ONB
OESTERREICHISCHE NATIONALBANK
EUROSYSTEM

FOCUS ON EUROPEAN ECONOMIC INTEGRATION

Stability and Security.

Q3/12

The OeNB's quarterly *Focus on European Economic Integration (FEEI)* presents peer-reviewed studies on macro-financial and monetary integration in Central, Eastern and Southeastern Europe (CESEE) as well as related country analyses and statistics. This publication reflects a strategic research priority of the OeNB.

Publisher and editor	*Oesterreichische Nationalbank* *Otto-Wagner-Platz 3, 1090 Vienna* *PO Box 61, 1011 Vienna, Austria* *www.oenb.at* *oenb.info@oenb.at* *Phone (+43-1) 40420-6666* *Fax (+43-1) 40420-6698*
Editors in chief	*Peter Mooslechner, Doris Ritzberger-Grünwald*
General coordinator	*Peter Backé*
Scientific coordinators	*Markus Eller, Martin Feldkircher, Tomáš Slačík*
Editing	*Dagmar Dichtl, Ingrid Haussteiner, Henry Meyer, Rena Mühldorf, Ingeborg Schuch*
Design	*Communications Division*
Layout and typesetting	*Walter Grosser, Birgit Vogt*
Printing and production	*Web and Printing Services*

DVR 0031577

Contents

Opinions expressed by the authors of studies do not necessarily reflect the official viewpoint of the Oesterreichische Nationalbank or of the Eurosystem.

Call for Entries: Olga Radzyner Award 2012 for Scientific Work on European Economic Integration

The Oesterreichische Nationalbank (OeNB) has established an award to commemorate Olga Radzyner, former Head of the OeNB's Foreign Research Division, who died in a tragic accident in August 1999. The award is bestowed on young economists for excellent research on topics of European economic integration and is conferred annually. In 2012, four applicants are eligible to receive a single payment of EUR 3,000 each from an annual total of EUR 12,000.

Submitted papers should cover European economic integration issues and be in English or German. They should not exceed 30 pages and should preferably be in the form of a working paper or scientific article. Authors shall submit their work before their 35th birthday and shall be citizens of any of the following countries: Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, FYR Macedonia, Hungary, Kosovo, Latvia, Lithuania, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia or Ukraine. Previous winners of the Olga Radzyner Award, ESCB central bank employees as well as current and former OeNB staff are not eligible. In case of coauthored work, each of the coauthors has to fulfill all the entry criteria.

Authors shall send their submissions either by electronic mail to *eva.gehringer-wasserbauer@oenb.at* or by postal mail – with the envelope marked "Olga Radzyner Award" – to the Oesterreichische Nationalbank, Foreign Research Division, Otto-Wagner-Platz 3, POB 61, 1011 Vienna, Austria. Entries for the 2012 award should arrive at the OeNB by September 17, 2012, at the latest. Together with their submissions, applicants shall provide copies of their birth or citizenship certificates and a brief CV.

For detailed information, please visit the OeNB's website at *http://www.oenb.at/en/ueber_die_oenb/foerderung/stipendien/radzyner/teilnahme/teilnahme.jsp* or contact Ms. Eva Gehringer-Wasserbauer in the OeNB's Foreign Research Division either by e-mail *(eva.gehringer-wasserbauer@oenb.at)* or by phone (+43-1-40420-5205).

Call for Applications: Visiting Research Program

The Oesterreichische Nationalbank (OeNB) invites applications from external researchers for participation in a Visiting Research Program established by the OeNB's Economic Analysis and Research Department. The purpose of this program is to enhance cooperation with members of academic and research institutions (preferably post-doc) who work in the fields of macroeconomics, international economics or financial economics and/or with a regional focus on Central, Eastern and Southeastern Europe.

The OeNB offers a stimulating and professional research environment in close proximity to the policymaking process. Visiting researchers are expected to collaborate with the OeNB's research staff on a prespecified topic and to participate actively in the department's internal seminars and other research activities. They will be provided with accommodation on demand and will, as a rule, have access to the department's computer resources. Their research output may be published in one of the department's publication outlets or as an OeNB Working Paper. Research visits should ideally last between 3 and 6 months, but timing is flexible.

Applications (in English) should include

- a curriculum vitae,
- a research proposal that motivates and clearly describes the envisaged research project,
- an indication of the period envisaged for the research visit, and
- information on previous scientific work.

Applications for 2013 should be e-mailed to *eva.gehringer-wasserbauer@oenb.at* by November 1, 2012.

Applicants will be notified of the jury's decision by mid-December. The following round of applications will close on May 1, 2013.

Studies

The Impact of Country Risk Ratings and of the Status of EU Integration on FDI Inflows in CESEE Countries

Nadja Walch,
Julia Wörz[1]

We analyze the determinants of foreign direct investment (FDI) inflows in the ten EU Member States, plus Croatia, in Central, Eastern and Southeastern Europe (CESEE) over the period from 1995 to 2011, with a particular focus on the effects of country risk ratings and the EU integration status on a country's attractiveness for FDI. We distinguish between twelve different risk ratings and seven stages of integration (non-EU country, potential candidate country, candidate country, negotiating country, EU Member State, ERM II member country and euro area country). Using quarterly data, we identify the market size and cost factors as the most important determinants, suggesting that market- and efficiency-seeking FDI were the most prevalent forms of FDI in the region. The host country's infrastructural environment also has the expected positive effect on FDI inflows. The effects of risk ratings turn out to be nonlinear in the sense that improvements in intermediate risk levels have the largest positive effect on FDI, while this effect diminishes in the case of upgrades at the highest levels. Turning to the status of EU integration, a more advanced stage represents an additional bonus over pure cost- and market-related factors, but only up to the onset of the global financial and economic crisis.

JEL classification: C33, F15, F21
Keywords: Foreign direct investment, European integration, country risk ratings

1 Introduction

Central, Eastern and Southeastern Europe (CESEE) has long been considered a very promising destination for foreign capital. The deep and unprecedented transition from planned to market economies helped to attract substantial amounts of foreign direct investment (FDI) – see, inter alia, Hunya (2007); Mooslechner and Ritzberger-Grünwald (2009); and Nunnenkamp (2002). The advantage of the CESEE countries was generally to be found in their location within Europe, together with low corporate tax rates, relatively low wages and access to EU subsidies. A favorable investment climate, a highly skilled workforce and free access to the rest of the EU market added to this advantage. Campos and Kinoshita (2003) stressed the fact that CESEE and former Soviet Union countries had been industrialized prior to their transformation and could therefore count on a relatively cheap yet highly educated workforce. Brada, Kutan and Yigit (2003) added the aspect of differences in resource endowments to the list of the region's locational advantages. Furthermore, the geographic proximity of the CESEE countries to Western markets has been mentioned as a favorable characteristic by many authors, e.g. Kinoshita (2011). In addition, the prospect of continuous economic growth prior to the global financial and economic crisis was another argument in favor of the region as an attractive FDI destination. The transition process and accompanying structural reforms suggested that an improved and stable business environment would emerge. As a consequence of continuous and strong FDI inflows over the past one-and-a-half decades, the CESEE countries now record FDI-to-output ratios that are above average by global standards (Fillat-Castejón and Wörz, 2011).

[1] *University of Innsbruck, nadja.walch@gmail.com; Oesterreichische Nationalbank, Foreign Research Division, julia.woerz@oenb.at.*

Given the interesting period of economic transition and the likely benefits of foreign capital as a catalyst for economic development, it becomes clear why the determinants of FDI to the CESEE region have been analyzed by so many authors over the past decade (e.g. Breuss, Egger and Pfaffermayr, 2001; Carstensen and Toubal, 2004; and Kalotay, 2006). At around the time of the accession of ten CESEE countries to the EU, in particular, many authors placed special emphasis on the influence of EU integration on the region's attractiveness for FDI (e.g. Bevan and Estrin, 2000; Campos and Kinoshita, 2003; and Eckert and Rossmeissl, 2005). Some authors also drew attention to the influence of different types of political and legal risks, however (e.g. Busse and Hefeker, 2007; and Bucevska, 2009).

The global economic crisis caused a global decrease in FDI through reduced access to funding, gloomy economic prospects and increased levels of risk aversion (UNCTAD, 2009). Giurca Vasilescu (2009) moreover mentions the negative impact of foreign demand and increased exchange rate volatility on FDI flows. The CESEE countries have experienced a particularly steep decline in FDI inflows since the beginning of the global financial and economic crisis. In particular, the significant worsening of investors' attitudes to risk may have been an important factor. Therefore, it is interesting to examine what importance investors attribute to country risk ratings when deciding on investment projects, and whether this importance has changed since the start of the crisis.

This paper aims to identify the importance of individual determinants of the region's attractiveness for FDI, with a special emphasis on the influence of EU membership and country risk ratings. We analyze whether countries that are more closely integrated with the European Union were able to establish some kind of "EU anchor" both before and during the financial crisis, and how country risk ratings have impacted on this EU anchor, by way of a panel regression covering a sample of eleven CESEE countries (the ten EU Member States in CESEE plus Croatia) over the period from 1995 to 2011.

Our analysis adds three innovative aspects to the rather extensive existing literature on the topic. First of all, while most of the above-mentioned literature deals with data covering rather distant time periods (mainly 1995–2005), we are able to include all the key milestones in the region's FDI history to date, such as the emergence of the CESEE region as a destination for FDI once the transformational recession had been overcome, the accession of ten CESEE countries to the EU and the adoption of the euro by three of these countries, the crisis-related decline in FDI inflows and the aftermath of the global economic crisis.

Second, to the best of our knowledge, we are the first to make detailed distinctions between these countries' different stages of institutional integration. Most authors modeled EU integration with the aid of a dummy variable that takes a value of 1 when a certain "benchmark" event (such as the signing of the Europe Agreements or the date of EU accession) takes place and thereafter. By contrast, we distinguish between seven stages in the integration process (ranging from third-country status to the adoption of the euro).

Third, we explicitly allow for a nonlinear relationship between country risk ratings and FDI inflows, reflecting the view that improvements in perceived risk levels at an intermediate level (i.e. especially the move from sub-investment grade to investment grade) are likely to have a much stronger impact on FDI decisions than improvements at the upper or lower end of the rating spectrum.

The following section briefly reviews the relevant findings in the existing literature. Section 3 presents the data, the economic reasoning behind our choice of variables and our empirical framework, while section 4 contains the results and section 5 concludes.

2 Review of the Literature

Research on the determinants of FDI flows to the CESEE region has not been based on any particular theoretical or empirical model. Many papers focus on institutional features in the specific context of the transition of these countries to a market economy system (e.g. changes in infrastructure, the legal and business environment and political risk). Apart from such an explicit focus on the region, also economic fundamentals – including host market size, market growth, productivity, labor market conditions, macroeconomic stability and trade openness – have been proven to be significant determinants of FDI by various researchers, e.g. Resmini (2000); Campos and Kinoshita (2003); Brada, Kutan and Yigit (2003); Busse and Hefeker (2007); and Bucevska (2009).

Resmini (2000) used a gravity model to investigate sector-specific differences with respect to FDI determinants in the manufacturing industries of selected CESEE economies. Apart from market fundamentals, she concluded that progress in an economy's transition process is a key determinant of FDI inflows. Hence, the inclusion of a transition index seems important.

Campos and Kinoshita (2003) estimated the effect of agglomeration, institutional development, initial market conditions and factor endowments on FDI stocks. In their analysis, they compared the relevance of the aforementioned factors for FDI flows to Central and Eastern European countries as well as to Baltic countries and CIS economies. According to their panel data analysis, institutions and agglomeration economies are more important than economic variables in determining FDI flows to transition economies. This provides support for the hypothesis that investors are cautious when investing in transition economies, with political risk (stability of institutions, bureaucracy, rule of law, etc.) playing a crucial role. Moreover, their research found that investors tend to follow the actions of others (agglomeration theory).

Bevan and Estrin (2000) analyzed which factors actually determine country risk. In their view, country risk ratings reflect a country's economic, political and institutional performance. They identify private sector development, the quality of the privatization process, low government deficits, high reserve stocks and a high share of industrial output in GDP as factors that lead to better perceptions of country risk. While corruption has a significant negative impact on risk ratings, no evidence was found of EU accession announcements having a direct impact on risk ratings. They also related country risk ratings to FDI inflows and found support for a significant positive effect of good risk ratings in CESEE. In a later paper – Bevan and Estrin (2004) – however, they found no proof of market evaluations of country risk – as measured by country credit ratings published in the Institutional Investor magazine – having a significant influence on FDI flows to the CESEE region. They explain this contradictory result with the fact that at this later period in time, transition countries were already able to attract FDI inflows

irrespective of their respective country risk rating and argued that investors believed that the accession process was too big to fail.[2]

Bucevska (2009) estimated the impact of various economic and noneconomic variables on the stock of outward FDI of EU member countries in selected CESEE countries. She also found support for the hypothesis that agglomeration economies, the importance of making progress in the EU accession process and good risk ratings improve a country's ability to attract foreign capital.

Brada, Kutan and Yigit (2003) used a very different approach and calculated differences in FDI to developed market economies and to countries in transition. Furthermore, they used their findings to establish a reference model, which they employed to project FDI inflow levels that could be expected for transition economies on the basis of country-specific economic conditions. In addition, they took account of FDI-dampening transition effects. The shortfall in actual FDI flows in comparison with projected inflows was then explained by the deterrent effects of political instability. In their conclusions, they stress the importance of making continuous progress in the transition process and the necessity to maintain and establish political stability in order to generate investor confidence.

To sum up, the economic literature has found various institutional and macroeconomic factors to be important determinants of FDI inflows in transition economies. In particular, the progress made in the transition to a market economy system, political stability and an advanced stage in the EU integration process seem to provide promising competitive advantages, while the impact of country risk ratings on FDI inflows to CESEE may have varied over time.

It seems appropriate here to explicitly summarize the main arguments for a positive effect of the EU integration process on FDI:

– EU accession requires the full adoption of the Union's *acquis communautaire*. New member countries have to transpose the full body of EU law into their national legislation. This institutional convergence leads to more political, economic and legal stability. Thus, EU accession should improve an economy's business environment, which in turn makes it more attractive for foreign investors – see e.g. Narula and Bellak (2009); Kalotay (2006); Nunnenkamp (2002); Eckert and Rossmeissl (2005); and Backé et al. (2010). Baldwin, Francois and Portes (1997) describe the risk premium effect of EU accession: membership is expected to reduce the occurrence of unexpected changes in an economy's legal system, industrial standards and administrative procedures. Since extreme policy slippages might be prevented – see Backé et al. (2010) – CESEE countries will be perceived to be a less risky place to invest in. This not only helps to overcome the risk aversion of investors, but also cuts the risk premiums demanded on investments in the economy in question. Thus, investors face reduced capital costs and might identify accession countries as a more favorable destination for FDI than otherwise similar destinations in non-accession countries (Baldwin, Francois and Portes, 1997).

[2] *In this context, the findings of Teles and Leme (2010) are worth mentioning. Their results show that country risk ratings are not only based on market fundamentals, but also reflect market sentiment. Using J.P. Morgan's EMBI+ indicator, they demonstrated that prejudice influenced risk ratings and that some countries were thus discriminated against in their risk assessment.*

- Involvement in supranational economic structures significantly lowers transaction costs between foreign production and export (Bevan and Estrin, 2004). EU membership clearly helps to overcome the burden of trade barriers and offers access to additional markets.
- New EU members are also subject to rights and duties stemming from treaties and agreements signed by the EU with third countries. Hence, participating in the EU not only facilitates trade with other member countries, but also entitles accession countries to more favorable conditions under the EU's preferential trading arrangements with third countries.
- By achieving full EU membership, accession countries also gain full rights to take part in the decision-making mechanisms of the Union. Therefore, they have a say in the further shape of the EU's path of integration. Moreover, new EU members become participants in the EU budget. The EU's structural funds, in particular, should be mentioned in this context. They aim at supporting disadvantaged regions and countries that are lagging behind with their economic development. The outlook of such transfer payments promises improvements to the FDI environment in terms of physical and human capital (Kalotay, 2006).
- Finally, full membership may help to decrease the probability of administrative protectionism being applied to non-EU members (Kalotay, 2006). This is particularly important for CESEE countries since a major proportion of their capital inflows stems from EU countries (EBRD, 2011). In view of the fact that protectionist measures may still be holding back capital flows, EU membership could significantly strengthen the CESEE countries' positions in the European investment market.

However, EU membership is not perceived to be only beneficial for FDI inflows. The assessments below demonstrate that EU accession might have only moderate or even negative effects on the inflow of foreign capital:

- The adoption of the Union's *acquis communautaire* could increase the cost of doing business in new EU member countries. Especially the implementation of environmental protection standards and labor market regulations could undermine initial competitive advantages of the CESEE region (Kalotay, 2006).
- Narula and Bellak (2009) write that the FDI-promoting effects of participating in the EU decrease in importance as the number of EU Member States increases. The perceived "EU bonus" is currently shared by 27 countries, with even more candidate countries already waiting for accession. Hence, the advantages of membership are not as unequivocal as they were and might stop functioning as an incentive for FDI inflows.
- Eckert and Rossmeissl (2005) argue that the EU integration process also leads to cultural convergence. As a result, foreign companies might no longer find it necessary to overcome cultural differences by investing abroad. This reduction of "immaterial" proximity-seeking FDI inflows does not only affect the scale of capital inflows, but also prevents the inflow of critical resources that would strengthen the competitiveness of CESEE countries in terms of their attractiveness as a destination for FDI.
- EU membership is also connected with the outlook of participation in Stage Three of Economic and Monetary Union (EMU). Although adopting the euro

would reduce the exposure to unfavorable exchange rate developments, participation in EMU restricts a country's autonomy with respect to managing its currency's exchange rate and the possibility of using the exchange rate as a tool for keeping production costs competitive (Kalotay, 2006). The loss of especially this aspect of price competitiveness in production costs would mean the elimination of a valuable competitive advantage of the CESEE region.

– According to Nunnenkamp (2002), the final step of the accession process – full membership in the European Union – should not be expected to have major FDI-promoting effects. First, most of the accession countries will already have signed Europe Agreements with the EU, and this has brought them to the top of the list of the EU's preferential trading partners. Second, investors tend to seek first-mover advantages. Therefore, the incentive for investing in a potential EU member country is far stronger during the negotiations on accession than after the Union has actually been joined.

The empirical analysis in this paper will shed light on these diverging arguments on the effects of EU membership on FDI flows to CESEE transition countries. Furthermore, we will also analyze whether these countries benefited from an "EU anchor" during the global financial crisis that gave investors confidence in a time of great instability in global financial markets.

With the accession of ten CESEE transition countries to the EU in 2004 and 2007, interest in the topic seems to have faded. Most of the aforementioned literature deals with data that do not cover very recent periods (mainly 1995–2005). Furthermore, potential changes in the pull factors for FDI in the region in the aftermath of the global financial and economic crisis have not been analyzed thus far. A rather puzzling observation during the 2008–2009 crisis was the extent to which it affected the CESEE region. The crisis originated in the U.S.A., a highly developed country, and was quickly transmitted to other advanced economies. Most emerging regions were affected only later, and to a lesser degree. The CESEE region proved to be a clear exception to this rule, as it was hit severely by the downturn of FDI in early 2009. Hence, it seems of interest to examine whether increased EU integration – after having served as a bonus in attracting FDI during the transition phase – actually aggravated the downturn in FDI flows to the region or whether this was related to other factors. In contrast to the rather vast body of literature on the topic, our data sample extends up until 2011. As such, it covers all the key "milestones" of the CESEE region's FDI history to date, namely:

– the "emergence" of the CESEE region as a destination for FDI;
– the establishment of a competitive position as an FDI host country;
– EU accession and adoption of the euro by three countries in the region;
– the global economic crisis; and
– the aftermath of the global economic crisis.

3 Empirical Setup

Our sample comprises 11 countries with a successful record of EU integration: Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. The data cover quarterly observations in the period from 1995 to 2011.

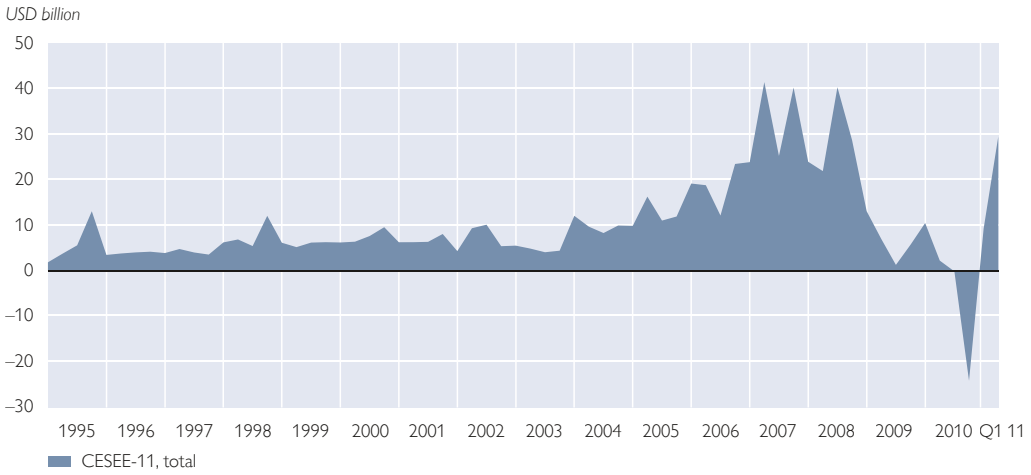
Our main focus is on FDI inflows to the region. We use data for FDI inflows in millions of U.S. dollars obtained from the IMF's International Financial Statistics

(IFS) database as our dependent variable.[3] The analysis of FDI patterns in the CESEE region is especially interesting as their transition from planned to market economies resulted in a large-scale privatization of state-owned companies and generated government policies that encouraged FDI (Richter, 2009). This caused FDI inflows to gradually pick up after the post-transitional recession. Chart 1 shows that as from 1995, FDI flows to the CESEE region rose continuously until 2007.[4] The increase in FDI was especially pronounced in the years of buoyant economic growth in the region. On the one hand, this surge in FDI prior to the global recession reflected a global trend in FDI; on the other hand, it was driven by some catching-up in terms of FDI inflows in Poland – the largest economy in the region – and Slovakia, as well as by lagged developments in Bulgaria and Romania (Hunya, 2007). As early as in 2007, FDI inflows to the region started to fluctuate around their peak levels. The reduction in FDI in 2008–2009 was a global phenomenon caused by the financial crisis and turned out to be very pronounced in the CESEE region as well.[5]

Chart 2 shows that the impact of the financial crisis differed from country to country in the region. FDI inflows to Estonia, Romania, Poland, Slovenia, Croatia and the Czech Republic showed some resilience. Their annualized FDI inflows are comparable before and after the start of the crisis. In Estonia, the annualized FDI inflows have recently even risen above the average level recorded throughout the period from 1995 to 2008, despite a sharp decline in early 2009. Slovakia, Latvia and Hungary are found to be the biggest losers, their average annualized FDI

Chart 1

Real Quarterly FDI Inflows in CESEE-11, 1995–2011



Source: Authors' calculations based on the IMF's IFS.

Note: FDI inflows are deflated and seasonally adjusted.

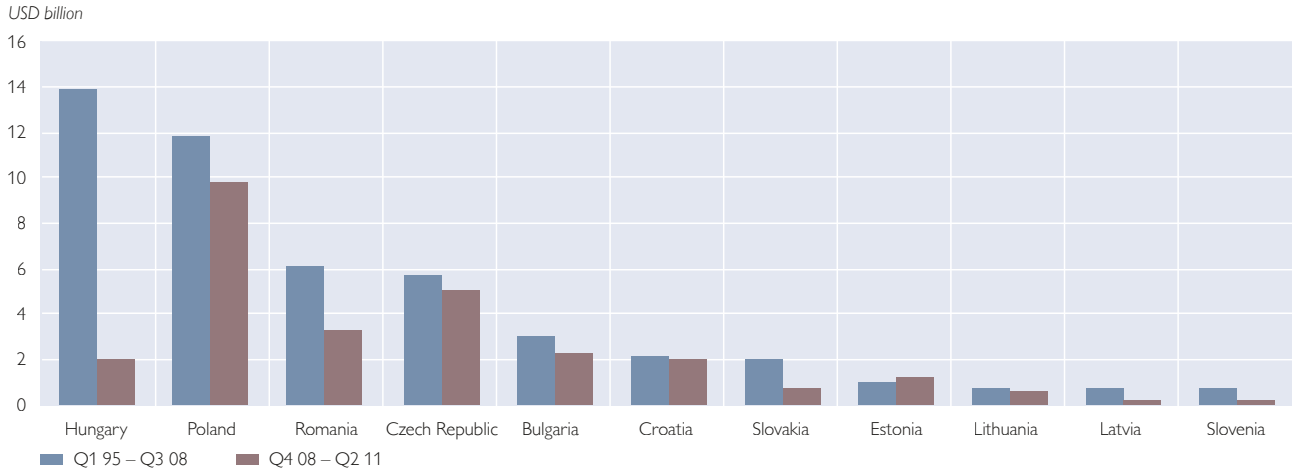
[3] *All data were downloaded through the FIW database tool (see www.fiw.ac.at). FDI inflows were first deflated and then seasonally adjusted before they were entered in the empirical estimations in log-form.*

[4] *Fidrmuc and Martin (2011) mention in their analysis of FDI in CESEE countries that this growth in FDI inflows needs to be seen in the context of the region's gradual integration into the EU, which is reflected in the large proportion of capital flows to the region that originated in EU Member States.*

[5] *As set out in UNCTAD (2010), the decline was smaller in Europe than in the U.S.A. and Japan, but it affected the CESEE countries considerably more severely than other parts of Europe.*

Chart 2

Average Annualized Real FDI Inflows, Country Breakdown



Source: Authors' calculations based on the IMF's IFS.

Note: FDI inflows are deflated and seasonally adjusted.

inflows having more than halved in absolute terms since the start of the financial crisis. Hungary represents an outlier and needs to be addressed separately: in 2010, it experienced an exceptionally marked drop in the level of FDI inflows. This notwithstanding, it is still one of the countries that registered the highest FDI growth rates, and was able to secure the highest FDI inflows, throughout the entire period from 1995 to 2011.

Our main goal is to identify the determinants of these rather volatile developments in FDI inflows to the region, with special emphasis on risk ratings and the status of EU integration. Our choice of explanatory variables was driven by previous empirical research conducted in this field and follows the approaches of authors such as Campos and Kinoshita (2003), Resmini (2000), and Bevan and Estrin (2004). After having established a robust model that explains FDI inflows to the CESEE region sufficiently well, our main variables of interest – country risk and the status of EU integration – are introduced to the baseline regression. Our final specification is given in equation 1, whereby all explanatory variables are lagged by one year in order to avoid endogeneity and to reflect the time lag required between investment decisions and their implementation:

$$\begin{aligned} ln\, fdi_{i,t} = \alpha + \beta_1\, ln\, GDP_{i,t-4} + \beta_2\, ln\, growth_{i,t-4} + \beta_3\, ln\, open_{i,t-4} + \\ + \beta_4\, ln\, ulc_{i,t-4} + \beta_5\, ln\, tax_{i,t-4} + \beta_6\, ln\, road_{i,t-4} + \beta_7\, ln\, risk_{i,t-4} + \\ + \beta_8\, ln\, risk^2_{i,t-4} + \beta_9\, ln\, EU_{i,t-4} + \mu + \varepsilon_{it} \end{aligned} \quad (1)$$

To control for the impact of classic determinants of FDI, the following variables are used in our model:

First, we control for differences in market size through the log of GDP. Market size is particularly important for market-seeking FDI, as the size of an economy influences product demand, the capacity to supply and the potential for economies of scale. The expected positive influence of the host country's GDP on FDI inflows is confirmed in e.g. Bevan and Estrin (2000). According to the review of the

literature by Chakrabarti (2001), market size is even seen as the most accepted significant determinant of FDI flows.

Furthermore, economic growth appears to be a useful proxy for the measurement of the market's potential and dynamics. High rates of economic growth are proof of promising market conditions that should attract foreign investors, so that its coefficient is assumed to be positive. Bevan and Estrin (2000) found strong support for the hypothesis of FDI-promoting effects of market growth. Busse and Hefeker (2007), for example, mentioned the endogeneity of the relationship between economic growth and investment inflows.[6]

Openness to trade was also found to be a significant determinant by many authors. For example, Campos and Kinoshita (2003) report a positive and significant coefficient for trade openness in the case of their sample of Eastern European and Baltic countries. However, the impact of trade barriers on FDI is not straightforward since it depends very much on the type of foreign investment involved. Likewise, Busse and Hefeker (2007) address the case of horizontal FDI, which is assumed to be driven by the so-called tariff-jumping hypothesis. Higher trade barriers increase the costs of serving a market via arm's-length trade in comparison with those of serving it through FDI. It may moreover protect the foreign investor's output against other foreign competitors, so that higher trade barriers could actually attract more FDI. We measure trade openness here as the ratio of imports and exports to GDP, with the sign of the coefficient being expected to be positive. The fact that low-cost production opportunities were initially one of the major advantages of the region leads to the assumption that export-oriented FDI is more important than horizontal FDI. However, considering the rapid convergence of these countries, the relevance of market-seeking FDI should not be underestimated.

As has already been mentioned, cost differences in FDI host countries are important determinants of flows for efficiency-seeking FDI. Lower production costs and a tax-friendly business environment constitute major locational advantages for many countries in the CESEE region. Therefore, unit labor costs and corporate tax rates are also included in the model.[7] A strong negative influence of unit labor costs (and tax rates) on the observed inflow of FDI would support the hypothesis of cost advantages being one of the major competitive advantages of the region. This would moreover lead to the conclusion that efficiency-seeking FDI might be the prevalent motivation behind FDI flows to CESEE countries.

Finally, in line with the economic literature, the model also controls for differences in the state of infrastructure and transition. The effects of physical infrastructure on the direction of FDI will be assessed by introducing a measure obtained from the United Nations Economic Commission for Europe (UNECE): the length of roads in each country.[8]

[6] *As mentioned earlier, all explanatory variables are introduced with a one-year lag in order to mitigate this problem.*

[7] *Data on labor costs stem from the Vienna Institute for International Economic Studies (wiiw). The measure used in the regression is an index tracking the development of unit labor costs in comparison with the reference year 2005. Historical corporate tax rates were attained from Mintz and Weichenrieder (2010) and the annual KPMG Corporate Tax Rate Surveys – KPMG International (1995–2011).*

[8] *Transition indicators, e.g. that of the EBRD, could be used to capture the effect of the attained level of transition. Unfortunately, institutional developments, which account for a major part of the EBRD's transition indicator, are highly correlated with the level of EU integration. In order to avoid bias-causing multicollinearity, we chose to focus on road infrastructure only, as we already largely cover institutional reforms through our EU integration variable.*

The model is estimated as a static panel. As mentioned above, all explanatory variables are entered with a four-period (= one-year) lag, as suggested by several authors (e.g. Busse and Hefeker, 2007; and Bevan and Estrin, 2004). FDI decisions represent decisions on lasting investments, so that there is likely to be a certain time lag before decision makers react to changes in the relevant variables that influence these investment decisions, not least on account of the fact that information on these variables likewise becomes available only with some time lag. We use a random effects estimator with robust standard errors (i.e. correcting for heteroskedasticity). Our choice of random effects estimator was driven by both statistical reflection (based on the Hausman test) and economic considerations (the selection of countries implies a rather homogenous sample in which variations occur mainly over time).

3.1 Country Risk Ratings

The review of the literature above already suggested that country risk entails many different components: political, institutional and economic risk. Hence, alternative indicators can be found, with each addressing a certain aspect of country risk. For example, the EBRD transition index and the Beri S.A. Operation Risk Index refer to the quality of the country's institutional landscape. Economic risk is often assessed in sovereign default ratings provided by agencies like Standard & Poor's, JPMorgan Chase or Moody's. Information on political risk can be found in the International Country Risk Guide published by the Political Risk Services (PRS) Group, for instance. Some country risk indicators, such as the Heritage Foundation's Index of Economic Freedom, address various aspects of country risk simultaneously. The authors of empirical analyses very often observe a positive relationship between political and institutional risk, on the one hand, and FDI, on the other, i.e. that more stable countries (with a higher risk rating) obtain larger FDI inflows (e.g. Brada, Kutan and Yigit, 2003; Resmini, 2000; and Busse and Hefeker, 2007).

The country risk ratings used here are the sovereign currency long-term debt ratings provided by Standard & Poor's: "The sovereign rating methodology (…) addresses the factors that affect a sovereign government's willingness and ability to service its debt on time and in full" – see Standard & Poor's (2011). These ratings therefore relate largely to the economic part of country risk. It describes a country's solvency position, but sees it in relation to the strength of the institutional and governmental system backing the economy. We chose to use foreign currency ratings as these also consider restrictions on transfers and convertibility (although, in the more recent years, the latter can largely be dismissed as a consequence of increasing EU integration), and thus reflect the influence of exchange rate movements on profit repatriation. In general, even for private issuers, the capacity to repay one's liabilities may be lower in foreign currency than in local currency, analogous to the sovereign government's relatively lower capacity to repay external versus domestic debt. Hence, we see foreign currency risk ratings as providing more relevant information for risk-averse investors. Alternatively, ratings relating to the political or institutional components of country risk could be used as well – as in Campos and Kinoshita (2003) and Resmini (2000). However, these risk measures are intrinsically linked to the status of EU integration. In order to avoid overly high collinearity between the

Table 1

Foreign Currency Long-Term Debt Ratings, 1995–2011

	BG	HR	CZ	EE	HU	LV	LT	PL	RO	SK	SI
1995			13		10			9		8	
1996			15		10			11		11	15
1997		11	15		11	12	11	11	8	11	15
1998	7	11	15	13	11	12	11	11	7	11	15
1999	7	11	14	13	12	12	11	12	5	10	15
2000	7	11	14	13	13	12	11	12	5	10	15
2001	7	11	14	13	14	12	11	13	6	10	15
2002	8	11	14	14	14	12	12	13	7	11	15
2003	9	11	14	14	14	13	13	13	8	12	16
2004	10	11	14	14	14	13	14	13	9	13	17
2005	11	12	14	15	14	14	14	13	10	14	17
2006	12	12	14	15	13	14	15	13	11	15	18
2007	12	12	14	15	13	13	15	14	11	15	18
2008	12	12	15	15	13	13	14	14	11	15	18
2009	11	12	15	15	11	10	12	14	10	16	18
2010	11	12	15	15	11	9	12	14	10	16	18
2011	11	11	15	15	11	10	12	14	10	16	18

Source: Standard & Poor's.

Note: 20 = AAA; 19 = AA+; 18 = AA; 17 = AA–; 16 = A+; 15 = A; 14 = A–; 13 = BBB+; 12 = BBB; 11 = BBB–; 10 = BB+; 9 = BB; 8 = BB–; 7 = B+; 6 = B; 5 = B–; 4 = CCC; 3 = CC; 2 = C; 1 = D.

two main variables of interest, we opted for sovereign debt ratings.[9] Table 1 provides an overview of the credit rating history of the respective CESEE countries in our sample:

In our empirical specification, country risk is introduced in a nonlinear fashion in order to reflect the fact that an upgrade from sub-investment to investment grade (meaning, in our case, from BBB– to BB+) is likely to have a stronger influence on investors' decisions than a further improvement within the spectrum of different investment grades, such as an increase from AA– to AA, the highest level attained in our sample (by Slovenia in 2006). The move from junk status to investment grade was experienced at varying points of time by six countries in our sample, with Latvia the only country that was subject to a downgrade from investment to sub-investment status in the course of the crisis (in 2009).

3.2 Status of EU Integration

Undoubtedly, the level of integration achieved in the European Union by far exceeds the integration efforts undertaken by its counterparts (e.g. NAFTA or ASEAN). The establishment of a single market by assuring free movement of people, capital, goods and services, and the introduction of a common currency in major parts of the EU is unique to Europe. To test the impact of EU membership on the inflow of foreign capital, many authors used EU dummy variables in their regressions. Bevan and Estrin (2004) assume a structural break triggered by the EU enlargement announcement in Cologne in 1998. Therefore, they employ a Cologne dummy, taking the value 0 for all countries until 1998. Bucevska (2009)

[9] *Bevan and Estrin (2000, 2004) also applied sovereign risk ratings, published in the Euromoney Institutional Investor Magazine, to account for country risk in their analysis of FDI determinants.*

added a dummy variable to her model, which takes the value 1 for countries that have started official accession negotiations with the EU, and the value 0 otherwise.

Such an approach does not reflect the full dimensions of EU integration, which is usually a lengthy and stepwise process. Richter (1997) defined different stages of integration for acceding countries: pre-accession stages covering the period up to the start of the accession talks and thereafter the period from the start of accession talks to formal accession. Furthermore, he distinguished two post-accession stages: the period from formal accession to the end of the last important derogation with respect to full EU integration and the period starting immediately after the phasing-out of the last important derogation. In our paper, we explicitly take account of this differentiated process. To capture the effect of different integration stages, we distinguish between potential candidates, candidates, candidates that have already started official accession negotiations and EU members. Furthermore, EU members are broken down into members, members participating in ERM II and euro area members. These further integration steps within the EU imply the absence of exchange rate risk and related transaction costs, which might attract additional investors from Western Europe. Thus, we build a categorical variable with seven categories. Using different levels of integration and tracking the countries over one-and-a-half decades, this variable allows for sufficient variation in our sample, although most of the countries observed joined the EU at roughly the same time.

Table 2 illustrates the EU integration process for all the countries in our sample over the period from 1995 to 2011:

Table 2

Status of EU Integration, 1995–2011

	BG	CZ	EE	HR	HU	LT	LV	PL	RO	SK	SI
1995	2	1	2	1	2	2	2	2	2	2	1
1996	2	2	2	1	2	2	2	2	2	2	2
1997	3	3	3	1	3	3	3	3	3	3	3
1998	3	4	4	1	4	3	3	4	3	3	4
1999	3	4	4	1	4	3	3	4	3	3	4
2000	4	4	4	2	4	4	4	4	4	4	4
2001	4	4	4	2	4	4	4	4	4	4	4
2002	4	4	4	2	4	4	4	4	4	4	4
2003	4	4	4	2	4	4	4	4	4	4	4
2004	4	5	6	3	5	6	5	5	4	5	6
2005	4	5	6	4	5	6	6	5	4	6	6
2006	4	5	6	4	5	6	6	5	4	6	6
2007	5	5	6	4	5	6	6	5	5	6	7
2008	5	5	6	4	5	6	6	5	5	6	7
2009	5	5	6	4	5	6	6	5	5	7	7
2010	5	5	6	4	5	6	6	5	5	7	7
2011	5	5	7	4	5	6	6	5	5	7	7

Source: European Commission.

Note: 1 = third party; 2 = potential candidate; 3 = candidate; 4 = negotiations; 5 = EU Member State; 6 = ERM II member, 7 = euro area member.

4 Drivers of FDI in CESEE Countries: Some Empirical Results

4.1 General Determinants of FDI in CESEE Countries

The estimation results obtained on the basis of equation 1 for our sample of 11 CESEE countries are given in table 3 below. Let us first discuss the results of a baseline specification that excludes our measures of EU integration and country risk. Our choice of control variables already has a rather good fit with the data: 45% of the overall (between and within) variation in the data is explained by the model (column 1 in table 3).

Market size, proxied by the log of GDP, has a strong and highly robust positive effect on the inflow of foreign capital, i.e. FDI inflows expand in proportion to market size. This provides evidence of the existence of market-seeking FDI in CESEE countries and is in line with the findings in the literature. GDP growth, by contrast, did not emerge as a significant determinant of FDI flows.

Openness to trade again has a positive impact on FDI inflows, even though the coefficient becomes insignificant when the EU integration variable is entered. Since EU integration by nature leads to the liberalization of a country's external economic relations, the effects attributed to a more liberal trade regime are possibly captured by the EU variable as well. Nevertheless, given the positive and significant coefficient in all other specifications, this confirms the findings of Busse and Hefeker (2007) on the influence of market openness on FDI.

Table 3

Determinants of FDI Inflows in CESEE Countries

	Baseline	Risk	EU	Risk+EU
Market size	1.083 ***	0.933 ***	0.975 ***	0.892 ***
	0.191	0.047	0.197	0.046
Growth	0.006	–0.003	0.009	–0.002
	0.010	0.010	0.010	0.010
Openness	0.497 *	0.783 ***	0.393	0.591 **
	0.226	0.192	0.234	0.193
Unit labor costs	–0.012 ***	–0.007 ***	–0.012 ***	–0.011 ***
	0.002	0.002	0.002	0.002
Taxes	–0.034 ***	–0.041 ***	–0.026 **	–0.027 **
	0.010	0.009	0.010	0.009
Infrastructure	0.001 **	0.000	0.001 **	0.000
	0.000	0.000	0.000	0.000
Risk		0.393 ***		0.574 ***
		0.086		0.094
$Risk^2$		–0.020 ***		–0.030 ***
		0.004		0.004
EU			0.113 *	0.229 ***
			0.048	0.054
Constant	–2.894	–3.237 ***	–2.332	–4.438 ***
	1.883	0.819	1.916	0.814
No. of observations	469	467	469	467
R^2 within	0.204	0.158	0.210	0.194
R^2 between	0.681	0.831	0.666	0.831
R^2 overall	0.453	0.519	0.451	0.535
Chi^2	114.5	532.7	125.3	606.1

Source: Authors' calculations.

*Note: GLS estimation results with Huber/White sandwich estimates of variance; t-values are reported below coefficients; *, **, and *** indicate statistical significance at the 90%, 95% and 99% confidence levels, respectively.*

Moreover, the results provide rather strong evidence of the importance of cost factors. Both cost variables – taxes and unit labor costs – display the expected negative and significant coefficient. Thus, not only market-seeking but also efficiency-seeking FDI motifs play an important role for the region. An increase of 1 percentage point in corporate tax rates reduces FDI inflows by roughly 3%, and an increase of one unit in the index of unit labor costs triggers a 1% fall in FDI inflows. This is in line with the empirical results obtained by Campos and Kinoshita (2003) and Bevan and Estrin (2004).

The beneficial effects of a well-developed infrastructure are also supported by our results, even though the coefficient on this variable is somewhat less robust to the inclusion of our risk variable.

In column 2 of table 3 we add country risk ratings to our model. In fact, the most significant FDI-promoting effects are expected to result from a rating upgrade from sub-investment to investment grade, hence at some inter-

mediate level of country risk. Further upgrades, although they are clearly expected to promote FDI inflows further, may well show diminishing effects. In order to capture this nonlinearity, we chose a quadratic specification, as mentioned above. Hence, we include both risk and the square of our categorical risk variable, which significantly improved the fit of the model. Our hypothesis implies that higher (= better) risk ratings will lead to higher FDI inflows since investors are assumed to be risk-averse. Therefore, the overall coefficient on country risk is expected to be positive. This is the case for the joint impact of the risk variables when looking at the results of columns 2 and 4 in table 3. The risk variable registered a positive and significant coefficient, whereas risk² displays a negative coefficient, which was expected as well. As explained earlier, the risk² variable should account for the effect that FDI inflows seem to react less markedly to improved country risk ratings once a certain risk threshold has been reached. According to the regression results, a significant influence on FDI inflows can be attributed to both risk variables. The magnitude of the impact of the standard risk variable on FDI is particularly high. The coefficient reported in column 4 promises an increase of 57.4% in FDI inflows if the country improves its risk rating by one level. This is dampened only slightly by the negative results for the risk² variable.

Finally, the effects of EU integration on a country's ability to attract foreign capital are discussed (see column 3). The EU integration variable displays a positive and significant coefficient, the magnitude of which is again rather high.[10] This supports the hypothesis of a certain "EU bonus" in competition for FDI inflows. Increasing ties with the European Union have helped to attract foreign capital. The regression results in column 3 show that moving one level further up on the EU integration ladder leads to an 11% increase in FDI inflows. A look at column 4 shows that this effect even doubles when further controlling for the country's international risk assessment.

4.2 FDI Determinants During the Global Crisis

In order to assess the relevance of the above-mentioned variables during and after the global financial crisis, we extend the model by a crisis dummy and several interaction terms, given in equation 2 below:

$$\begin{aligned} ln\, fdi_{i,t} = \alpha + \beta_1\, ln\, GDP_{i,t-4} + \beta_2\, ln\, growth_{i,t-4} + \\ + \beta_3\, ln\, open_{i,t-4} + \beta_4\, ln\, ulc_{i,t-4} + \beta_5\, ln\, tax_{i,t-4} + \\ + \beta_6\, ln\, road_{i,t-4} + \beta_7\, ln\, risk_{i,t-4} + \beta_8\, ln\, risk^2_{i,t-4} + \\ + \beta_9\, ln\, EU_{i,t-4} + \beta_{10}\, ln\, crisis_t + \beta_{11}\, ln\, crisis^*\, risk_{i,t-4} + \\ + \beta_{12}\, ln\, crisis^*\, EU_{i,t-4} + \mu_i + \varepsilon_{it} \end{aligned} \qquad (2)$$

The results are given in table 4. Our crisis dummy is designed to take the value 1 for all observations as from the fourth quarter of 2008, the period covering the crisis itself and its aftermath. In line with the observed fall in global FDI (UNCTAD, 2009), we can read from column 1 in table 4 that FDI inflows have been reduced significantly since the start of the crisis.

[10] *Once again, the EU variable was defined as a categorical variable ranging from 1 to 7, with 7 the highest level of EU integration (euro area member).*

Table 4

Determinants of FDI Inflows in CESEE Countries: Controlling for the Crisis Impact

	Crisis 1	Crisis 2	Crisis 3	Crisis 4
Market size	0.917 ***	0.915 ***	0.914 ***	0.914 ***
	0.046	0.045	0.045	0.047
Growth	–0.022 *	–0.020	–0.024 *	–0.025 *
	0.010	0.010	0.011	0.011
Openness	0.819 ***	0.819 ***	0.822 ***	0.800 ***
	0.187	0.186	0.185	0.187
Unit labor costs	–0.001	–0.002	–0.001	–0.000
	0.002	0.002	0.002	0.002
Taxes	–0.025 **	–0.025 **	–0.025 **	–0.025 **
	0.009	0.009	0.009	0.009
Infrastructure	0.001 ***	0.001 **	0.001 **	0.001 *
	0.000	0.000	0.000	0.000
Risk	0.546 ***	0.515 ***	0.527 ***	0.572 ***
	0.092	0.091	0.091	0.096
$Risk^2$	–0.029 ***	–0.027 ***	–0.028 ***	–0.031 ***
	0.004	0.004	0.004	0.005
EU	0.212 ***	0.211 ***	0.216 ***	0.221 ***
	0.055	0.055	0.055	0.056
Crisis	–0.923 ***			–1.060
	0.165			0.889
Crisis*Risk		–0.061 ***		0.099
		0.012		0.064
Crisis*EU			–0.167 ***	–0.231
			0.032	0.186
Constant	–5.457 ***	–5.175 ***	–5.273 ***	–5.560 ***
	0.799	0.793	0.798	0.816
No. of observations	467	467	467	467
R^2 within	0.246	0.238	0.238	0.242
R^2 between	0.834	0.834	0.840	0.841
R^2 overall	0.561	0.558	0.561	0.563
Chi^2	666.2	656.0	661.7	689.6

Source: Authors' calculations.

*Note: GLS estimation results with Huber/White sandwich estimates of variance; t-values are reported below coefficients; *, **, and *** indicate statistical significance at the 90%, 95% and 99% confidence levels, respectively.*

The inclusion of crisis dummies seems to be important and further improved the fit of the econometric model. The remaining control variables are largely robust to this new addition. The impact of the market size and tax rates is robust in comparison with the results of the model specification without crisis dummies. Trade openness and infrastructure are now significant across all estimation variations, whereas the variable accounting for unit labor costs lost its significance, but retained its negative coefficient.

Column 2 in table 4 displays the results of the risk-crisis interaction term. This term should help us to assess whether investors have become more sensitive to country risk since the start of the crisis. The coefficient on the interaction term is negative and significant. Thus, since the beginning of the crisis, the positive effect of better risk ratings has been reduced. Comparing this to the coefficient on country risk, the effect is small, however. The risk-crisis interaction term loses its significance (and becomes positive) in the model modification reported in column 4, where all the crisis-related dummies are added to the estimation.

Similar results can be observed for the EU crisis interaction term, which has a negative sign and is highly significant at the 0.1% level. Adding this to the coefficient of the EU variable still leaves us with a positive overall impact, although it is much smaller. Again, therefore, the EU integration bonus has been reduced since the beginning of the crisis. However, this negative coefficient is not robust. It loses its significance when the crisis dummy and the risk-crisis interaction term are added to the model. Thus, during the financial crisis, higher EU integration levels did not support the attractiveness for foreign capital to the same extent as before. Hence, there is no evidence of an additional "EU bonus" during the financial crisis, which might be explained by a loss of investor confidence on account of the fact that the European Union and the euro area were struggling with recessions and debt crises themselves.

4.3 Robustness

In order to test the robustness of the obtained regression results and to find out more about the sensitivity of the individual variables, several model variations were estimated.[11]

First, the dependent variable was replaced by two other measurements of the FDI performance of the respective countries, namely FDI growth and the ratio of FDI to gross fixed capital formation as a dependent variable. This resulted in a considerably lower explanatory power of the model, suggesting that an analysis of FDI growth and the FDI ratio call for different model specifications that may be related to the very pronounced volatility of FDI flows.

Next, the robustness of trade openness was examined. Instead of using the ratio of imports and exports to GDP, we focus on the ratio of exports to GDP alone. Especially when assessing the importance of the export platform hypothesis for FDI flows to the CESEE region, this might be more relevant. The results are highly robust to this change in one of the explanatory variables. They only differ in terms of magnitude; the openness variable registered higher coefficients in this modification.

Finally, GDP growth was replaced by the (logged) level of GDP per capita, which examines the impact of a country's stage of development on FDI. The results for the coefficient on GDP per capita are often inconsistent for the eight specifications, but all other control variables are robust to this change.

5 Conclusions

The analysis of the determinants of FDI flows to CESEE transition economies received much attention in the recent economic literature, especially around the time when ten of the eleven countries under review joined the EU.

In this paper, we analyze the determining powers of various variables for FDI inflows to these countries over the whole period from 1995 to 2011. This period includes important milestones for the evolution of FDI in the CESEE countries, and thus provides a number of valuable new insights. On the one hand, we examine whether additional FDI-promoting effects are triggered by upgrades in country credit ratings and by an intensifying EU integration process. On the other hand, we investigate whether the role of traditional drivers of FDI has changed during the global financial crisis.

The results obtained from our static random-effect estimation model show that market-seeking and efficiency-seeking FDI seem to be very important for CESEE transition economies. The coefficients representing these factors are robust and significant. Moreover, a good road infrastructure and the countries' trade openness proved to be of relevance to foreign investors.

Likewise, a higher level of integration with the European Union helped to attract foreign capital, but this "EU bonus" lost its power during the financial crisis. This result could indicate a renewed risk aversion with respect to the CESEE transition countries, but it may also reflect a general reluctance to invest in the EU in view of the intensification of the ongoing crisis in some peripheral euro area countries. Furthermore, the estimation results show that country risk ratings

[11] *Estimation results of these model modifications are available from the authors on request.*

played a major role in the decision-making process of foreign investors during the period from 1995 to 2011. The relationship between country risk and FDI was found to be nonlinear. The highest effects on FDI were observed at intermediate risk levels, at the point where a country moves from sub-investment to investment grade. This seems to trigger new FDI most strongly. The reaction of FDI inflows to improved risk ratings starts to diminish again at higher risk ratings. The question whether the impact of country risk on FDI was intensified as a result of the increased risk perception caused by the crisis was also examined in the empirical analysis. Interestingly, no support for an increased importance of country risk as a determinant of FDI flows during and after the financial crisis was found.

Summing up, FDI seems to be driven by economic fundamentals such as market size, cost factors and a liberal trade regime. Additional factors influencing locational decisions of foreign investors have been found to be a good infrastructure, country risk ratings and a close relationship with the European Union.

Therefore, it can be concluded that governments should follow a range of interrelated policies in order to attract the inflow of foreign direct investment, which is of relevance when it comes to economic development and the continuation of the catching-up process. These policies include not only appropriate tax systems and labor market regulation that improve the cost structure of a country's industries, but also measures that support the physical infrastructure of the economy, as well as a commitment toward deeper economic integration in the European context. Finally, macrofinancial stability, as reflected in country risk ratings, must be borne in mind. The nonlinearity in the relationship between risk ratings and FDI inflows suggests that such stability is of particular relevance for countries that currently face lower risk ratings.

References

Backé, P., S. Gallego, S. Gardó, R. Martin, L. Molina and J. M. Serena. 2010. How Did the Global Financial Crisis Affect the CESEE Region and Latin America? A Comparative Analysis. In: Focus on European Economic Integration Q1/10. OeNB. 49–66.

Baldwin, R. E., J. F. Francois and R. Portes. 1997. The Costs and Benefits of Eastern Enlargement: The Impact on the EU and Central Europe. In: Economic Policy 12(24). 125–176.

Bevan, A. A. and S. Estrin. 2000. The Determinants of Foreign Direct Investment in Transition Economies. CEPR Discussion Paper No. 2638.

Bevan, A. A. and S. Estrin. 2004. The determinants of foreign direct investment into European transition economies. In: Journal of Comparative Economics 32(4). 775–787.

Brada, J. C., A. M. Kutan and T. M. Yigit. 2003. The Effects of Transition and Political Instability on Foreign Direct Investment. Central Europe and the Balkans. Bonn: Center for European Integration Studies (ZEI).

Breuss, F., P. Egger and M. Pfaffermayr. 2001. The Impact of Agenda 2000's Structural Policy Reform on FDI in the EU. In: Journal of Policy Modeling 23(7). 807–820.

Bucevska, V. 2009. Key Determinants of Foreign Direct Investments: Empirical Evidence from the EU Candidate Countries. Proceedings from the Third International Conference, Regional Cooperation and Economic Integration. Ss. Cyril and Methodius University, Faculty of Economics – Skopje. 281–286. http://www.customs.gov.mk/Uploads/Kniga_prelomena.pdf (retrieved on August 1, 2012).

Busse, M. and C. Hefeker. 2007. Political risk, institutions and foreign direct investment. In: European Journal of Political Economy 23(2). 397–415.

Campos, N. F. and Y. Kinoshita. 2003. Why Does FDI Go Where It Goes? New Evidence from the Transition Economies. IMF Working Paper WP/03/228.

Carstensen, K. and F. Toubal. 2004. Foreign direct investment in Central and Eastern European countries: a dynamic panel analysis. In: Journal of Comparative Economics 32(1). 3–22.

Chakrabarti, A. 2001. The Determinants of Foreign Direct Investments: Sensitivity Analyses of Cross-Country Regressions. In: Kyklos 54(1). 89–114.

EBRD. 2011. Regional Economic Prospects in EBRD Countries of Operations: October 2011. http://www.ebrd.com/downloads/news/REP_October_2011_181011_Final.pdf (retrieved on August 1, 2012).

Eckert, S. and F. Rossmeissl. 2005. Consequences of Convergence – Western Firms' FDI Activities in Central and Eastern Europe at the Dawning of EU-Enlargement. In: Journal for East European Management Studies. 56–74.

Fidrmuc, J. and R. Martin. 2011. FDI, Trade and Growth in CESEE Countries. In: Focus on European Economic Integration Q1/11. OeNB. 70–113.

Fillat-Castejón, C. and J. Wörz. 2011. Good or Bad? The Influence of FDI on Output Growth: An Industry-Level Analysis. In: Journal of International Trade and Economic Development 20(3). 293–328.

Giurca Vasilescu, L. 2009. FDI in Romania – Assessing the Possible Effects of the International Financial Crisis. Proceedings from the Third International Conference, Regional Cooperation and Economic Integration. Ss. Cyril and Methodius University, Faculty of Economics – Skopje. http://www.customs.gov.mk/Uploads/Kniga_prelomena.pdf (retrieved on August 1, 2012).

Hunya, G. 2007. Shift to the East – wiiw Database on Foreign Direct Investment No. 2007-05. The Vienna Institute for International Economic Studies.

Hunya, G. 2010. FDI in the CEECs Hit Hard by the Global Crisis – wiiw Database on Foreign Direct Investment No. 2010-05. The Vienna Institute for International Economic Studies.

IMF. 2009. Balance of Payments Manual. 6th edition.

Kalotay, K. 2006. New Members in the European Union and Foreign Direct Investment. In: Thunderbird International Business Review 48(4). 485–513.

Kinoshita, Y. 2011. Sectoral Composition of Foreign Direct Investment and External Vulnerability in Eastern Europe. Washington, D.C.: IMF.

KPMG International. 1995–2011. KPMG's Corporate and Indirect Tax Rate Survey.

Mintz, J. M. and A. J. Weichenrieder. 2010. The Indirect Side of Direct Investment. Multinational Company Finance and Taxation. Cambridge, MA: MIT Press.

Mooslechner, P. and D. Ritzberger-Grünwald (eds.). 2009. 1989–2009: Twenty Years of East-West Integration: Hopes and Achievements. Focus on European Economic Integration – Special Issue. OeNB.

Narula, R. and C. Bellak. 2009. EU enlargement and consequences for FDI assisted industrial development. An essay in memory of Sanjaya Lall. In: Transnational Corporations 18(2). 69–90.

Nunnenkamp, P. 2002. Die Auswirkungen der EU-Osterweiterung auf die Direktinvestitionen und deren Rückwirkungen. CESifo Group. Munich (11/2002).

Resmini, L. 2000. The Determinants of Foreign Direct Investment in the CEECs: New Evidence from Sectoral Patterns. In: Economics of Transition 8(3). 665–689.

Richter, S. 1997. European Integration: the CEFTA and the Europe Agreements. Prepared in the Framework of a Research Cooperation between the Organisation for Economic Co-operation and Development (OECD) and WIIW.

Richter, S. 2009. L'Europe centrale 20 ans après la chute du Mur. In: Politique étrangère 3. 489–502.

Standard & Poor's. 2011. Sovereign Government Rating Methodology And Assumptions. http://img.en25.com/Web/StandardandPoors/CriteriaGovernmentsSovereignsSovereignGovernmentRatingMethodologyAndAssumptions_1365.pdf (retrieved on August 1, 2012).

Teles, V. and M. C. Leme. 2010. Fundamentals or market sentiment: what causes country risk? In: Applied Economics 42(20). 2577–2585.

UNCTAD. 2006. World Investment Report 2006. FDI from Developing and Transition Economies: Implications for Development. New York: United Nations.

UNCTAD. 2009. Assessing the impact of the current financial and economic crisis on global FDI flows. Geneva: United Nations.

UNCTAD. 2010. Global Investment Trends Monitor No. 2. January.

Annex

Table A1

List of Variables Used and the Sources of Data

FDI (= dependent variable)	Log of FDI inflows in USD million, deflated with GDP deflator, seasonally adjusted Source: IMF's IFS, obtained from FIW (www.fiw.ac.at).
Market size	Log of GDP in USD million, deflated with GDP deflator, seasonally adjusted Source: IMF's IFS, obtained from FIW (www.fiw.ac.at).
Growth	GDP year-on-year growth in % Source: Authors' calculations based on the IMF's IFS.
Openess	Trade openness calculated as: (imports + exports) / GDP Source: Authors' calculations based on the IMF's IFS and DOTS.
Unit labor costs	Unit labor cost index, reference year: 2005 = 100 Source: wiiw.
Taxes	Corporate tax rates (on distributed profits) Source: KPMG International, and Mintz and Weichenrieder.
Infrastructure	Infrastructural development level: length of motorways in km Source: UNECE.
Risk	Country risk ratings: foreign currency long-term debt ratings. Source: Standard & Poor's.
EU	Level of EU integration Source: Authors' summary based on information obtained from www.ec.europa.eu.
Crisis	Dummy variable, takes a value of 1 as from Q4 2008, and zero otherwise.

Non-Price Competitiveness Gains of Central, Eastern and Southeastern European Countries in the EU Market

Konstantins Benkovskis, Julia Wörz[1]

We propose an export price indicator adjusted for non-price factors as a more meaningful measure of a country's competitiveness than traditional indicators. Our starting point is the approach developed by Broda and Weinstein (2006), who adjust price developments for changes in varieties of imported products. We relax their assumption of unchanged quality over time and use the proposed index to analyze the momentum of export prices of the ten CESEE EU members which acceded in 2004 and 2007. The index is calculated using data from Eurostat Comext at the highly disaggregated eight-digit CN product level. Our analysis spans the time period 1999 to 2011, thus including the recent global recession period in 2009. The results show that all CESEE-10 countries experienced a loss in price competitiveness, but that the loss was much smaller than is usually suggested by traditional CPI- or ULC-based real effective exchange rate measures. Although relative export prices (unit values) increased more strongly in the CESEE-10 countries as compared to their competitors, the average quality of their goods increased even more strongly, thus fully compensating for the rise in prices. These improvements in non-price competitiveness were pronounced in all CESEE-10 countries.

JEL classification: C43, F12, F14, L15
Keywords: Non-price competitiveness, quality, relative export price, new EU Member States

1 Introduction

The countries of Central, Eastern and Southeastern Europe (CESEE) have demonstrated tremendous gains in international competitiveness during their transition from centrally planned to market economies. Productivity levels are substantially higher today than they were 20 years ago and the world market share of the region has risen considerably. These developments have fueled an unprecedented process of catching-up with Western Europe. However, catching-up has implied convergence to Western Europe in both income and price levels. The convergence process was in fact accompanied by a real appreciation trend of CESEE currencies over the past two decades, which could suggest a loss in price competitiveness as a result of the catching-up progress.

This example demonstrates that the widespread notion of competitiveness is in fact an ill-defined concept. In the broadest perspective, a nation's competitiveness is reflected by its relative global ranking in per capita income levels. This broad assessment of competitiveness can be accompanied by an evaluation of taxation policies, regulation, market rigidities and labor market conditions as important explanatory factors which determine competitiveness. Such a perspective reflects the World Economic Forum's definition of competitiveness as "… the set of institutions, policies, and factors that determine the level of productivity of a country." (Sala-i-Martin, 2010). In a narrower sense, the business community and the economic policy discussion alike look at relative prices of goods and services (see De Grauwe, 2010, for a comprehensive overview of competitiveness). Clearly, relative prices reflect different supply conditions and hence influence the ability to sell in the global market. Policy discussions are often dominated by the analysis of price and cost measures. In particular the real effective exchange rate is often used

[1] *Latvijas Banka, Monetary Policy Department, konstantins.benkovskis@bank.lv; Oesterreichische Nationalbank, Foreign Research Division, julia.woerz@oenb.at.*

as a general proxy of competitiveness despite the fact that price measures ignore important non-price aspects of competitiveness, such as quality improvements or shifts in consumer preferences. Further, price and cost measures may show divergent developments, making it difficult to identify a single price indicator of competitiveness. Therefore it should always be acknowledged that individual indicators emphasize different aspects of competitiveness, and it is clearly insufficient to keep the analysis limited to price competitiveness measures.

In this analysis we try to incorporate important non-price features of a country's competitiveness. We correct a country's export price index for any bias which might arise from non-price factors such as physical quality, variations in consumers' tastes and competitive pressure exerted by newly entering competitors. Hence, our proposed comprehensive measure of export price developments can be divided into three parts: changes in relative export unit values, changes in the set of competitors and changes in the relative quality of products. While this measure still neglects some important aspects of competitiveness, such as institutional factors and human capital, it gives a more unbiased picture of a country's ability to sell goods on a certain market. We apply this adjusted export price index to the export performance of the ten CESEE member countries which acceded to the EU in 2004 and 2007. We are able to show that according to this measure most CESEE countries unambiguously showed gains in non-price competitiveness since 1999 on the EU market. These competitiveness gains are rather pronounced for all CESEE member countries.

The next section explains the rationale behind our proposed measure of competitiveness. Section 3 then explains the theoretical background, section 4 illustrates the database and section 5 presents the empirical results. Finally, section 6 concludes.

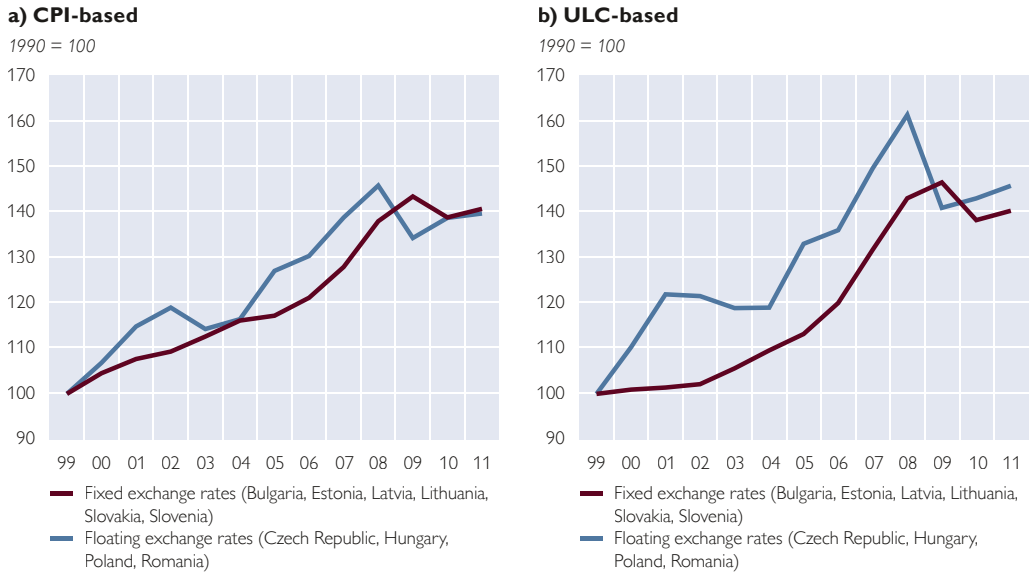
2 From Price to Non-Price Competitiveness

The real effective exchange rate is one of the most widely used tools in the analysis of a country's international competitiveness. It reflects relative changes in the prices of a country's goods and services as a result of changes in nominal exchange rates and inflation differentials. Inflation differentials can be captured in various ways leading to different measures of the real exchange rate. The most popular measure is based on inflation differentials as measured by the CPI. This popularity is obviously explained by data availability and comparability issues, for example due to the availability of harmonized CPI measures within the EU. Other popular definitions are PPI-based and ULC-based real exchange rates. Chart 1 shows two such measures for the ten CESEE EU member countries, one based on consumer prices and the other one based on unit labor costs.

Both indicators show a steep increase for CESEE over the sample period from 1999 to 2011 relative to other exporters, which can be interpreted as a clear loss in price competitiveness. This process was not uniform across countries or over the years: the cumulated real exchange rate dynamics were rather heterogeneous in the region. While Slovenia showed almost no deterioration in price competitiveness, Romania, Slovakia and the Czech Republic were severely affected. Over time, the most rapid losses in price competitiveness were observed during the boom years. In 2009 price competitiveness improved in the Czech Republic, Poland and Hungary due to a nominal depreciation of the national currency, while

Chart 1

Real Effective Exchange Rates of CESEE-10 (36 Trading Partners)



Source: Eurostat.

Note: An increase denotes a real appreciation of the national currency, which can be interpreted as a loss of competitiveness.

in 2009–2010 such an improvement was also observed in countries with fixed exchange rates (in the Baltic states and Bulgaria, the CPI-based index shows the improvement only in 2010, which can be explained by the inertia of consumer prices and tax rate increases in 2009 in some countries). However, such a simple interpretation of the long-run real appreciation trend in CESEE can be quite misleading for various reasons.

First, traditional real exchange rate measures have several drawbacks. The CPI-based index shows the dynamics of relative consumer prices, which can be a rather poor approximation of the dynamics in relative export prices. Domestic and export prices face different demand and supply conditions and can therefore differ greatly. Further, the CPI-based index includes changes in indirect taxes, like VAT, which do not affect export activities directly. Although the PPI-based index is closer to the production side of the economy, it still includes production for the domestic market (data on export-oriented PPI are usually very scarce). The ULC-based index has a similar drawback, especially when it refers to the total economy, including the services sector. In addition, unit labor costs refer only to some production costs and ignore important factors like profit margins. A solution to these shortcomings is to use a relative export price index – an indicator that is often used in macroeconomic models when explaining the dynamics of real exports. However, if an aggregate export deflator is used to construct a measure of competitiveness, there is still one serious problem – the structure of exports differs across countries. The solution to this problem is to conduct the analysis on the most disaggregated level to ensure that similar export products are compared for different countries before aggregating the results at the country level.

Second, real exchange rate indices measure only the price competitiveness of exports while ignoring non-price factors that affect the performance of exports.

One such non-price factor, emphasized by Flam and Helpman (1987), is connected to vertical differentiation or to the quality of exported products. Another non-price factor is a change in consumers' tastes, which can be driven by objective as well as by subjective factors like image or branding.

Finally, as emphasized in particular in the recent empirical trade literature, consumers gain additional utility from increased product variety through international trade. Therefore, changes in the set of rivals can affect the competitiveness of an exporter (higher amount of rivals, exporting the same product to one particular market means increasing variety for consumers). Although several price measures (CPI and PPI) are adjusted for changes in product quality, they do not provide the possibility to incorporate changes in consumers' tastes or product variety.

3 Theoretical Framework

In this paper, we propose a quality- and variety-adjusted relative export price index which overcomes many of the above-mentioned drawbacks and describes both price and non-price competitiveness of exports. In our context, we define *quality* as any tangible or intangible attribute of a good that changes consumers' valuation of it (definition by Hallak and Schott, 2008). Hence, quality encompasses both physical attributes of a product (e.g. size, available functions, durability) and intangible attributes or matters of taste (e.g. product image, brand name). We identify *variety* with products imported from different countries of origin within the same product category, i.e. we adopt the Armington (1969) assumption as in Broda and Weinstein (2006).[2] As our focus is on export prices in this paper, variety in our case means the set of countries (rivals) who export the same product category to a particular market.

Although our final goal is to evaluate an adjusted relative *export* price index, we define the theoretical model from the *import* side. There are two reasons for focusing on imports rather than on exports. First, to describe the role of quality and variety in international trade one primarily needs to understand how consumers value quality and variety. This can be done by using a representative household's utility function, which includes domestic and imported products. Second, our decision to work with imports as the mirror-image of exports also in the empirical analysis is motivated by our choice of database. As explained in section 4 below, we work with Eurostat's Comext database, as the only way to obtain information on competitors of CESEE from outside the EU (e.g. U.S.A. and China) is to use total imports of all EU Member States.

Our theoretical model to measure price and non-price competitiveness is based on Benkovskis and Wörz (2011), who extend the variety-adjusted import price index developed by Feenstra (1994) and Broda and Weinstein (2006) by evaluating changes in the quality of traded goods. A more detailed exposition of the theoretical background underlying the methodology used in this paper is given in the appendix. A detailed description of the augmented import price index underlying our adjusted relative export price index can be found in Benkovskis and

[2] *The Armington (1969) assumption, although very restrictive, is widely used in empirical research due to data limitations. Obviously, the definition of variety (set of competitors) on a firm or brand level would be more realistic, but this definition would require micro-level data. See Bloningen and Soderbery (2010) and Sheu (2011) for examples of such an approach.*

Wörz (2011). The evaluation of the unobserved quality or taste parameter follows the work by Hummels and Klenow (2005).

Given consumers' valuation of variety (set of exporters for a specific product) and quality, we model consumers' utility through a nested constant elasticity of substitution (CES) utility function with three nests. By solving the consumers' maximization problem respecting the budget constraint it is possible to introduce the above-mentioned non-price factors into a measure for relative export prices (see appendix A1–A3 for technical derivations). Based on the formula for a variety- and quality-adjusted import price index obtained from Benkovskis and Wörz (2011, see appendix A1), we use the mirror image of trade flows in this paper and apply this formula to export prices (see appendix A2). In other words, we interpret imports of product g originating in country c as country c's export of product g to the importing market.

Hence, we obtain the following formula for a variety- and quality-adjusted relative export price index (RXP) reflecting changes in the relative export price of good g exported by exporter k to a particular market in time t:

$$RXP_{gkt} = \prod_{c \in C_g^{-k}} \left(\frac{p_{gkt}}{p_{gct}} \frac{p_{gct-1}}{p_{gkt-1}} \right)^{w_{gct}^{-k}} \left(\frac{\lambda_{gt}^{-k}}{\lambda_{gt-1}^{-k}} \right)^{\frac{1}{1-\sigma_g}} \prod_{c \in C_g^{-k}} \left(\frac{d_{gkt}}{d_{gct}} \frac{d_{gct-1}}{d_{gkt-1}} \right)^{\frac{w_{gct}^{-k}}{1-\sigma_g}} \tag{1}$$

where C_g^{-k} is the set of product varieties available in both periods, excluding varieties coming from country k; w_{gct}^{-k} and λ_{gt}^{-k} are calculated similar to w_{gct} and λ_{gt} (see equation A5), again excluding country k from the set of exporters (varieties).

The index of adjusted relative export prices in (1) can be divided into three parts:

- The first term gives the traditional definition of changes in relative export prices which are driven by changes in relative export unit values weighted by the importance of competitors on a given market (represented by w_{gct}^{-k}). An increase in relative export unit values is interpreted as a loss in price competitiveness.
- The second term represents Feenstra's (1994) term capturing changes in varieties (i.e. the set of exporters of this product in our case). This term is calculated excluding exports coming from country k. It can be interpreted as the effect stemming from a changing set of competitors – more competitors for the same product increase utility and lower minimum unit costs for consumers while at the same time lowering the market power of exporters from country k. Therefore, more competitors imply a positive contribution to the adjusted relative export price index and are associated with a loss in non-price competitiveness.
- The third term is simply the change in the relative quality of exports. If the quality of country k's exports is rising faster than that of its rivals, the contribution to the adjusted relative export price index is negative, thus signaling improvements in non-price competitiveness.

Finally, we need to design an aggregate relative export price as the index in (1) describes relative export prices just for one specific product which is exported to one particular market. Therefore we relax the assumption of a single destination for exports and allow for various importing countries. We moreover assume con-

sumers to be maximizing their utility in all those countries. Of course, all parameters and variables entering the three-layered utility function can be different across countries. If we denote the export price, export volume and relative export price index of a product g exported by country k to country i as $p(i)_{gkt}$, $x(i)_{gkt}$ and $RXP(i)_{gkt}$ accordingly, the aggregate adjusted relative export price index can be defined as

$$RXP_{kt} = \prod_{i \in I} \prod_{g \in G} RXP(i)_{gkt}^{W_{igt}}$$

where (2)

$$W_{igt} = \frac{\left(S_{igt} - S_{igt-1}\right) / \left(\ln S_{igt} - \ln S_{igt-1}\right)}{\sum_{i \in I} \sum_{g \in G} \left(\left(S_{igt} - S_{igt-1}\right) / \left(\ln S_{igt} - \ln S_{igt-1}\right)\right)} \; ; \; S_{igt} = \frac{p(i)_{gkt}\, x(i)_{gkt}}{\sum_{i \in I} \sum_{g \in G} p(i)_{gkt}\, x(i)_{gkt}} \, .$$

Equation (2) shows that the aggregated index is just another Sato (1976) and Vartia (1976) index and its weights are computed using the share of product g exports to country i out of total exports by country k.[3] The reason for using export rather than import shares in (2) is straightforward. As RXP_{kt} is designed to describe the price and non-price competitiveness of country k's exports, the importance of various products and markets in this index should be determined by country k's export structure.

4 Description of the Database

For the empirical analysis we use the trade data available from Eurostat's Comext database. While this limits our analysis to the EU market and therefore precludes the evaluation of non-price competitiveness of CESEE's exports on other important markets (e.g. Russia or Turkey), it gives a good representation of total export performance as the EU-27 is by far the largest trading partner for all CESEE-10.[4] Further, data release is very timely in the case of Eurostat's Comext database – annual figures are available approximately three months after the end of the year, which gives us an opportunity to include recent years in the analysis. Another advantage over other data sources (e.g. U.N. Comtrade) is the disaggregation level. As we need to break down nominal trade flows into prices and volumes, we carried out the analysis at the most detailed level, which is the eight-digit level of the CN (Combined Nomenclature) classification in Eurostat's Comext yielding approximately 10,000 products each year.

[3] *In this case the use of Sato-Vartia index cannot be explained by the CES aggregation function, as in equation (A5). The choice of this index was instead driven by other justifications. The Sato-Vartia index satisfies most of the bilateral index tests except circularity and monotonicity (see Diewert, 1993a, for the description of these tests and Reinsdorf and Dorfman, 1999, for a discussion of the Sato-Vartia index and monotonicity axiom). The alternative would have been to use the Fisher index, which would also satisfy the monotonicity test. However, the Fisher index was not an option because it reflects changes in absolute export prices whereas* $RXP(i)_{gkt}$ *denotes a change in relative prices. Moreover, the Fisher index would have required an evaluation of absolute quality. Benkovskis and Wörz (2011) show how to evaluate absolute quality of imported products, although this requires additional assumptions (i.e. on a benchmark product) and is much less robust than relative quality estimates.*

[4] *The share of CESEE-10 exports to the EU-27 is reasonably high, ranging between 61% and 85% in 2011 (62.5% for Bulgaria, 83.0% for the Czech Republic, 66.2% for Estonia, 75.9% for Hungary, 65.9% for Latvia, 61.4% for Lithuania, 77.8% for Poland, 71.1% for Romania, 84.7% for Slovakia and 71.0% for Slovenia).*

Although we analyze the performance of CESEE-10 on the EU-27 market, we cannot simply treat the EU-27 as one importer.[5] The EU market is not only large but also heterogeneous, and the performance of exporters in different parts of the market has to be analyzed separately (e.g. Latvia's exports to Lithuania have to be distinguished from Germany's exports of the same product to France). Therefore we disaggregate imports not only by products, but also by importing countries within the EU-27, which represents the most detailed geographical disaggregation. Our dataset contains annual data on imports of all 27 EU Member States at the eight-digit CN level between 1999 and 2011.[6] To keep the calculation burden within reasonable limits, we restrict the list of partners to 50 different countries inside and outside the EU-27. The list of partner countries includes all EU Member States, several CIS countries (e.g. Russia, Ukraine, Belarus, Kazakhstan) and other important trading partners (e.g. U.S.A., Japan, Canada, Australia, China, India, Brazil).[7] We use unit value indices (euro per kg) as a proxy for prices and trade volume (kg) as a proxy for quantities.

The use of the most detailed eight-digit CN classification has one significant drawback that can affect final results – the CN classification is regularly revised. Each year a significant amount of CN codes are subject to changes; some are just relabeled, others are split or merged.[8] Pierce and Schott (2009) analyzed the reclassifications in the ten-digit U.S. Harmonized System and illustrated the importance of tracking these changes when conducting empirical research; therefore we cannot ignore this issue. The most problematic cases are splits or mergers of the codes (growing and shrinking family trees in the terminology of Pierce and Schott, 2009). One feasible solution to such cases is to merge the values and volumes of the respective categories. Although this leads to a broadening of several categories and some problems in interpreting the unit values, it helps to retain the consistency of the analysis over time while keeping coverage reasonably high.[9]

We made two further adjustments to our database. First, in many cases we have data for either values or volumes but not for both. In these cases no unit value index can be calculated. Such incomplete observations were ignored and removed from the database. The second adjustment is related to structural changes within the categories of goods. Although we use the most detailed classification available, we may still be comparing apples and oranges within some categories, as would be

[5] *Such an approach which ignores the heterogeneity of the EU-27 market was used in Benkovskis and Rimgailaite (2011).*

[6] *The exceptions are Poland and Slovakia, for which the most disaggregated data in terms of products at CN eight-digit level are available only starting from 2004.*

[7] *This sample of partners provides a representative picture of the overall imports, as it covers between 82.3% of total imports in Cyprus and 99.2% of total imports in Estonia in 2011.*

[8] *For more detailed information on CN reclassifications see http://ec.europa.eu/eurostat/ramon/nomenclatures/.*

[9] *During the period 1999 to 2011 we observe 14,518 different eight-digit CN product codes in our database, only 7,376 of which were not subject to reclassification issues, however. After implementing the algorithm described above, we were left with 9,020 product codes. Obviously, some of these codes now refer to more than one product. According to Eurostat information, the total number of eight-digit CN subheadings was 9,294 in 2011. Therefore the problem is not severe, as only 274 products are not observable separately in that year.*

reflected by large price level differences within a product code. Consequently, all observations with outlying unit value indices were excluded from the database.[10]

5 Results

As a first step we need to estimate the elasticities of substitutions between varieties in all EU countries. Then we are able to calculate variety- and quality-adjusted relative export price indices for the CESEE-10's exports and make inferences about their non-price competitiveness. We do these calculations for total CESEE-10 exports to the EU-27 and for main export categories and destinations.

5.1 Elasticities of Substitutions in EU Countries

The elasticity of substitution between varieties is estimated for all products where data on at least 3 countries of origin were available (see appendix A4 for technical details).[11] Table 1 displays the main characteristics of estimated elasticities of substitution between varieties. The mean elasticities are very high, in the range between 20 and 32, which is not very informative, however, as the distribution is skewed to the right. Therefore, the main focus could be on the median elasticity of substitution between varieties. For easier interpretation one can calculate the median mark-up, which equals $\sigma_g/(\sigma_g-1)$. The median elasticity of substitution lies in a range between 5 and 8. This gives quite a plausible range for median mark-ups – between 15% and 25%. Cyprus is a clear outlier, perhaps due to the small number of estimated elasticities.

The estimates in table 1 are generally higher than the estimate results reported in Broda and Weinstein (2006) for U.S. imports, who estimated the median elasticity to be 3.7 for seven-digit (TSUSA) goods in the period between 1972 and 1988 and 3.1 for ten-digit (HTS) goods in the period between 1990 and 2001. To our knowledge, the only paper which reports similar estimates for all EU-27 countries is Mohler and Seitz (2010). Again, our estimates are roughly one-third higher than theirs. This could be attributed to some differences in estimation methodology[12] as well as to the different sample period. Mohler and Seitz (2010) cover the period between 1999 and 2008; so 2009, the year of the significant trade collapse was not analyzed. Nevertheless, our results provide a similar ordering with low elasticities for Greece, Luxembourg, Portugal, Slovakia, and high elasticities for Germany, Hungary, Latvia, Lithuania and Romania.

[10] *An observation is treated as an outlier if the absolute difference between the unit value and the median unit value of the product category in the particular year exceeds four median absolute deviations. The exclusion of outliers does not significantly reduce the coverage of the database. For example, in 2011 outliers accounted for 1.8% of total import value in Germany and for 10.0% in Malta.*

[11] *The number of products for which this condition was met is indicated in the first column of table 1. Although the coverage is reduced, it still remains reasonably high. Even taking into account that we restricted ourselves to just 50 partner countries, excluded outliers and required at least 3 countries of origin, the coverage ratio ranged from 61.0% of total aggregated imports (for Malta) to 87.0% (for the Czech Republic) in 2011.*

[12] *Mohler and Seitz (2010) follow Feenstra's (1994) methodology, which provides estimates of σ_g only as long as $\theta_1 > 0$ and use a regression on sample means over t.*

Table 1

Elasticities of Substitution between Varieties

	No. of estimated elasticities	Mean	Standard deviation	Maximum	Minimum	Median	Median mark-up
Austria	5899	23.42	63.3	1959.7	1.03	6.19	19.3
Belgium	6475	23.46	205.6	16067.8	1.03	6.69	17.6
Bulgaria	4426	25.25	51.8	1023.7	1.03	7.53	15.3
Cyprus	3405	31.64	49.0	524.2	1.01	9.78	11.4
Czech Republic	5715	23.77	56.0	1455.1	1.02	7.11	16.4
Denmark	5410	23.05	81.4	4344.4	1.01	6.43	18.4
Estonia	3843	24.87	61.3	1555.8	1.02	6.92	16.9
Finland	4943	21.03	45.0	1542.7	1.00	6.85	17.1
France	7097	20.39	48.0	1284.2	1.05	6.88	17.0
Germany	7015	20.44	60.7	3895.1	1.06	7.80	14.7
Greece	5154	26.00	90.8	4014.5	1.03	5.84	20.7
Hungary	5382	24.42	59.9	1791.9	1.02	7.47	15.5
Ireland	4595	28.04	142.2	6663.9	1.02	6.32	18.8
Italy	6720	20.17	46.7	938.3	1.05	7.30	15.9
Latvia	3848	25.27	61.8	1607.7	1.01	7.14	16.3
Lithuania	4202	23.33	56.0	1208.2	1.01	7.10	16.4
Luxembourg	3520	29.77	125.6	4663.3	1.01	4.91	25.6
Malta	2357	28.30	65.6	1084.4	1.03	5.79	20.9
Netherlands	6164	22.83	67.1	2771.9	1.02	7.17	16.2
Poland	5642	20.38	53.4	1505.4	1.05	6.42	18.4
Portugal	5348	24.72	92.8	4746.8	1.02	5.93	20.3
Romania	5320	24.06	51.3	1521.4	1.01	7.57	15.2
Slovakia	4203	30.11	84.7	1676.9	1.01	5.52	22.1
Slovenia	4719	23.63	50.9	991.2	1.05	6.89	17.0
Spain	6429	21.47	47.9	998.9	1.00	6.51	18.2
Sweden	5510	24.15	58.1	1387.1	1.01	6.98	16.7
U.K.	6698	20.20	46.8	1385.9	1.01	6.26	19.0

Source: Eurostat Comext, authors' calculations.

Note: Elasticities of substitutions are estimated using equation (A12) for all products where data on at least 3 countries of origin were available.

5.2 Relative Export Prices Adjusted by Non-Price Factors

Finally, we can calculate the adjusted relative export price index for CESEE-10 exports to the EU-27, which will take into account several non-price factors like quality of exports and changes in the set of rivals. This is done using equations (1) and (2), while unobserved relative quality is evaluated by equation (A8). Chart 2 shows three different relative export price indices for every country. The first one is the conventional relative export price index (RXP), which does not take into account changes in quality and the set of competitors and is calculated using the first term in equation (1). This index can serve as a benchmark denoting the pure price competitiveness of CESEE-10 exports. The second index also takes into account changes in the composition of competitors on the market. It is calculated using the first two terms in equation (1). A comparison with the conventional export price index indicates the contribution of changes in the set of rivals to competitiveness. Finally, the relative export price index adjusted by non-price factors is calculated using all three terms in equation (1). This index includes all non-price competitiveness factors analyzed in this paper. By comparing it with the RXP adjusted by the set of rivals we can highlight the role of quality and tastes in export competitiveness.

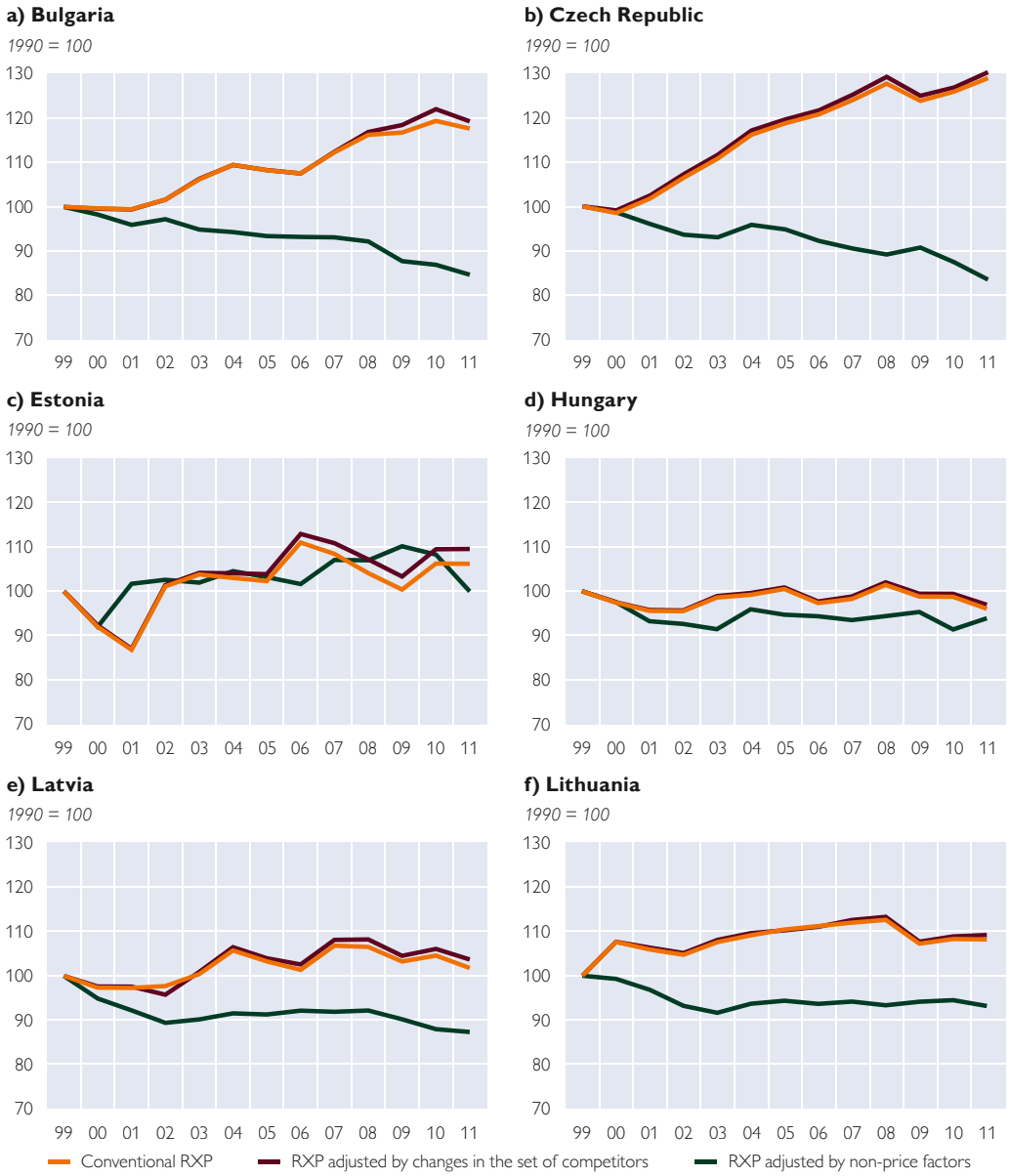
Before analyzing the role of these different factors for export competitiveness we shall contrast our relative export price index – based on trade data – to the more frequently used exchange rate-based indices reported in chart 1. As both CPI- and ULC-based real exchange rates describe price competitiveness, we must compare them with the conventional relative export price index. There are some differences in scope between these traditional measures and our index. Chart 1 reflects the price competitiveness of exports to the rest of the world while our calculations are limited to exports to the EU market. Still, the EU represents by far the most important trading partner for all countries in our sample, so this limitation should not pose a major problem. On the other hand, our indicator compares the competitiveness of the CESEE countries with that of 49 competitors (including all other 26 EU members, the most important CIS countries and other important trading partners like the U.S.A., Japan, China) while the traditional indicators in chart 1 are calculated with respect to 36 trading partners.

The indicators coincide in signaling losses in price competitiveness between 1999 and 2011 for all CESEE-10 countries. Moreover, the ranking is very similar – almost no losses for Slovenia and the highest relative price increases in Romania, Slovakia and Czech Republic. The time pattern of conventional RXP also gives rise to similar conclusions, with the most rapid increase during the boom years and a decrease in 2009. The difference to the CPI-based index for the Baltic states can be explained by an increase in indirect taxes in that year. However, there is an important distinction between the results in chart 1 and chart 2. The scale of price competitiveness losses is significantly smaller when measured by conventional relative export prices. This could be driven by various factors including structural differences between the economies which are not taken into account in chart 1, increasing indirect tax rates in the case of the CPI-based index or more rapid productivity improvements in export-oriented sectors of the economies and countercyclical behavior of profit margins in the case of the ULC-based index. The comparison of RXP adjusted by changes in the set of competitors with the conventional RXP shows no meaningful effect from changes in the set of rivals. In other words, a rising or falling number of rivals is not an important driver of CESEE's export competitiveness. In all cases the difference between the two indexes is marginal. The most pronounced effects are observed for Bulgaria and Estonia, where the second index is a bit higher, indicating an increasing number of competitors and a slight loss of market power. The opposite effect, although also marginal, is observed for Romania whose exporters seem to be facing fewer rivals and thus experienced a gain in market power compared to the beginning of the sample period.

Finally, when we look at the RXP adjusted by non-price factors we observe a rather strong impact of changes in quality on export competitiveness. Chart 2 shows that this index has notably decreased for all CESEE-10. Decreases were particularly steep for Poland, Slovakia and the Czech Republic and far less pronounced for Estonia, Slovenia and Hungary. This indicates that all CESEE-10 covered here were gaining non-price competitiveness. Although their export unit values were increasing faster than those of their main rivals, the quality of their exports was rising even faster. This, of course, includes tangible as well as intangible components of quality, as our methodology does not allow disentangling the two compo-

Chart 2

CESEE-10 Export Prices Relative to Their Competitors' Export Prices (Exports to EU Market)

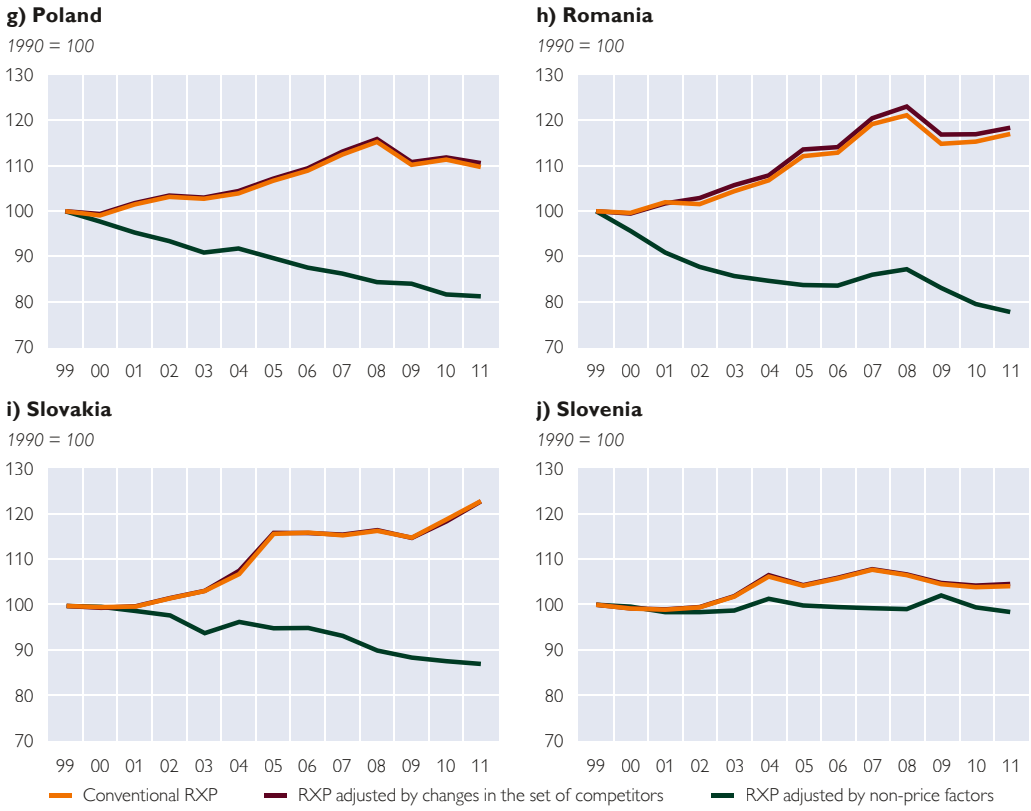


Source: Eurostat Comext, authors' calculations.

Note: Relative export prices are calculated by cumulating RXP changes from equations (1) and (2). An increase denotes losses in competitiveness.

Continued Chart 2

CESEE-10 Export Prices Relative to Their Competitors' Export Prices (Exports to EU Market)



Source: Eurostat Comext, authors' calculations.

Note: Relative export prices are calculated by cumulating RXP changes from equations (1) and (2). An increase denotes losses in competitiveness.

nents. Most probably the CESEE-10 were able to improve the physical quality of their production as well as their image branding and market placement.

This finding is corroborated by earlier literature. Aturupane, Djankov and Hoekman (1999) and Landesmann and Stehrer (2002) give early evidence for increasing unit value ratios of CESEE-10 exports. Dulleck et al. (2005) consider three dimensions of quality upgrading (across industries, across different quality segments within industries and within quality segments inside industries), whereby their third notion of quality upgrading (upgrading inside products) refers directly to our definition of quality. For the time period from 1995 to 2000, just prior to our observation period, they find evidence for quality increases in CESEE-10 exports, whereby the five Central European countries (Poland, the Czech Republic, Slovakia, Hungary and Slovenia) show higher initial levels of quality and exhibit a faster upgrading process than the Southeastern and Baltic countries. Further, it is only for those five CESEE economies that quality upgrading in this period was associated with improvements in both physical properties and nontangible properties such as image of the products; for the remaining five countries, the evidence pointed toward technological and physical upgrading only. Finally, Fabrizio, Igan and Mody (2007) state that the gains in market shares of CESEE countries, despite the pronounced appreciation trend of their currencies, can be ascribed to an im-

pressive shift in the quality of their exports. However, they also caution that this process and the positive development effects arising from it may attenuate soon.

As mentioned above, the contribution of changes in tastes and quality to export competitiveness can be inferred from the difference between the RXP adjusted by non-price factors to the RXP adjusted only by changes in the set of competitors. The negative gap between these two indices in all ten countries suggests a positive contribution of quality to these countries' export performance and hence competitiveness. The strongest quality improvements were observed in Poland, Bulgaria, the Czech Republic and Romania; the lowest improvements were shown by Estonia, Hungary and Slovenia, while the other Baltic states were in the middle of the scale. Very clearly, the disadvantage of the Southeastern European countries in terms of quality, which was observed by Dulleck et al. (2005), had diminished considerably. Concerning the time path of adjustments, in some countries, like the Czech Republic or Latvia, relative quality improvements occurred gradually, while in other countries, like Lithuania, large improvements happened in specific years.

Our methodology is based on highly disaggregated data, which enables us to identify changes in relative quality within different product groups and on individual importing countries inside the EU market. The results of this detailed analysis[13] reveal that quality improvements were strongest for almost all countries (with the exception of Hungary and Lithuania) in machinery and mechanical appliances, followed by vehicles and other transport equipment (notably for the Czech Republic, Hungary, Poland and Romania). Hungary also showed impressive quality improvements in chemicals (possibly related to strong foreign direct investment in this industry), likewise Lithuania. Lithuania and Poland further recorded large improvements in plastics. In regional terms, most countries showed the strongest quality improvements on the German market, but also in France. Further results point towards the fact that strong mutual trade ties and/or proximity exert an upward pressure on quality. We can identify a couple of neighboring country pairs with notable quality improvements in bilateral trade. For example, Slovakia and Slovenia recorded strong improvements on the Austrian market and Bulgaria experienced large gains in relative export quality in Greece. Further, Latvia showed strong quality upgrading on the Lithuanian market and vice versa. Latvia was moreover able to strongly raise the average quality of its export products also on the Estonian market, while Estonian export products gained in relative quality in Sweden. Further, the quality of the Czech Republic exports to Slovakia rose notably.

6 Conclusions

Despite a trend of real appreciation, which temporarily reversed during the crisis, the CESEE-10 countries showed an impressive export performance over the past one and a half decades. This apparent puzzle – a real appreciation of the currency is very broadly associated with a loss in price competitiveness – can be solved by looking into the non-price aspects of competitiveness. In this paper we develop a relative export price index which allows us to disentangle the impact of changes in

[13] *Relative quality improvements are calculated for each country and four main sections of exports as well as four main partner countries in the EU. These results are available from the authors on request.*

relative quality from changes in price competitiveness. This index is calculated using data from Eurostat's Comext at the highly disaggregated eight-digit CN product level for imports of all EU members from 50 main trading partners inside and outside the EU. We used annual data over the time period 1999 to 2011, thus including also the most recent episode of the global trade collapse in early 2009.

Our relative export price index is derived from the theoretically well-founded variety- and quality-adjusted relative import price index as proposed by Benkovskis and Wörz (2011). In addition to controlling for a changing variety in traded goods, this index also allows for changes in product quality. This adjusted relative export price index can be divided into three parts. First, the traditional definition of relative export prices, which is driven by changes in relative export unit values weighted by both the importance of competitors on a particular market and the share of a particular market in the respective country's exports. Second, Feenstra's (1994) term capturing changes in the set of rivals exporting a particular product (changes in variety in our context). And third, the change in relative quality of the exported product compared to the average quality of the same product when exported by all competitors.

Our results show that all CESEE-10 countries experienced a loss in pure price competitiveness over the sample period. Thus, our pure price index reflects the results obtained from traditional measures of price competitiveness, i.e. the CPI- or ULC-based real effective exchange rate, although our pure price index signals that losses in price competitiveness were somewhat smaller than suggested by exchange rate-based measures. This could be driven by various factors including changes in indirect tax rates, differences in export structures, countercyclical behavior of profit margins and more rapid productivity improvements in export-oriented sectors of CESEE-10 countries. We further find that changes in the set of competitors (which could be interpreted as changes in variety for consumers in the importing market) do not affect competitiveness. Our interpretation of this finding is that changes in market power were too small to affect the export competitiveness of any of CESEE-10 economies over the sample period.

Finally, taking quality changes into account, we are able to show that improvements in the relative quality of exports (compared to 49 rivals, including all other 26 EU members, the most important CIS countries and other important trading partners like the U.S.A., Japan, China) have greatly influenced the competitive position of the CESEE-10 countries and enhanced their export performance. In line with earlier findings in the literature we find substantial quality improvements of CESEE-10 exports. Over the past decade, quality improvements were particularly pronounced in Bulgaria and Romania, but also in Poland and the Czech Republic. Lithuania and Latvia also showed strong and continuous quality improvements.

In a sectoral perspective, quality improvements were most pronounced in those industries which represent the region's major export goods. Almost all countries showed the strongest quality gains in machinery and mechanical goods, in many countries followed by improvements in vehicles and other transport equipment.

Our analysis illustrates that quality improvements in CESEE-10 export goods were not only substantial over the past decade, but also large enough to comfortably offset negative developments in price competitiveness of these countries.

Clearly, the loss in price competitiveness is a result of the convergence process which has characterized the economic development of these countries up to date. Along with income convergence, also price and wage levels experienced an upward trend, resulting in trend appreciation of the currencies. However, improvements in quality – i.e. physical quality as well as intangible aspects related to labeling and consumers' tastes – were considerably stronger over the observation period. Our analysis does not enable us to make any inferences regarding the underlying reasons for these quality improvements. For example, FDI rather than purely domestic structural change may have played an important role for this process of quality upgrading. In any case, these developments have influenced the region's trade performance positively.

As a result, CESEE-10's competitiveness has increased over time, thus explaining the large gains in market shares on the European market. In general, these gains were felt most strongly in Western European destination countries. However, there were also quality improvements of some CESEE-10 countries in peer markets; for example Latvia and Lithuania showed strong mutual quality improvements, which may be influenced by similar consumer tastes present in those two countries.

Another important result points towards differences in the speed of quality upgrading between countries. Unlike in earlier studies we find no evidence that peripheral (i.e. the Baltic and Southeastern European) countries are closing the quality gap more slowly than the Central Eastern European countries. The process of quality upgrading still appears to be heterogeneous throughout the region, with Slovenia and Hungary – potentially starting from a much higher level – showing rather weak improvements at the economy-wide level compared to other countries. But nevertheless, especially at the sectoral level, all countries show unambiguous evidence of quality upgrading in a broad sense in important export goods.

References

Aturupane, C., S. Djankov and B. Hoekman. 1999. Horizontal and vertical intra-industry trade between Eastern Europe and the European Union. In: Weltwirtschaftliches Archiv 135(1). 62–81.

Armington, P.S. 1969. A Theory of Demand for Products Distinguished by Place of Production. International Monetary Fund Staff Papers. 16(1). 159–178.

Benkovskis, K. and J. Wörz. 2011. How Does Quality Impact on Import Prices? OeNB Working Paper 175.

Benkovskis, K. and R. Rimgailaite. 2011. The Quality and Variety of Exports from the New EU Member States: Evidence from Very Disaggregated Data. In: Economics of Transition 19(4), 723–747.

Bloningen, B.A. and A. Soderbery. 2010. Measuring the Benefits of Foreign Product Variety with an Accurate Variety Set. In: Journal of International Economics 82(2). 168–180.

Broda, C. and D.E. Weinstein. 2006. Globalization and the Gains from Variety. In: Quarterly Journal of Economics 121(2). 541–585.

De Grauwe, P. 2010. Dimensions of Competitiveness. CESifo Seminar Series. The MIT Press, Cambridge Massachusetts.

Diewert, W.E. 1993a. Index Numbers. In: Diewert, W.E. and A.O. Nakamura (eds.). Essays in Index Number Theory. Volume I Chapter 5. Elsevier Science Publishers B.V. 71–108.

Diewert, W.E. 1993b. The Economic Theory of Index Numbers: A Survey. In: Diewert, W.E. and A.O. Nakamura (eds.). Essays in Index Number Theory. Volume I Chapter 7. Elsevier Science Publishers B.V. 177–228.

Dixit, A.K. and V. Norman. 1980. Theory of International Trade: A Dual, General Equilibrium Approach. Cambridge University Press.

Dulleck, U., N. Foster, R. Stehrer and J. Woerz. 2005. Dimensions of Quality Upgrading Evidence from CEECs, In: Economics of Transition 13(1). 51–76.

Fabrizio, S., D. Igan and A. Mody. 2007. The Dynamics of Product Quality and International Competitiveness. IMF Working Paper WP/07/97.

Flam, H. and E. Helpman. 1987. Vertical Product Differentiation and North-South Trade. In: American Economic Review 77(5). December. 810–822.

Feenstra, R.C. 1994. New Product Varieties and the Measurement of International Prices. In: American Economic Review 84(1). 157–177.

Hallak, J.C. and P.K. Schott. 2008. Estimating Cross-Country Differences in Product Quality. NBER Working Paper 13807. February.

Hummels, D. and P.J. Klenow. 2005. The Variety and Quality of a Nation's Exports. In: American Economic Review 95(3). 704–723.

Landesmann, M.A. and R. Stehrer. 2002. Evolving competitiveness of CEECs in an enlarged Europe. In: Rivista di Politica Economia 92(1). 23–87.

Leamer, E.E. 1981. Is it a Demand Curve, or is it a Supply Curve? Partial Identification through Inequality Constraints. In: Review of Economics and Statistics 63(3). 319–327.

Mohler, L. and M. Seitz. 2010. The Gains from Variety in the European Union. Munich Discussion Paper No. 2010-24.

Pierce, J.R. and P.K. Schott. 2009. Concording US Harmonized System Categories over Time. NBER Working Paper 14837. April.

Reinsdorf, M.B. and A.H. Dorfman. 1999. The Sato-Vartia Index and the Monotonicity Axiom. In: Journal of Econometrics 90(1). 45–61.

Sala-i-Martin, X. 2010. The Economics behind the World Economic Forum's Global Competitiveness Index. In: De Grauwe, P. (ed.). Dimensions of Competitiveness. Chapter 1. CESifo Seminar Series, The MIT Press, Cambridge Massachusetts. 1–18.

Sheu, G. 2011. Price, Quality, and Variety: Measuring the Gains from Trade in Differentiated Products. Unpublished Manuscript. U.S. Department of Justice. September.

Technical Appendix

A1. A Variety and Quality-Adjusted Import Price Index

We start by defining a nested, constant elasticity of substitution (CES), utility function of a representative household which consists of three nests as proposed by Broda and Weinstein (2006). On the upper level a composite import good and the domestic good are consumed:

$$U_t = \left(D_t^{\frac{\kappa-1}{\kappa}} + M_t^{\frac{\kappa-1}{\kappa}} \right)^{\frac{\kappa}{\kappa-1}}; \quad \kappa > 1 \tag{A1}$$

where D_t is the domestic good, M_t is composite imports, and κ is the elasticity of substitution between domestic and foreign good. At the second level of the utility function, composite imported good consists of individual imported products:

$$M_t = \left(\sum_{g \in G} M_{gt}^{\frac{\gamma-1}{\gamma}} \right)^{\frac{\gamma}{\gamma-1}} ; \quad \gamma > 1 \tag{A2}$$

where M_{gt} is the subutility from consumption of imported good g, γ is elasticity of substitution between different import goods, while G denotes the set of imported goods.

At the third level of the utility function variety and quality are introduced. Each import good M_{gt} is defined by a nonsymmetric CES function:

$$M_{gt} = \left(\sum_{c \in C} d_{gct}^{\frac{1}{\sigma_g}} m_{gct}^{\frac{\sigma_g-1}{\sigma_g}} \right)^{\frac{\sigma_g}{\sigma_g-1}} ; \quad \sigma_g > 1 \quad \forall \quad g \in G \tag{A3}$$

where m_{gct} denotes quantity of variety g from country c, C is a set of all partner countries, d_{gct} is a taste or quality parameter, and σ_g is the elasticity of substitution among varieties of good g. After solving the utility maximization problem subject to the budget constraint, the minimum unit-cost function of import good g is represented by

$$\varphi_{gt} = \left(\sum_{c \in C} d_{gct} p_{gct}^{1-\sigma_g} \right)^{\frac{1}{1-\sigma_g}} \tag{A4}$$

where φ_{gt} denotes minimum unit-cost of import good g, P_{gct} is the price of good g imported from country c and σ_g is the elasticity of substitution among varieties of good g.[14] Equation A4 shows that the minimum unit-cost of each import good depends not only on prices (or unit values), but also on a quality or taste parameter d_{gct}.

The price indices for good g can be defined as a ratio of minimum unit-costs in the current period to minimum unit-costs in the previous period ($P_g = \varphi_{gt} / \varphi_{gt-1}$).[15]

The conventional assumption is that quality or taste parameters are constant over time for all varieties and products, ($d_{gct} = d_{gct-1}$) and the price index is calculated over the set of product varieties $C_g = C_{gt} \cap C_{gt-1}$ available in both periods t and $t-1$, where $C_{gt} \subset C$ is the subset of all varieties of goods consumed in period t. Sato (1976) and Vartia (1976) proved that for a CES function the conventional price index P_g^{conv} will be given by

$$P_g^{conv} = \prod_{c \in C_g} \left(\frac{p_{gct}}{p_{gct-1}} \right)^{w_{gct}} \tag{A5}$$

[14] *This approach is based on the famous "duality approach" to modeling international trade in a general equilibrium framework developed by Dixit and Norman (1980). In this approach consumer behavior is modeled through expenditure or indirect utility functions and producer behavior by cost, revenue or profit functions. Cost minimization can therefore be seen as being equivalent to utility maximization. From the consumers' perspective, the price paid for one unit of utility can be minimized either by choosing a cheaper product or choosing a more qualitative product.*

[15] *See Diewert (1993b) for more details.*

whereby weights w_{gct} are computed using cost shares s_{gct} in the two periods as follows:

$$w_{gct} = \frac{\left(s_{gct} - s_{gct-1}\right)/\left(\ln s_{gct} - \ln s_{gct-1}\right)}{\sum_{c \in C_g}\left(\left(s_{gct} - s_{gct-1}\right)/\left(\ln s_{gct} - \ln s_{gct-1}\right)\right)}$$

and x_{gct} is the cost-minimizing quantity of good g imported from country c.

The import price index in (A5) ignores possible changes in quality and variety (set of partner countries). The underlying assumption that variety is constant was relaxed by Feenstra (1994) and further by Broda and Weinstein (2006). According to their innovation, the price index derived in (A5) is multiplied by an additional term which captures the role of new and disappearing variety:

$$\left(\frac{\lambda_{gt}}{\lambda_{gt-1}}\right)^{\frac{1}{\sigma_g - 1}}, \text{where } \lambda_{g,t} = \frac{\sum_{c \in C_g} p_{gc,t} x_{gc,t}}{\sum_{c \in C_{g,t}} p_{gc,t} x_{gc,t}} \text{ and } \lambda_{g,t-1} = \frac{\sum_{c \in C_g} p_{gc,t-1} x_{gc,t-1}}{\sum_{c \in C_{g,t-1}} p_{gc,t-1} x_{gc,t-1}}$$

This approach is not limited to the number of varieties only, but also takes into account expenditure shares, therefore giving higher weight to varieties with a high weight in the consumption bundle. In case the expenditure share of new varieties exceeds that of disappearing varieties, their additional term is smaller than unity, which lowers the import price index in (A6) below. In other words, if a new competitor appears on the market, consumer utility rises and minimum unit costs shrink. The effect from a changing set of variety also depends on the elasticity of substitution between varieties. That is, if varieties are close substitutes, the additional term is close to unity and changes in available varieties do not have a significant effect on the price index.

Benkovskis and Wörz (2011) further relax the assumption that taste or quality parameters are unchanged for all varieties of all goods ($d_{gct}=d_{gct-1}$). Thus, they allow for vertical product differentiation. The resulting variety- and quality-adjusted import price index P_g^q is thus:

$$P_g^q = \left(\frac{\sum_{c \in C_{gt}} d_{gct} p_{gct}^{1-\sigma_g}}{\sum_{c \in C_{gt-1}} d_{gct-1} p_{gct-1}^{1-\sigma_g}}\right)^{\frac{1}{1-\sigma_g}} =$$

$$= \prod_{c \in C_g}\left(\frac{p_{gct}}{p_{gct-1}}\left(\frac{d_{gct}}{d_{gct-1}}\right)^{\frac{1}{1-\sigma_g}}\right)^{w_{gct}} \left(\frac{\lambda_{gt}}{\lambda_{gt-1}}\right)^{\frac{1}{\sigma_g - 1}} = P_g^{conv}\left(\frac{\lambda_{gt}}{\lambda_{gt-1}}\right)^{\frac{1}{\sigma_g - 1}} \prod_{c \in C_g}\left(\frac{d_{gct}}{d_{gct-1}}\right)^{\frac{w_{gct}}{1-\sigma_g}} \tag{A6}$$

The additional term $\prod_{c \in C_g}\left(\frac{d_{gct}}{d_{gct-1}}\right)^{\frac{w_{gct}}{1-\sigma_g}}$ captures changes in the quality and taste parameter. This term states that if aggregate product quality increases over time,

this gives higher utility to consumers and reduces the minimum unit-costs (note that minimum costs in (A4) are defined as euro per unit of utility). The additional term also depends on the product-specific elasticity of substitution between varieties. If σ_g is high, the term reflecting changes in quality goes to unity. In other words, changes in quality for close substitutes have no large effect on import prices and welfare. At the extreme, in perfect competition all goods are standardized and there is no room for quality changes. Quality only becomes important in monopolistic competition where goods are differentiated, i.e. in the case of imperfect substitutes.

A2. From Import to Export Prices

So far, the index derived is equal to the one we derive in Benkovskis and Wörz (2011). In what follows, we move from an index for import prices to an index for export prices. We can easily interpret x_{gct} – which are imports of product g originating from country c – as country's c exports of a product g to the importing market (for the moment let's assume that all exporting countries target a single destination – the importing country where the representative household resides).[16] Another problem arises from the need to compare the performance of one particular country with that of its competitors, while equation (A6) gives the aggregate import price from all suppliers. We propose to define changes in the adjusted relative export price of good g exported by country k in the following way:

$$RXP_{gkt} = \frac{\varphi_{gt}^{k} / \varphi_{gt-1}^{k}}{\varphi_{gt}^{-k} / \varphi_{gt-1}^{-k}} = \frac{\left(p_{gkt} / p_{gkt-1}\right)\left(d_{gkt} / d_{gkt-1}\right)^{\frac{1}{1-\sigma_g}}}{\varphi_{gt}^{-k} / \varphi_{gt-1}^{-k}} \tag{A7}$$

where φ_{gt}^{k} denotes the minimum unit-cost of good g when exported by (imported from) country k, while φ_{gt}^{-k} is the minimum unit cost of good g when exported by (imported from) all countries except k. In other words, φ_{gt}^{k} is obtained by maximizing the nested utility function if country k is the only exporter. It is obvious that $\varphi_{gt}^{k} = p_{gkt} d_{gkt}^{\frac{1}{1-\sigma_g}}$ and the minimum unit costs of good g exported by (imported from) country k depend on the export price (unit values) and on the quality of the exported product. Analogously, φ_{gt}^{-k} is obtained from maximizing utility under the assumption that exports from country k are zero.[17] After combining (A6) and (A7) we obtain

$$RXP_{gkt} = \prod_{c \in C_g^{-k}} \left(\frac{p_{gkt}}{p_{gct}} \frac{p_{gct-1}}{p_{gkt-1}} \right)^{w_{gct}^{-k}} \left(\frac{\lambda_{gt}^{-k}}{\lambda_{gt-1}^{-k}} \right)^{\frac{1}{1-\sigma_g}} \prod_{c \in C_g^{-k}} \left(\frac{d_{gkt}}{d_{gct}} \frac{d_{gct-1}}{d_{gkt-1}} \right)^{\frac{w_{gct}^{-k}}{1-\sigma_g}} \tag{1}$$

where C_g^{-k} is a set of product varieties available in both periods, excluding varieties coming from country k, $w_{gc,t}^{-k}$ and $\lambda_{g,t}$ are calculated similar to $w_{gc,t}$ and $\lambda_{g,t}$, again excluding country k from the set of exporters (varieties).

[16] *We will relax this assumption in equation (A9) below.*

[17] *Note that excluding exports originating from country k does not affect the optimal structure of remaining trade flows in the utility maximization problem. This is because the relative quantity of imports coming from two different origins is only determined by relative prices and by the quality of imports from those origins.*

A3. Evaluation of Relative Quality

The calculation of the adjusted relative export price index in (1) is a challenging task due to the fact that relative quality is unobservable. As in Hummels and Klenow (2005) we evaluate unobserved quality from the utility optimization problem in the following way: after taking first-order conditions and following transformation into log-ratios we can express relative quality in terms of relative prices, volumes and the elasticity of substitution between varieties as

$$\ln\left(\frac{d_{gc,t}}{d_{gk,t}}\right)=\sigma_g \ln\left(\frac{p_{gc,t}}{p_{gk,t}}\right)+\ln\left(\frac{x_{gc,t}}{x_{gk,t}}\right) \tag{A8}$$

where k denotes a benchmark country.

This expression is similar to equation (6) in Hummels and Klenow (2005), except that we allow the elasticity of substitution to differ between individual goods and the right-hand side is multiplied by the inverted elasticity of substitution, due to a slightly different definition of the utility function. Equation (A8) shows that relative quality is to a large extent indicated by relative prices. If the price of a specific good exported by country c (measured by its unit value) is higher than the price of the same good exported by country k, this is an indication of a higher quality of the former. Moreover, when different varieties are close substitutes, the role of relative prices increases. However, relative price is not the only indicator of relative quality, as also relative consumed quantity of a single variety gives a contribution to the evaluation of relative quality. A greater amount of consumption is a clear sign of better quality, and relative quantity is a more important indicator of relative quality when the elasticity of substitution between varieties is small.

A4. Estimation of Elasticities

The elasticity of substitution between varieties (σ_g) cannot be directly obtained from statistical data. Instead, one needs to specify the demand and supply equations. The demand equation is defined by re-arranging the minimum unit-cost function in terms of the market shares, taking first differences and a reference country:

$$\frac{\Delta \ln s_{gct}}{\Delta \ln s_{gkt}}=-\left(\sigma_g-1\right)\frac{\Delta \ln p_{gct}}{\Delta \ln p_{gkt}}+\varepsilon_{gct} \tag{A9}$$

where $\varepsilon_{gct}=\Delta lnd_{gct}$, therefore we assume that the log of quality is a random walk process. The export supply equation relative to country k is given by:

$$\frac{\Delta \ln p_{gct}}{\Delta \ln p_{gkt}}=\frac{\omega_g}{1+\omega_g}\frac{\Delta \ln s_{gct}}{\Delta \ln s_{gkt}}+\delta_{gct} \tag{A10}$$

where $\omega_g \geq 0$ is the inverse supply elasticity assumed to be the same across partner countries. A weakness of the system of equations (A9) and (A10) is the absence of exogenous variables, which would be needed to identify and estimate elasticities. To get these estimates, one needs to transform the system of two equations into a single equation by exploiting Leamer's (1981) approach and the independence of

errors ε_{gct} and δ_{gct}.[18] This is done by multiplying both sides of equations. After such transformations, the following equation is obtained:

$$\left(\frac{\Delta \ln p_{gct}}{\Delta \ln p_{gkt}}\right)^2 = \theta_1 \left(\frac{\Delta \ln s_{gct}}{\Delta \ln s_{gkt}}\right)^2 + \theta_2 \left(\frac{\Delta \ln p_{gct}}{\Delta \ln p_{gkt}}\right)\left(\frac{\Delta \ln s_{gct}}{\Delta \ln s_{gkt}}\right) + u_{gct} \qquad \text{(A11)}$$

where

$$\theta_1 = \frac{\omega_g}{(1+\omega_g)(\sigma_g - 1)}; \theta_2 = \frac{1-\omega_g(\sigma_g - 2)}{(1+\omega_g)(\sigma_g - 1)} u_{gct} = \varepsilon_{gct}\delta_{gct}$$

It should be noted that the evaluation of Θ_1 and Θ_2 leads to inconsistent estimates, as the relative price and relative market shares are correlated with the error u_{gct}. However, it is still possible to obtain consistent estimates by exploiting the panel nature of the data. Broda and Weinstein (2006) argue that one needs to define a set of moment conditions for each good g by using the independence of the unobserved demand and supply disturbances for each country over time:

$$G(\beta_g)=E_t(u_{gct}(\beta_g))=0 \ \forall c$$

where $\beta_g = (\sigma_g, \omega_g)$represents the vector of estimated elasticities. For each good g the following GMM estimator is obtained:

$$\hat{\beta}_g = \arg\min_{\beta \in B} G^*(\beta_g)' W G^*(\beta_g) \qquad \text{(A12)}$$

where $G^*(\beta_g)$ = is the sample analog of $G(\beta_g)$ and B is a set of economically feasible values of β ($\sigma g>1$ and $\omega g \geq 0$). W is a positive definite weighting matrix, which weights the data such that the variance depends more on large shipments and becomes less sensitive to measurement error. Broda and Weinstein (2006) first estimate Θ_1 and Θ_2 by solving an unconstrained minimization problem and then apply a grid search in case this produces imaginary numbers or the wrong sign for elasticities. We use a direct approach and solve equation (A12) as a constrained minimization problem.

[18] *It can be argued, however, that the quality or taste parameter can implicitly enter the residual of both demand and supply equations (A9) and (A10). This is more likely when the quality reflects tangible properties of a product and as such increases the production costs of high-quality product. This problem cannot be addressed without a well-derived supply side in the model. Therefore we leave this question to further research.*

Banking Sector Concentration and Firm Indebtedness: Evidence from Central and Eastern Europe

Mariya Hake[1]

Using data from the Amadeus firm-level database, this paper explores the impact of banking sector concentration on corporate debt in the manufacturing sectors in eight Central, Eastern and Southeastern European (CESEE) countries in the precrisis period 2002–2007. Our findings indicate that banking sector concentration has a positive effect, raising firm debt. This confirms the predictions of the relationship lending theory. However, in the CESEE countries with the most concentrated banking markets – such as Estonia and Lithuania – the effect on the corporate leverage ratio is found to be negative. We also show that young firms increase their leverage, while mature firms reduce their dependence on external financing when banking markets are more concentrated. Furthermore, the positive impact of banking sector concentration is weakened by EU accession and greater stock market capitalization, which can be explained by the financial deepening process and the improved availability of alternative sources of external finance.

JEL classification: G21, G32, O52
Keywords: Firm leverage, banking sector concentration, Central, Eastern and Southeastern Europe, firm-level data

1 Introduction

The banking sectors in the Central, Eastern and Southeastern European (CESEE)[2] countries have gone through a fundamental transformation in the past 20 years. Banking system ownership shifted from the state to the private sector, and foreign-owned banks began to increasingly dominate the CESEE banking markets. At the same time, financial systems in the CESEE region remained bank-dominated, and banks became the key source of external (firm) finance for the private sector. Moreover, bank credit became crucial also for corporate investment and innovation activities in the CESEE countries and was thus an intrinsic part of the precrisis growth model in the region (Becker et al., 2010; Backé, Égert and Zumer, 2007). This, in turn calls for a better understanding of the determinants of private debt accumulation in the CESEE countries in the precrisis period. In this context, one question is how the structure of the banking sector, i.e. in particular its degree of concentration,[3] influences the corporate leverage ratio in the manufacturing sector[4]

[1] *Oesterreichische Nationalbank, Foreign Research Division, mariya.hake@oenb.at.* *The author would like to thank Peter Backé, Markus Eller, Martin Feldkircher, Doris Ritzberger-Grünwald (all OeNB), Christian Bellak (Vienna University of Economics and Business) and two anonymous referees for helpful comments. This paper is based on Hake (2012).*

[2] *We focus on the following countries: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia. As many of the values of leverage for firms in Romania and Slovenia were missing in Amadeus, we excluded these countries from the estimations.*

[3] *A central point of discussion in the theoretical literature is the link between competition and concentration in the banking industry. While some theoretical contributions (i.e. the efficiency theory) claim that the efficiency of larger banks enhances their performance, other theoretical approaches (i.e. the structure-conduct-performance theory) postulate that a higher concentration of the banking market encourages collusion and reduces efficiency, i.e. decreases competition. The second approach has been broadly confirmed by empirical evidence for developed countries (e.g. Birkker and Haaf, 2002) as well as for a sample of CESEE countries (e.g. Delis, 2010). Hence, in line with these studies, we presume that higher levels of concentration are associated with a lower level of competition in the banking market.*

[4] *For reasons of comparability, we opted to focus only on firms in the manufacturing sector. The inclusion e.g. of financial corporates would distort comparability, as they have a different liability structure than manufacturing firms.*

of the CESEE countries – and this is the specific research question that is tackled in this paper. We explore this issue by using firm-level data. We also address the reversed causality problem in our analysis, as the banking sector itself could be influenced by firms' financing decisions. In our analysis, we focus on the precrisis period, during which private sector debt accumulated substantially. This period forms a rather homogeneous sample of firms without the incisive structural breaks that would likely occur if we had included the period after the onset of the crisis. Moreover, firm-level data for CESEE countries are available only with a considerable time lag so that only few data points are available to study developments since the onset of the crisis.

Two different theories explain the impact of banking sector concentration on firm debt. The first theory, the market power theory, implies that the increase of industry concentration is related to a reduction of competition and to greater inefficiencies in markets without information asymmetries. Hence, any deviation from perfect competition on the credit market introduces inefficiencies that could lead to credit rationing, reduced credit demand by firms, or both. The second theory, the relationship lending theory, states that on markets with asymmetric information, higher banking sector concentration increases the incentives for banks to reduce information asymmetries by acquiring soft information through relationships with corporates. Fewer information asymmetries would have a positive impact on credit to firms.

The available empirical evidence on Western European banking markets has so far shown a predominantly negative effect of banking sector concentration on firm debt. However, these studies have also indicated that small and young firms, which have less access to other sources of external financing, could benefit more from relationship lending in more concentrated banking markets. It is also well known that banks behave differently in different institutional frameworks, implying that results for the developed countries might not be valid for the CESEE countries. The question is even more relevant for most CESEE countries because banking sector concentration is high there.[5] Interestingly, empirical evidence on the effect of banking sector concentration on firm leverage is still missing for the CESEE countries. This paper intends to fill the gap in the empirical literature.

The paper is organized as follows: In the following section, the findings of both the theoretical and the empirical literature on the impact of banking market structure on corporate debt leverage are summarized. Section 3 outlines the methodological approach and discusses the variables included in the estimations. After the data and the summary statistics are introduced in section 4, the baseline results are presented and discussed in section 5. Section 6 explores the firm and country heterogeneity of the impact of banking sector concentration. Section 7 concludes, addressing the threats from elevated banking sector concentration in the CESEE countries.

[5] *For instance, in the precrisis period 2002–2007, the banking sector concentration ratio (CR5, the concentration ratio of the five largest banks in a country) in the CESEE countries in our sample averaged between 49.4% in Poland and 98% in Estonia, whereas the CR5 ratio in the EU-15 countries varied between some 21% (Italy, Germany) and almost 80% (the Netherlands, Finland).*

2 Banking Sector Concentration and Corporate Leverage: Review of the Literature

The cost of capital is closely related to the investment decisions of a firm as well as to the firm's value and performance. Therefore, the importance of firm debt relative to other sources of finance is the subject of numerous theoretical contributions.[6] More specifically, the impact of banking sector competition on firm leverage is unclear from both the empirical and the theoretical perspective. Two main theories postulate the effect of banking market structure on corporate leverage. The first theory, the market power hypothesis (Carbó-Valverde, Rodríguez-Fernández and Udell, 2009), implies that higher concentration corresponds to increasing market power. When banks exert their market power, loans are priced higher than under perfect competition; hence, fewer firms will take out a loan. Therefore, the market power hypothesis postulates that a higher degree of banking sector concentration implies higher interest rates on loans and lower credit demand, which hampers growth. In addition, as Black and Strahan (2002) have shown, fewer enterprises are established in a concentrated banking market.

The second theory, the relationship (i.e. information-based) theory, implies that higher concentration in the banking market translates into a reduction of information asymmetries and hence into a reduction of credit rationing (Stiglitz and Weiss, 1981). Consequently, banks could invest more in relations (i.e. credit could be offered on the basis of the future profits of the firm) and would not be dependent only on transactional lending (i.e. reliance on readily observable information about the borrower). In addition, banks could also monitor other activities of the borrowing firms, such as deposits at the same bank (Kane and Malkiel, 1965). Moreover, as shown in a theoretical model by Petersen and Rajan (1995), lending to young firms with no performance record could be more intense in more concentrated markets because banks with larger market power could recoup the cost of lending over time.

Other theoretical studies conclude that relationship lending with increased monitoring could induce firms to avoid myopic behavior and hence permits more corporate investment (e.g. Von Thadden, 1995). Additionally, higher bank concentration could make banks more efficient because the standards of information sharing improve in parallel with concentration (Japelli and Pagano, 2006). For instance, Brown, Jappelli and Pagano (2009) perform analysis based on the Business Environment and Enterprise Performance (BEEPS) 2005 firm survey data for 24 transition countries and find that the more developed the information sharing standards between the banks are, the more the costs of investment financing decline, and the fewer obstacles there are to investment financing. Furthermore, the monopoly gains of the bank can be eroded by information "leaks" when such firm registers are available (e.g. Padilla and Pagano, 1997). On a negative note, though, when confronted with higher loan interest rates, borrowers (firms) could also adjust their investment policies in favor of high risk. However, Agoraki, Delis

[6] *In particular, the pecking order hypothesis captures the costs of asymmetric information and prioritizes the sources of financing according to the "principle of least effort" (adverse selection) (Myers and Majluf, 1984). Hence, firms prefer internal sources of finance to debt when managers know that the firm is overvalued. Internal finance, in turn, is preferred to equity financing. By contrast, the tradeoff theory states that the capital structure of a firm is the balance of the tax savings from debt to deadweight bankruptcy costs (for a more detailed review, see Hake, 2012).*

and Pasiouras (2011) have shown for the CESEE countries in the period 1998–2005 that, while banking markets had become more concentrated, less risk-taking behavior (as measured by the ratio of nonperforming loans) could be observed.

Most of the empirical evidence on the impact of banking sector concentration on corporate debt is based on U.S. or Western European data. The early empirical literature on the U.S. banking markets in the 1960s and 1970s finds a negative correlation between concentration and proxies for risk-taking behavior, as for instance the debt-to-assets ratio and the ratio of nonperforming loans to total loans (Rhoades and Rutz, 1982). Later, Petersen and Rajan (1994) find support for the relationship lending theory in a study on U.S. SMEs and hence assume a positive effect on the borrowed quantity. The effect on the cost of lending, though, is not as clear: The paper shows that the availability of "soft" information does not usually translate into lower interest rates; it affects the duration of the relationship instead.

By contrast, in the analysis of U.S. firms, Zarutskie (2006) finds a generally positive effect of enhanced competition on credit supply, but this effect tends to be negative in the case of information-sensitive borrowers such as small and young firms. In a cross-industry and cross-country study (including both developed and developing countries), Cetorelli and Gambera (2001) generally confirm the positive effect of banking sector competition on corporate credit growth but also find that fast-growing industries tend to benefit more from a concentrated bank sector because of enhanced relationship lending. Their paper, though, does not include the CESEE countries. Going further, in a more recent study on nonfinancial SMEs in Western European countries, Baert and Vander Vennet (2009) find a negative correlation between firm leverage and increased bank market power. In addition, this study tests whether the effect is different for firms in different size groups and concludes that the theory of relationship lending cannot be supported. Conversely, in an extensive study on the determinants of firm book leverage with firm-level data from 39 countries (including developing countries but not CESEE countries), Gonzáles and Gonzáles (2008) find that banking sector concentration has a positive impact on firm debt, which suggests that the information asymmetries between firms and banks are reduced. This study concludes that banking sector concentration could be regarded, up to a point, as a substitution for the weak legal enforcement of property rights.

To our knowledge, just a few studies have empirically analyzed the effect of banking market structure on firm leverage in the CESEE countries (Coricelli et al., 2010; Agoraki, Delis and Pasiouras, 2011), but they did not focus directly on the link between banking sector concentration and firm leverage. The present study therefore complements this literature by analyzing the effect of banking sector competition on corporate debt in a sample of CESEE countries. We venture that due to several factors, the impact of banking sector competition in the CESEE countries on corporate debt could differ from the respective effects shown to be in force in advanced economies. First, the role of foreign-owned banks in the countries of the sample has increased substantially in the past decade. A considerable number of banks entered the market through the acquisition of domestic banks, which were previously mainly under state ownership. Second, relationship lending could also benefit older and larger firms with an established relationship with the lender; hence, foreign-owned banks could prefer to follow the policy of the

acquired bank. Furthermore, even in a more concentrated market, banks could turn out to be very risk averse and hence could favor safer lending to established firms at the expense of lending to young and financially distressed firms.

3 Econometric Specification and Variables

We adopt a model of capital structure that considers firm-level characteristics (demand determinants), banking sector characteristics at the country level (supply determinants) and general macroeconomic indicators. Hence, the main model we estimate is:

$$\ln Leverage_{ijt} = \alpha + \beta X_{jt-1} + \chi \ln Y_{ijt-1} + \eta Ind_{kjt-1} + \varphi Z_{jt-1} + \alpha_i + \eta_t + \varepsilon_{ijt} \qquad (1)$$

with $i=1,...,N$ firms, $k=1,...,K$ manufacturing sectors, $t=2002,...,2007$ years, $j=1,...,J$ countries; the residual (ε_{ijt}) is independent and identically distributed. Moreover, in the estimations, all variables are lagged with one period due to endogeneity concerns.

The model above has been estimated by applying a panel fixed effects estimator (here, fixed effects (α_i) refer to the firm level). In addition, we included time fixed effects (η_t) to control for unobserved effects that vary across time rather than across firms and that impact firm leverage (Baltagi, 2008). Consistently with other studies (e.g. Booth et al., 2001; Baert and Vander Vennet, 2009), we also argue that this is the proper estimation method in this setting, as (1) this approach alleviates the omitted variables bias in the setting of unbalanced panels, and as (2) the Hausman test rejected the application of the random effects estimator while showing the fixed effects estimator to be consistent and more efficient. Unfortunately, country and industry dummies cannot be included in the fixed effects model because they are highly correlated with firm fixed effects. Clustering at the country level is not possible, as the number of parameters to be estimated exceeds the number of clusters (Baltagi, 2008). Hence, to control for industry and country fixed effects, we additionally applied a pooled ordinary least squares (OLS) estimation.

Generally, firm leverage is measured in the literature as the book leverage ratio (total firm debt to total assets) or market leverage (debt divided by the sum of book debt plus the market value of its equity). In this respect, market leverage is a forward-looking measure and book leverage represents a backward-looking measure (Frank and Goyal, 2009). We opted for using the book leverage measure because only a few firms in our sample have data on firm equity. In addition, this measure is in line with recent studies (e.g. Coricelli et al., 2010).

X_{jt-1} encompasses banking sector concentration measures at the country level. In line with existing empirical evidence (e.g. Gonzáles and Gonzáles, 2008), our preferred measure of banking sector concentration is the asset share of the five largest banks in the total sum of assets of all credit institutions in a given country (CR5 ratio). Due to potential drawbacks of this measure (such as a considerable correlation with country size), we also applied the Herfindahl index, which is calculated as the sum of the squared market shares (according to total assets) of all credit institutions in a country (ECB, 2006; ECB, 2008). The correlation between these two concentration measures is high and amounts to some 90%. Moreover, note that potential correlations of the concentration measures with

time-invariant firm-, industry- or country-specific characteristics are captured by the chosen estimation techniques above.

Y_{ijt-1} includes firm-level credit (demand) factors used in the corporate finance literature, such as firm size, firm profitability and firm tangibility. These firm-level control variables are in line with those used in other studies on the determinants of firm leverage (e.g. Frank and Goyal, 2009), and their influence is related to the impact of the pecking order theory as well as the tradeoff theory outlined above.

Generally, the impact of the above-mentioned firm-level covariates on firm debt cannot be certified a priori. On the one hand, firm leverage could be positively related to firm size, as larger firms tend to be more diversified and typically have a lower risk of default. On the other hand, though, larger firms are more transparent to outside investors and hence may prefer issuing equity to taking out a loan (Rajan and Zingales, 1995). Furthermore, firm tangibility, measured as the ratio of firm fixed assets to total assets, illustrates the collateral assets a firm could offer when applying for a loan. Its influence on corporate leverage should hence be positive. Moreover, higher firm profitability expresses the generation of cash flow and the firm's preference to finance future investments from internal funds, which is consistent with the pecking order theory (Myers and Majluf, 1984; Booth et al., 2001). Additionally, Jensen (1986) suggests that managers prefer to avoid the disciplinary role of debt in an ineffective market of corporate control; hence, the correlation is negative. In addition, the main model is altered in the robustness tests section later on by adding some interaction variables, such as the interaction terms of banking sector concentration and firm size, firm age and firm-level profits. Finally, in line with Rajan and Zingales (1995) as well as Baert and Vander Vennet (2009), we also include median industry leverage (Ind_{kjt-1}) to capture the target industry capital structure.

Besides the firm-level and banking sector characteristics and in line with other studies (e.g. De Haas and Peeters, 2004; Hanousek and Shamshur, 2011), we also included country-level control variables (Z_{jt-1}), such as GDP growth, the rate of inflation and the EBRD index of development of the financial sector.[7] Consistently with other empirical studies, the inflation rate could positively influence the level of corporate debt, as it tends to decrease interest rates in the short run. By contrast, inflation could also be negatively related to firm-level leverage, as higher inflation tends to discourage lenders from giving long-term credits. Furthermore, we included GDP growth as a proxy for firm financing needs and thus expect a positive impact. Several studies so far have shown that GDP growth is negatively related to total corporate debt (Demirgüç-Kunt and Maksimovic, 1996). The rationale behind this phenomenon is that since firms with large growth opportunities tend to use less debt, as argued by Myers' hypothesis (Myers, 1977) and as corporate growth is positively related to GDP growth, the impact of economic growth on corporate debt is also negative. The EBRD banking sector index has also been included to capture the development of the banking sector in a country. Hence, this determinant indicates financial deepening, and we expect it to have a positive effect on firm debt leverage.

[7] *Previous studies on the effect of banking sector concentration on firm debt (see Northcott, 2004, for a summary) show that not only the degree of concentration but also certain policies that promote competition and the development of the banking sector have an effect.*

Finally, in the robustness section of the paper, we also included the extent of alternative sources of external finance (i.e. the degree of stock market capitalization) as well as other country-level control variables, such as the interest rate and an EU accession dummy.[8] The EU accession dummy is related to the enhanced availability of different sources of external finance and consequently to the financial deepening process (e.g. the development of stock markets). Hence, we presume that both the higher stock market capitalization and EU accession of these countries would reduce the impact of the concentration of the banking sector. Finally, we also account for the average price of loans (i.e. the real interest rate) and expect a negative effect when banking markets are more concentrated.

4 Data and Descriptive Statistics

This chapter draws on firm-level data included in the 2009 version of the Amadeus database, which is a pan-European database providing financial statement data for a large set of private and public companies in more than 30 European countries, including the countries in Central and Eastern Europe. The database includes balance sheet and ownership information for companies, but coverage of the relevant variables for the years before 2002 and also in 2008 is limited, so that in the empirical analysis we had to restrict the period to the time from 2002 to 2007. This paper focuses on firms in the manufacturing sectors in eight CESEE countries: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia. Hence, the final dataset consists of an unbalanced panel of some 16,000 firms in the manufacturing sectors in our sample of CESEE countries, with firms in the Czech Republic, Hungary and Poland accounting for the prevailing share of firms. Among the key advantages of the data from our perspective is that they cover both listed and unlisted firms of a wide variety of size and age categories. On a negative note, however, the coverage of Amadeus differs across years, sectors and countries. In addition, it is difficult to distinguish between enterprises exiting due to insolvency and enterprises that do not report data for several years. Having that in mind, the Amadeus database still represents one of the key firm-level data sources for cross-country analyses. Next to the firm-level data, we also use country-level measures of banking sector concentration that come from the European Central Bank (ECB), while additional data are drawn from the World Bank and the European Bank for Reconstruction and Development (EBRD). We introduce the data in this section and complement the description with a detailed table in the annex.

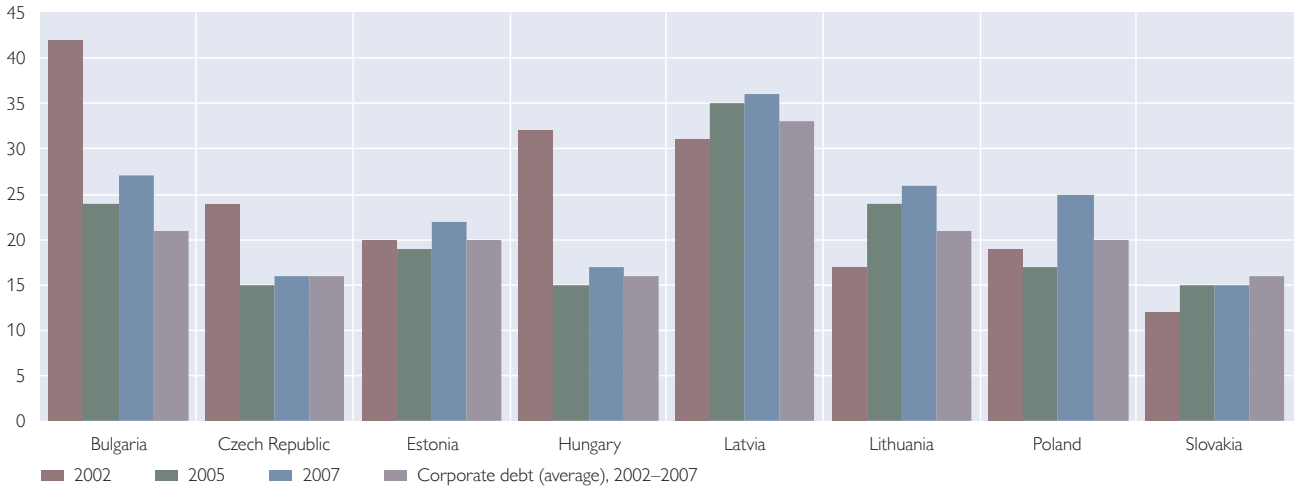
Chart 1 shows the cross-country average of firm indebtedness over the period 2002–2007 as well as at three years in this period show not only the average development but also the development over time. Among all firms, the average ratio is 0.21, but the degree of corporate indebtedness of manufacturing firms varies across countries, ranging from 0.16 e.g. in Slovakia to 0.33 in Latvia. When we turn to the change over time, the leverage ratio increased in the period between 2002 and 2007 in most countries, in particular in Latvia and Lithuania. In contrast, in the Czech Republic and in Slovakia, the corporate debt ratio barely changed

[8] *For a definition of the variables, see table A1 in annex 2.*

Chart 1

Distribution of the Debt Ratio among Countries

% of total firm assets



Source: Amadeus, author's calculations.

over the period.[9] This discrepancy could be due to the fact that these countries experienced their credit boom in the 1990s. Compared to studies dealing with Western European data, firm indebtedness as a share of total assets in the sample of our countries is larger, which can be partly explained by the underdeveloped markets for alternative external financing in the CESEE countries. For instance, for firms from EU-15 countries, Baert and Vander Vennet (2009) find book leverage ratios that are similar to those of some of the CESEE countries in this study (Poland, Slovakia and the Czech Republic) but not as high as those of Bulgaria and the Baltic countries, where the mean corporate debt ratio is twice as large as the debt ratio in the EU-15 countries.

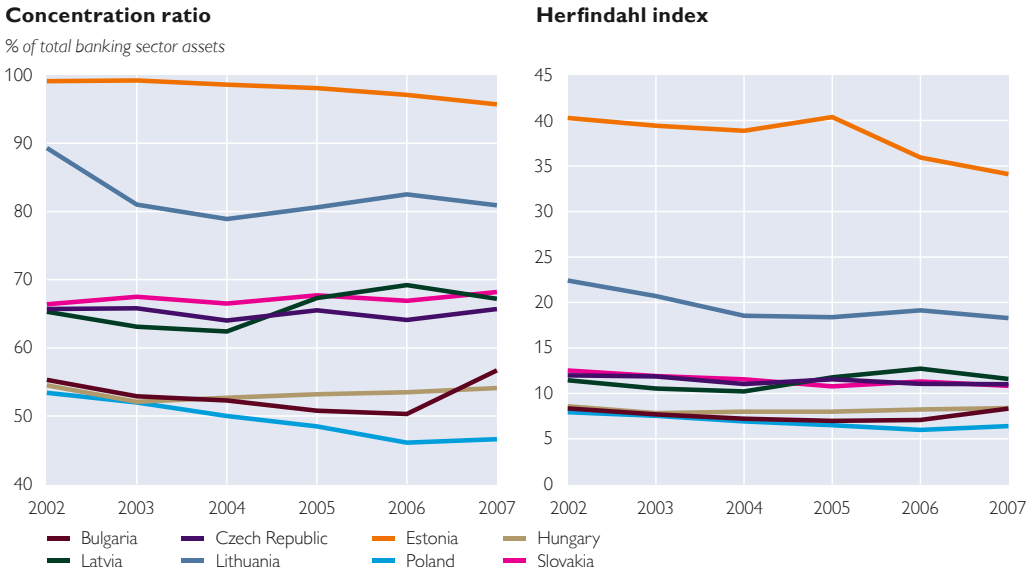
Turning our attention to the structural characteristics (i.e. the level of concentration)[10] of the banking markets in the countries of our sample, a common characteristic is that the banking sectors demonstrate high concentration, but with a large country variance related partly to country size or to the different pace of introducing banking sector regulations (chart 2). For instance, the ratio of the five largest banks in Estonia amounts to over 90% of total assets, while in Poland this value averages some 50%. Moreover, the overall degree of concentration decreased slightly in the observation period, with the exception of Bulgaria, where the banking market shows higher concentration in 2007 than in 2002. In addition, the

[9] *Our data show a peak of the firm debt ratio in 2002 in Bulgaria, the Czech Republic and Hungary and a flattening afterwards. This could be explained by the low number of firms in Bulgaria in 2002 compared to the following years. However, the result is in line with aggregate data from Eurostat for the Czech Republic and Hungary. In addition, calculations of firm indebtedness on the basis of a balanced panel of firms yields a similar pattern of firm indebtedness in most of the CESEE countries in our sample. See the annex1 for an assessment of the representativeness of the Amadeus database with regard to corporate leverage.*

[10] *We use the annual banking statistics of the ECB (ECB, 2006; ECB, 2008), which comprise data on different characteristics of the banking market structure in each of the EU member countries.*

Chart 2

Banking Sector Concentration Measures in CESEE Countries



Source: ECB.

Herfindahl index averages around 10, which indicates a moderate degree of competition (again with a large country variation).[11]

The descriptive statistics of the variables used in the analysis are presented in table 1. The firm book leverage varies among countries and has a mean of 16% and a median of 10% of total assets. The Herfindahl index varies between 5.6 and

Table 1

Descriptive Statistics of Firm-Level and Country-Level Characteristics

	Observations	Mean	Median	Standard deviation	Minimum	Maximum
Firm book leverage	44,893	0.21	0.16	0.18	0	0.99
Firm size (log)	44,791	8.29	8.24	1.44	1.1	15.63
Firm profits (log)	40,406	–2.53	–2.42	0.97	–10.05	–0.48
Firm tangibility (log)	44,668	–1.11	–0.9	0.81	–8.66	–0.12
Industrial leverage (median)	44,893	10.32	9.71	4.58	0.96	18.6
CR5 ratio	48	58.5	53.5	11.9	46.1	99.1
Herfindahl index	48	10.4	8.2	6.8	5.99	40.4
EBRD Banking Index	48	3.61	3.7	0.3	3	4
GDP growth rate	48	5.3	5.3	2.1	1	12.2
Inflation rate (CPI)	48	3.5	2.8	2.3	–1.1	10
Interest rate	48	0.05	0.04	0.034	–0.078	0.14
Stock market capitalization	48	26.5	28.1	12.9	4.7	55.1

Source: Author's calculations.

Note: Firm-level covariates in logs. Descriptive statistics computed after performing the baseline estimations in columns (1)–(2) in table 2.

[11] *The Herfindahl index is defined as varying between 1 and 100. Values below 5 indicate low concentration, values of 7 to 11 correspond to moderate concentration, and a Herfindahl index of over 11 indicates high concentration. The index was computed on an unconsolidated basis (ECB, 2006; ECB, 2008).*

40.4, with a standard deviation of 6.8, whereas the CR5 ratio varies between 46% and 99%, with a standard deviation of 11.9 percentage points. Moreover, the average cross-country share of young firms (i.e. aged less than nine years) is 14.7%, while the large firms and foreign-owned firms in our sample make up some 25% and 22.7% of all firms, respectively. In addition, the number of observations varies due to the unbalanced panel of the dataset.

5 Estimation Results

The baseline estimations with the two banking sector concentration indicators are shown in table 2. In models (1) and (2), a higher concentration of the banking market tends to sustain corporate leverage, which is supported by both competition measures.[12] Hence, an increase by one unit (i.e. one percentage point in the case of the CR5 ratio) of the concentration of the five largest banks in a country increases the corporate leverage ratio by up to 1.2% in the subsequent year, while the impact of the other banking sector concentration measure (the Herfindahl index) shows a positive though insignificant effect.[13] Moreover, the effect is shown to be nonlinear, as the squared term of the CR5 ratio (in column 3) is negative and significant, implying that after a turning point the effect becomes less positive. Interestingly enough, due to the small magnitude of the quadratic term, the positive effect remains even at higher levels of banking sector concentration. Hence, the results support the relationship lending hypothesis in the theoretical literature and imply that on average, corporate debt increases when banking markets are more concentrated. In addition, in the process of financial deepening in the precrisis period, access to external finance is given also to a larger number of corporates in the economy.[14] Notably, the positive impact of banking sector concentration in Eastern Europe stays in contrast to the results of recent papers analyzing corporate leverage and banking sector concentration in Western Europe (Baert and Vander Vennet, 2009). Hence, probably due to the different degree of financial deepening (i.e. also the availability of the alternative sources of financing) and the insufficient protection of creditor and property rights (Gonzáles and Gonzáles, 2008), the effects of banking sector competition in the CESEE and the Western European countries differ.

As the fixed effects estimator assumes the same coefficient of the banking sector concentration measure for all countries in our sample, we have explored the country variability of banking sector concentration by applying a country-by-country approach (detailed results are available from the author on request).

[12] *As the concentration measures are in levels and the dependent variable is in logarithm, the coefficients can be interpreted as percentage changes. Moreover, all the covariates included in the estimations have been lagged by one period to prevent any reverse causality problems, and the coefficients should be interpreted as the effect of the variable on corporate leverage one year later.*

[13] *Even though the Herfindahl index is not significant in our baseline estimation, it yields significant results (table 4). Hake (2012) includes also the Lerner index as a further banking sector concentration measure to verify the robustness of the results. The Lerner index indicates the marginal price to marginal costs in the banking industry in a country (i.e. banks' market power with regard to their price-setting behavior). Interestingly, our results based on this measure also confirm the positive and significant impact of banking sector concentration on firm indebtedness (results are available from the author on request). However, we dropped these estimations from the paper due to the limited availability of data for the index (i.e. only for the period 2002–2005).*

[14] *Unfortunately, we cannot account for the specific cost (i.e. the interest rate) and the currency denomination of the credit.*

Interestingly, the results of table 2 are broadly confirmed (significantly positive in Hungary, the Czech Republic and Poland), with the notable exception of manufacturing firms in Bulgaria, where we obtain a confirmation of the market power hypothesis. The firms in these countries account for some 60% of the total number of firms in our sample. Nonetheless, we believe that the analysis based on the whole range of countries reflects a larger variation in the banking sector concentration measure and hence allows for a more precise estimate of the effects.

Turning our attention to the firm-level characteristics included in the table 2,[15] firm size, firm tangibility and the industry mean debt ratio have positive and significant coefficients. Hence, larger firms and firms that can offer collateral have a larger debt-to-total assets ratio. In particular, our estimations show that a 10% increase in firm size and firm fixed assets leads to an increase of some 0.3% and 1% in the corporate leverage ratio, respectively. In addition, a 10% rise in firm profits leads to a decrease of 0.4% in the leverage ratio, as more profitable firms are apparently able to finance investment either through own cash flow or through the stock market. This result is also consistent with predictions by the pecking order theory. Furthermore, the mean industrial leverage is a common determinant included in other studies (Frank and Goyal, 2009) and represents the target capital structure of an industry.[16] Interestingly, the positive impact of this indicator points to a potential for catching up (0.1% impact on firm leverage).

The analysis of the impact of the country-level characteristics shows that the inflation rate and GDP growth mostly have an insignificant impact on firm leverage. Nevertheless, the inflation rate has the expected positive impact, which can be explained by the decline in real interest rates as inflation increases and the consequent rise in loan demand. This phenomenon could also be related to the high level of corporate loan euroization in the countries in our sample, as both the theoretical and the empirical literature have shown that higher inflation could be positively related to larger share of loan euroization and hence to larger debt ratios. Moreover, the tradeoff theory suggests a positive effect as well, as the real value of tax deductions is higher when (expected) inflation is higher (Frank and Goyal, 2009). In line with previous studies, we have also found that GDP growth reduces the level of corporate debt in total firm assets, which could be explained by the fact that firms are able to earn higher profits in times of economic expansion, which itself (as shown by the impact of firm profits on debt leverage in our estimations) increases the possibility of investment from internal sources (e.g. retained profits) and consequently decreases borrowing from banks. Going further, the positive coefficient of the EBRD index of banking sector reforms reflects the positive impact of a strengthened regulatory framework and enhanced financial intermediation.[17] In particular, the coefficients in table 2 show that an increase of

[15] *The control variables included are in line with similar studies (see Gonzáles and Gonzáles, 2008).*

[16] *This measure has been estimated on the NACE Rev.2 4-digit level.*

[17] *Unreported estimations also included the market capitalization ratio as an explanatory variable even though it has a marginal positive influence on corporate leverage level and shows that higher level of corporate governance standards which emerge from the higher degree of market capitalization translate into a higher degree of leverage. Admittedly, this variable is highly correlated with the EBRD index of banking sector reforms and hence was dropped from the estimations. However, it is included in the robustness checks section.*

the EBRD index by one unit (i.e. from 2 to 3)[18] increases the corporate debt ratio by some 20%.

The main results remain broadly the same in columns 4 to 6, where we performed several methodological checks. First, we estimated a balanced panel in terms of our dependent variable instead of an unbalanced panel (column 4). Second, in column (5), a dynamic estimation with a lagged firm leverage ratio was performed by applying the system generalized method of moments (GMM). The validity of the instruments was tested using the Sargan-Hansen test of overidentifying restrictions and the Arellano-Bond test for first and second order autocorrelation. Finally, we also performed a pooled ordinary least squares (OLS) estimation to explicitly account for industry and country fixed effects. Altogether, our main

Table 2

Baseline Results

	(1) CR5 ratio	(2) Herfindahl Index	(3) CR5 ratio squared	(4) Balanced panel	(5) System GMM	(6) Pooled OLS	(7) Endogeneity
CR5 ratio$_{t-1}$	0.012 ***		0.015 ***	0.010 *	0.014 ***	0.010 **	0.035 *
	(0.004)		(0.004)	(0.006)	(0.004)	(0.005)	(0.018)
Herfindahl index$_{t-1}$		0.034					
		(0.075)					
CR5 ratio squared$_{t-1}$			–0.000 **				
			(0.000)				
Firm debt ratio (lag)$_{t-1}$					–0.216 ***		
					(0.007)		
Firm size$_{t-1}$	0.030	0.030	0.028	0.041	–0.029	–0.075 ***	0.030 **
	(0.018)	(0.018)	(0.018)	(0.030)	(–0.018)	(0.006)	(0.015)
Firm profits$_{t-1}$	–0.042 **	–0.042 **	–0.042 **	–0.062 ***	–0.008	–0.110 ***	–0.042 ***
	(0.007)	(0.007)	(0.007)	(0.011)	(0.007)	(0.007)	(0.007)
Firm tangibility$_{t-1}$	0.106 ***	0.106 ***	0.107 ***	0.144 ***	0.051 ***	0.179 ***	0.107 ***
	(0.017)	(0.017)	(0.017)	(0.028)	(0.016)	(0.009)	(0.013)
Industrial leverage (median)$_{t-1}$	0.012 **	0.012 **	0.012 **	0.016 *	–0.006	0.019 ***	0.012 **
	(0.006)	(0.006)	(0.006)	(0.009)	(0.005)	(0.007)	(0.005)
GDP growth rate$_{t-1}$	–0.006	–0.004	–0.006	–0.017 *	0.028 ***	–0.017 **	–0.008
	(0.006)	(0.006)	(0.006)	(0.009)	(0.005)	(0.008)	(0.006)
Inflation rate (CPI)$_{t-1}$	0.003	0.007	0.002	0.009	–0.005	0.002	–0.003
	(0.005)	(0.005)	(0.005)	(0.008)	(0.004)	(0.007)	(0.007)
EBRD Banking Index$_{t-1}$	0.178 ***	0.138 ***	0.148 ***	0.064	0.156 ***	0.237 ***	0.251 ***
	(0.052)	(0.051)	(0.051)	(0.090)	(0.048)	(0.074)	(0.074)
Observations	44,893	44,893	44,893	16,984	44,893	44,893	44,893
R^2	0.071	0.072	0.072	0.091		0.102	0.072
AR(1)					0.00[27]		
AR(2)					0.38[27]		
Hansen/Sargan test					0.80		
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	No	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Author's calculations.

*Note: Firm fixed effects estimations. Robust standard errors in parentheses. The firm book leverage ratio is the dependent variable. Columns (1)–(3) are based on firm fixed effects estimations. Estimation (4) uses a balanced panel of firms (according to the leverage ratio). Number of instruments in squared brackets. Instruments include lagged levels of the dependent variable and independent variables dated t-2 or earlier. The tests in the system GMM estimation depict the p-values. Estimations (5) and (6) include country and industry fixed effects. Estimation (7) applies the deposits-to-GDP ratio as well as the EBRD competitiveness index as instruments for the CR5 ratio. The period of estimation is 2002–2007. R^2 is the within-R^2. *(**)[***] stands for significance at the 10%(5%)[1%] level.*

[18] *The EBRD index changes in 0.3 steps. For more details see http://www.ebrd.com/pages/research/economics/data/macro.shtml.*

result – the positive impact of banking concentration on firm book leverage – remains very stable across these different estimation techniques. The impact ranges from 1% to 1.4% in the case of a one percentage point increase in the CR5 ratio.

Finally, an issue in the estimations is whether the banking sector itself is influenced by firms' financing decisions, i.e. whether banking sector concentration influences firm-level debt or vice versa (the reversed causality problem with endogenous regressors as a consequence). Indeed, a higher demand for external financing due to increased levels of investment would induce changes in the banking sector structure, for instance through the entry of foreign banks. By contrast, lower demand for corporate debt could reduce bank profitability and hence could, in the extreme, lead to an exit of banks. Hence, an additional aspect of our analysis is to account for this potential endogenous relationship. Following contributions in the corporate finance literature that deal with the impact of banking sector concentration (i.e. Baert and Vander Vennet, 2009; Cetorelli and Gambera, 2001), we use total deposits as a share of GDP, the EBRD competition measure on the country level as well as the interaction of these two variables to derive an instrument for the banking concentration measure in column (7) of table 2. After verifying that the chosen instruments are valid ones (test for overidentifying restrictions), we applied a two-stage least squares (2SLS) instrumental variable estimation of the fixed effects panel data model. Interestingly, the effect of banking sector concentration appears to be even more pronounced (it nearly triples) if potential endogeneity is taken into consideration.

6 Robustness Section: Heterogeneity of the Impact of Banking Market Concentration

In this section, we focus on the potential heterogeneity of the impact of banking sector concentration on corporate leverage. Hence, we address the question whether the impact of the banking concentration measures vary with respect to firm characteristics (such as firm age, firm size, firm profitability and ownership status) and various country-level characteristics. In addition, we examine whether the degree of competition (i.e. above and below the median of the banking sector concentration measures) affects firm leverage differently.

First, we test whether the implications of the relationship (information-based) hypothesis also apply homogeneously for all firms, i.e. whether we can identify firm-specific differences according to the age of the firm. Previous empirical studies (e.g. Cetorelli and Gambera, 2001) found that even if the theory of relationship lending could not be corroborated in general, the impact of banking sector concentration is different (i.e. positive) for young firms. The rationale is that young firms are more dependent on external financing because their own cash flow is insufficient and access to the stock markets is more complicated. Hence, in a more concentrated banking market, due to relationship lending (i.e. banks could invest in the reduction of information asymmetries), young firms could reschedule their payments over several periods and pay less at the beginning and increase their repayment later on. In addition, firm age is a proxy for the information on firm quality, which is revealed to the market as a whole.

Following Rajan and Zingales (1995), who show that U.S. firms raise their external financing up to the tenth year of their life, we test whether young firms

will benefit from banking sector concentration (in terms of higher leverage in more concentrated markets, table 3) by adding an interaction term of a firm age-dummy and the respective banking sector concentration measure. Columns (1) and (2) show the effect of the banking structure on young firms (younger than nine years). Here, again, our results are consistent with the relationship hypothesis according to which young firms increase their debt ratio in more concentrated banking markets. In particular, the results in column (1) prove that the young firms in our sample increase their leverage by 1.3% when the CR5 ratio increases by one unit (i.e. 1 percentage point), whereas the effect as measured by the CR5 ratio for all firms is 1.2%. In line with these results, the coefficient of the interaction with the Herfindahl index also confirms the positive impact for the young firms in our sample.

Going further, we consider the group of mature firms (firms older than ten years) in columns (3) and (4). Here, again, the results of the baseline estimations are broadly confirmed, though the interaction terms of the firm age dummy and the banking sector concentration measure are now negative and significant. This implies that mature firms use either cash flow or alternative sources of external financing (i.e. corporate bonds, stocks) when the banking sector is more concentrated, hence supporting the pecking order theory. In addition, we could interpret this result as a demand effect. Due to the information on firm quality disclosed to the public for mature firms, unlike for young (start-up) firms, mature firms can use alternative sources of external finance. When we turn our attention to the magnitude of the impact, we see in table 3 that the interaction terms with one of the bank sector concentration measures (the CR5 ratio) imply that while on average the effect is 1.2% (caused by one unit increase of CR5 ratio), mature firms increase their leverage ratio by only 0.9%. In contrast, the interaction with the Herfindahl index shows an even stronger negative effect for mature firms, namely a decrease in firm leverage of some 4% caused by a one unit increase of the Herfindahl index. Overall, though, the effect remains positive.

In a next step, we focus on the heterogeneity of the results with respect to further firm characteristics, i.e. more profitable firms, foreign-owned firms and firms from different size classes. More profitable firms (column 5) reduce their debt in a more concentrated banking market, implying that investment projects are presumably financed mainly by cash flow, which is in line with the pecking order theory. Accordingly, less profitable firms benefit more from concentrated banking markets, backed by the negative interaction term with the banking sector concentration ratio. Furthermore, most likely on the back of existing relationships of the banks with the parent firms,[19] the debt of foreign-owned firms is increased by the higher banking sector concentration, though the effect is only marginally significant. In particular, the effect on firm leverage increases to 1.8% in the case of foreign-owned firms (in comparison to nearly 1.0% on average for the whole sample of firms). To conclude, the leverage ratio of larger firms in our sample (column 7) is also shown to increase on account of banking sector concentration due to the positive relation between the manufacturing industry and banking sector concentration (Cetorelli and Gambera, 2001), especially in sectors that are

[19] *The share of foreign-owned banks in the countries of our sample is more than 60% of total bank assets in the period covered (ECB, 2006; ECB, 2008).*

Table 3

Firm Characteristics and the Effects of Banking Sector Concentration

	(1) Young firm	(2) Young firm	(3) Mature firm	(4) Mature firm	(5) Profitability	(6) Foreign firm	(7) Large firm
CR5 ratio$_{t-1}$	0.010 **		0.010 **		0.008 **	0.010 **	0.010 **
	(0.004)		(0.004)		(0.004)	(0.049)	(0.004)
CR5 ratio$_{t-1}$*young firm (dummy)	0.003 *						
	(0.002)						
Herfindahl index$_{t-1}$		0.083		0.018 *			
		(0.078)		(0.006)			
Herfindahl index$_{t-1}$*young firm (dummy)		0.088 *					
		(0.045)					
Young firm (dummy)	–0.236 **	–0.070 **					
	(0.002)	(0.029)					
CR5 ratio$_{t-1}$*mature firm (dummy)	–0.003 *		–0.003 *				
	(0.001)		(0.001)				
Herfindahl index$_{t-1}$*mature firm (dummy)				–0.039 **			
				(0.019)			
Mature firm (dummy)			0.220 **	0.113 ***			
			(0.106)	(0.039)			
CR5 ratio$_{t-1}$*large firm (dummy)							0.001 ***
							(0.000)
Large firm (dummy)							
CR5 ratio$_{t-1}$*foreign firm (dummy)						0.008 *	
						(0.005)	
Foreign firm (dummy)						–0.427	
						(0.283)	
CR5 ratio$_{t-1}$*firm profitability$_{t-1}$					–0.001 ***		
					(0.001)		
Firm size$_{t-1}$	0.039 **	0.039 **	0.040 **	0.039 **	0.028	0.030 *	
	(0.020)	(0.020)	(0.020)	(0.020)	(0.018)	(0.018)	
Firm profit$_{t-1}$	–0.047 ***	–0.047 ***	–0.047 ***	–0.047 ***	0.032	–0.042 ***	–0.042 ***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.028)	(0.007)	(0.007)
Firm tangibility$_{t-1}$	0.107 ***	0.106 ***	0.107 ***	0.107 ***	0.105 ***	0.106 ***	0.106 ***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.107)	(0.017)	(0.107)
Industrial leverage (median)$_{t-1}$	0.012 **	0.012 **	0.013 **	0.012 **	0.012 **	0.012 **	0.011 *
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
GDP growth rate$_{t-1}$	–0.006	–0.004	–0.006	–0.004	–0.005	–0.004	–0.005
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Inflation rate (CPI)$_{t-1}$	0.004	0.008	0.004	0.007	0.003	0.003	0.004
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
EBRD Banking Index$_{t-1}$	0.187 ***	0.148 ***	0.185 ***	0.145 ***	0.179 ***	0.193 ***	0.172 ***
	(0.055)	(0.054)	(0.055)	(0.054)	(0.052)	(0.053)	(0.052)
Observations	40,845	40,845	40,820	40,820	44,893	44,893	44,792
R^2	0.081	0.072	0.081	0.081	0.091	0.073	0.073
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Author's calculations.

*Note: Firm fixed effects estimations. Robust standard errors in parentheses. The firm book leverage ratio is the dependent variable. The number of observations in specifications (1)–(4) is lower due to missing data for the firm age variable. All regressions include firm and time fixed effects. The period of estimation is 2002–2007. R^2 is the within-R^2. *(**)[***] stands for significance at the 10%(5%)[1%] level.*

highly dependent on external finance. Hence, our study shows that bank concentration enhances industries' market concentration.

Next, we turn our attention to the heterogeneity of the results that is due to country-level characteristics. First, we split our countries into two country

samples according to the concentration of their banking sectors and test whether the effect on the leverage ratio of the firms in the countries with the most concentrated banking sectors is different from the baseline results in table 2.[20] The mean of the concentration ratio of the five largest banks in the sample of countries in the period from 2002 to 2007 is some 59%. In a next step, we estimate the effect for the group of countries below the mean of the concentration measure (Bulgaria,

Table 4

Banking Sector Concentration and Country-Level Characteristics

	(1) High concentration	(2) Real interest rate	(3) EU dummy	(4) Stock market capitalization
CR5 ratio$_{t-1}$	0.013 ***	0.014 ***	0.016 ***	0.019 ***
	(0.004)	(0.004)	(0.005)	(0.006)
CR5 ratio$_{t-1}$*high concentration (dummy)	–0.028 **			
	(0.013)			
High concentration (dummy)	2.281 **			
	(1.058)			
CR5 ratio$_{t-1}$*real interest rate		–0.009 **		
		(0.005)		
Real interest rate$_{t-1}$		0.004		
		(0.003)		
CR5 ratio$_{t-1}$*EU dummy			–0.002 **	
			(0.001)	
EU dummy			0.106	
			(0.070)	
CR5 ratio$_{t-1}$*stock market capitalization$_{t-1}$				–0.001 **
				(0.001)
Stock market capitalization$_{t-1}$				0.006
				(0.004)
Firm size$_{t-1}$	0.028	0.030	0.033 *	0.031 *
	(0.018)	(0.018)	(0.018)	(0.018)
Firm profit$_{t-1}$	–0.042 ***	–0.042 ***	–0.043 ***	–0.042 ***
	(0.007)	(0.007)	(0.007)	(0.007)
Firm tangibility$_{t-1}$	0.106 ***	0.105 ***	0.106 ***	0.106 ***
	(0.017)	(0.017)	(0.017)	(0.017)
Industrial leverage (median)$_{t-1}$	0.011 *	0.011 **	0.012 **	0.011 *
	(0.006)	(0.006)	(0.006)	(0.006)
GDP growth rate$_{t-1}$	–0.005	–0.004	–0.011 *	–0.013 **
	(0.006)	(0.006)	(0.006)	(0.006)
Inflation rate (CPI)$_{t-1}$	0.002	–0.000	0.002	–0.000
	(0.005)	(0.006)	(0.005)	(0.005)
EBRD Banking Index$_{t-1}$	0.181 ***	0.201 ***	0.172 ***	0.213 ***
	(0.053)	(0.054)	(0.052)	(0.054)
Observations	44,893	44,893	44,893	44,893
R^2	0.071	0.091	0.072	0.083
Firm fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes

Source: Author's calculations.

*Note: Firm fixed effects estimations. Robust standard errors in parentheses. The firm book leverage ratio is the dependent variable. All regressions include firm and time fixed effects. The period of estimation is 2002–2007. R^2 is the within-R^2. *(**)[***] stands for significance at the 10%(5%)[1%] level.*

[20] *The nonlinear effect of the CR5 ratio was already shown in table 2.*

Hungary, and Poland) and above it (the Czech Republic, Estonia, Latvia, Lithuania and Slovakia). It is evident that on average, banking sector concentration is favorable for corporate indebtedness, which strongly contradicts the results of studies with Western European firm-level data (e.g. Baert and Vander Vennet, 2009). This implies that in the oligopolistic setting of the banking sector in Eastern Europe with several dominating banks, relationship lending tends to prevail. Hence, the private sector debt level is on average not restrained. Interestingly, though, for the countries with the most concentrated markets, the impact of the interaction variable on corporate leverage turns out to be negative and significant. Consequently, support for the market power hypothesis can be found for the most concentrated markets (e.g. Lithuania and Estonia with a CR5 concentration ratio of more than 59%). This result suggests that a higher degree of banking market concentration lowers firm debt. In particular, the effect is negative (–1.5% for a one percentage point increase of the CR5 ratio).

Column (2) in table 4 shows the estimations of the impact of the overall interest rate level on corporate leverage in a country. The results are intuitive and show a negative effect on average, as the higher interest rate reduces firm book leverage. Overall, though, the impact of the CR5 ratio remains positive. In a next step, we included a dummy variable set at 1 after a country signed the EU Accession Treaty and at 0 before this date to test whether an EU accession perspective impacted corporate leverage. Consequently, the announcement of EU membership has a dampening effect on the positive impact of corporate leverage, implying that firms resorted more heavily to alternative sources of external financing and that the financial deepening process intensified in the run-up to the crisis in 2008. Finally, in column 4, we tested the impact of the market capitalization ratio on leverage. It turned out to be negative, which again reflects access to external finance on the stock market. Hence, firms with access to stock markets consider alternative sources of external capital, even more so if banking markets are concentrated.

7 Concluding Remarks and Policy Implications

The entry of foreign banks in the financial sectors of the CESEE countries and mergers between banks in the 1990s and 2000s fundamentally changed the structure of CESEE banking sectors and increased sector concentration. This paper analyzed the impact of the banking sector structure on firm leverage in selected CESEE countries in the period up to 2007 based on firm-level data.

Based on a sample of manufacturing firms in eight CESEE countries, we determined that increasing concentration in the banking market is associated with a larger amount of corporate credit in most countries. This result contradicts the empirical evidence on bank corporate debt in Western Europe and the U.S.A. We trace these findings back to the relationship (i.e. information-based) theory, which states that banks in concentrated markets are able to invest more in the reduction of information asymmetries and hence can compensate the higher risk of certain projects by sharing the future profit streams of the firm. As a consequence, banking sector concentration does not have a negative impact on corporate debt or economic growth, as the traditional theory of industrial organization per se would predict, and in fact it could even be positive. Furthermore, this paper showed that young firms (i.e. usually financially constrained firms) benefit from more concentrated banking markets, which is in line with previous empirical contributions

using Western European or U.S. data. In addition, mature firms have a lower leverage ratio when banking markets are more concentrated, which could be interpreted as a demand effect: Such firms' demand for bank credit may be lower, as they have better access to other forms of external finance. Our results on the differentiation of the impact according to further firm-level characteristics indicate that less profitable firms, larger firms and foreign-owned firms show higher leverage in more concentrated banking markets.

In addition, our results indicate that the sample of CESEE countries used here is not fully homogeneous. Consequently, in countries where the banking sector concentration of the five largest banks in a country exceeds 80% on average (Estonia and Lithuania), the effect on corporate leverage is negative. Further results of the paper on firm-level characteristics show that the positive impact of banking sector concentration on firm leverage is reduced by the improved availability of alternative sources of external finance, the interest rate level in the country as well as EU membership, the latter suggesting the development of financial markets and an increasing complexity of the financial markets in the region.

In conclusion, as shown by our analysis, banking sector concentration does not hamper the availability of bank finance, which was a key factor for economic growth and corporate investment projects in CESEE countries in the precrisis period, at least up to a certain threshold of concentration. More specifically, the probability of higher loan costs coupled with a lower amount of debt could rise if banking sectors are very concentrated. As lending to new innovative firms could suffer in an oligopolistic setting, a tradeoff between the quantity of the credit and the quality of the borrowers could emerge over time, which, looking forward, could be a risk to financial stability. In addition, shifting our attention to the impact on the real economy, high corporate leverage could precipitate an economic downturn by triggering a sharp contraction of investment. Therefore, from a policy perspective, on the one hand, it would be desirable to keep a cautious stance on mergers in the banking sector that threaten to raise banking sector concentration to very high levels. In such a situation, competition policy would have to play a role in preventing the banking market from becoming overly concentrated and potentially having a negative impact on firm leverage. On the other hand, though, against the background of high private sector debt levels in the CESEE countries, policymakers need to be able to assess the sustainability of private sector debt, given that excessive leverage amplifies macroeconomic downturns and poses a threat to macroeconomic recovery after the crisis.

References

Agoraki, M., M. Delis and F. Pasiouras. 2011. Regulations, competition and bank risk-taking in transition countries. In: Journal of Financial Stability 7(1). 38–48.

Backé, P., B. Égert and T. Zumer 2007. Private Credit in Central and Eastern Europe: New (Over)Shooting Stars? In: Comparative Economic Studies 49. 201–231.

Baert, L. and R. Vander Vennet. 2009. Bank Ownership, Firm Value and Firm Capital Structure in Europe. FINESS Working Paper D.2.2.

Baltagi, B. 2008. Econometric Analysis of Panel Data. John Wiley & Sons.

Beck, T., R. Levine and A. Demirgüç-Kunt. 2003. Law and finance: Why does legal origin matter? In: Journal of Comparative Economics 31(4). 653–675.

Becker, T., D. Daianu, Z. Darvas, V. Gligorov, M. Landesmann, P. Petrovic, J. Pisanni-Ferry, D. Rosati, A. Sapir and B. Weder di Mauro. 2010. Whither growth in central and eastern Europe? Policy lessons for an integrated Europe. BRUEGEL.

Bikker, J. A. and K. Haaf. 2002. Competition, Concentration and Their Relationship: An Empirical Analysis of the Banking Industry. In: Journal of Banking and Finance 11. 2191–2214.

Black, S. and P. Strahan. 2002. Entrepreneurship and Bank Credit Availability. In: Journal of Finance 57(5). 2807–2834.

Booth, L., A. Aivazian, A. Demirgüç-Kunt and V. Maksimovic. 2001. Capital Structures in Developing Countries. In: Journal of Finance 56(1). 87–130.

Brown, M., T. Jappelli and M. Pagano. 2009. Information sharing and credit: Firm-level evidence from transition countries. In: Journal of Financial Intermediation 18(2). 151–172.

Carbó-Valverde, S., F. Rodríguez-Fernández and G. Udell. 2009. Bank Market Power and SME Financing Constraints. In: Review of Finance 13(2). 309–340.

Cetorelli, N. and M. Gambera. 2001. Banking Market Structure, Financial Dependence and Growth: International Evidence From Industry Data. In: Journal of Finance 56. 617–648.

Coricelli, F., N. Driffield, S. Pal and I. Roland. 2010. Microeconomic implications of credit booms: evidence from emerging Europe. EBRD Working Paper 119.

De Haas, R. and M. Peeters. 2004. The dynamic adjustment towards target capital structures of firms in transition economies. EBRD Working Paper 87.

Delis, M. 2010. Competitive conditions in the Central and Eastern European banking systems. Omega 38(5). 268–274.

Demirgüç-Kunt, A. and V. Maksimovic. 1996. Stock Market Development and Financing Choices of Firms. In: World Bank Economic Review 10(2). 341–369.

ECB. 2006. Report on EU Banking Structure. October. European Central Bank.

ECB. 2008. Report on EU Banking Structure. October. European Central Bank.

Fama, E. and K. R. French. 2002. Testing Trade-Off and Pecking Order Predictions About Dividends and Debt. In: Review of Financial Studies 15(1). 1–33.

Frank, M. and V. Goyal. 2009. Capital Structure Decisions. Which Factors Are Reliably Important? In: Financial Management 38(1). 1–37.

Gonzáles, V. and F. Gonzáles. 2008. Influence of Bank Concentration and Institutions on Capital Structure: New International Evidence. In: Journal of Corporate Finance 14(4). 363–375.

Hake, M. 2012. Three Essays on Firm Performance in Central and Eastern Europe. Dissertation. Vienna University of Economics and Business. Forthcoming.

Hanousek, J. and A. Shamshur. 2011. A Stubborn Persistence: Is the Stability of Leverage Ratios Determined by the Stability of the Economy? In: Journal of Corporate Finance 17(5). 1360–1376.

Jappelli, T. and M. Pagano. 2006. Information sharing in credit markets: International evidence. In: Journal of Banking and Finance 26. 2023–2054.

Jensen, M. 1986. Agency Costs of Free Cash Flow, Corporate Finance and Takeovers. In: American Economic Review 76. 323–329.

Kane, E. and B. Malkiel. 1965. Bank Portfolio Allocation, Deposit Variability and the Availability Doctrine. In: Quarterly Journal of Economics 79(1). 257–261.

Modigliani, F. and M. Miller. 1958. The Cost of Capital, Corporation Finance, and the Theory of Investment. In: American Economic Review 48. 261–297.

Mueller, D. 2003. The Corporation. Investment, Mergers and Growth. Routledge, New York.

Myers, S. 1977. Determinants of Corporate Borrowing. In: Journal of Financial Economics 5. 147–175.

Myers, S. and N. Majluf. 1984. Corporate Financing and Investment Decisions When Firms Have Information that Investors Do Not Have. In: Journal of Financial Economics 13. 187–221.

Northcott, C. 2004. Competition in Banking: A Review of the Literature. Bank of Canada Working Paper 2004-24.

Padilla, A. and M. Pagano. 1997. Endogenous Communication Among Lenders and Entrepreneurial Incentives. In: Review of Financial Studies 10. 205–236.

Petersen, M. and R. Rajan. 1994. The Benefits of Lending Relationships: Evidence from Small Business Data. In: Journal of Finance 49(1). 3–37.

Petersen, M. and R. Rajan. 1995. The effect of credit market competition on lending relationships. In: Quarterly Journal of Economics 110(2). 407–443.

Rajan, R. and L. Zingales. 1995. What Do We Know about Capital Structure? Some Evidence from International Data. In: Journal of Finance 50(5). 1421–1460.

Rhoades, S. and R. Rutz. 1982. Market Power and Firm Risk. In: Journal of Monetary Economics 9. 73–85.

Stiglitz, J. and A. Weiss. 1981. Credit Rationing in Markets with Imperfect Information. In: American Economic Review 71. 393–410.

Von Thadden, E. 1995. Long-Term Contracts, Short-Term Investment and Monitoring. In: Review of Economic Studies 62. 557–575.

Zarutskie, R. 2006. Evidence on the effects of bank competition on firm borrowing and investment. In: Journal of Financial Economics 81. 503–537.

Annex I

Coverage of Firm Leverage in the Amadeus Database

A key issue for our analysis is the representativeness of the Amadeus database. To obtain an indication of the representativeness of the Amadeus database, we compared the coverage of corporate leverage in Amadeus with leverage data from Eurostat's Financial Accounts Statistics. Unfortunately, the validity of this comparison is limited, as corporate leverage data from Eurostat are available only for nonfinancial corporations at the aggregate level, whereas our study deals only with firms in the manufacturing sector. Nonetheless, the unweighted corporate debt-to-total-assets ratio amounts to 0.25 in the period from 2002 to 2007, a value close to that obtained from our computation (0.204). However, large country-specific differences can be detected. This can most likely be traced to the somewhat different industry composition of the two samples. In Hungary and Estonia, for example, the leverage ratio at the aggregate level is some 10 percentage points higher than the leverage ratio obtained from Amadeus, while in Poland, the Czech Republic and Slovakia, which account for over 50% of the total number of firms in our sample, the average leverage ratio differs by less than 3 percentage points.

Annex II

Table A1

Description of Variables

Variable	Definition	Data source
Firm-level data		
Firm book leverage	The ratio of the sum of short-term debt and long-term loans to total assets, in logarithm	Amadeus
Firm size	Total firm sales, in logarithm	Amadeus
Firm profit	The ratio of earnings before interest and taxes to firm total assets, in logarithm	Amadeus
Firm tangibility	The ratio of firm fixed assets to total assets, in logarithm	Amadeus
Industrial leverage (median)	The median book leverage of an industry at the four-digit level	Amadeus
Mature firm (dummy)	The dummy is 1 if a firm was established for more than ten years before 2007 and 0 otherwise	Amadeus
Young firm (dummy)	The dummy is 1 if a firm was etsablished up to nine years before 2007 and 0 otherwise	Amadeus
Foreign firm (dummy)	The ownership stake of a foreigner is at least 10%	Amadeus
Large firm (dummy)	The dummy is 1 if a firm has a number of employees above the mean of our sample (i.e. 150 employees)	Amadeus
Country-level data		
CR5 ratio	Market share of the largest five banks in a country	ECB
Herfindahl index	The sum of the squared market shares of banks in a country	ECB
EBRD Banking Index	Index measuring reforms in a country's banking sector. It ranges between 1 and 4+; 4+ corresponds to the standards of an industrialized market economy	EBRD
GDP growth rate	Year-on-year change in a country's real GDP in percentage points	Eurostat
Inflation rate (CPI)	Change in a country's CPI in percentage points	wiiw, Eurostat
Interest rate	Lending interest rate adjusted for inflation as measured by the GDP deflator in a country, in percentage points	World Bank
Stock market capitalization	Share price times the number of shares outstanding of listed companies at the end of the year, as a percentage of GDP	World Bank
EU dummy	The dummy is 1 after the year in which a country signs the EU accession treaty and 0 before this date	
Deposits-to-GDP ratio	Deposits of other resident sectors	national central banks
EBRD Competition Index	Index measuring a country's competition policy reforms. It ranges between 1 and 4+; 4+ corresponds to the standards of an industrialized market economy with effective enforcement of competition policy and unrestricted entry in most markets	EBRD

CESEE-Related Abstracts from Other OeNB Publications

The abstracts below alert readers to studies on CESEE topics in other OeNB publications. Please see www.oenb.at for the full-length versions of these studies.

Ukrainian Banks Face Heightened Uncertainty and Challenges

Stephan Barisitz, Ulrich Gunter, Mathias Lahnsteiner

Following a sharp recession in 2009, the Ukrainian economy recovered in 2010 and 2011. In particular in 2011, domestic demand-led growth was accompanied by widening external imbalances. The economy's external vulnerabilities – related to the current account deficit (2011: 5.6% of GDP) and the elevated foreign debt stock (77% of GDP) – entail risks for the banking sector, as exchange rate pressures against the hryvnia's U.S. dollar peg have been recurrent and foreign exchange reserves declined in the second half of 2011. While the share of foreign currency loans in total loans has been steadily declining (thanks to a ban on extending new foreign currency loans to unhedged borrowers imposed by the National Bank of Ukraine in the fall of 2008), it remains sizeable (end-2011: 41%). Many of these loans are unhedged. The stabilization of nonperforming loans at a high level could be interrupted by a further deterioration of the economic situation or by a new bout of hryvnia depreciation. Moreover, the population's confidence in the Ukrainian currency is prone to volatile swings. As deposit inflows have picked up and loan growth has remained subdued, the loan-to-deposit ratio has receded, but is still relatively high (end-2011: 163%). With the funding structure shifting to domestic deposits, the banking sector's external position has improved (net external liabilities have fallen to 8% of total liabilities). In 2011, loan growth became positive in real terms again. Recapitalization efforts contributed to upholding capital adequacy. The banking sector's profitability improved, but nevertheless stayed in negative territory.

Published in *Financial Stability Report 23*.

Intra-Group Cross-Border Credit and Roll-Over Risks in CESEE – Evidence from Austrian Banks

Markus Hameter, Mathias Lahnsteiner, Ursula Vogel

During the last decade several CESEE countries built up high external liabilities vis-à-vis foreign banking sectors, with Austrian banks being important creditors. The provision of cross-border credit allowed for rapid financial deepening in many of these countries but also led to a build-up of vulnerabilities to negative spillovers. This study points out that Austrian banks granted a considerable part of direct cross-border credit to affiliated borrowers in CESEE, in particular to their own bank subsidiaries. To our knowledge, this is the first paper that examines the differences between direct cross-border lending to affiliates and direct cross-border lending to nonaffiliates. Our analysis shows that intra-group cross-border credit from Austrian banks was more stable than lending to nonaffiliated borrowers during the 2008/09 financial crisis period. We argue that this is due to lower information asymmetries and parent banks' efforts to provide their subsidiaries with liquidity in times of financial distress to support their investments.

Published in *Financial Stability Report 23*.

Event Wrap-Ups

71st East Jour Fixe[1]

Slovenia: The First Five Years in Monetary Union

Compiled by
Jarmila Urvova

Introduction

The 71st East Jour Fixe, hosted by the OeNB on July 9, 2012, dealt with the Slovenian experience of euro adoption and the possible effects of euro area membership on Slovenia's ability to cope with the recent crisis. Five years of membership in monetary union, almost coinciding with five years since the onset of the crisis, provided an opportunity for stocktaking, for evaluating Slovenia's successes, possible mistakes and future challenges. The lessons could prove useful for other CESEE countries planning to join the euro area.

In his opening statement, *Peter Mooslechner,* Director of the OeNB's Economic Analysis and Research Department, recalled that Slovenia had long been regarded an "eminent pupil" of the CESEE region, with its high relative per capita income level, sound economic structures and institutions, and a fairly swift establishment of broad macroeconomic stability. He posed the question whether euro adoption and the expectations it created might not have contributed to an unsustainable cyclical boom in Slovenia in 2006 to 2007, e.g. by the convergence of interest rates to lower levels, helping stimulate a credit boom. Moreover, the crisis uncovered several structural weaknesses of the economy that have yet to be addressed by policymakers.

Slovenia in Monetary Union: Still a Lot Work to Be Done

In her keynote address, *Mejra Festić,* Vice Governor of the Bank of Slovenia, provided a comprehensive overview of macroeconomic developments in Slovenia in recent years and described the main structural issues and policy challenges. Slovenia's boom before the crisis had been fueled by strong credit growth supported by low real interest rates. After the introduction of the euro, inflation accelerated, mainly due to commodity price developments, which led to an erosion of real wages and increasing wage growth pressures. The consequent sharp rise of nominal wages throughout the economy, combined with a fall in productivity, then led to a deterioration of Slovenian cost competitiveness. Due to the high exposure to the construction sector, the share of nonperforming loans of Slovenian banks spiked in 2009; since banks' dependence on wholesale funding is high, both they and the corporate sector are now facing a lack of funding. Systemically important banks had to be recapitalized in 2011 and 2012, which contributed to the ongoing post-crisis deterioration of public finances. Festić stressed that fiscal credibility needed to be restored, structural reforms should be sped up and the capital position of both the banks and the corporate sector had to be strengthened in order to revive growth in the Slovenian economy.

Coping with Macroeconomic Challenges

The speakers of the first session, chaired by *Doris Ritzberger-Grünwald,* Head of the OeNB's Foreign Research Division, examined macroeconomic developments in Slovenia during the recent economic downturn, providing an outlook for the near future and emphasizing implications for the fiscal policy in particular. The session

[1] *The presentations and the workshop program are available at http://ceec.oenb.at (Events).*

shed light on how Slovenia is performing among CESEE countries and compared various economic scenarios modeled for Slovenia.

Hermine Vidovic, Senior Researcher at The Vienna Institute for International Economic Studies (wiiw), opened the session, contrasting Slovenian macroeconomic developments before and after the crisis and comparing them to those of the country's regional peers. Her presentation aimed to identify reasons why Slovenia – unlike other CESEE countries – has not yet started to recover from the recession. In particular, Vidovic drew attention to Slovenia's private corporate indebtedness ratio, which is one of the highest among CESEE countries, the sudden stop of bank credit availability, the low capital adequacy of the Slovenian banking system, relatively high gross foreign debt (115% of GDP in 2011) resulting in part from the current account deterioration during the crisis as well as recent political instability. The speaker also presented the most up-to-date wiiw forecast for the Slovenian economy, according to which stagnation or even further contraction was likely in 2013, with upward pressure on the unemployment rate and subdued household consumption. The ailing banking sector remained the greatest downside risk to this outlook.

Reinhard Neck, professor of economics at Klagenfurt University, presented a study describing the macroeconomic model of the Slovenian economy, SLOPOL, based on quarterly macroeconomic and demographic data for 1995 to 2011. The model simulations shown during the presentation suggested that external trade developments could explain about two-thirds of the drop in Slovenian GDP during the crisis and that an extremely, in fact unrealistically expansionary fiscal policy, i.e. a public deficit of 30% of GDP, would have been needed to prevent the output contraction. Investigating optimal policies within the model, the study authors found that the optimal fiscal policy for Slovenia would be countercyclical and not strongly expansionary. With long-term simulation results, Neck also demonstrated that none of the three possible remedies of the aging problem (increase of the retirement age, decrease of the pension replacement rate and increase in the social security contribution rate) alone would suffice to keep Slovenian public finances sustainable in the long run.

Mitja Košmrl, desk officer for Slovenia at the European Commission (DG ECFIN), provided an overview of the fiscal challenges in Slovenia. He argued that the seeming gradual improvement of the general government balance before the crisis had only been due to the business cycle, as the underlying structural balance had been deteriorating. Therefore, successful implementation of the recently adopted 2012 austerity package was of utmost importance. However, additional measures were likely to be needed for 2013 and beyond. Košmrl also pointed out as the main structural fiscal issues to be addressed the aging problem affecting pension system sustainability, an insufficient medium-term budgetary framework and risks stemming from the interlinkages between the sovereign and the banking sector.

The Euro – A Catalyst for Structural Change?

The second session, chaired by *Peter Backé,* Deputy Head of the Foreign Research Division at the OeNB, looked at structural issues of the Slovenian economy in more depth. The speakers addressed the question of what particular reforms need to be implemented in Slovenian labor, product and banking markets to better

equip the Slovenian economy to handle economic downturns such as the recent one.

Rafał Kierzenkowski, Head of the Slovenia and Hungary Desk at the Economics Department of the OECD, presented recent research results which demonstrated potential gains for Slovenia from adopting labor market and product market reforms. He argued that potential growth in Slovenia in recent years had been almost solely related to developments in labor productivity, whereas potential employment growth had been stagnating. Moreover, according to Kierzenkowski, there is a need to increase the share of tradable sectors in the economy, as well as to restore cost competitiveness by curbing unit labor costs. The speaker showed that in the medium-term, Slovenia could benefit from increasing spending on active labor market policies, and also from addressing labor market dualism by equalizing the protection of regular and temporary employment contracts. These measures as well as the reduction of coverage rates of collective agreements and pension system reform could boost Slovenian labor supply. Refraining from further increases of the minimum wage would not only help improve cost competitiveness but would also impact positively on the unemployment of the young and the low-skilled. There is also room for easing regulation in professional services, telecommunications and transport, and for privatization.

Reiner Martin, Deputy Head of the ECB's Financial Stability Assessment Division, focused his presentation on the Slovenian banking sector. His analysis inferred that the problems the Slovenian banking sector is coping with today are structural or induced by the crisis, rather than being related to the country's participation in the euro area. He showed that the share of foreign ownership, or the relative size of the banking sector expressed as the assets-to-GDP ratio, have barely changed in recent years. The loan-to-deposit ratio, however, had been rising quite sharply until it reached 160% in 2009 and has declined only marginally since. Credit growth came to a halt in 2010, in line with that of Slovenia's regional peers, and has even been negative since, whereas the share of nonperforming loans has risen rapidly to about 12%. Profitability of the banking sector has plunged, aggravating the already low capital adequacy of the sector. According to Martin, reconsideration of the funding model and of the role of the state in the Slovenian banking sector is needed to overcome the structural problems uncovered by the crisis.

The Slovene Experience: Any Lessons for Euro Aspirants?

In his concluding statement, *Damjan Kozamernik,* Director of the Analysis and Research Department at the Bank of Slovenia, addressed possible reasons for an insufficient policy counteraction of the boom-bust cycle preceding the recent crisis in Slovenia. In doing so, he drew the following lessons: The correct identification of the source of macroeconomic imbalances (i.e. supply versus demand shocks) is crucial for an effective policy reaction. Furthermore, it is key to build up fiscal buffers "in good times" and to bolster the credibility of the policy mix, which also should include macroprudential and financial supervision measures. Moreover, under a regime with irrevocably fixed exchange rates, the flexibility of the economy should be enhanced to withstand shocks better. For Slovenia in particular, this would have meant and still means the introduction of a forward-looking wage-setting rule to ensure that the labor costs growth do not exceed productivity growth.

Notes

Periodical Publications

See *www.oenb.at* for further details.

Geschäftsbericht (Nachhaltigkeitsbericht) — German
Annual Report (Sustainability Report) — English

This report reviews the OeNB's mandate, responsibilities and organization as well as the monetary policy of the Eurosystem, economic conditions and developments both in the financial markets and in financial market supervision during the reporting year. Furthermore, it contains the OeNB's financial statements, Intellectual Capital Report and Environmental Statement.

Geldpolitik & Wirtschaft — German
Monetary Policy & the Economy — English

Monetary Policy & the Economy provides analyses and studies on central banking and economic policy topics and is published at quarterly intervals.

Finanzmarktstabilitätsbericht — German
Financial Stability Report — English

This semiannual report contains analyses of Austrian and international developments with an impact on financial stability and studies designed to offer in-depth insights into specific financial stability-related topics.

Focus on European Economic Integration — English

This quarterly publication presents peer-reviewed studies on macrofinancial and monetary integration in Central, Eastern and Southeastern Europe (CESEE) as well as related country analyses and statistics. This publication reflects a strategic research priority of the OeNB.

Statistiken – Daten & Analysen — German, English summaries

This quarterly publication contains analyses of Austrian financial institutions, cross-border transactions and positions as well as financial flows. Some 200 tables provide information about macroeconomic, financial and monetary indicators. On the OeNB's website, these tables are also available in English. In addition, this series includes special issues on selected statistics topics published at irregular intervals.

Research Update — English

This quarterly newsletter is published online (*www.oenb.at/research-update*) and informs readers about selected findings, research topics and activities of the OeNB's Economic Analysis and Research Department.

Proceedings of OeNB Workshops — German, English

These proceedings contain papers presented at OeNB workshops at which national and international experts discuss monetary and economic policy issues.

Working Papers — English

This online series provides a platform for the publication of studies by OeNB economists or external authors on particular monetary policy topics.

Conference Proceedings of the OeNB's Economics Conference — English

These proceedings contain contributions to the OeNB's annual Economics Conference, an international platform for exchanging views and information on monetary and economic policy as well as financial market issues.

Conference Proceedings of the OeNB's Conference on European Economic Integration — English

These proceedings contain contributions to the OeNB's annual Conference on European Economic Integration (CEEI), which focuses on Central, Eastern and Southeastern European issues and the ongoing EU enlargement process.

Publications on Banking Supervision — German, English

www.oenb.at/en/presse_pub/period_pub/finanzmarkt/barev/barev.jsp

Addresses

	Postal address	Telephone/Fax/E-mail
Head Office		
Otto-Wagner-Platz 3 1090 Vienna, Austria Internet: *www.oenb.at*	PO Box 61 1011 Vienna, Austria	Tel: (+43-1) 404 20-6666 Fax: (+43-1) 404 20-2399 E-mail: *oenb.info@oenb.at*
Branch Offices		
Northern Austria Branch Office		
Coulinstraße 28 **4020 Linz, Austria**	PO Box 346 4021 Linz, Austria	Tel: (+43-732) 65 26 11-0 Fax: (+43-732) 65 26 11-6399 E-mail: *regionnord@oenb.at*
Southern Austria Branch Office		
Brockmanngasse 84 **8010 Graz, Austria**	PO Box 8 8018 Graz, Austria	Tel: (+43-316) 81 81 81-0 Fax: (+43-316) 81 81 81-6799 E-mail: *regionsued@oenb.at*
Western Austria Branch Office		
Adamgasse 2 **6020 Innsbruck, Austria**	Adamgasse 2 6020 Innsbruck, Austria	Tel: (+43-512) 908 100 Fax: (+43-512) 908 100-6599 E-mail: *regionwest@oenb.at*
Representative Offices		
New York Representative Office Oesterreichische Nationalbank 450 Park Avenue, Suite 1202 **10022 New York, U.S.A.**		Tel: (+1-212) 888-2334 Fax: (+1-212) 888-2515
Brussels Representative Office Oesterreichische Nationalbank Permanent Representation of Austria to the EU Avenue de Cortenbergh 30 **1040 Brussels, Belgium**		Tel: (+32-2) 285 48-41, 42, 43 Fax: (+32-2) 285 48-48