onset of the financial crisis in August 2007.[3] This convergence, as reflected by spreads between the three euro candidates and the German 10Y government bond yields is shown in Figure 1a. The crisis has visibly disrupted the convergence process. The spreads for Hungary, Poland and the Czech Republic began to rise with the onset of the crisis, implying divergence of sovereign risk premia. The peak of divergence happened in the first quarter of 2009, that is, several months after the collapse of Lehman Brothers in September of 2008. There are also some visible contagion effects from the sovereign debt crisis in Greece and other euro-periphery countries, manifested by episodes of the elevated sovereign risk in the euro area in mid-2010 and again at the end of 2011. The bond yield convergence process resumed when the sovereign debt crisis in Europe started to subside in the beginning of 2012. Within the examined group of countries, Hungarian sovereign risk premium was the highest because of its weakest fiscal fundamentals. It was oscillating around the level of 400 basis points in July 2013. At the same time, the risk premium for Poland was around 200 basis points while for the Czech Republic it was close to 0.

As shown in Figure 1b, the spreads between the local and the German 10Y government bonds for Slovenia and Slovakia followed a similar pattern to that of the three euro candidates until 2011 when the two euro countries were experiencing economic recession. Before the outbreak of the financial crisis, both countries' risk premia were reduced to a near-zero level. They were moving closely together in spite of the different timing of the euro adoption (January 2007 by Slovenia and January 2009 by Slovakia). Following the outbreak of the Greek sovereign debt crisis that reverberated across the euro area, the risk premia for Slovenia and Slovakia assumed a different path. The risk premium for Slovenia reached the highest level among the five examined CEE countries, oscillating around 500 basis points in mid-2013. The Slovak risk premium resumed a declining pattern with the improving economic outlook in mid-2012. The case of Slovenia shows that the euro adoption alone does not provide an implicit guarantee against sovereign default risk. The elevated level and volatility of the Slovenian sovereign risk premium implies this country vulnerability to external contagion effects.

Co-movements between the sovereign bond markets of CEE countries and those of Germany can be further explained by the correlation coefficients shown in Table 1. Correlation between the Czech and German as well as the Polish and German 10Y government bonds has been continuously high.

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[3] We assume that the global financial crisis began with the collapse of two hedge funds managed by Bear Stearns in mid-August 2007 (see Orlowski, 2008 for further explanation). That triggered a subprime mortgage crisis in the United States and subsequently the global credit crunch and the systemic crisis that peaked with the collapse of Lehman Brothers in September of 2008.

a

b
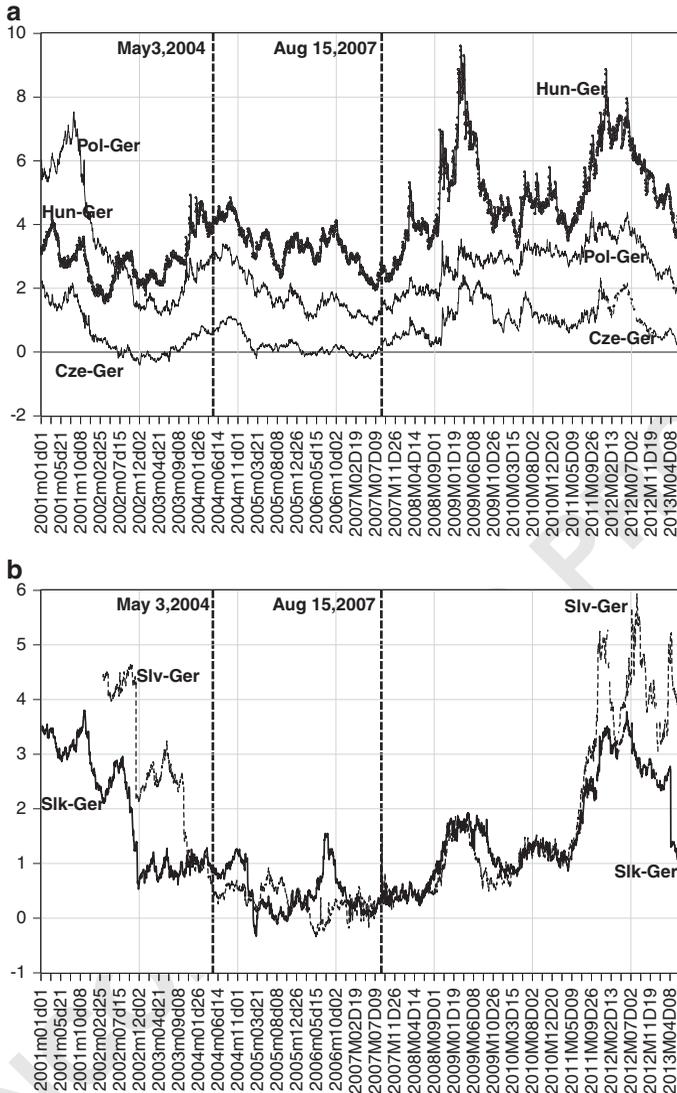
Figure 1: (a) Spreads between local and German 10Y government bond yields: Poland, Czech Republic and Hungary
Daily series, 3 January 2001–23 July 2013 sample period (3270 observations). Spreads are denoted as Pol-Ger for Poland, Hun-Ger for Hungary and Cze-Ger for the Czech Republic
Data Source: Thomson Reuters Datastream
(b) Spreads between local and German 10Y government bond yields: Slovakia and Slovenia
Daily series: 3 January 2001–23 July 2013 sample period for Slovakia and 18 March 2003–23 July 2013 for Slovenia. Spreads are denoted as Slk-Ger for Slovakia and Slv-Ger for Slovenia
Data Source: as in Figure 1a

Table 1: Correlation coefficients between local and German 10Y government bond yields daily series: 3 January 2001–23 July 2013 sample period (3270 observations)

Correlation between	3 January 2001–30 April 2004 (pre-EU accession)	3 May 2004–15 August 2007 (accession to crisis)	16 August 2007–23 July 2013 (crisis to recent)
Czech and German 10YGB	0.807	0.767	0.849
Polish and German 10YGB	0.824	0.522	0.718
Hungarian and German 10YGB	0.172	0.484	0.263
Slovak and German 10YGB	0.899	0.785	0.501
Slovenian and German 10YGB	0.728	0.786	−0.435

Note: Slovenian bond yields as of 18 March 2003, others for the entire sample period.
Source: Authors' own estimation based on Thomson Reuters Datastream data

In both cases, correlation increased during the period of active preparations for the EU accession, that is, before May 2004. This high correlation signifies considerable gains in macroeconomic stability in both the Czech Republic and Poland. However, after the EU accession, correlation became lower; more considerably for Poland than for the Czech Republic, presumably underscoring some relaxation of the Polish macroeconomic discipline. During our latest analyzed period (crisis to recent), correlation has increased for both countries, showing continuous gains in macroeconomic stability and narrowing of sovereign risk premia. Correlation between the Slovak and German bond markets was also high before the EU accession. Since then it has entered a declining path that accelerated with the onset of the financial crisis showing vulnerability of this small euro member to contagion effects.

Correlation between German and Hungarian bond yields is considerably and continuously lower than that of German and the Czech, Polish and Slovak. It remained low during and after the financial crisis. This low co-movement indicates some decoupling of the Hungarian from the German bond market. The deterioration of the country's fiscal discipline, along with the recent concerns about central bank's independence and, therefore, about credibility of monetary policy are among the contributing factors to the high government bond yields in Hungary (Horváth *et al.* 2011).

Slovenian bond yields are negatively correlated with the German yields during the latest analyzed period (crisis to recent) as it can be expected based on the recessionary conditions in Slovenia discussed above. The negative correlation stems from increases in Slovenian yields as a consequence of capital outflows to low-risk German bonds and the resulting decline in German
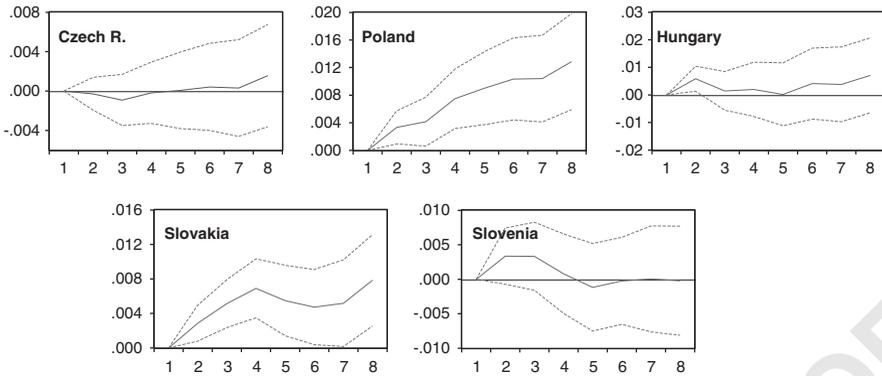
Figure 2: Accumulated impulse responses of local 10Y government bond yields to a shock in German 10Y GB yields

Notes: Daily changes in bond yields. Sample period 3 January 2001–23 July 2013 (except for Slovenia as of 18 March 2003). Accumulated impulse responses are generated from VAR functions with 10 lag intervals in unrestricted VAR, Monte Carlo distribution of response standard errors and 8-day diffusion, optimized by minimizing Schwartz Information Criterion. From top-left to bottom-right, accumulated responses of the Czech, Polish, Hungarian, Slovak and Slovenian 10Y government bond yields to Cholesky 1 standard deviation shock in German 10Y GB yields (with a 2 standard error band)
Source: Authors' own estimation based on Thomson Reuters Datastream data

yields. This divergent path of bond yields underscores financial vulnerability of Slovenia.

To provide further insights into the transmission of shocks between the euro area and each of the CEE countries' government bond markets, we conduct the vector autoregressive (VAR) analysis along with impulse response functions. Such analysis allows for exact assessment of intensity and duration of transmission of shocks generated in one market into other markets. In essence, the VAR model explains the evolution of the dependent variable, in our case local bond yield, based on its own lags and the lags of independent variables, that is, German bond yields.

Our VAR model estimates linear interdependencies in the multivariable setting based on daily changes in government bond yields. We use Thomson Reuters Datastream daily government bond yields data for the maximum available sample period 3 January 2001–23 July 2013 (for Slovenia the data availability begins with the inception of its secondary bond market trading on 18 March 2003). The strength and length of shocks transmitted from the euro area to individual CEE bond markets are reflected by impulse response functions generated from our VAR model and shown in Figure 2. The VAR model has been optimized for lag intervals by minimizing the Schwartz Information Criterion. We also apply a Monte Carlo rather than an asymptotic

distribution of errors, as this choice leads to more robust results. Optimized lag intervals in unrestricted VAR along with the lag diffusion periods are specified in notes to Figure 2. The impulse response functions show an accumulated pattern of reactions of local bond yields to (Cholesky) 1 standard deviation shock in the German bond yield over the 8-day time horizon. From the matrix of all impulse responses generated from our VAR model, we are displaying only those shocks originating in the German bond market and transmitted to the bond markets of each of the five CEE countries.

The accumulated reactions of the Czech, Hungarian and Slovenian markets to German-generated shocks are minimal, implying rather low capital inflows from Germany to these three markets. In contrast, the reactions of the Polish and, to a lesser extent, the Slovak bond yields to German shocks are pronounced and positive, showing high susceptibility of these two markets to the conditions in Germany resulting in high capital inflows.

In sum, convergence of CEE to German bond yields is not uniform. The Czech government bond market shows strong co-movement with German bonds, suggesting that the country is ready to join the euro without encountering potentially adverse shocks. Convergence of the Polish bond market, while ongoing, is still incomplete. In contrast, convergence of the Hungarian yield is still far from completion; thus the country does not seem to be ripe for adopting the euro.

CORRELATION OF EQUITY MARKETS

We now examine co-movements of equity markets. More specifically, we study correlation of stock returns as measured by daily changes in logs of stock market indexes, that is, the Czech's Prague SEPX, the Polish WIG20, the Hungarian BUDINDX, the Slovak Bratislava SAX16, the Slovenian Ljubljana Blue Chip SBI and the German DAX40. We use daily Thomson Reuters Datastream data for the sample period 3 January 2001–26 July 2013 (for Slovenia the data availability begins on 31 March 2006). Table 2 shows correlation of returns of each of the local and the German equity market for the same subperiods that we applied to the bond markets analysis in the previous section.

As shown in Table 2, CEE equity market returns were positively, but not strongly correlated with the German market returns during the pre-EU accession period. Following the accession, equity market returns for the three non-euro countries that are pursuing independent monetary policies became increasingly correlated. At the same time, returns in Slovak and Slovenian markets show minimal correlation with returns in Germany. During our latest analyzed period, Slovakia shows even mildly negative correlation. Therefore,

Q13 **Table 2:** Correlation coefficients between daily returns (changes in logs) in local *versus* German and US equity markets

Correlation between market returns of	and German DAX			and US DJIA
	3 January 2000–30 April 2004 (pre-EU accession)	3 May 2004–15 August 2007 (accession to crisis)	16 August 2007–26 July 2013 (crisis to recent)	16 August 2007–26 July 2013 (crisis to recent)
Czech Republic	0.337	0.595	0.599	0.376
Poland	0.367	0.548	0.656	0.425
Hungary	0.395	0.532	0.599	0.420
Slovakia	0.253	0.098	−0.014	0.006
Slovenia	NA	0.096	0.234	0.113

Notes: Daily market indexes are stated as changes in logs. Sample period: 3 January 2001–26 July 2013, 3541 observations, (except for 31 March 2006–26 July 2013 for Slovenia). Stock market indexes are: Frankfurt DAX40, New York DJIA, Prague SE PX, Warsaw WIG20, Budapest BUDINDX, Bratislava SAX16, Ljubljana Blue Chip SBI.
Source: Authors' own estimation based on Thomson Reuters Datastream data

it seems that Slovakia and Slovenia as small euro-area countries with low-capitalized equity markets may attract capital from investors seeking higher returns. Such capital inflows are likely to have short-term investment horizon,

Q7 and thus be more volatile. These are typical characteristics of frontier equity markets[4] that Slovenia and Slovakia resemble.

We now look at the correlation of CEE and the US stock markets. As shown in Table 2, correlations of daily returns between the local and the US markets are lower than those between the local and German markets, particularly for the three 'euro outs'.

To gain further insights into transmission of shocks in equity markets, as we have done in our analysis of bond markets shock transmission, we apply the VAR analysis and impulse response functions. The VAR model allows us to assess the interdependence between the equity market returns of CEE countries and Germany as well as the United States. Again, we use daily Thomson Reuters Datastream data for the sample period 3 January 2001–26

[4] By definition, frontier equity markets are those that have lower market capitalization and liquidity than the more developed markets, thus they attract investors seeking higher long-term returns as these markets exhibit low correlation with the larger markets. See for instance Amin and Orlowski (2014) for a detailed analysis of low correlations of returns between South Asian frontier markets and the leading global equity markets. Although the term 'frontier markets' is normally applied to emerging financial markets, their characteristics seem to fit to the low-capitalized euro-periphery markets that attract similar type of investors from the more developed core euro area markets.
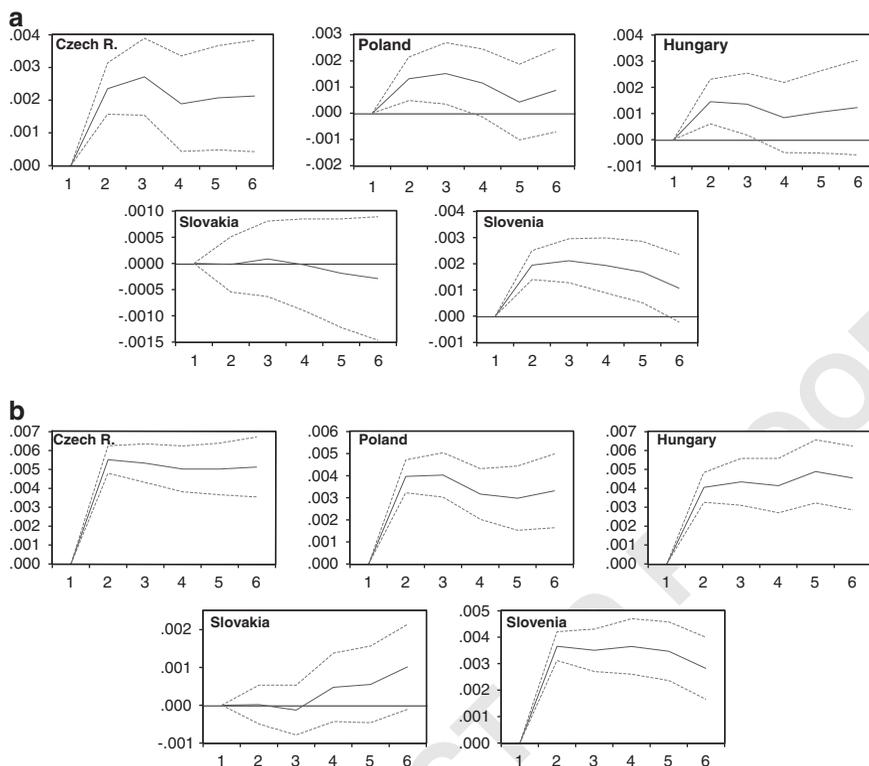
Figure 3: (a) Accumulated impulse responses of changes in local stock market indexes to a shock in the German DAX40

Notes: Daily market indexes are stated as changes in logs (Δlogs). Sample period: 3 January 2001–26 July 2013, 3541 observations, (except for 31 March 2006–26 July 2013 for Slovenia). From top-left, responses of: Prague SE PX, Warsaw WIG20, Budapest BUDINDX, Bratislava SAX16, Ljubljana Blue Chip SBI Top, to a Cholesky 1 standard deviation shock in German DAX40 (with a 2 standard error band). VAR model specification: 6 lag intervals in unrestricted VAR, Monte Carlo distribution of errors, with a 6-day diffusion, optimized by minimizing Schwartz Information Criterion

Source: Authors' own estimation based on Thomson Reuters Datastream data

(b) Accumulated impulse responses of changes in local stock market indexes to a shock in the US DJIA

Notes: Daily market indexes are stated as changes in logs. Sample period: 3 January 2000–26 July 2013, 3541 observations, (except for 31 March 2006–26 July 2013 for Slovenia). From top-left, responses of: Prague SE PX, Warsaw WIG20, Budapest BUDINDX, Bratislava SAX16, Ljubljana Blue Chip SBI Top, to a Cholesky 1 standard deviation shock in DJIA (with a 2 standard error band). VAR model specification as in Table 3a

Source: Authors' own estimation based on Thomson Reuters Datastream data

July 2013 (for Slovenia the data availability begins on 31 March 2006). The impulse response functions generated by our VAR model through the same optimization process as in the previous section are shown in Figures 3a and 3b. In Figure 3a, the impulse, that is, a Cholesky 1 standard deviation shock in

returns generated in the German DAX, has a strong positive impact on returns in the Polish, Czech, Hungarian and Slovenian markets. However, there is no discernible transmission of shocks from the German to Slovak markets. The Slovak case resembles a typical case of shock transmission pattern from the leading to the frontier capital markets (Amin and Orlowski, 2014).

Patterns of accumulated impulse responses of CEE equity market returns to shocks generated in the United State are shown in Figure 3b. Notably, the absorption of the US-generated shocks is stronger than that of the German shocks for all five CEE markets. Moreover, the shock transmission from the United States to the Czech Republic, Poland, Hungary and Slovenia is more instantaneous, showing a 1-day lag only. In contrast, the absorption of German shocks is spread over a 4-day period. The responses of the Slovak market to external shocks are the weakest within the CEE group of countries.

On the basis of the Slovak case, we draw a conclusion that patterns of correlations and the shock transmission in equity markets for the non-euro CEE countries may change once they adopt the euro. Correlations of their equity market returns with those of the German market may become lower or even negative, as these markets may be treated by investors as euro-periphery, or even euro-frontier equity markets. Such potential change in the equity market status should be taken into consideration in the determination of the actual timing of the euro adoption.

The equity market interdependence and interactions have a strong impact on integration of the banking sectors, as the leading banks in CEE become increasingly exposed to security holdings of the euro-area institutions, and therefore to sovereign risk problems in the common European currency system.

INTEGRATION OF BANKING SECTORS

In this section, we examine the degree of integration between the core EU and CEE banking sectors.[5] A comprehensive assessment of this integration goes beyond the scope of our study, therefore, we focus only on selected aspects of this integration that relate directly to the depth and scope of financial markets' integration. Specifically, we discuss: (1) the foreign bank participation as reflected by the share of foreign (core EU) bank assets in total bank assets in CEE countries, (2) spreads between the euro area and CEE bank lending rates and (3) trends in euro-area financing for banks.

The transformation of the bank industry in the CEE dating back to the early 1990s brought on macroeconomic instability. It stemmed from the severance of

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[5] For the evolution of the CEE banking sector, see Bonin *et al.* (2013).
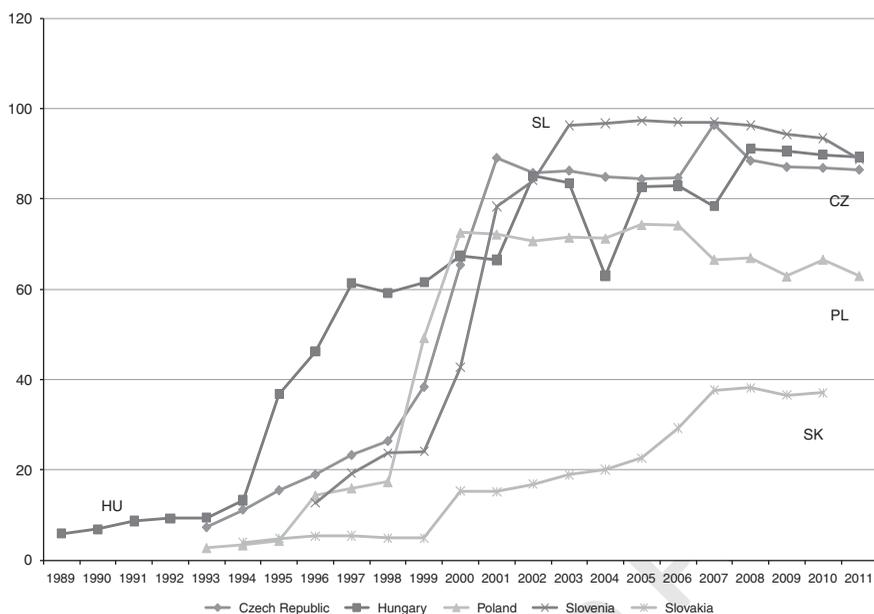
Figure 4: Asset share of foreign-owned banks (in percent)
Source: ECB and EUROSTAT

economic ties with previous economic partners that compounded the existing distortions in the new banking systems and resulted in a series of banking crises (Vinhas de Souza, 2004).

The common policy actions aimed at improving liquidity and solvency of the CEE banking sectors included the privatization and consolidation. While specific approaches to privatization varied from country to country, the resources and expertise required for consolidation were mostly provided by large Western European banks, in exchange for entry into these fast growing markets. As the total number of banks in those markets fell, reflecting the consolidation process, the share of assets owned by foreign banks increased very significantly, as shown in Figure 4.

Looking at the ownership structure of the CEE banks, we can see that the foreign banks that dominate those markets are from the EU, and especially from the euro area, as shown in Table 3. Slovakia has the highest share of the euro-area banks, with Austrian-based institutions accounting for almost 40% of total banking sector assets, followed by 25% of Italian-based banks (Raiffeisen Bank International, 2012). Financial institutions from these two euro-area countries play also an important role in other CEE countries. Among

Table 3: Share of foreign bank assets in total bank assets (2009 data)

	Czech Republic	Poland	Hungary	Slovakia	Slovenia
EU share in total bank assets	78	54	50.1	89.2	28.1
Non-EU share of total bank assets (largely US and Russian)	9.1	8.9	40.5	5.1	8.5
Foreign banks share in bank assets	87.1	62.9	90.6	94.3	36.6
EU share in all foreign bank assets	89.6	85.8	55.3	94.6	76.7
State-owned banks share in total assets[a]	3	21.5	5.3	8.2	20.1

[a]Average share of state-owned banks for this peer group is 11.62% of total assets.
Data Source: European Central Bank (ECB) and Raiffeisen Bank International, 2012

Q14

non-EU banks, the most pronounced role is played by American and Russian institutions.

Despite the fact that Slovenia has been a member of the euro since 2006, the share of non-domestic euro-area banking assets is by far the smallest, which is explained by state ownership of the two largest banks in the country. On the other hand, Slovakia, which has also adopted the euro, has the lowest share of non-euro-area banking assets. Thus, membership in the euro area has no direct impact on the degree of participation of euro-area banks in these two countries, as the shares of euro-area banks in total bank assets do not differ significantly from those in the non-euro CEE countries.

However, there is an important operational distinction in the role of foreign banks operating in CEE and those operating in Western euro area. Foreign banks in CEE are involved mainly in retail banking operations, while their engagement in wholesale banking is more pronounced in Western euro-area countries. Moreover, the CEE banks are generally more profitable, better capitalized and less reliant on wholesale funding than those in the euro area (Raiffeisen Bank International, 2012).

To assess the degree of integration of the banking sectors, we analyze spreads of nominal lending rates between CEE countries and the euro-area averages, specifically nominal interest rates on loans to non-financial corporations (Figure 5). [6] In the five examined CEE countries, lending rate spreads fell significantly right after their May 2004 EU accession. They continued to decline until the first quarter of 2008 when the repercussions from the global financial crisis began to affect the region. More recently, the spreads are the highest in Hungary, reflecting the prevalence of credit and sovereign default risks in this

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[6] Data source: the ECB's Statistical Data Warehouse, http://sdw.ecb.europa.eu/browse.do?node=9484266.
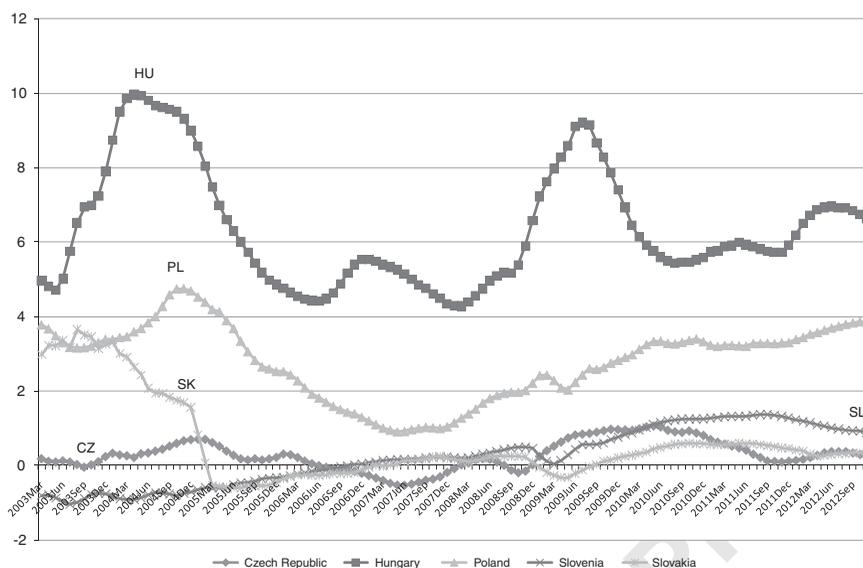
Figure 5: Spreads between local and euro-area weighted average nominal interest rates on loans to non-financial corporations
Source: ECB and EUROSTAT

economy. They are lower, yet still elevated in Poland. In both countries the spreads have been recently increasing. In contrast, the lending rate spreads have been declining and reaching near zero levels in Slovakia, Slovenia and the Czech Republic, as these countries are attaining a low credit risk environment comparable to that in the core euro area.

Further insights are provided by the correlations between the CEE countries rates and the weighted average euro-area rate on loans to non-financial corporations shown in Table 4. Such correlation has recently declined for the Czech Republic, indicating an effective decoupling of the Czech banking sector from the recent credit risk problems in the euro area. The same correlation for Poland shows a remarkably steady path. For the remaining three countries, the correlation has increased significantly, indicating a stronger co-movement in credit risk, particularly in the countries that have already adopted the euro, that is, Slovenia and Slovakia.

Widening premiums on lending rates shown in Figure 5 suggest a setback in financial integration in some CEE countries over the past few years. This trend is also observable in Figure 6, which shows the total deposits by financial institutions (monetary financial institutions MFIs, excluding the ESCB – European System of Central Banks), money market funds (MMFs) and debt

Table 4: Correlations between local and weighted-average euro-area rates on loans to non-financial corporations (average for the period, 3-month rolling windows)

	Czech Republic	Hungary	Poland	Slovenia	Slovakia
July 2010–November 2013: EA crisis	0.11	0.27	0.28	0.60	0.39
March 2003–June 2008: Pre-global crisis	0.41	0.06	0.28	0.52	0.55
March 2003–June 2010: Pre-EA crisis	0.38	0.14	0.24	0.46	0.51
March 2003–April 2004: Pre-EU accession	0.36	−0.42	0.28	0.43	0.22

Source: Authors' own estimation based on ECB data (http://sdw.ecb.europa.eu/browse.do?node= 9484266)
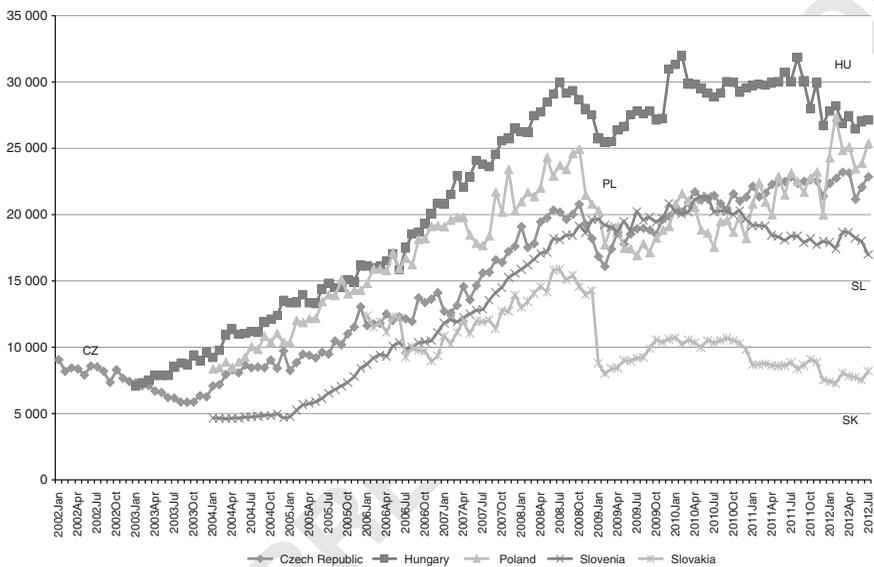

Figure 6: Total of deposits by monetary financial institutions, money market funds inflows and debt issued (in billions of Euros)
Data source: ECB

issued in CEE banks, as a proxy measure of total capital inflows from the euro area. More recently, euro-area capital outflows from the CEE banking sectors have accelerated, in response to the deepening sovereign debt crisis in the euro area and increasing counter-party risk in the EU banking sector. Upon eruption of the euro crisis in mid-2009, the financial intermediation fell in all five countries (Hasan *et al.*, 2013). Since mid-2010, it has fallen particularly in Hungary in response to its worsening macroeconomic fundamentals and to adverse domestic policies, most notably, the transferring of the exchange rate costs from non-Forint mortgages from households to banks.

In sum, there is no straightforward conclusion concerning integration of the CEE and euro-area banking sectors. The individual countries and their banking sectors are at different stages of business cycle, have different regulatory policy frameworks, show a non-uniform sensitivity to exogenous shocks and have different status concerning the euro-area membership. Nevertheless, we can summarize the results of our indicators, that is, the market share of euro-area banks in respective CEE countries, the spread in nominal interest rate on loans to non-financial corporations (a price-based indicator) and trends in euro-area financing for banks (a quantity based indicator) in the following terms. We observe that the Czech Republic and Poland have held up better in terms of banking integration measures than the euro-area members, that is, Slovakia and Slovenia, while Hungary, dominated by country-specific shocks, lags behind all the others.

We conclude that the level of banking integration with the euro area is conditional on more complex factors than merely on the euro adoption. It depends also on fundamentals, market structure and regulatory policy frameworks.

CONCLUSION

We argue that integration of financial markets is essential for subsequent monetary integration. Following this assumption, we examine integration of government bond and equity markets, as well as the banking sectors of five CEE countries with the euro-area core as represented by Germany. We note that financial integration is an important prerequisite for a successful adoption of the euro by the candidate countries, as it would allow them to mitigate systemic risk and shield them from potentially destabilizing shocks.

Our analysis shows substantial progress in bond yield convergence of CEE countries before their 2004 EU accession and until the outbreak of the recent global financial crisis in August 2007. The crisis disrupted integration, particularly for Hungary whose macroeconomic fundamentals are weaker, as reflected by its higher sovereign risk premium. On an optimistic note, bond market integration for all examined countries with the exception of Slovenia has been gaining traction since 2012. The Czech bond market is now fully aligned with the German market, showing eliminated sovereign risk premium. The Polish bond market is again on the right convergence path. Arguably, the Czech Republic and Poland may be now ripe to adopt the euro without encountering adverse effects of contagion from the euro-periphery.

We further demonstrate that equity markets of the non-euro CEE countries are highly correlated with global equity markets, as proxied by the US market,

and to a lesser extent with the German market. We argue that correlation and the shock transmission in equity markets of these countries may change once they adopt the euro. Correlations of their equity market returns with those of the German market may become lower or even negative, as these markets may be treated by investors as euro-periphery, or even euro-frontier equity markets.

Integration of the banking sectors depends on fundamentals, market structure and policy frameworks and not merely on the euro adoption. A country with more robust macroeconomic and regulatory conditions is prone to be more resilient to both internal and external adverse shocks.

The recent financial crisis has disrupted integration of CEE financial markets and institutions with those in the euro area. The CEE countries may still choose to strengthen their institutional resilience and pursue disciplined macroeconomic policies before moving to adopt the euro.

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