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OESTERREICHISCHE NATIONALBANK
EUROSYSTEM

# FOCUS ON EUROPEAN ECONOMIC INTEGRATION

Q3/10

Stability and Security.

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***Imprint***
*Publisher and editor:*
*Oesterreichische Nationalbank*
*Otto-Wagner-Platz 3, 1090 Vienna, Austria*
*Günther Thonabauer, Communications Division*
*Internet: www.oenb.at*
*Printed by: Oesterreichische Nationalbank, 1090 Vienna, Austria*


***DVR 0031577***

***Vienna, 2010***

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*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 2010 for Scientific Work on European Economic Integration

The Oesterreichische Nationalbank has established an award to commemorate Olga Radzyner, former Head of the Foreign Research Division, who died in a tragic accident in August 1999. The award is bestowed on young economists for excellent research focused on topics of European economic integration and is conferred annually. In 2010, four applicants are eligible to receive a single payment of EUR 3,000 each from an annual total of EUR 12,000.

The submitted work should cover European economic integration issues and be in English or German. It should not exceed approximately 30 pages and should preferably be in the form of a working paper or a 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 and 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 by postal mail – with the envelope marked "Olga Radzyner Award" – to the Oesterreichische Nationalbank, Foreign Research Division, Otto-Wagner-Platz 3, PO Box 61, 1011 Vienna, Austria. Entries for the 2010 award should arrive at the OeNB by October 4, 2010, at the latest.

For more information, please see www.oenb.at or contact Ms. Eva Gehringer-Wasserbauer in the Foreign Research Division of the Oesterreichische Nationalbank either by e-mail (eva.gehringer-wasserbauer@oenb.at)
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# Studies

# Macrofinancial Stability in Croatia in the Wake of the Global Crisis: Risks and Policy Responses

Sándor Gardó[1]

*After a long-lasting boom period, the global crisis put the resilience of Croatia's economic and financial system to a severe test. The country has mastered this test so far. To some extent, the crisis also altered the country's macrofinancial risk profile, although – against the backdrop of a high (and increasing) degree of currency substitution – credit risk continues to represent the main challenge to financial stability, in particular as bank clients' rising debt-servicing problems started to translate into deteriorating credit quality. However, the banking sector's shock-absorbing capacity – as indicated by still relatively high profitability and capitalization levels – the strategically-oriented presence of foreign banks and vigilant central bank measures were key in cushioning the spillovers of the global crisis and in alleviating vulnerabilities.*

*JEL classification: F36, G2, O52, P2*
*Keywords: Financial stability, banking sector, financial crisis*

## 1 Introduction

The paper aims to give an overview of the most recent financial sector developments in Croatia,[2] notably with regard to banking sector stability, and to highlight possible existing or newly emerging macrofinancial challenges in the context of the global economic and financial crisis. The study also provides updated evidence of and information on financial sector developments in Croatia, following up on earlier OeNB studies on this topic (especially Gardó, 2008).

An introductory overview of macroeconomic conditions in section 2 puts financial developments into perspective, placing the main emphasis on Croatia's policy responses to the spillovers of the global economic and financial crisis. Section 3 discusses banking market developments during the crisis years 2008–09 and into early 2010, inter alia by analyzing the structure, balance sheet composition and profitability of the banking market. This is followed by an examination of the underlying risk factors and the sector's shock-absorbing capacity. Section 4 focuses on nonbank financial intermediaries as well as on stock and bond markets, while section 5 concludes.

## 2 The Macroeconomic Environment

After the boom years 2002 to 2007, which were characterized by buoyant domestic demand, the Croatian economy saw a gradual slowdown in growth over the course of 2008 on the back of the unfolding global financial turmoil. The downward trend reached its peak in the first half of 2009, when the spillovers of the global crisis fully hit the Croatian economy and led to the deepest recession since early transition. The strong economic downturn also entailed notable changes in the growth pattern: While domestic demand plunged on the back of waning consumer confidence, tightening credit conditions, fiscal adjustments and deteriorating labor market

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[2] *Cutoff date for data: July 1, 2010.*

Table 1

**Real Economic Developments**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Q1/2010 |
|---|---|---|---|---|---|---|---|---|
| | *Annual change in %* | | | | | | | |
| Real GDP growth | 5.0 | 4.2 | 4.2 | 4.7 | 5.5 | 2.4 | –5.8 | –2.5 |
| | *Contribution to growth in percentage points* | | | | | | | |
| Total consumption | 3.4 | 3.3 | 3.0 | 2.6 | 4.5 | 0.9 | –5.1 | –2.8 |
| *of which: private consumption* | *3.1* | *2.6* | *2.7* | *2.2* | *3.9* | *0.5* | *–5.3* | *–3.1* |
| *public consumption* | *0.2* | *0.6* | *0.3* | *0.4* | *0.6* | *0.3* | *0.0* | *0.3* |
| Gross fixed capital formation | 5.2 | 1.2 | 1.2 | 2.7 | 1.7 | 2.2 | –3.4 | –3.7 |
| Inventories[1] | –2.3 | –0.1 | 0.5 | 0.5 | 0.9 | 0.6 | –1.9 | 0.5 |
| Net exports of goods and services | –1.2 | –0.2 | –0.5 | –1.2 | –1.7 | –1.3 | 4.7 | 3.5 |
| *of which: exports of goods and services* | *4.9* | *2.4* | *1.7* | *2.9* | *2.0* | *0.8* | *–7.3* | *1.1* |
| *imports of goods and services* | *6.1* | *2.6* | *2.2* | *4.1* | *3.7* | *2.1* | *–12.0* | *–2.4* |
| *Memorandum items:* | *%* | | | | | | | |
| Industrial production (annual change, real) | 3.3 | 3.2 | 4.6 | 4.1 | 4.9 | 1.2 | –9.3 | –0.5 |
| Unemployment rate (LFS) | 14.3 | 13.8 | 12.7 | 11.1 | 9.6 | 8.4 | 9.1 | 11.2 |

*Source: Crostat, OeNB calculations.*

[1] *Including statistical discrepancy.*

conditions, the contribution of net exports to GDP growth turned strongly positive, despite the collapse in world trade, with imports contracting more strongly than exports (see table 1). This growth pattern also characterized the first quarter of 2010, when the fragile economic recovery, which started in the second half of 2009, continued and the fall in economic activity moderated to 2.5% year-on-year. The European Commission's (EC) 2010 Spring Forecast still sees the Croatian economy to contract by 0.5% in 2010 and forecasts moderate growth of 2% in 2011. According to the EC's 2009 Progress Report, enhanced structural reforms, a more effective fight against corruption and organized crime as well as measures targeted at improving the business climate would be essential to ensure a sustained and broad-based recovery and to improve Croatia's short- and medium-term growth outlook.[3]

Against this backdrop, as in other Central, Eastern and Southeastern European (CESEE) countries, external imbalances in Croatia narrowed in some aspects in 2009, with the current account deficit falling to 5.2% of GDP, down from over 9% in 2008 (the highest level since the mid-1990s). Nevertheless, financing needs were high, especially in the first quarter of 2009, when the limited access to foreign funds, portfolio investment outflows and smaller FDI inflows translated into decreasing foreign exchange reserves. However, given gradually softening global liquidity conditions, financing pressures eased from the second quarter of 2009. As a result of falling GDP and continued (though smaller) increases in debt financing, Croatia's gross foreign debt increased further and reached close to

[3] *The World Bank's Doing Business 2010 report puts Croatia in 103rd place in a ranking of 183 countries, the third worst (after Bosnia and Herzegovina and Kosovo) among the CESEE EU Member States and EU candidate and potential candidate countries (CC/PCC). In Transparency International's Corruption Perception Index 2009, Croatia is in 66th place and thus ranks in the middle of the CESEE EU Member States and CC/PCC benchmark sample.*

Table 2

**External Position of the Economy**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Q1/2010[1] |
|---|---|---|---|---|---|---|---|---|
| | *% of GDP* | | | | | | | |
| Current account balance | –6.2 | –4.4 | –5.6 | –6.9 | –7.6 | –9.2 | –5.2 | –4.2 |
| Net FDI inflows | 5.6 | 1.8 | 3.5 | 6.5 | 8.2 | 6.8 | 2.1 | 4.2 |
| Gross external debt | 66.3 | 70.0 | 72.1 | 74.9 | 76.9 | 85.1 | 98.2 | 98.2 |
| *of which: public sector* | *21.1* | *20.0* | *17.2* | *14.5* | *12.5* | *8.8* | *11.4* | *10.8* |
| *private sector* | *45.1* | *50.0* | *54.9* | *60.4* | *64.3* | *76.3* | *86.9* | *87.4* |
| *of which: banks* | *20.5* | *23.6* | *25.1* | *26.1* | *20.7* | *21.2* | *23.5* | *23.5* |
| *other sectors* | *24.6* | *26.4* | *29.8* | *34.3* | *43.6* | *55.1* | *63.4* | *63.9* |
| Foreign exchange reserves | 21.8 | 19.6 | 20.8 | 22.3 | 21.7 | 19.3 | 22.1 | 21.3 |
| Import coverage (*months*) | 5.2 | 4.8 | 5.1 | 5.3 | 5.2 | 4.6 | 6.7 | 7.3 |

*Source: HNB, OeNB.*

[1] *Rolling 4-quarter averages.*

100% of GDP at end-2009 (see table 2). The increase reflected a revival of foreign borrowing by the corporate sector in the latter part of the year (which had largely come to a halt at the turn of 2008–09) and two government bond issues in international financial markets in 2009. At the same time, reserve accumulation resumed and by end-2009, foreign exchange reserves of around EUR 10 billion (or some 22% of GDP) again reached levels seen before the collapse of Lehman Brothers. Driven by a further improving trade balance, the current account deficit continued to narrow in the first quarter of 2010. At the same time, external debt levels stagnated in both absolute and relative terms.

Monetary policymaking remained challenging in 2008 and 2009. In the first half of 2008, Hrvatska narodna banka's (HNB) focus was on containing inflationary

Table 3

**Monetary and Financial Indicators**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Q1/2010 |
|---|---|---|---|---|---|---|---|---|
| | % | | | | | | | |
| Inflation (HICP, annual average) | 2.4 | 2.1 | 3.0 | 3.3 | 2.7 | 5.8 | 2.2 | 1.1 |
| Repo rate (end of period)[1] | . . | . . | 3.5 | 3.5 | 4.1 | 6.0 | 6.0 | . . |
| Money market overnight interest rate (annual average) | 3.1 | 5.0 | 3.0 | 2.4 | 5.0 | 5.9 | 7.2 | 7.2 |
| Real short-term interest rate (contemporaneous) | 0.7 | 2.9 | 0.0 | –0.9 | 2.3 | 0.1 | 5.0 | –0.5 |
| Domestic credit (annual change) | 17.4 | 12.8 | 20.1 | 22.6 | 14.8 | 13.6 | 3.0 | 0.0 |
| HRK/EUR exchange rate (annual average) | 7.6 | 7.5 | 7.4 | 7.3 | 7.3 | 7.2 | 7.3 | 7.3 |
| Nominal effective exchange rate (2005 = 100)[2, 3] | 104.3 | 101.3 | 100.0 | 98.8 | 97.2 | 94.2 | 96.7 | 96.1 |
| Real effective exchange rate (2005 = 100)[2, 3, 4] | 105.0 | 102.2 | 100.0 | 98.0 | 95.8 | 90.6 | 91.0 | 90.6 |

*Source: HNB.*

[1] *2009 figure refers to October 2009; the HNB has not held repo auctions since then.*
[2] *Period averages.*
[3] *A decreasing index denotes a nominal (real) appreciation of the kuna.*
[4] *CPI-deflated.*

pressures related to adverse global food and energy price developments, which drove average inflation to a nearly 15-year high in 2008 (see table 3), as well as on reining in credit growth driven by banks' foreign liabilities. However, the HNB's priorities quickly turned to safeguarding exchange rate and financial stability when the global financial market turmoil gained markedly in depth and intensity following the demise of Lehman Brothers, and inflationary pressures subsided in tandem with the deepening economic downturn and sharp corrections in global commodity prices.

Given, in particular, falling investor and depositor confidence (resulting in heavy stock market losses, increasing risk premiums and temporary deposit withdrawals) and, to a lesser extent, increased demand for foreign exchange by the government and corporations (to repay foreign liabilities), the kuna came under some downward pressure in the final quarter of 2008 and the first quarter of 2009.[4] During this turbulent period, the HNB allowed for some moderate depreciation of the kuna, but in order to prevent a more marked weakening, it did not only change reserve requirement allocation rules but also undertook outright market interventions in favor of the kuna.[5] Furthermore, to boost banking sector (foreign currency) liquidity, the HNB also reduced mandatory reserve requirements, eased foreign currency liquidity regulations and raised the maximum level of open foreign exchange positions banks are allowed to hold (see table 4). With a view to moderating interest rates fluctuations in interbank markets and stabilizing liquidity supply, towards end-2008, the HNB started to hold its regular repo auctions at a fixed interest rate of 6% and kept doing so until mid-October 2009. Given improving liquidity conditions in the market, the HNB has not conducted repo auctions since then.

Driven by improving global investor sentiment, increased foreign currency inflows following public sector Eurobond issues and also seasonal factors (tourism), the kuna began to strengthen from the second quarter of 2009. In the final quarter of 2009, the HNB even intervened in foreign exchange markets to smooth out excessive volatility of the kuna. As seasonal (tourism-related) appreciation pressures set in, the HNB intervened two more times against the kuna in June 2010, with a total volume of EUR 244 million.

Against the background of a continuously benign inflationary environment (with consumer price inflation averaging 0.8% in the first half of 2010) and with a view to supporting economic recovery, in early 2010, the HNB further reduced mandatory reserve requirements from 14% to 13%. Banks allocated large parts of the released liquidity with the Croatian Bank for Reconstruction and Development (HBOR) within the government's three-pillar credit/financing scheme, which intends to facilitate the extension of credit to enterprises.[6]

[4] *For an empirical analysis of the determinants of downward exchange pressures, see HNB (2010).*

[5] *The first intervention in favor of the kuna – in the amount of EUR 270.6 million – took place on October 27, 2008, and was followed by two other interventions on January 23, 2009, (EUR 328.3 million) and February 18, 2009, (EUR 184.7 million).*

[6] *The government's financing models are Model "A", in which the state participates in the co-financing of bank loans through HBOR to finance working capital for companies (40% of the loans are provided by HBOR and 60% by commercial banks), Model "B", which encompasses a guarantee fund with the aim of assuming part of the risks (25% to 50%) tied to the extension of new long-term loans for development and investment projects, and finally Model "C", which envisages debt-equity swaps for troubled enterprises via a specially created economic cooperation fund for a period of five years or less.*

Table 4

**HNB Measures in the Context of the Global Financial Crisis (2008–2010)[1]**

| Monetary policy instrument | | Date | Measure |
|---|---|---|---|
| Interest rates | | January 2008 | The HNB increases the discount rate by 450 basis points to 9.0%. |
| | | December 2008 | As of December 2008, the HNB starts to hold its regular repo auctions at a fixed 6% interest rate. |
| | | October 2009 | The HNB discontinues its regular repo auctions. |
| Reserve requirements | General reserve requirement | October 2008 | Starting from the reserve requirement calculation date of October 9, 2008, banks' vault cash is no longer included in the liquid kuna claims that may be used to maintain the kuna component of the reserve requirement. With this step, the HNB withdraws some EUR 365 million from the market. |
| | | November 2008 | The HNB reduces banks' reserve requirement rate from 17% to 14% to provide additional liquidity to the banking system totaling HRK 8.4 billion (5.9 billion in kuna and 2.5 billion in foreign exchange). The decision has to be applied as of the reserve requirement calculation period starting on December 10, 2008. |
| | | January 2009 | To maintain exchange rate stability, i.e. to ease depreciation pressures on the kuna against the euro, the HNB increases the foreign exchange component of the reserve requirement which is to be allocated in kuna from 50% to 75%. The decision has to be applied as of the reserve requirement period starting on January 14, 2009. |
| | | February 2010 | The HNB reduces the reserve requirement from 14% to 13% with the aim of speeding up economic recovery. This move releases HRK 2.9 billion in additional liquidity (2.4 billion in kuna and 0.5 billion in foreign exchange). |
| | Marginal reserve requirement | October 2008 | The HNB suspends the 55% marginal reserve requirement on all commercial bank borrowing from abroad as of October 10, 2008. The elimination of the marginal reserve requirement will release HRK 3.2 billion in liquidity. |
| | Special reserve requirement | February 2009 | The HNB abolishes the 55% special reserve requirement on banks' liabilities arising from issued securities, which releases additional liquidity of approximately HRK 10 million. |
| Administrative measures | | January 2008 | While keeping the annual 12% credit growth ceiling, the HNB increases the rate of purchase of compulsory HNB bills from 50% to 75% of the loans granted in excess of the credit ceiling. At the same time, the remuneration rate is decreased from 0.75% p.a. to 0.25% p.a. |
| | | November 2009 | The HNB removes the obligation of banks to subscribe to HNB bills at 0.25% interest in case credit growth exceeds 12% annually, thereby releasing liquidity of around HRK 137 million. |
| Loan classification & provisioning & capital requirements | | January 2008 | The HNB imposes higher capital requirements on banks whose growth rate of placements exceeds the maximum permissible growth rate of placements and introduces increased risk weights (100%) to placements with a currency clause extended to clients with no own foreign currency income. |
| | | March 2008 | The HNB requires a 100% risk weight (instead of 75%) to be applied to foreign currency loans and loans with a currency clause fully and completely secured by mortgages on residential property that is or will be occupied or let by the borrower (with an unhedged currency position). At the same time, a 150% risk weight (instead of 125%) shall apply to foreign currency claims and claims with a currency clause not covered by bank deposits or adequate pledged property (referring to clients with an unhedged currency position). |
| Bank liquidity | | March 2008 | In the period from March 10, 2008, to May 31, 2008, banks are required to include in their foreign currency claims the amount with which they participate in the short-term foreign currency loan granted in March 2008 to the Ministry of Finance of the Republic of Croatia, totaling EUR 200 million. |
| | | May 2008 | The HNB cuts the ratio of banks' liquid foreign currency claims to foreign currency liabilities from 32% to 28.5%. |
| | | February 2009 | On February 4, 2009, the HNB cuts the ratio of banks' liquid foreign currency claims to foreign currency liabilities from 28.5% to 25% to boost liquidity and make it easier for the state to borrow at home. This step frees up around EUR 840 million. |
| | | February 2009 | On February 18, 2009, the HNB releases EUR 1.25 billion to banks by cutting the ratio of banks' liquid foreign currency claims to foreign currency liabilities from 25% to 20%. |
| Open foreign exchange positions | | February 2009 | On February 20, 2009, the HNB increases the maximum permitted open foreign exchange position for banks from 20% to 30% of own funds. This move should make it easier for banks to dispose the foreign exchange funds freed up by reducing the rate of minimum required foreign currency claims for banks from 25% to 20%. |

*Source: HNB and OeNB compilation.*

[1] *For an overview of HNB measures in the period from 2000 to 2007 (mainly with a view to rein in lending growth), see Gardó (2008).*

Headline fiscal balances continued to improve overall in 2008, but public finances increasingly came under pressure toward year-end 2008 along with decelerating economic activity. In order to cope with the spillovers of the global crisis,

in early 2009, the government adopted a set of ten anti-recession measures[7] and, with a view to maintaining public confidence in banks, it also quadrupled the level of guaranteed bank deposits (natural persons) to HRK 400,000 (approximately EUR 55,000).[8] The severity of the economic downturn and the related revenue shortfalls also induced a series of budget revisions in 2009, including expenditure cuts and revenue-boosting measures, such as the introduction of a temporary "crisis/solidarity tax" on incomes and pensions in August 2009 and the increase of the main VAT rate from 22% to 23%. Still, given the severity of the economic downturn, the general government budget deficit climbed to over 4% of GDP in 2009 (see table 5), far beyond the originally targeted 0.9% of GDP.

According to Croatia's 2009 Pre-accession Economic Programme, the 2010 budget envisages a consolidated general government budget deficit of 3.3% of GDP, which is expected to be cut gradually to 2.3% of GDP by 2012, mainly via fiscal consolidation on the expenditure side. Risks to the 2010 budget are, however, tilted to the downside for several reasons. First, the 2010 budget is based on economic growth and inflation projections of 0.5% and 3%, respectively; however, lower outcomes are not unlikely. Second, given the still weak economic conditions, budget revenues remained below plan in the first five months of 2010. This shortfall in revenues might be additionally compounded by tax cuts planned for the second half of 2010, including the abolition of the crisis tax in two steps. In a similar vein, as part of the recently launched Economic Recovery Program (April 2010), which aims to facilitate economic recovery and increase Croatia's economic competitiveness over the next ten years, amendments, inter alia to personal income taxation, were adopted, reducing the level and number of income tax rates and abolishing certain tax reliefs as of July 2010.

To finance the budget deficit and refinance maturing public debt the government took out a EUR 1 billion loan from domestic banks in early 2009 and tapped international financial markets with two Eurobond issues totaling EUR 750 million and USD 1.5 billion (EUR 1 billion) in May and November 2009, respectively. Consequently, public debt levels picked up in 2009 but remained still relatively low at some 35% of GDP (or some 50% of GDP when public guarantees and HBOR debt are included). During 2008 and 2009, all major rating agencies reduced Croatia's sovereign rating outlook, but affirmed the country's long-term foreign currency ratings at pre-crisis investment grade levels, i.e. BBB (Standard & Poor's), BBB- (Fitch) and Baa3 (Moody's).[9] Given continued financing needs, the government tapped domestic bond markets with a kuna-denominated bond issue worth HRK 3.5 billion (EUR 480 million) and a euro-denominated issue worth EUR 350 million. It also took out a loan from the World Bank (EUR 200 million) and planned an international bond issue in the second quarter of 2010, which it had to postpone given increasing global sovereign default risk concerns and the related gloomy international environment.

[7] *The measures included, among others, the revision of the state budget, the financial strengthening of HBOR and support for the tourism and real estate sectors.*

[8] *Starting from January 1, 2010, deposits of legal persons are also insured up to HRK 400,000 (approximately EUR 55,000).*

[9] *Standard & Poor's and Fitch revised Croatia's rating outlook down from stable to negative in October 2008 and May 2009, respectively, while Moody's reduced its outlook from positive to stable in November 2008.*

Table 5

**Fiscal Indicators**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010[3] | 2011[3] | 2012[3] |
|---|---|---|---|---|---|---|---|---|---|---|
| | *% of GDP* | | | | | | | | | |
| General government balance[1] | –4.5 | –4.3 | –3.5 | –3.0 | –2.5 | –1.4 | –4.1 | –3.3 | –3.1 | –2.3 |
| Total budget revenues[1] | 39.3 | 39.3 | 38.9 | 39.2 | 40.3 | 39.4 | 38.8 | 38.4 | 36.8 | 35.8 |
| Total budget expenditures[1] | 43.8 | 43.6 | 42.4 | 42.2 | 42.8 | 40.8 | 42.9 | 41.7 | 39.9 | 38.1 |
| General government debt[2] | 35.8 | 37.9 | 38.4 | 35.8 | 33.2 | 29.3 | 35.4 | 36.1 | 37.3 | 37.4 |
| *of which: foreign debt* | *20.1* | *20.5* | *17.2* | *14.5* | *12.6* | *8.9* | *11.3* | *13.2* | *14.1* | *15.8* |
| *domestic debt* | *15.7* | *17.4* | *21.2* | *21.3* | *20.6* | *20.4* | *24.1* | *22.9* | *23.2* | *21.6* |

*Source: European Commission (AMECO database).*

[1] *According to ESA 95 methodology.*
[2] *Excluding public guarantees and HBOR debt.*
[3] *According to Croatia's 2009 Pre-Accession Economic Programme.*

## 3 The Croatian Banking Sector

### 3.1 Banking Sector Structure

No major structural changes took place in the Croatian banking sector in 2008 and 2009. The total number of banks increased by 1 to 34, following the market entry of two savings banks[10] and the merger between Slavonska banka and Hypo Alpe-Adria-Bank in February 2009. The Croatian banking industry continues to be dominated by foreign ownership (see table 6). The asset share of foreign banks remained fairly stable at around 91% in 2008 and 2009, but the number of foreign banks decreased by 1 due to the merger mentioned before. Austria is the largest foreign investor, accounting for slightly over 60% of total banking sector assets (including Bank Austria, which is a member of the UniCredit Group), followed by Italy, France and Hungary. Preliminary, unaudited data for the first quarter of 2010 provide an almost identical picture.

Despite the large number of banks, the sector is fairly concentrated. The market share of the four largest banks increased even further – albeit slightly – in 2008 and 2009, to over 65% of total assets at year-end 2009 (see table 7). Similarly, the Herfindahl-Hirschman index reached 1,367 points in 2009, after 1,279 in 2007. The large number of small banks (25 in total), each with a strong regional focus and a tiny market share, suggests potential for further market consolidation.

The market penetration of banking services continued to increase in the last two years. The number of operating units rose from 1,191 in 2007 to 1,299 at year-end 2009, and the number of ATMs grew by some 600 to 3,601 over the same period. Network expansion went hand in hand with a continued rise in staff levels until the end of 2008, when staff numbers reached 22,027. However, a less conducive economic environment and the unfolding lower demand for banking services seem to have initiated staff reductions in the second half of 2009, with the number of employees falling to 21,673 by year-end 2009.

According to the EBRD's banking reform index, the Croatian banking sector exhibits well developed institutional standards and performance norms. In contrast

[10] *To comply with the acquis communautaire, savings and loan cooperatives had to be turned either into savings banks in accordance with the Banking Act or into credit unions pursuant to the new Credit Unions Act adopted in December 2006.*

Table 6

## Ranking of Croatian Banks in Terms of Total Assets as at December 31, 2009[1]

| No. | Bank | Main shareholders[2] | Total assets | Share in total assets |
|---|---|---|---|---|
| | | | *(EUR million)* | *(%)* |
| 1. | Zagrebačka Banka d.d. | Bank Austria Creditanstalt AG (84.2%), Allianz AG (11.7%) | 12,645.0 | 24.1 |
| 2. | Privredna Banka Zagreb d.d. | Intesa BCI Holding International S.A. (76.6%), EBRD (20.9%) | 8,863.9 | 16.9 |
| 3. | Erste & Steiermärkische Bank d.d. | ESB Holding Gmbh (96.1%) | 6,695.1 | 12.8 |
| 4. | Raiffeisenbank Austria d.d. | Raiffeisen International Bank-Holding AG (75%), Raiffeisenbank-Zagreb Beteiligungsgesellschaft mbH (25%) | 5,381.6 | 10.3 |
| 5. | Hypo Alpe-Adria-Bank d.d. | Hypo Alpe-Adria-Bank International AG (100%) | 5,281.3 | 10.1 |
| 6. | Société Générale-Splitska Banka d.d. | Société Générale (99.8%) | 3,774.1 | 7.2 |
| 7. | Hrvatska Poštanska Banka d.d. | Croatian Privatisation Fund (33.1%), Hrvatska pošta (40.6%), Croatian Pension Insurance Administration (25%) | 1,905.4 | 3.6 |
| 8. | OTP Banka Hrvatska d.d. | OTP Bank RT (100%) | 1,720.7 | 3.3 |
| 9. | Volksbank d.d. | VB International AG (99.2%) | 1,044.1 | 2.0 |
| 10. | Međimurska Banka | Privredna banka Zagreb d.d. (96.4%) | 386.7 | 0.7 |

*Source: HNB.*

[1] *Audited data.*
[2] *As of June 30, 2009.*

Table 7

## Structural Indicators

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| EBRD index of banking sector reform[1] | 3.7 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Number of banks (foreign-owned) | 41 (19) | 37 (15) | 34 (14) | 33 (15) | 33 (16) | 34 (16) | 34 (15) |
| Number of banks per 100,000 inhabitants | 0.92 | 0.83 | 0.77 | 0.74 | 0.74 | 0.77 | 0.77 |
| Number of employees | 17,086 | 17,424 | 18,624 | 18,877 | 20,613 | 22,027 | 21,673 |
| Number of operating units[2] | 1,022 | 1,037 | 1,114 | 1,120 | 1,191 | 1,252 | 1,299 |
| Number of ATMs | 1,611 | 1,913 | 2,307 | 2,641 | 2,995 | 3,342 | 3,601 |
| Assets of private banks (% of total assets) | 96.6 | 96.9 | 96.6 | 95.8 | 95.3 | 95.5 | 95.7 |
| Assets of foreign banks (% of total assets) | 91.0 | 91.3 | 91.3 | 90.8 | 90.4 | 90.7 | 90.8 |
| Assets of four largest banks (% of total assets) | 61.6 | 64.9 | 64.9 | 64.0 | 63.9 | 64.9 | 65.1 |
| Herfindahl-Hirschmann index[3] | 1,270 | 1,363 | 1,359 | 1,299 | 1,279 | 1,311 | 1,367 |

*Sources: HNB, EBRD.*

[1] *Reform progress ranges from 1 (little progress beyond the establishment of a two-tier system) to 4+ (standards and performance norms of advanced industrial economies).*
[2] *Including branches and subbranches.*
[3] *Sum of the squared asset shares of individual banks. The index ranges between 0 and 10,000. An index below 1,000 suggests a nonconcentrated sector, an index above 1,800 suggests a highly concentrated sector.*

to some other transition economies, Croatia was able to maintain its EBRD ranking during the crisis years 2008 and 2009, which is better than that of many CESEE EU Member States; only Hungary and Estonia had similarly high rankings in in 2009.[11]

### 3.2 Asset and Liability Structure

Financial deepening slowed markedly over 2008 and 2009. Initially, this could be attributed to HNB measures to curb credit growth, while later on deteriorating economic conditions, the process of global deleveraging, banks' increasing risk aversion and lower credit demand by bank clients (due to falling business and consumer confidence, deteriorating income and labor market prospects and rising interest rates) played a more prominent role. The expansion of banking assets slowed sharply from 13% in 2007 to 2.5% in 2009. Thus, the increase in financial penetration as a percentage of GDP from 109.8% in 2007 to 114.2% at end-2009 (see table 8) should mainly be seen in the context of strongly falling GDP levels. Croatia's financial intermediation levels continue to rank among the highest in CESEE but are still well below the euro area average of almost 340% of GDP (based on the aggregated balance sheet of other MFIs).

With a share of 57.4% of total assets in 2009, banking sector assets continued to be dominated by claims on domestic households and enterprises. This figure is as high as in 2007 despite the strong slowdown in lending to both corporations and households over 2008 and 2009. In contrast to most other CESEE economies, the slowdown was more pronounced in the retail segment, which seems to be the result of, inter alia, a slump in general-purpose cash loans and car loans.

The banking sectors' claims on the general government increased during the crisis years 2008 and 2009 due to stepped-up government borrowing from banks. In particular, given budgetary financing needs, in early 2009, the government took out a EUR 1 billion syndicated loan from a group of six domestic banks, for which the HNB relaxed liquidity provisions so that the banks were able to extend this loan without recourse to additional external funding. Emerging crowding-out concerns were, however, alleviated by a decreasing risk aversion in global financial markets starting from March 2009 and the subsequent two Eurobond issues by the government in 2009, a World Bank loan in January 2010 and two bond issues in domestic markets in spring 2010.

Banks' claims on domestic monetary financial institutions, which mostly consist of deposits with the HNB, decreased over the last two years, largely reflecting the HNB's measures with a view to easing reserve requirements during the most critical periods of the global financial crisis. These measures included abolishing the marginal reserve requirement in October 2008, reducing the mandatory reserve requirement rate from 17% to 14% in December 2008, suspending the special reserve requirement in February 2009 and removing the obligation for banks to subscribe to HNB bills in case credit growth exceeds 12% annually in November 2009, thereby releasing total liquidity of some HRK 12 billion (approximately EUR 1.6 billion).

[11] *A ranking for the Czech Republic (which also posted an index of 4.0 in 2007) is no longer available, as in 2007 the country ceased to be an EBRD country of operation.*

Table 8

**Asset Structure of the Banking Sector**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| Commercial bank assets (% of GDP) | 89.9 | 93.4 | 98.5 | 106.4 | 109.8 | 108.1 | 114.2 |
| | *% of total assets* | | | | | | |
| Total domestic claims | 79.2 | 77.3 | 82.7 | 84.5 | 84.2 | 84.3 | 84.5 |
| Claims on domestic MFIs | 18.8 | 17.6 | 18.7 | 18.4 | 17.9 | 13.8 | 14.9 |
| Claims on domestic nonbanks | 60.4 | 59.7 | 64.0 | 66.1 | 66.3 | 70.5 | 69.6 |
| *of which: general government* | *11.2* | *9.9* | *11.6* | *9.7* | *9.0* | *10.6* | *12.2* |
| *domestic households and enterprises* | *49.2* | *49.8* | *52.4* | *56.4* | *57.3* | *59.9* | *57.4* |
| *of which: domestic enterprises* | *23.2* | *22.3* | *23.1* | *25.8* | *25.4* | *26.6* | *26.1* |
| *domestic households* | *25.9* | *27.5* | *29.3* | *30.6* | *31.9* | *33.3* | *31.3* |
| External assets | 16.5 | 18.3 | 13.2 | 12.6 | 13.1 | 12.9 | 12.6 |
| *Memorandum items:* | | | | | | | |
| Claims on domestic households (% of total claims on households and enterprises) | 52.7 | 55.2 | 55.9 | 54.3 | 55.7 | 55.6 | 54.5 |
| Loans-to-claims ratio for domestic nonbanks *(%)* | 86.4 | 88.8 | 88.6 | 90.8 | 90.8 | 91.5 | 92.8 |
| *of which: general government (%)* | *37.5* | *39.4* | *42.2* | *49.5* | *45.6* | *54.7* | *68.0* |
| *domestic households and enterprises (%)* | *97.8* | *98.4* | *98.9* | *98.0* | *98.3* | *98.7* | *98.4* |

*Source: HNB.*

The share of foreign assets in total bank assets remained fairly stable over the review period. Thus, despite high global and local liquidity pressures banks did not have to run down foreign assets on a large scale in an annual comparison.[12] This was underpinned by the fact that foreign parent banks were on the spot to support their subsidiaries during times of heightened liquidity pressures. In fact, banks' external liabilities, which continued to fall in the context of HNB credit restrictions over the first three quarters of 2008, increased substantially in the final quarter of 2008 (in particular following the abolition of the marginal reserve requirement in October 2008) and helped to compensate for the decrease in domestic funding sources related to temporary deposit withdrawals.[13] Thus, banks' net foreign asset position, which had improved strongly in 2007 on the back of HNB measures to contain bank lending based on foreign borrowing,[14] again deteriorated from –4.8% of total assets in 2007 to –7.9% in 2009.

Banks' liabilities continued to be dominated by deposits of domestic nonbanks (51% of total liabilities at end-2009), especially private sector deposits (i.e. households and enterprises). Solid pre-crisis private sector deposit growth came to a halt in the final quarter of 2008, when waning public confidence in the banking sector caused temporary deposit withdrawals. The first quarter of 2009, however, saw the situation stabilize and household deposits (mainly in foreign currency) rise again, in particular in the second half of 2009. In fact, in 2009, household deposits

[12] *It is important to note, however, that the relaxation of the HNB's foreign currency liquidity regulations in February 2009 (with the aim of facilitating governments' financing needs) led to a temporary recourse to foreign assets in the first quarter of 2009, which were then gradually rebuilt over the rest of 2009.*

[13] *See, among others, Bokan et al. (2009).*

[14] *The impulse responses of VAR estimates by the IMF suggest that HNB measures (especially the marginal and special reserve requirements) have achieved some success in temporarily reducing the overall volume of capital inflows to Croatia. See IMF (2010b), p. 146–148.*

Table 9

**Liability Structure of the Banking Sector**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| | *% of total liabilities* | | | | | | |
| Deposits of MFIs | 2.6 | 2.1 | 2.9 | 3.6 | 5.6 | 4.3 | 4.6 |
| Deposits of domestic nonbanks | 56.6 | 54.9 | 52.9 | 52.5 | 53.3 | 52.6 | 51.1 |
| *of which: general government* | *1.8* | *1.6* | *1.6* | *1.4* | *1.5* | *1.6* | *1.1* |
| *households and enterprises* | *54.8* | *53.0* | *51.1* | *51.0* | *51.7* | *50.9* | *49.9* |
| Debt securities issued | 1.6 | 2.7 | 2.0 | 1.7 | 1.4 | 1.9 | 1.0 |
| Capital and reserves | 8.9 | 8.6 | 9.0 | 10.3 | 12.5 | 13.5 | 13.9 |
| External liabilities | 23.0 | 24.1 | 23.9 | 23.5 | 17.8 | 18.9 | 20.5 |
| Remaining liabilities | 7.3 | 7.6 | 9.3 | 8.4 | 9.4 | 8.8 | 8.9 |
| *Memorandum items:* | *%* | | | | | | |
| Domestic nonbanks' claim-to-deposit ratio | 106.7 | 108.6 | 120.9 | 125.9 | 124.4 | 133.9 | 136.1 |
| General government's claim-to-deposit ratio | 622.7 | 616.0 | 723.6 | 695.2 | 599.4 | 659.7 | 1,109.6 |
| Households' and enterprises' claim-to-deposit ratio | 89.8 | 93.9 | 102.5 | 110.5 | 110.9 | 117.6 | 115.0 |

*Source: HNB.*

were up by some 4% on their 2008 levels as households sharply cut spending in light of the less conducive economic environment, deteriorating labor market conditions and the related worsening of households' income position toward year-end 2009. By contrast, corporate deposits fell by some 6% in 2009 given more limited access to other funding sources and declining corporate profitability so that total private sector deposits by and large stagnated during 2009 and their share in total liabilities fell to slightly below 50% (see table 9).

The term structure of deposits changed during the crisis years too, with the share of time deposits climbing to some 73% of total deposits at year-end 2009, up from 65% in 2007. While this development might to some extent be explained by the run-down of demand deposits (mainly for confidence reasons), it may also reflect the above-mentioned change in the structure of deposits (growing household and declining corporate deposits) and clients' shifting of deposits to longer maturities to secure higher interest rates, in particular before the global low-interest rate cycle (including the flattening of the yield curve) set in.

Foreign currency-denominated positions, while increasing over the last two years, continued to dominate the liability side of the banking sector, accounting for some three-quarters of total deposits at year-end 2009. This might be explained by the fact that workers' remittances and largely also tourism revenues are earned in foreign currency, but also by confidence issues, which may have triggered the conversion of kuna deposits into foreign currency-denominated deposits and entailed people's higher propensity to save in foreign currency.[15] As bank claims continued to grow faster than deposits, claim-to-deposit ratios increased over 2008 and 2009 and remained well in excess of 100%. This implies a continued need for refinancing from other sources, including foreign funding.

In the Croatian banking sector's liability structure, capital and reserves are also playing a strong (and over the last two years increasing) role as financing

[15] *For further details, see Dvorsky, Scheiber and Stix (2009).*

items; their share in total liabilities is more than twice as high as in the euro area. The reasons for this include 1) higher capital requirements in Croatia in general (and for banks whose placement growth exceeded certain permitted growth rates in particular), 2) presumably higher risks faced by banks operating in an emerging market environment and 3) widespread foreign ownership, with foreign banks providing their subsidiaries a portion of financing in the form of equity.[16] Especially the last point has been of importance in the case of Croatia, as the high marginal and special reserve requirement on banks' foreign liabilities and issued securities as well as the minimum foreign currency liquidity requirements as stipulated by HNB regulations induced parent banks to finance strong credit growth by boosting subsidiaries' capital positions.

### 3.3 Banking Sector Profitability

As in other CESEE countries, deteriorating economic conditions started to take a toll on banking profitability in Croatia in the final quarter of 2008, but the full impact materialized only in 2009. While banks remained profitable throughout the review period, profitability declined on weak business conditions and higher provisioning needs. Consequently, banks' return on average assets (pre-tax) dropped from 1.6% in 2007 and 2008 (see table 10) to 1.2% at end-2009, while the continuing decline in return on average equity (after-tax) to 6.7% was additionally underpinned by banks' attempts to strengthen their capitalization (in particular via retained earnings, but also minor capital injections). Preliminary HNB data suggest broadly unchanged banking profitability in the first quarter of 2010.

Net interest income continued to constitute the main source of revenue in the banking sector. Despite increasing interest rate spreads in the last two years, which were driven by a pick-up in lending rates, interest income grew only moderately in 2009, given tighter supply-side credit conditions based on banks' increased risk aversion and more subdued credit demand. Interest expenses grew more strongly, however, most likely due to the more widespread use of longer-term, fixed-interest rate deposit contracts. Thus, in 2009, net interest income decreased not only in absolute terms but also as a share of total operating income.

At the same time, net noninterest income increased considerably in both absolute and relative terms. In this context, net income from fees and commissions remained fairly stable, but strong increases in other, less stable sources of income such as securities and foreign exchange trading activities (including related valuation effects) pushed the share of total net noninterest income to some 37.5% of total operating income at year-end 2009. In this context, it is important to note that movements in net interest and noninterest income seem highly correlated, given certain swap transactions of Croatian banks with parent institutions.[17]

Despite continued network expansion and ongoing infrastructure deepening (e.g. ATMs), bank efficiency increased and operating expenses fell below 50% of total operating income at end-2009, partly due to lower staff expenses following crisis-induced cutbacks in staff. Finally, in order to provide for increased risks related to the deteriorating economic conditions and the pick-up in nonperforming loans, banks sharply stepped up their provisioning efforts in 2009.

[16] *For more details on the refinancing structure of banks in CESEE, see Walko (2008).*

[17] *See HNB (2010) p. 44f.*

Table 10

**Banking Sector Profitability**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| | *% of total income* | | | | | | |
| Total operating income | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| *of which: net interest income* | *75.3* | *69.2* | *70.2* | *70.5* | *67.5* | *69.3* | *62.5* |
| *net noninterest income* | *24.7* | *30.8* | *29.8* | *29.5* | *32.5* | *30.7* | *37.5* |
| General administrative expenses | 57.4 | 54.3 | 54.4 | 54.9 | 52.1 | 52.4 | 49.4 |
| Loan loss provision expenses | 7.7 | 6.6 | 5.3 | 6.2 | 7.6 | 7.6 | 22.4 |
| Income tax | 6.0 | 6.4 | 7.8 | 7.7 | 8.2 | 7.8 | 5.7 |
| After-tax profit/loss | 28.9 | 32.6 | 32.5 | 31.1 | 32.1 | 32.2 | 22.6 |
| | *% of average assets* | | | | | | |
| Net interest income | 3.4 | 3.0 | 2.9 | 2.7 | 2.6 | 2.8 | 2.5 |
| Net noninterest income | 1.1 | 1.3 | 1.2 | 1.1 | 1.3 | 1.2 | 1.5 |
| | *percentage points* | | | | | | |
| Interest rate spread (total loans - total deposits) | 8.0 | 7.6 | 7.0 | 6.5 | 6.0 | 6.3 | 7.0 |
| | *%* | | | | | | |
| Return on average assets (before tax) | 1.6 | 1.7 | 1.6 | 1.5 | 1.6 | 1.6 | 1.2 |
| Return on average equity (after tax) | 14.1 | 16.1 | 15.0 | 12.4 | 10.9 | 9.9 | 6.7 |
| | *% of average interest-bearing assets* | | | | | | |
| Net interest margin | 4.9 | 4.5 | 4.2 | 3.8 | 3.7 | 3.8 | 3.4 |

*Source: HNB.*

## 3.4 Risks and Shock-Absorbing Capacity

### 3.4.1 Credit Risk

Credit risk continues to represent the main source of risk to financial stability in Croatia. In fact, after years of strong credit growth, in the second half of the last decade, the ratio of private sector credit to GDP had reached fairly elevated levels relative to underlying fundamentals in Croatia.[18] Strong credit growth, albeit decelerating due to various HNB measures aimed at reining in lending growth based on banks' foreign liabilities, continued during 2007 and the first three quarters of 2008. However, credit growth moderated considerably thereafter as the downturn fully hit the Croatian economy in the first half of 2009, with both demand- and supply-side factors contributing to this development. The slowdown in household lending was more pronounced than in corporate lending, partly because demand for corporate loans kept up fairly well due to the – temporary – drying-up of other (including foreign) funding sources. As at year-end 2009, private sector credit levels were at some 67% of GDP, which is higher than the levels seen in most other CESEE countries, but still substantially below euro area levels of 120% of GDP. In the first quarter of 2010, overall credit growth came to a halt in an annual comparison; while loans to the government and corporations grew by 5% and 3%, respectively, loans to households continued to contract (–3%).

[18] *For further details, see Zumer, Égert and Backé (2009).*

Household debt, mostly consisting of bank loans, fell in 2009 (see table 11) after years of double-digit growth rates. For this reason and given increases in disposable income (by an average 2.8% in 2009),[19] household debt also fell relative to gross disposable income to 84.4% in 2009. Household debt levels remained stable at 40% of GDP during the crisis years though, given last year's fall in nominal GDP. Implicit interest payments relative to gross disposable income increased in 2008 and 2009, largely driven by a pick-up in interest rates. Housing loans, the most dynamic line of business in the household segment during the boom years, strongly lost momentum during the second half of 2009 on the back of lower demand for property and falling real estate prices (by 4% on average in 2009), which, given losses in collateral values, might indirectly expose banks to real estate-related risks. In contrast to other segments of household lending, growth in housing loans remained in positive territory in 2008 and 2009 though, so that their share in total household loans increased slightly to 43% over the last two years.

Table 11

**Selected Macroprudential Indicators[1]**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| **Households** | | | | | | | |
| Debt (% of GDP) | 25.4 | 28.0 | 32.4 | 36.6 | 39.5 | 40.4 | 40.6 |
| Debt (% of gross disposable income) | 52.1 | 58.3 | 69.5 | 78.0 | 85.1 | 88.6 | 84.4 |
| Annual change in debt (%) | 28.2 | 19.4 | 24.4 | 22.4 | 18.5 | 11.4 | –2.7 |
| Implicit interest payments (% of gross disposable income) | 4.5 | 4.8 | 5.1 | 5.3 | 5.7 | 6.1 | 6.3 |
| **Nonfinancial enterprises** | | | | | | | |
| Debt (% of GDP) | 43.7 | 45.8 | 50.8 | 58.9 | 66.3 | 72.0 | 78.5 |
| Debt (% of corporate bank deposits) | 320.2 | 339.4 | 398.6 | 395.9 | 387.1 | 498.9 | 580.0 |
| Annual change in debt (%) | 12.9 | 13.2 | 19.6 | 25.5 | 23.5 | 18.3 | 6.1 |
| Implicit interest payments (% of GDP) | 3.2 | 3.1 | 3.1 | 3.5 | 4.2 | 4.4 | … |
| **Total nonfinancial private sector** | | | | | | | |
| Debt (% of GDP) | 69.1 | 73.8 | 83.2 | 95.5 | 105.8 | 112.5 | 119.1 |
| Annual change in debt (%) | 18.0 | 15.5 | 21.4 | 24.3 | 21.6 | 15.7 | 2.9 |
| **General government[2,3]** | | | | | | | |
| Debt (% of GDP) | 35.7 | 37.9 | 38.5 | 36.0 | 33.4 | 29.3 | 35.4 |
| Annual change in debt (%) | 11.7 | 14.8 | 9.2 | 1.3 | 2.0 | 9.1 | 17.3 |
| Interest paid (% of GDP) | 1.8 | 1.8 | 1.9 | 1.9 | 1.8 | 1.5 | 1.7 |
| **Total nonfinancial sector** | | | | | | | |
| Debt (% of GDP) | 104.8 | 111.7 | 121.7 | 131.5 | 139.3 | 141.8 | 154.4 |
| Annual change in debt (%) | 18.0 | 15.5 | 21.4 | 24.3 | 21.6 | 10.9 | 6.0 |
| *Memorandum items:* | | | | | | | |
| Total external debt (% of GDP) | 66.3 | 70.0 | 72.1 | 74.9 | 76.9 | 85.1 | 98.2 |
| Total private external debt (% of GDP) | 45.1 | 50.0 | 54.9 | 60.4 | 64.3 | 76.3 | 86.9 |

*Source: HNB.*

[1] *All items refer to total (i.e. domestic and foreign) debt.*
[2] *Starting from 2008 data excluding Croatian Highways.*
[3] *Growth rate for 2008 adjusted for exclusion of Croatian Highways.*

[19] *It is important to note, however, that full-year 2009 data mask strongly decelerating intra-year dynamics in disposable income growth from +8.9% in the first quarter of 2009 to –3.8% in the final quarter of 2009 on the back of the introduction of a special "crisis tax" in July and the lagged impact of slowing wage growth and worsening labor market conditions.*

Despite a crisis-driven slump in investment activity, the growth in corporate sector debt levels continued at a robust pace in 2008 and 2009. However, this may have been partly driven by exchange rate valuation effects (e.g. the depreciation of the kuna vis-à-vis the Swiss franc by some 13% since the start of 2008), even though the bulk of Swiss franc loans seems to be related to the household segment, and within this segment to housing loans (detailed information about the currency decompositions of loans is not available, however). In this context, the corporate sector's debt growth (mainly bank loans) decelerated significantly in 2009 but remained positive, so that corporations' domestic debt climbed to over 75% of GDP, with interest payable also rising considerably on the back of increased refinancing costs.

Croatia's banking sector is highly exposed to indirect credit risk arising from the use of foreign currency in domestic operations. The large share of foreign currency-denominated and -indexed loans in total loans exposes households and enterprises to exchange rate and foreign interest rate fluctuations, thereby implying credit risk for banks. Given that households account for over 45% of total foreign currency-denominated (and -indexed) loans in Croatia, unhedged domestic borrowers seem to bear the bulk of the currency risk. According to HNB (2009c), some 96% of total net placements and contingent liabilities to households are considered as unhedged, implying substantial currency-induced credit risk in this sector. However, this risk is somewhat mitigated by the fact that household deposits are also largely denominated in foreign currency, as workers' remittances and tourism revenues represent a major source of household income.

Against the background of stricter capital adequacy and liquidity requirements imposed by the HNB, in particular the introduction of higher risk weights on foreign currency-denominated and -indexed loans (mainly claims on unhedged borrowers), the degree of currency substitution in bank liabilities declined considerably in 2006, 2007 and the first three quarters of 2008. This trend reversed, however, after the collapse of Lehman Brothers, which has shaken trust in the stability of global financial markets. In fact, the temporary waning of the Croatian population's and corporations' confidence in the local banking sector and the domestic currency led to the increased denomination of bank liabilities in foreign currency (especially due to conversions of local currency into foreign currency deposits), but the run-down in corporate deposits in kuna-denominated transaction accounts might have contributed to this development as well.[20] This, in conjunction with the release of foreign currency reserves by the HNB, entailed stepped-up foreign currency lending by banks to avoid currency mismatches. Thus, driven mainly by the strong growth of foreign currency lending to the corporate sector, the share of foreign currency-denominated (including indexed) loans in total loans increased considerably from 61% in 2007 to some 72% in 2009 (see table 12). Exchange rate valuation effects (the depreciation of the kuna vis-à-vis the Swiss franc) played some role in this development too.

Before the crisis, the Swiss franc, next to the euro, played an important role in domestic borrowing too. Given low interest rates, Swiss franc loans quickly became popular in Croatia during the boom years, with their share in total foreign currency loans (total loans) quintupling (quadrupling) from 5% (3.9%) at the start

[20] *For further details, see Dvorsky, Scheiber and Stix (2009).*

Table 12

## Selected Indicators of Banking Sector Stability

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| **Credit risk** | *Annual change in %* | | | | | | |
| Credit growth | 17.4 | 12.8 | 20.1 | 22.6 | 14.8 | 13.6 | 3.3 |
| Growth of credit to the private sector | 16.2 | 13.3 | 18.7 | 23.7 | 14.2 | 12.1 | –0.7 |
| Real growth of credit to the private sector | 14.5 | 10.8 | 14.6 | 21.3 | 8.3 | 8.971 | –2.6 |
| Growth of credit to households | 27.4 | 18.0 | 20.5 | 21.9 | 18.1 | 12.0 | –3.0 |
| Housing loan growth | 37.4 | 28.9 | 28.9 | 34.0 | 22.5 | 15.7 | 1.2 |
| | *% of total loans* | | | | | | |
| Nonperforming loans | 8.9 | 7.5 | 6.2 | 5.2 | 4.8 | 4.9 | 7.8 |
| *of which: households* | *6.4* | *4.7* | *4.5* | *4.1* | *3.7* | *3.9* | *5.8* |
| *corporations* | *12.9* | *11.9* | *9.7* | *7.6* | *7.3* | *7.2* | *12.8* |
| Foreign currency credit (% of total credit) | 74.2 | 75.7 | 77.4 | 71.5 | 61.4 | 65.4 | 72.7 |
| Foreign currency deposits (% of total deposits)[1] | 87.5 | 87.3 | 86.4 | 76.3 | 66.8 | 68.5 | 76.1 |
| **Market risk** | | | | | | | |
| *Foreign exchange risk* | | | | | | | |
| Open foreign exchange position (% of total assets) | 1.2 | 1.0 | 0.6 | 0.2 | 0.7 | 0.5 | 0.9 |
| **Stock market risk** | | | | | | | |
| Ratio of shares and participations (equity holdings) to total assets (%) | 1.4 | 0.9 | 0.8 | 0.7 | 0.7 | 0.2 | 0.1 |
| **Liquidity risk** | | | | | | | |
| Ratio of liquid assets to total assets (%)[2] | 32.8 | 31.2 | 28.0 | 27.5 | 27.6 | 23.9 | 23.7 |
| Ratio of liquid assets to short-term liabilities (%)[2] | 117.2 | 120.4 | 103.1 | 102.6 | 107.1 | 106.1 | 119.2 |
| Ratio of total loans to total deposits (%) | 76.7 | 80.7 | 88.5 | 92.5 | 92.8 | 99.5 | 98.3 |
| **Shock-absorbing factors** | | | | | | | |
| Loan loss provisions (% of nonperforming loans) | 60.9 | 62.5 | 60.0 | 57.0 | 54.7 | 49.5 | 42.5 |
| *of which: loan loss provisions for household loans* | *53.0* | *69.9* | *66.2* | *62.6* | *67.0* | *63.8* | *60.6* |
| *loan loss provisions for corporate loans* | *62.0* | *57.4* | *56.4* | *52.2* | *45.3* | *38.1* | *33.0* |
| Nonperforming loans net of provisions (% of capital) | 22.6 | 19.0 | 16.7 | 14.0 | 11.3 | 12.8 | 22.2 |
| Capital adequacy ratio (%) | 16.2 | 15.3 | 14.7 | 14.0 | 16.4 | 15.2 | 15.8 |
| *Memorandum items* | | | | | | | |
| Number of banks (foreign-owned) | 41 (19) | 37 (15) | 34 (14) | 33(15) | 33(16) | 34 (16) | 34 (15) |
| Asset share of foreign-owned banks (% of total assets) | 91.0 | 91.3 | 91.3 | 90.8 | 90.4 | 90.7 | 90.8 |

*Source: HNB.*

[1] *Time deposits.*
[2] *Liquid assets = cash in vaults + deposits with the HNB + deposits with other banks + treasury bills.*

of 2005 to 27% (16%) at end-2007. However, the global financial crisis brought about major changes regarding the currency composition of foreign currency loans and a falling (to 19% and 13%, respectively) Swiss franc share by year-end 2009, a trend which also continued in the first quarter of 2010. The declining

popularity of Swiss franc loans due to the higher volatility of the kuna against the Swiss franc (compared with the euro), a more limited supply of Swiss franc loans by banks given difficulties in obtaining liquidity in this currency and conversions of Swiss franc loans into euro loans have presumably contributed to this development.

Credit risk started to manifest itself in a deterioration of credit quality in the final quarter of 2008, which accelerated in 2009, as borrowers faced difficulties servicing their loans in a less conducive economic environment. After having decreased for years largely on the back of strong credit growth, the share of nonperforming loans[21] (NPL) in total loans picked up from 4.8% in 2007 to 7.8% at end-2009. NPL ratios in the retail segment were half as high as in the corporate sector, which is associated with the relatively large share of housing loans (some 43% at year-end 2009) in total household loans and their (up to now) fairly low delinquency rates (some 2.7%). Another possible explanation underpinning this development could be the recourse of large corporations with a good financial standing to cross-border borrowing (IMF, 2008), which could imply an adverse selection problem. However, in their recent empirical analysis, Cerovac and Ivičic (2009) find no evidence of a negative impact of corporations' direct cross-border borrowing on the risk profile of domestic banks' balance sheets. Quite the contrary, default rates seem somewhat higher for corporations with direct foreign financing (which are often affiliated to the construction sector). There are no data available on NPLs by currency composition, which makes it impossible to infer whether banks applied stricter risk management practices to foreign currency-denominated and -indexed loans to account for the higher risks associated with these loans. Being a lagging indicator, NPLs are set to increase further in 2010, inter alia on the back of declining corporate profitability and adverse labor market conditions.

### 3.4.2 Market and Liquidity Risks

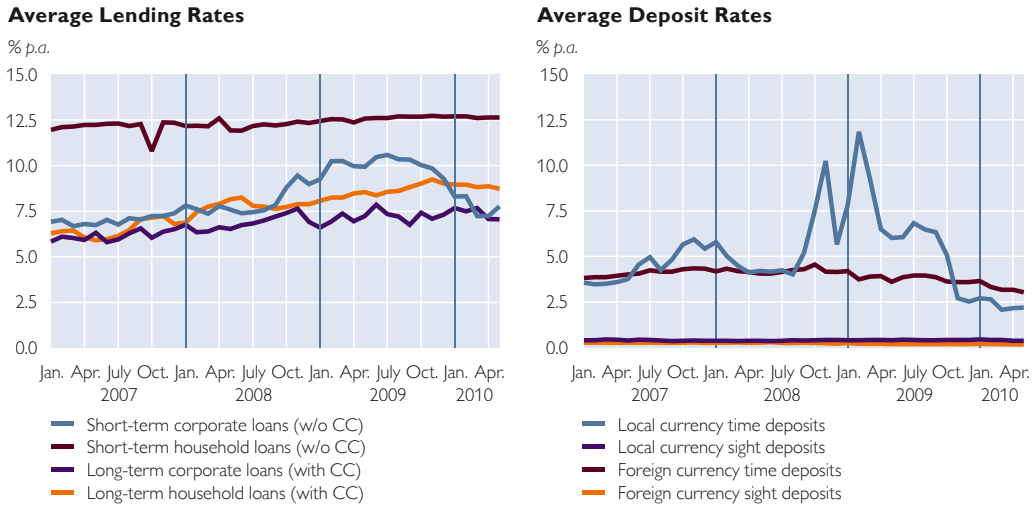
The banking sector's exposure to interest rate risk is limited. Most of the interest rate risk (both domestic and foreign) has been shifted to bank clients and – in the event of adverse developments – would materialize through the credit risk channel, as loan contracts (including fixed-interest rate loans) often carry safeguard clauses which allow for pertinent interest rate adjustments. In fact, some two-thirds of total loans provide for interest rate adjustments within three months (and 95% within one year). At the same time, on the liability side, deposits are predominantly short-term, with some 85% (55%) of total deposits having a maturity of less than one year (three months), allowing for a rather great degree of flexibility in times of high interest rate volatility.

In contrast to global interest rate developments, average lending rates in Croatia increased more or less substantially and across the board over the last two years

[21] *Pursuant to the HNB Decision on the Classification of Placements and Off-Balance Sheet Liabilities of Credit Institutions, placements are to be classified as placements without impairment (risk category "A"), partly recoverable placements (risk categories "B-1", "B-2" and "B-3") or fully irrecoverable placements (risk category "C"), with the latter two categories being labelled as nonperforming. In more detail, placements have to be classified as 1) B-1, if liabilities are overdue by more than 90 but less than 180 days, 2) B-2, if liabilities are overdue by more than 180 but less than 270 days, 3) B-3, if liabilities are overdue by more than 270 but less than 365 days, or 4) C, if liabilities are overdue by more than 365 days.*

Chart 1

**Average Lending and Deposit Rates**




*Source: HNB.*

*Note: CC = currency clause.*

(see chart 1), especially rates on short-term local currency corporate loans and long-term household loans indexed to foreign currency, which increases indirect local and foreign interest rate risks. Average deposit rates remained fairly stable over 2008 and 2009, with major fluctuations in local currency time deposits. To some extent, these fluctuations were attributable to banks' attempts to stop deposit withdrawals during the height of the crisis and to prevent large-scale deposit conversions into foreign currencies, but – given their coincidence with the concurrent spikes in money market rates – also to the fairly high bargaining power of corporate treasurers, who demand short-term deposit interest rates comparable to money market rates or otherwise place their funds in the money market.

The share of equity participations in total assets declined by more than two-thirds over the last two years in the context of adverse global stock market developments. These positions do not represent a major risk to banking stability, as the banking sector's exposure to stock market risk is negligible in light of equity positions of only 0.1% of total assets in 2009.

Direct foreign exchange risk appears to be manageable as well. Open foreign exchange positions did not see major increases over the review period. However, in contrast to previous years, short open foreign exchange positions exceeded long positions over 2008 as a whole and in the first quarter of 2009, implying that during this period banks were more exposed to foreign exchange risks associated with a depreciation of the kuna. This changed, however, as of the second quarter of 2009, as foreign currency-denominated and -indexed assets increased more strongly than corresponding liabilities so that the ratio of average long foreign exchange positions to regulatory capital exceeded average short positions in the remainder of 2009.

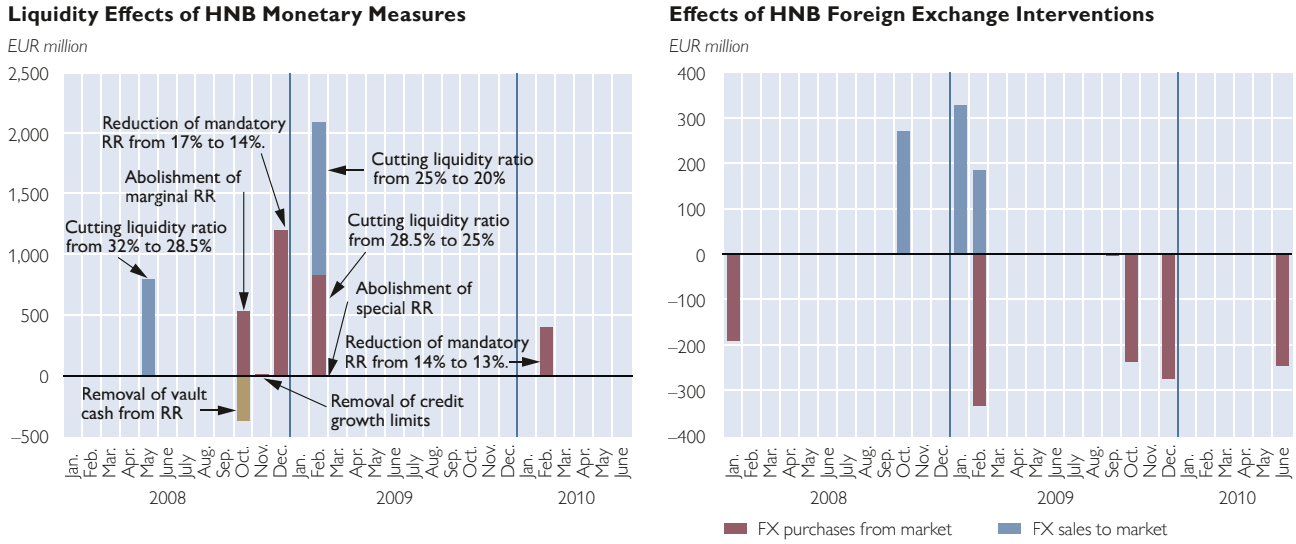
There were substantial changes in legislation related to open foreign exchange positions during the crisis years. In May 2008, the HNB cut the minimum required

rate of foreign currency claims from 32% to 28.5% with the aim of facilitating the governments' budgetary financing by taking recourse to a EUR 760 million syndicated loan provided by domestic banks. In order to ease mounting foreign currency liquidity pressures that emerged at the turn of 2008 and 2009, the ratio of liquid foreign currency claims to foreign currency liabilities was cut further in two steps from 28.5% to 25% in early February 2009 (again with a view to facilitating government financing) and then to 20% in late February 2009, thereby releasing foreign exchange liquidity to banks of around EUR 2.1 billion. At the same time, to facilitate the management of the released funds, in February 2009, the HNB increased banks' maximum permitted open foreign currency positions to 30% of banks' regulatory capital (from previously 20%).

As reflected by liquidity indicators, liquidity risks increased somewhat over the last two years. In 2008, the ratio of liquid assets to total assets declined rather strongly to 24%, mainly on the back of the reduction of mandatory reserve requirements from 17% to 14% as of the reserve requirement calculation period starting on December 10, 2008. This HNB move released liquid assets worth a total HRK 8.4 billion (5.9 billion denominated in kuna and 2.5 billion in foreign exchange), corresponding to some EUR 1.2 billion (see chart 2). In 2009, the ratio of liquid to total assets stabilized. At the same time, the loan-to-deposit ratio increased further in 2008, reaching some 100%. However, given the strongly decelerating credit growth in the context of the financial crisis, in 2009 the loan-to-deposit ratio stabilized at 2008 levels. Despite the above, liquidity levels can still be considered high, also given the large amounts of free reserves held with the HNB. At the same time, the liquidity risks associated with the high share of liabilities toward nonresidents in total liabilities did not materialize during the crisis given parent banks' strong commitment vis-à-vis Croatia.

Chart 2

**Effects of HNB Measures in Response to the Spillovers of the Global Crisis**




*Source: HNB.*

*Note: RR = reserve requirement.*

### 3.4.3 Shock-Absorbing Factors

Croatia's banking sector is well capitalized in terms of standard capital ratios. Notwithstanding substantial capital increases by banks, capital adequacy fell slightly in 2008 on the further tightening of capital adequacy regulations, which required banks to apply higher risk weights to foreign currency-denominated (and -indexed) claims vis-à-vis unhedged borrowers. However, at 15.2%, in 2008 the capital adequacy ratio was still well above the 10% required by Croatian law (see table 12). Bank capitalization improved again, in 2009 in particular owing to capital increases (mainly via retained earnings) in the context of the global crisis as well as slower growth in risk-weighted assets as a result of a slowdown in credit growth and stepped-up lending to the public sector (which carries lower risk weights). In order to further strengthen bank capitalization in line with the new Credit Institutions Act (which entered into force on January 1, 2009, replacing the Banking Act) and complementary HNB decisions on the capital adequacy of credit institutions, the HNB increased banks' minimum capital requirement from 10% to 12% as of March 31, 2010, when Basel II standards became operational in Croatia. Preliminary HNB data for the first quarter of 2010 reveal a capital adequacy ratio of some 19% for the banking sector. The rather substantial increase as compared to year-end 2009 is, however, less the result of increases in capital, but can largely be explained by lower risk weights applied for foreign currency-denominated (or –indexed) lending within the framework of Basel II compared with those applied under previous national regulations.

These substantial capital buffers allow the banking sector to withstand shocks stemming from operational and market risks and underpin its shock-absorbing capacities. In fact, HNB stress tests showed that even under a shock scenario which assumes a GDP decline by 6% and an exchange rate depreciation by 10%,[22] the banking sector as a whole would remain adequately capitalized. Moreover, stress tests for individual banking groups suggest that under the shock scenario, corporate banks would be the most exposed as they have the lowest initial capital adequacy ratios.

Moreover, despite the severity of the economic downturn and the increase in nonperforming loans, the banking sector retained its profitability in 2009, albeit at somewhat lower levels than during the boom years. This should provide banks with an additional buffer to weather the global economic and financial crisis, with retained earnings helping beef up banks' capital positions.

Finally, as the global crisis experience showed, widespread foreign ownership also bolstered banking system stability. In fact, foreign banks' strategic, long-term interest in Croatia and their commitment to supporting their Croatian subsidiaries during the turbulent times in late 2008 and early 2009 helped mitigate the impact of the crisis on the banking sector, both directly and indirectly. Specifically, parent banks were instrumental in further strengthening subsidiaries' capital base (predominantly via retained earnings) as well as in providing sufficient funding and liquidity. Moreover, Croatian subsidiaries indirectly benefited from the positive spillovers of foreign banks' commitment to and action in other CESEE countries. Last but not least, they also benefited from private-public coordination under the aegis of international financial institutions (e.g. through the European Bank Coordination ("Vienna") Initiative), which helped restore public trust and alleviate confidence concerns.

[22] *For further details, see HNB (2009b).*

Box

## Capital Flows During the Crisis Years 2008–09

*Croatia's pre-crisis growth model was largely based on domestic demand and financed by large-scale capital inflows. These inflows were driven by both pull factors (e.g. privatization, financial liberalization, favorable economic prospects) and push factors (e.g. low global interest rates). According to a new HNB paper, the monetary policy conduct of the Croatian central bank also contributed indirectly to additional capital inflows.[1] While these capital inflows helped finance the country's convergence and catching-up process, they also entailed widening external imbalances, which were easy to finance as long as favorable global liquidity conditions prevailed. The general setting changed considerably with the outbreak of the global financial crisis, though. In fact, the limited availability and increasing cost of capital did not only take a toll on real economic activity, but also exposed Croatia's substantial refinancing needs.*

*Against this background, this box aims to provide a comprehensive picture by analyzing capital flows based on balance of payments data, external debt and BIS statistics (i.e. claims and liabilities of BIS reporting banks).[2] These different sources provided largely consistent data.*

*Croatia has been affected by the global financial crisis inter alia through the tightening of global credit conditions, resulting in a slowdown in (or the temporary reversal of) capital inflows.*

*First, according to balance of payments data, total net capital inflows dropped considerably until and including the third quarter of 2008, when they even turned negative, but picked up considerably in the final quarter of the year. This was not an unusual development but rather one that followed seasonal developments, as, in general, huge tourism-related current account surpluses in the third quarter of a year imply less need for external financing. Hence, developments in 2009 largely mirrored the general pattern of total capital inflows seen in previous years, despite some moderation in volumes (in particular in the first half of 2009). However, the composition of capital flows changed considerably in line with the spillovers of the global crisis and the HNB's monetary policy measures taken in response to these spillovers.*

*In more detail, developments in the first three quarters of 2008 were largely driven by FDI inflows (which were already decelerating in the face of an increasingly uncertain global environment) and banking inflows (which were also losing momentum following restrictive HNB measures). The picture changed in the final quarter of 2008, when Croatia recorded considerable portfolio investment outflows triggered by the collapse of Lehman Brothers and the subsequent deepening of the global financial market turbulences. At the same time, FDI inflows and other private investment inflows picked up considerably. While the former was due to the public bid of Hungary's oil company MOL for a 31% stake in its Croatian counterpart INA in a deal worth some EUR 1.3 billion, the latter can be attributed to increased banking inflows, which most likely accelerated on the back of parent bank support during the height of the crisis. Other public investment flows remained negligible throughout 2008.*

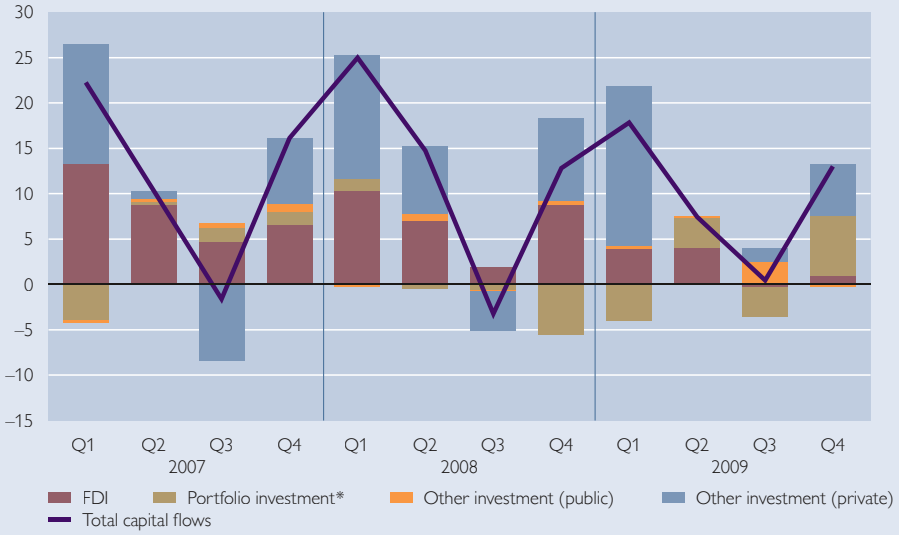
*In the first quarter of 2009, portfolio investment outflows continued in a still adverse global environment, but they were by far compensated for by substantial banking inflows, which grew strongly as HNB measures (relaxation of foreign exchange liquidity regulations) allowed banks to repatriate parts of their foreign assets to remedy domestic liquidity pressures. In the second quarter of 2009, portfolio investments turned positive, a development which was largely driven by the government's EUR 750 million Eurobond issue in May; this suggests that private portfolio investment flows remained negative also in the second quarter of 2009. Among the most striking developments in the third quarter of 2009 was, on the one hand, the relatively strong increase in other public investment inflows, which was driven by Croatia accepting the IMF's general and special SDR allocation (amounting to EUR 330 million), and,*

[1] *For further details, see Ljubaj, Martinis and Mrkalj (2010).*

[2] *When analyzing capital flows it is important to differentiate between flows (balance-of-payments data) and changes in stocks (external debt statistics and BIS data on claims and liabilities of BIS reporting banks), as the latter also comprise exchange rate effects, reclassifications and other adjustments, as well as revaluation adjustments (e.g. write-offs of loans, price changes of securities).*

**Capital Flows**

*Net flows in % of GDP based on BOP data*




*Source: IFS.*

**Including financial derivatives.*

*on the other hand, the negative net FDI flows, which were a result of relatively large FDI outflows related to equity investments of INA in oil exploration in Syria and round-tripping transactions[3] related to the takeover of a Croatian company by a foreign owner. At the same time, portfolio investment outflows turned again negative following the repayment of a EUR 450 million bond by Zagrebacka banka.*

*The final quarter of 2009 brought about another substantial pick-up in portfolio investment inflows, which was largely driven by the government's EUR 1.1 billion Eurobond issue in financial markets. FDI inflows turned again positive in the final quarter of 2009, but remained rather moderate in comparison to developments seen in 2007 or 2008.*

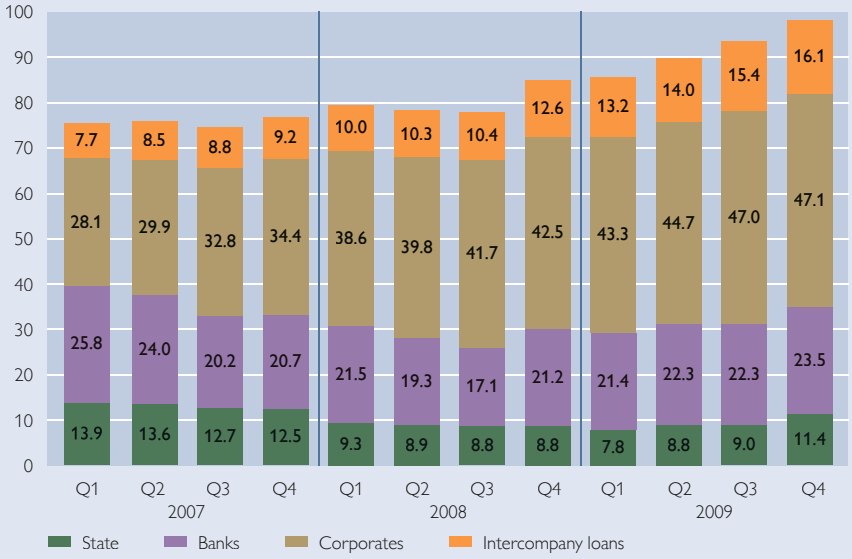
*Second, external debt statistics show that Croatia's gross external debt continued to increase over the last two years. In 2008, gross foreign debt increased from 76% of GDP to 85% of GDP. In particular during the first three quarters of 2008, the corporate sector heavily borrowed from abroad, thereby circumventing HNB credit restrictions on domestic lending. However, nonfinancial corporations' foreign borrowing slowed markedly in the final quarter of 2008, when direct access to foreign funding became more limited and costly. By contrast, in the context of HNB restrictions, banks gradually reduced their foreign liabilities over the first three quarters of 2008, but markedly stepped up foreign borrowing in the final quarter of 2008 to compensate for the decrease in domestic funding sources (partly related to temporary deposit withdrawals). Similarly, intercompany loans picked up in the last quarter of 2008 (partly to be explained by round-tripping transactions) while public foreign debt levels decreased in the first half of 2008 and stabilized at 8.8% of GDP in the second half of the year.*

*Croatia's gross foreign debt levels increased further by some 13 percentage points in 2009, reaching some 98% of GDP at year-end. Besides the strong fall in GDP in 2009 (which explains an increase in total external debt of some 4 percentage points), this can largely be attributed to resuming foreign borrowing of the corporate sector starting from the second quarter of 2009, when global liquidity pressures subsided in the wake of considerable monetary easing in industrial countries, inter- and supranational coordinated support measures and*

[3] *For further details, see issue No. 154 of HNB (2009e).*

### External Debt Structure by Debtors

*% of rolling 4 quarter GDP*



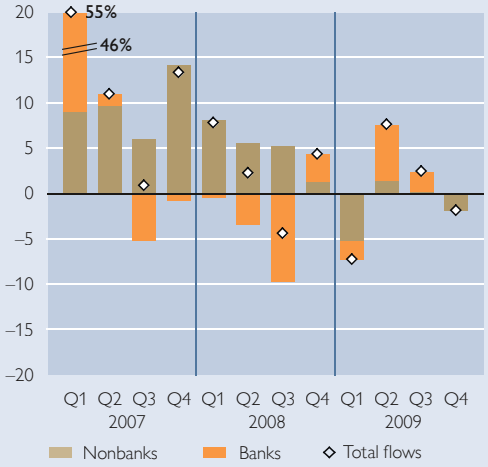

*Source: HNB, OeNB.*

*investors' normalizing risk appetite. Similarly, foreign debt related to intercompany loans increased considerably over 2009, suggesting that parent companies continued to provide financing to their subsidiaries during the crisis (even when adjusted for round-tripping). Moreover, in an improving global environment the public sector also contributed to an increase in foreign debt. Banks' foreign indebtedness increased, however, more moderately in 2009, given sluggish domestic credit demand and thus less need to secure external funding.*

*Third, according to BIS data, changes in the claims of BIS reporting banks show that total capital inflows to Croatia started to decelerate from the first quarter of 2008 and even turned negative in the third quarter of 2008, a development which was largely driven by banking*

### Claims of BIS Reporting Banks

*Exchange rate-adjusted changes in stocks in % of GDP*




### Liabilities of BIS Reporting Banks

*Exchange rate-adjusted changes in stocks in % of GDP*


*Source: BIS, OeNB.*

*flows and was in line with the aforementioned HNB measures and seasonal factors. In the final quarter of 2008, however, banking inflows accelerated again, implying that foreign bank presence may have provided some shelter during times of heightened global liquidity pressures (see also Mihaljek, 2009). The claims of BIS reporting banks vis-à-vis Croatian nonbanks (albeit gradually decelerating toward year-end) increased over the whole year 2008. However, over the first quarter of 2009, BIS reporting banks reduced their positions vis-à-vis all sectors in Croatia, most likely responding to liquidity pressures in home markets. Although capital flows rebounded in the second quarter of 2009, they remained at rather moderate levels thereafter, given subdued credit demand due to unfavorable economic conditions.*

*The liabilities of BIS reporting banks vis-à-vis Croatia decreased strongly in the second and last quarters of 2008 as well as the first quarter of 2009, an indication that in particular at the turn of 2008–09, tight global liquidity conditions and limited access to foreign funding induced Croatian banks to repatriate parts of their foreign assets. This was supported or driven by HNB measures, as the relaxation of minimum reserve requirements and the easing of foreign currency liquidity regulations (with the aim of alleviating the government's financing needs) facilitated banks' recourse to foreign assets. With the stabilization of global financial markets and waning liquidity pressures from the second quarter of 2009, Croatian banks again started to rebuild foreign assets.*

*Overall, the global crisis seems to have had a rather limited impact on the general pattern of capital flows to Croatia, which was largely in line with previously observed (partly seasonally-determined) developments, although the crisis did change the composition of capital flows. Accordingly, Croatia did not experience a major meltdown in cross-border capital flows during 2008 and 2009, as parent banks and corporations cushioned large-scale reversals of capital flows, while corrective central bank action (aimed at liquidity easing by relaxing regulatory requirements) largely helped offset the crisis-related slowdown (or temporary reversal in certain sub-segments) of capital inflows.*

## 4 Nonbank Financial Institutions and Financial Markets

Similar to the financial system of other CESEE countries, Croatia's financial system is dominated by banks, which continue to represent the main channel for financial intermediation. After rapidly gaining ground in the early and mid-2000s, nonbank financial intermediation lost again in relative importance during the crisis years 2008 and 2009, making up for some 23.4% of total financial sector assets at end-2009, down from 26.2% in 2007. Developments within individual market segments were heterogeneous though. While investment funds have suffered substantial losses in market share, insurance and leasing companies as well as compulsory pension funds strengthened their market positions. Despite continued positive developments in many market segments, nonbank financial intermediation in Croatia still holds further catch-up potential, in particular when taking the EU as a long-run convergence benchmark. The pace of catching-up will largely depend on the speed of economic recovery, the magnitude of debt restructuring in individual economic sectors as well as foreign investors' risk appetite in the wake of the global crisis and Croatia's ongoing EU integration process.

### 4.1 Nonbank Financial Institutions

Following several years of rapid expansion, developments in Croatia's nonbank financial sector took a hit in 2008 and 2009 in the face of less favorable global economic and financial developments. Thus, the nonbank financial sector lost some market share to the banking sector over the last two years in terms of total

financial sector assets (see table 13). Adverse movements in global and local stock markets in 2008 and the first quarter of 2009 entailed substantial asset losses in particular at open-end (but also closed-end) investment funds, which had a fairly strong bias toward equity investments before the crisis. In fact, in 2007, around 50% of open-end investment funds' total assets consisted of equity funds and an additional 30% of balanced funds (which contain a more or less large equity part). Thus, driven by the global stock market slump following the demise of Lehman Brothers, their share in total financial sector assets has contracted by more than two-thirds since 2007. By contrast, (compulsory) pension funds' assets continued to grow buoyantly, as they are invested to a large extent (some 75%) in less risky domestic and foreign government bonds. Similarly, insurance companies' assets rose further, with the life segment outperforming the nonlife segment, where in line with the economic downturn in particular the demand for insurance of land motor vehicles, insurance of goods in transit and credit insurance had fallen considerably. Leasing companies also gained some ground over the last two years, driven mainly by strong growth in finance leasing (machines and equipment, real estate). Given the relatively limited size of the sector (at some 33% of GDP at end-2009) in comparison with the banking system, the risks related to the nonbank financial sector seem rather limited at present and are unlikely to erode financial system stability. However, some segments' strong dependence on stock market developments (suggesting higher risks in case of further adverse shocks) and the potential for regulatory arbitrage by (parent) banks (which very often also own nonbank financial intermediaries) are calling for a cautious policy stance and close cooperation between the HNB, which is in charge of banking supervision, and the Croatian Financial Services Supervisory Agency (HANFA), which supervises nonbank financial institutions.

Table 13

**Financial Sector Structure**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| | *Share in total financial sector assets in %* | | | | | | |
| Banks, nonconsolidated assets (net)[1] | 84.0 | 81.7 | 79.0 | 76.6 | 73.8 | 77.7 | 76.6 |
| Open-end investment funds, net assets | 1.2 | 1.6 | 2.7 | 4.0 | 6.4 | 2.1 | 2.4 |
| Closed-end investment funds, net assets | 0.4 | 0.4 | 1.1 | 1.4 | 1.6 | 0.4 | 0.4 |
| War Veterans Fund[2] | . . | . . | . . | . . | . . | 0.5 | 0.4 |
| Insurance companies | 5.2 | 5.1 | 5.0 | 4.9 | 5.2 | 5.6 | 5.8 |
| Housing savings banks, nonconsolidated assets (net)[1] | 1.4 | 1.9 | 1.9 | 1.6 | 1.4 | 1.5 | 1.4 |
| Compulsory pension funds, net assets | 1.9 | 2.8 | 3.6 | 4.0 | 4.5 | 4.7 | 5.9 |
| Voluntary pension funds, net assets | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 |
| Savings and loan cooperatives[3] | 0.6 | 0.5 | 0.5 | 0.5 | 0.4 | . . | . . |
| Savings banks | . . | . . | . . | . . | . . | 0.0 | 0.0 |
| Leasing companies | 5.2 | 5.9 | 6.2 | 6.8 | 6.5 | 7.3 | 6.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

*Source: HNB, HANFA and Ministry of Finance of the Republic of Croatia.*

[1] *Supervisory data (figures may differ from monetary statistics because of consolidation).*
[2] *War Veterans Fund members have been able to withdraw their shares from the fund freely since April 14, 2008. This fund is therefore excluded from closed-end funds.*
[3] *These intermediaries are in the process of liquidation and were required to transform into banks or credit unions. Latest available data refer to June 2007.*

### 4.2 Bond Market Developments

The dynamic development of Croatia's domestic bond market from 2004 to 2007 took a hit in the wake of the global financial crisis, as issuing activity nearly came to a halt in 2008 and 2009 (see chart 3). Sluggish issuing activity coupled with the repayment of maturing bonds and early repayments led to a marked decrease in bond market capitalization both in absolute and relative terms compared to pre-crisis levels (see chart 4). The share of corporate bonds in total bond market capitalization remained fairly low at some 11%.

In more detail, the government, which used to borrow heavily via the domestic bond market in order to substitute for foreign borrowing and to avoid further increases in the country's external debt levels, did not tap domestic bond markets over the last two years, but rather opted for refinancing via the domestic banking sector (syndicated loans) and international financial markets (see section 2). Similarly, against the background of a rather small number of issues in 2008 and 2009 (four altogether) the total volume of corporate bond issues decreased markedly, driven on the one hand by lower demand for financing in a weak economic environment, but on the other hand also by increased funding costs given higher risk premiums. This is in contrast to the years before when corporations had become increasingly interested in tapping the domestic bond market, inter alia to counter restrictive HNB measures, which limited the availability of bank credit.

In this context, it is important to note that no government, corporate or municipal bonds were listed in the domestic market for a year, i.e. from the final quarter of 2008 to the third quarter of 2009, and that issuing activity started to resume only from the final quarter of 2009 on, with two smaller corporate bond issues. In the first quarter of 2010, issuing activity seemed to have gained further momentum, with the government tapping domestic bond markets with a kuna-denominated bond issue amounting to HRK 3.5 billion (some EUR 480 million) and a euro-denominated issue worth EUR 350 million. Looking forward, Croatia's ongoing EU integration process (with prospective EU accession – depending

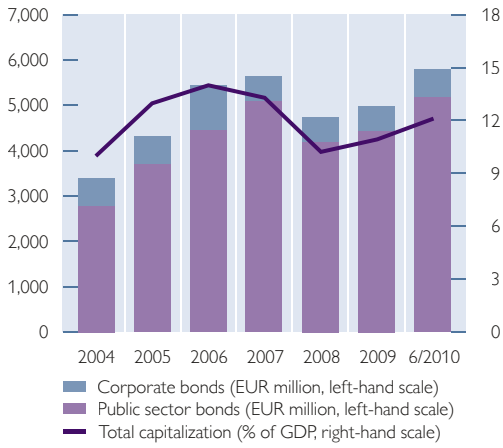
Chart 3

**Bond Issues in the Domestic Market**


*Source: Zagreb Stock Exchange.*

Chart 4

**Bond Market Capitalization**

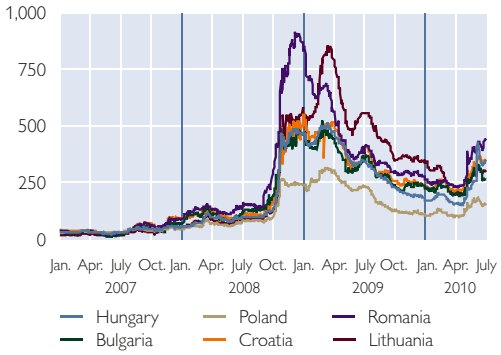



*Source: Zagreb Stock Exchange.*

Chart 5

**Eurobond Yield Spread Developments**

*JP Morgan Euro-EMBIG spreads, basis points*

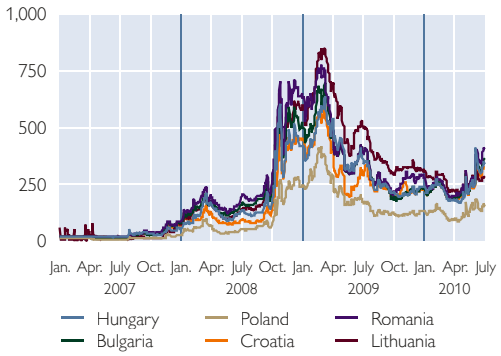



*Source: Bloomberg.*

Chart 6

**Credit Default Swap Developments**

*Sovereign 5-year CDS premiums, basis points*




*Source: Datastream.*

also on the length of the ratification process in all the EU Member States – in 2012 or 2013),[23] the related prospect of upcoming rating upgrades coupled with higher interest on the part of foreign investors in the domestic bond market, improving economic fundamentals, municipalities' need to co-finance EU-funded projects, the government's budgetary financing needs and the increasing role of institutional investors (e.g. pension funds) are all factors which are expected to underpin the growth potential of the domestic bond market.

Turning to international bond markets, starting from historically low levels, Croatia's long-term government bond yield spreads versus the euro area picked up substantially in the aftermath of the collapse of Lehman Brothers, in line with developments seen in many of Croatia's CESEE peers (see chart 5). Likewise, risk premiums (measured in terms of sovereign 5-year credit default swap spreads) increased markedly during the height of the crisis at the turn of 2008–09, but by March 2010 had come down considerably, while still remaining twice as high as before Lehman's bankruptcy (see chart 6). As global financial market conditions improved from the second quarter of 2009 and bond yield spreads and risk premiums decreased, the government tapped international financial markets with one euro-denominated and one U.S. dollar-denominated bond issue in May and November 2009, respectively. In line with global developments, in the second quarter of 2010, risk premiums and bond yield spreads picked up again on increasing global sovereign default risk concerns, which led the government to postpone a planned international bond issue to the second half of 2010.

### 4.3 Stock Market Developments

After the stock market rally in 2006 and 2007, when Croatia belonged to the best performers worldwide, Croatian stock markets took a severe hit in 2008, in particular in the aftermath of the collapse of Lehman Brothers. Croatia's main stock index CROBEX fell by 67% in 2008 on the back of investors' sharply increasing risk aversion and continued to do so in the first quarter of 2009 as

[23] *By the end of June 2010, Croatia had opened all 35 EU negotiation chapters and provisionally closed 20 of them.*

recession fears took hold and profit expectations deteriorated, when the CROBEX bottomed out at 1,263 points (75% below end-2007 levels) in early March. However, the subsequent improvement in global investor sentiment brought about the stabilization and then some recovery of Croatian stock markets in the remainder of 2009. Nevertheless, at year-end 2009, the CROBEX was still some 60% down on its end-2007 level. Due to falling equity prices, stock market capitalization (which at 112% of GDP was roughly at par with Croatia's bank intermediation levels in 2007) fell markedly over the crisis years, reaching some 40% of GDP at year-end 2009 (see table 14). Given uncertainties regarding the magnitude of the impact of the global crisis on the real economy, falling stock market capitalization went in tandem with strongly decreasing market turnover and liquidity. Driven by a rather favorable global environment, stock market indicators improved further in the first quarter of 2010, but the second quarter saw a correction against the background of resurfacing global risk aversion, which pushed Croatia's leading stock market index some 7.5% below its year-end 2009 level.

2009 also entailed some regulatory and structural changes on the Zagreb Stock Exchange. The new Capital Market Act came into force on January 1, 2009, aiming to increase market transparency and to align Croatian legislation more closely with EU standards. Also, in July 2009, a Multilateral Trading Platform (MTP) was created, which complements trading in the official and regulated markets, and led to a considerable drop in the number of listed shares. Finally, a new equity index was introduced in September 2009, the CROBEX 10, which comprises 10 blue chip companies with the largest market capitalization and turnover.

Given Croatian households' relatively elevated indebtedness and more muted income prospects, as well as corporations' frequent recourse to alternative forms of financing (e.g. bank finance, direct external borrowing), no major local stimuli can be identified for the Croatian stock market for the time being. Consequently, in the short run, equity market developments will largely be shaped by sentiment swings in global markets. However, improving macroeconomic conditions, reaccelerating structural reforms (including privatization) and resuming foreign (equity) capital inflows encouraged by Croatia's ongoing EU integration process offer a rather favorable medium-term outlook.

Table 14

**Stock Market Indicators**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 6/2010[2] |
|---|---|---|---|---|---|---|---|---|
| Crobex stock market index | 1,185 | 1,566 | 1,998 | 3,210 | 5,239 | 1,722 | 2,004 | 1,855 |
| Number of listed shares | 175 | 183 | 194 | 202 | 383 | 377 | 280 | 268 |
| Market capitalization (EUR million)[1] | 4,856 | 8,048 | 10,945 | 22,014 | 48,086 | 19,396 | 18,557 | 17,316 |
| Market capitalization (% of GDP)[1] | 16.4 | 25.1 | 30.5 | 56.5 | 112.1 | 41.5 | 40.6 | 35.9 |
| Regular turnover (EUR million)[1] | 198 | 349 | 639 | 1,428 | 2,999 | 2,331 | 1,013 | 372 |
| Regular turnover (% of GDP)[1] | 0.7 | 1.1 | 1.8 | 3.7 | 7.0 | 4.9 | 2.2 | 1.6 |

*Source: Zagreb Stock Exchange.*

[1] *Equities.*
[2] *Figures expressed as a percentage of GDP are based on AMECO 2010 GDP forecast.*

## 5 Concluding Remarks

The previous macrofinancial stability assessment on Croatia (Gardó, 2008) identified 1) a rapid pace of financial deepening based on strong growth of credit to the private sector, 2) a widespread use of foreign currency-denominated or –indexed loans and the existence of related indirect credit risk, 3) high and rising external imbalances and 4) upward inflationary pressures as the main risk factors to financial stability in Croatia.

The international environment has changed considerably since then, as the deepest financial and economic crisis for decades hit the global economy in 2008 and 2009. Against this background, the global crisis put the resilience of Croatia's economic and financial system to a severe test, which the country has mastered for the time being, and to some extent also altered the country's risk profile. In fact, the crisis itself and the adjustment measures implemented by the authorities to cope with the spillovers of the global crisis reduced some of the existing risks, whereas other risks were intensified by or materialized during the crisis.

In more detail, Croatia was hard hit by the global economic and financial crisis especially in 2009, when the economy slid into its deepest recession since early transition. The current account improved considerably during the crisis but the country's external position remains an important source of vulnerability, given high (and in 2008 and 2009 further increasing) external debt levels and substantial roll-over needs, with the spillovers of the global financial crisis also revealing temporary financing strains in early 2009. Yet, in contrast to other countries in the CESEE region, Croatia managed to weather the global financial turbulences without recourse to international support. Still, the country may have benefited from the positive spillover effects of international support measures in other CESEE countries as well as the stabilization and recovery of global financial markets starting from March 2009. Nevertheless, Croatia's major macrofinancial challenges relate first and foremost to alleviating the country's external vulnerabilities, in particular on the financing side. In this context, it is crucial to prevent a further deterioration in Croatia's external debt position. This is a challenging task given corporations' increasing reliance on direct foreign borrowing and Croatia's obligation to fully liberalize capital flows in accordance with the *acquis communautaire*.[24]

As in other CESEE countries, inflationary concerns quickly became a non-issue in Croatia in the context of the global crisis, which gave the HNB the leeway to focus on other and partly newly-emerging priorities. In fact, the HNB successfully managed to preserve financial and exchange rate stability during the turbulent times by employing a wide set of measures, ranging from verbal interventions and standard monetary policy measures (mainly related to regulations on reserve and

[24] *According to Croatia's Stabilization and Association Agreement (SAA) with the EU, from the fourth year after the SAA's entry into force (i.e. by February 1, 2009), Croatia has to ensure free movement of capital relating to portfolio investment and financial loans and credits with maturities of less than one year. However, in line with the SAA provisions and due to exceptional circumstances (i.e. in order to facilitate coping with the spillovers of the global economic and financial crisis), Croatia agreed with the European Commission on an extension of the deadline. Accordingly, the liberalization of short-term loans to nonresidents with maturities from 3 months to 1 year was postponed until January 1, 2010, while short-term loans with maturities of up to 3 months shall be liberalized as of July 1, 2010. Now, as these provisions have entered into force, the only restriction in place is related to deposit transactions of residents abroad, which – under Article 78 of the Foreign Exchange Law – will be liberalized as of January 1, 2011.*

liquidity requirements) to outright foreign exchange market operations. However, the HNB's limited room for maneuver against the background of the tightly managed float and the still high external imbalances highlights the continued need for fiscal prudence with a view to lasting macrofinancial stabilization. In fact, in light of deteriorating public finances, fiscal reform and consolidation are imperative, all the more so as public finances are still burdened with subsidies for various industries (e.g. shipping), high health and pension commitments as well as substantial quasi-fiscal expenditure. Therefore, ensuring lasting fiscal consolidation, mainly through spending restraint, remains an important challenge.

Croatia's largely bank-based financial system remained stable and profitable over the last two years, despite less favorable financial and economic conditions and temporary confidence problems (as was the case in some other CESEE countries). Although financial deepening largely came to a halt during the financial crisis, the Croatian banking system is relatively advanced in a CESEE context, both as regards the degree of financial intermediation and the institutional setting. In the wake of the global financial crisis, credit growth decelerated sharply, driven by both supply- and demand-side factors. Consequently, the HNB's fight against overly high credit growth based on banks' foreign borrowing paled in comparison to previous years' priorities. Still, the management of credit risk remains the most important financial stability challenge for Croatia's banking sector. In fact, like in other CESEE countries and advanced economies, households and corporations in Croatia have increasingly encountered problems in servicing their debt burden (which ranks among the highest in the CESEE region) in the face of weak economic conditions. Credit risk is additionally compounded by the dominant role of foreign currency positions, which – in a worst-case scenario of a substantial depreciation of the domestic currency – would imply substantial foreign exchange risks for unhedged borrowers. Banks' exposure to market risks seems to be subdued; by shifting foreign exchange and interest rate risk to clients, banks to a large extent transformed market risk into credit risk. Again, this reinforces the need for carefully monitoring credit risk.

At the same time, it is also important to stress the banking system's shock-absorbing capacity. Up to now, the sector's still fairly high profitability, its strong capitalization and the strategically-oriented presence of foreign banks have helped absorb losses stemming from credit risk. Moreover, banks' good liquidity positions before the crisis, which gave the central bank enough room for maneuver to carry out liquidity-easing operations during the turbulent times, also allowed banks to weather the global liquidity pressures. Banks' sizeable net foreign liabilities continue to represent a potential vulnerability factor, though, and require cautious monitoring, even if the main external financing source of the Croatian banking sector are parent banks, which have shown a strong commitment to the CESEE region and have proven their readiness to support their CESEE subsidiaries in times of crisis.

The HNB's main challenge continues to be safeguarding both financial and monetary stability in a still uncertain global economic and financial environment, while also contributing to economic recovery. How successful this will be hinges not only on external factors, such as the short- to medium-term global economic prospects and the financial position of parent banks, but also on local determinants like the magnitude and speed of debt restructuring by different economic sectors,

the pace of banks' resolution of the nonperforming loan problem and their willingness to re-ignite lending activity as well as the degree of support provided by other policy areas.

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# Measuring Competition in CESEE: Stylized Facts and Determinants across Countries and Sectors

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*Using the Amadeus firm-level database, this paper examines sector-specific indicators of competition in a number of Central, Eastern and Southeastern European (CESEE) countries. More specifically, it provides an overview of two key indicators of the level of competition, namely profit margins and the concentration of sales, across 27 industries in 13 CESEE countries. We discuss the advantages and disadvantages of various indicators of competition that are commonly used in the literature and explain why we use the aforementioned proxy variables for the intensity[2] of competition. The paper then provides a cross-country and cross-sector overview of the differences in these competition indicators for the period from 1999 to 2007 before empirically identifying the main determinants of these differences. We find large differences between individual sectors, while differences between countries are considerably smaller. Profit margins and concentration ratios are notably high in communications, finance, housing, and miscellaneous goods and services. Manufacturing achieves, on average, lower profit margins and concentration ratios than other sectors. Over time, profit margins have increased in most sectors as a result of the rapid catching-up process in the CESEE region, while concentration ratios have declined, suggesting that the region is still in a phase of rapid market expansion. We observe some indication of an increase in competition in only a handful of sectors, e.g. housing and utilities, passenger transport, and information services. At the same time, in many retail trade sectors and in financial services, both profit margins and concentration ratios displayed disproportionately high growth in our sample period. All remaining sectors show diverging trends for both indicators.*

*JEL classification: C23, D40, L11, L52*
*Keywords: Competition, Central, Eastern and Southeastern Europe, profit margins, firm-level data*

## 1 Introduction

Economic theory suggests that competitive markets exert a positive influence on the economic development of countries. Competitive markets encourage the entry of new firms and act as a powerful selection mechanism for existing companies, ensuring that only the most efficient survive. As argued by Schumpeter back in 1942, incumbent firms with market power are constantly threatened by existing competitors as well as new market entrants. Given this permanent threat of competition, firms need to innovate, which in turn spurs productivity growth. Competition thus improves the allocation of production factors across and within sectors, creates powerful incentives for innovation and productivity growth and ultimately contributes to economic growth. Hence, economic policymakers have strong incentives to ensure a highly competitive environment. This is further corroborated by the view that highly competitive markets will also ensure that consumer needs are served best through an appropriate product range, high-quality

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[2] *Please note that we use the terms "intensity," "degree" and "level" of competition interchangeably throughout this study.*

products and services, and low prices. It is therefore no surprise that competition policy plays an important part in the economic policy framework of most countries and of the EU.

In principle, the positive effects of competition on economic growth apply to all economies. As far as Central, Eastern and Southeastern European (CESEE) countries are concerned, however, there are some special aspects. First, most CESEE countries are (very) small economies. In particular in the nontradable sectors, where outside producers cannot increase the level of domestic competition via imports, the number of companies is therefore likely to be limited. This in turn increases the danger of oligopolistic or even monopolistic market structures. Second, the economic "starting point" of all CESEE countries 20 years ago was characterized by state-owned monopolies. Unlike countries with an uninterrupted capitalist history, the CESEE countries had to (re-)create competitive market structures and functioning competition policies from scratch, a process which was (and in some cases still is) certainly driven by the process of EU accession and the associated adoption of the acquis communautaire. Third, future economic growth in CESEE may have to rely more on domestically generated productivity gains than in the past, when imported capital was readily available and acted as a key driver of growth. Given the above-mentioned positive effects that competitive markets are likely to have on productivity growth and consumer welfare, it is of particular importance to look at the level of competition in CESEE.

To our knowledge, no paper has yet systematically examined the country- or sector-specific differences in indicators of the intensity of competition in CESEE. Nor have the determinants of these differences been analyzed. Against this backdrop, in this paper we use the Amadeus firm-level database to provide an overview of two key indicators of the intensity of competition that are commonly used in the literature, namely profit margins and the concentration of sales, across 27 sectors in 13 CESEE countries.[3] In the next section, we review the literature on competition in CESEE. In section 3, we discuss conceptual issues related to the measurement of competition and justify our choice of indicators. Section 4 provides an exposition of the database and describes the level of competition in our sample across different sectors and countries as well as over time. Section 5 then presents an empirical investigation of the determinants of the country- and sector-specific differences in the indicators of competition, and section 6 concludes.

## 2 What Do We Know about Competition in CESEE?

Several arguments suggest that the degree of competition should differ between developing and emerging economies as opposed to highly mature markets. Graddy and Klepper (1990) observe empirical regularities in the evolution of new industries, which suggest that the early phases of industrialization are characterized by growing numbers of firms, followed by a phase of decline or shakeout in firm numbers. In the final phase, the number of firms stabilizes. Each stage is likely to be characterized by different forms of competition (price versus quality) and a different intensity of competition. While the first phase is marked by less intense competition pressures

[3] *Bosnia and Herzegovina (BA), Bulgaria (BG), the Czech Republic (CZ), Estonia (EE), Croatia (HR), Hungary (HU), Lithuania (LT), Latvia (LV), Poland (PL), Romania (RO), Serbia (RS), Slovenia (SI) and Slovakia (SK).*

compared with the second, the outcome in the final phase is unclear.[4] Graddy and Klepper (1990) show that the competitive outcome in the third phase depends on specific developments in the early phases of market development, thus assigning an important role to competition policy in the early stages of industrialization. Clearly, industries in developing and emerging markets are expected to be predominantly in the first or second phase, which calls for the careful monitoring of the evolution of market structures for the long-term benefit of consumers.

In the CESEE countries, a number of industries may already have reached or completed the shakeout stage. The existing literature on competition in CESEE is, however, limited. Moreover, most papers focus on competition policy and the impact of competition on economic performance. Hölscher and Stephan (2004), for example, provide an overview of competition policy in a number of CESEE countries prior to their accession to the EU. They find that competition policy in these countries was already well established in the late 1990s but caution that a one-to-one adoption of EU competition policies in CESEE may not be the optimal solution, given that these countries' small size but high level of economic integration creates particular difficulties in defining the "relevant market." Vagliasindi (2006) analyzes the link between competition policy and the intensity of competition in CESEE. The author uses survey results to assess the implementation of competition policy on the one hand and the intensity of competition on the other. A key finding of the paper is that the implementation of competition policy has a significant positive impact on the intensity of competition. At the same time, Vagliasindi argues that privatization helps create functioning markets only if it is accompanied by suitable institutional reforms.

A number of papers look at the link between competition and economic performance. Djankov and Murrell (2002) survey the available literature on the impact of product market competition on enterprise efficiency in transition economies. They find that in Eastern European countries, product market competition – through both domestic and import competition – has a significant effect in terms of improving enterprise performance.[5] Carlin, Schaffer and Seabright (2004) find that monopolies in transition countries innovate less and grow more slowly than firms facing at least a minimum of rivalry. The authors also argue that the presence of only a few rivals enhances firm performance more than the presence of many competitors. The evidence they present for the second finding is, however, empirically weaker. The authors use the results of the cross-country Business Environment and Enterprise Performance Survey (BEEPS), in which firms were asked, inter alia, to provide a self-assessment of the intensity of competition that they are facing.[6] Using the same database, Commander and Švejnar (2007) find that competition (as well as foreign ownership) has a positive impact on firms' performance, defined as the level of sales adjusted for inputs. Fernandes (2009)

[4] *Glen, Lee and Singh (2001) find that the persistence of profitability of firms in emerging markets tends to be smaller than that of firms in mature economies. This finding, which the authors regard as evidence of relatively more intense competition in emerging markets, is, however, based on non-European emerging market economies.*

[5] *They also find, however, that increased competition may have negative effects on efficiency when incentives are weak, as was often the case during the early transition period (Djankov and Murrell, 2002, p. 763).*

[6] *Specifically, firms were asked to report the number of competitors in the market for their main product, the expected impact of a price increase by 10% and their price-cost margin (Carlin, Schaffer and Seabright, 2004, p. 16).*

looks at the structure and performance of the services sector in transition economies. Using EBRD transition indices to capture progress in liberalization, she finds a positive and significant impact of liberalization on productivity growth in services sectors and in downstream manufacturing industries. She therefore argues that product market barriers that limit competition in various services sectors should be removed to enhance productivity growth.[7] Gradzewicz and Hagemejer (2007) argue that both domestic competition and foreign competition (imports) significantly lower the level of markups. Their measure of domestic competition is the Herfindahl index of market concentration. Ospina and Schiffbauer (2010) find competition to have a positive impact on firm productivity. This study is based on firm-level data from the World Bank Enterprise Survey, and the indicators of competition used by the authors are markups and cost competition. Like the BEEPS indicator of competition intensity, the World Bank survey is based on firms' self-assessment.

## 3 How to Measure Competition

Although economists tend to attribute a significant role to the intensity of competition, there is a clear lack of suitable concepts and data to measure competitive pressure. Choosing suitable indicators for the analysis of competition intensity thus involves difficult choices and compromises.

The papers surveyed above focus on competition policy or the impact of competition on economic performance. Although most of them use one or more indicators of competition, the selection of these indicators is not their primary concern. There are, however, also a few papers which aim specifically to find the most suitable indicators for measuring competition. A report for the U.K.'s Office of Fair Trading (OFT, 2004) e.g. lists 32 suitable indicators, which are grouped into the categories barriers to entry, productivity, concentration, profitability, prices, consumer complaints, innovation, switching costs and others. However, some of these indicator groups (e.g. consumer complaints) are mainly relevant for specific analyses (in this case consumer protection) rather than for a general assessment of the intensity of competition. In addition and more importantly, for most or all CESEE countries, many of the underlying data needed for the construction of indicators for barriers to entry, innovation and switching costs are not available. Another recent study looking at the measurement of competition is Creusen, Minne and van der Wiel (2006). The authors of this study use only four measures of competition, the so-called relative profit measure, the price-cost margin, the Herfindahl concentration index and the labor-income ratio, but analyze their pros and cons in some detail. They find that the different indicators frequently contradict each other as regards changes in the intensity of competition over time. According to the authors, "these differences can partly be traced back to differences in their economic concepts [...] because they respond differently to a reallocation of output from inefficient to efficient firms" (Creusen, Minne and van der Wiel, 2006, p. 1).

[7] *Campos and Coricelli (2002) provide a useful overview of the impact of liberalization and institutions on growth.*

The two indicators most commonly used in the literature are concentration measures and profit margins.[8] However, in neither case is the interpretation of a change in the indicator free of theoretical ambiguity.[9] Relatively high profit margins would a priori indicate less intense competition, but very low or negative profit margins may also point to predatory behavior by (some) market participants. In addition, what are considered normal profit margins is likely to depend strongly on the characteristics of the industry; moreover, profit margins tend to increase over time as the surviving firms' cost-effectiveness is higher without this having a detrimental effect on competition.

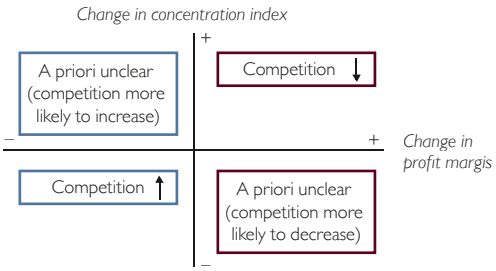
Lower concentration as a result of lower entry barriers to a market would normally be seen as an indication of an increase in competition. However, when firms in a market act more aggressively, thus driving out less efficient firms, the subsequent rise in concentration does not automatically imply less competition. This behavior was recently observed in the telecommunications sector of many Western European countries. A rise in competition tends to increase the market share of more efficient firms. This reallocation effect may even lead to a counterintuitive positive correlation between concentration, profit margins and competition.

This discussion makes clear that, when looking at just one indicator in isolation, the risk of misleading results is particularly high. We therefore use two alternative indicators of competition in our analysis, describing both indicators and their evolution over time and across countries. Thus, our analysis delivers a fuller picture of key indicators of competition in the CESEE region.

When we look at the two indicators of competition together, there are four possible scenarios, each of which suggests different changes in the level of competition (see chart 1). If profit margins and the concentration index fall, the intensity of competition in the market concerned is likely to increase. Conversely, if both measures rise, the intensity of competition is likely to decline. The two "mixed" scenarios are obviously more difficult to interpret. On balance, however, it would appear more likely that a drop in profit margins indicates an increase in the intensity of competition even if the concentration in the relevant market rises, and vice versa. This is because more recently and based on theoretical considerations, profit margins have by and large come to be seen as the relatively more important indicator of competition, although the above-mentioned caveats in interpretation still apply (Janger and Schmidt-Dengler, 2010; Boone, 2004).

Chart 1

**Combined Interpretation of Key Competition Indicators**




Source: OeNB.

[8] *The vast majority of studies on the link between product market competition and enterprise restructuring surveyed in Djankov and Murrell (2002) for example use only one indicator of competition, usually a measure of concentration, e.g. sales concentration.*

[9] *For further details, see also OFT (2004) and Boone, van Ours and van der Wiel (2007).*

## 4 A Map of Competition in CESEE

### 4.1 Definition of Indicators and Data Sources

The main source of data for our study is the Amadeus firm-level database. This database can be used to calculate a limited number of sector-specific competition indicators for the CESEE countries without having to exclude too many countries or sectors due to lack of data. These indicators can be grouped under the categories firm profitability and market concentration. While profitability can be measured using profit margins and return on assets, the Herfindahl index on sales (herfSALE) and the Herfindahl index on employment (herfEMPL) can be used to assess concentration.

All competition indicators are calculated directly, using indicators available from the Amadeus database. Profit margins (PRMA) are defined as profit and loss before taxes in relation to operating revenue:

$$PRMA=(PLBT/OPRE)*100$$

Profit and loss before taxes (PLBT) includes operating and financial profits. Operating revenue (OPRE) is equal to EBIT (earnings before interest and taxes) and includes sales plus stock variations plus other operating revenues but not value-added tax (VAT).[10]

Table 1

**Pairwise Correlation Coefficients between Different Indicators of Competition**

| | herf-SALE | herf-EMPL | RTAS | PRMA |
|---|---|---|---|---|
| | *1999–2007* | | | |
| herfSALE | 1 | | | |
| herfEMPL | **0.60** | 1 | | |
| RTAS | –0.05 | 0.01 | 1 | |
| PRMA | 0.06 | 0.06 | **0.53** | 1 |
| | *1999–2001* | | | |
| herfSALE | 1 | | | |
| herfEMPL | **0.60** | 1 | | |
| RTAS | –0.14 | –0.03 | 1 | |
| PRMA | 0.12 | 0.18 | **0.63** | 1 |
| | *2002–2004* | | | |
| herfSALE | 1 | | | |
| herfEMPL | **0.56** | 1 | | |
| RTAS | 0.01 | 0.09 | 1 | |
| PRMA | 0.19 | 0.17 | **0.64** | 1 |
| | *2005–2007* | | | |
| herfSALE | 1 | | | |
| herfEMPL | **0.59** | 1 | | |
| RTAS | 0.01 | 0.04 | 1 | |
| PRMA | 0.10 | 0.10 | **0.48** | 1 |

*Source: Authors' calculations.*

*Note: Calculations are based on the Amadeus dataset.*

Return on assets (RTAS) is calculated as profit and loss before taxes divided by total assets, where total assets are the sum of fixed assets (FIAS; intangible, tangible and other assets) and current assets (CUAS; stocks, debtors and other assets such as cash and cash equivalents):

$$RTAS=(PLBT/(FIAS+CUAS))*100$$

The Herfindahl index for a given industry sector is defined by the sum of the squared market shares:

$$HI=\sum_{j=1}^{N} s_j^2$$

with $s_j$ denoting firm $j$'s share of economic activity in total industry activity

$$s_j=(a_j \,/\, \sum_{j=1}^{N} a_j)$$

and $N$ the number of firms operating in the respective industry sector. Economic activity $a$ corresponds once to employment (herfEMPL) and once to sales figures (herfSALE). Note that the Herfindahl index lies in the interval $1/N$ (no concentration, meaning each firm

[10] *Ideally, we would have been able to construct a price-cost margin from the Amadeus database, however the information available on the different cost components of firms was unfortunately too sketchy for many industries and countries. In order to work with a reasonably large dataset and ensure sufficient comparability across countries and sectors, we chose to define profit margins as above.*

has the same market share) and 1 (total concentration, only one firm is in the market).

Given the multidimensionality of the dataset, which covers a large number of sectors and countries, we decided to limit the number of competition indicators that we use for our analysis to one per category. This facilitates the visualization and interpretation of the results. As a first step in this selection process we look at the correlations by sector and by country between the different indicators within the same category and across categories.[11]

We find a high correlation between Herfindahl concentration indices based on sales and on employment as well as between PRMA and RTAS. There is no sign of a strong correlation between the two categories of profitability and concentration. Thus, we decided to concentrate on one indicator from each category in order to paint a more complete picture of key indicators of competition in the CESEE countries. The main criterion for selection within each category is the availability of data. In this paper, we thus decided to focus on profit margins and the Herfindahl concentration index based on sales.

### 4.2 Choice of Sectoral Disaggregation

The sector composition we use has been guided by two considerations: First, we wanted to aggregate firms according to the distance from the final consumer at which they operate. Thus, we distinguish between manufacturers, wholesale traders and retail traders. Second, we wanted to arrive at a classification which could be matched as closely as possible to existing subcomponents of the Harmonised Index of Consumer Prices (HICP). Thus, we aggregated four-digit NACE (Revision 2) codes into 35 sectors.[12] Of these 35 sectors, we selected 27 for our analysis.[13] The sectors covered in this paper can broadly be divided into five groups:

- Manufacturing (group M, containing seven sectors)
- Wholesale trade (group HH, containing seven sectors)
- Retail trade (group HR, containing seven sectors)
- Consumer services (group H, containing two sectors)
- Business services (group S, containing two sectors)

In addition, we single out two sectors which show significantly higher concentration ratios than all other sectors and therefore deserve particular attention. These are communication services (sector H08) and financial services (sector S02).

These economic groups allow us to take a horizontal as well as a vertical look at the intensity of competition. Thus, for example, we can analyze the competitive environment in the manufacturing sectors as opposed to the distribution and other

[11] *Only limited data for 2008 were available at the time of writing this article. Although including the beginning of the crisis in 2008 in the analysis would have been of obvious interest, it would also have had a significant negative impact on the overall quality of the dataset.*

[12] *This paper is part of a larger research project, in which we will analyze how different competitive environments relate to price level and inflation developments. Of the selected sectors, 20 can be mapped directly to HICP subcomponents. More specifically, we have 12 HICP-compatible activities, of which 8 are counted separately at the wholesale and retail level. A recent related study on this issue is Janger and Schmidt-Dengler (2010).*

[13] *The final choice of sectors was determined by data availability. In addition, we excluded a number of sectors where the government is expected to have a major impact on competition intensity, e.g. public services and education. We also excluded agriculture, forestry, mining and quarrying given their diminishing economic importance. Table A2 in annex 2 gives a complete list of all sectors used in the analysis.*

service sectors and identify possible qualitative differences at the level of production, wholesale and retail trade.

### 4.3 Evolution of Competition in CESEE (1999–2007)

This section provides stylized facts on the intensity of competition across countries and sectors as well as changes in intensity over time.[14] More specifically, it identifies those sectors or countries where the selected indicators for competition intensity are particularly high or low relative to other sectors or countries.

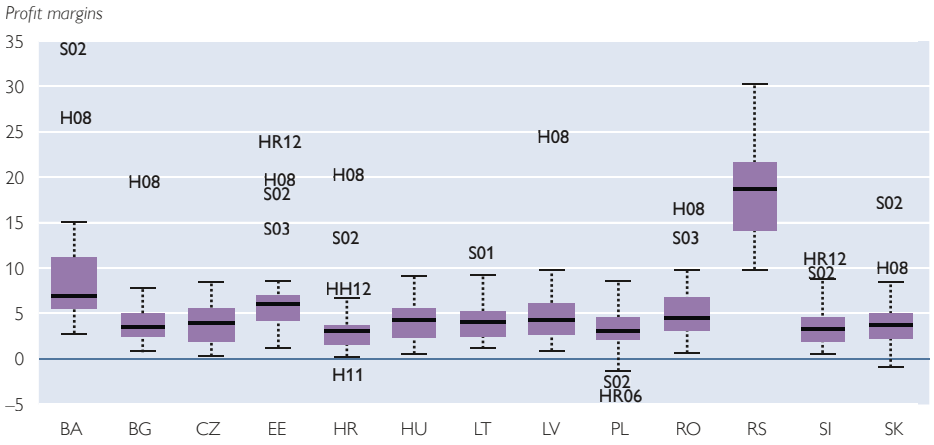
Charts 2 and 3 show country-by-country box plots of profit margins and the Herfindahl sales concentration index for the period from 1999 to 2007 for all 27 sectors. The box plots show the minimum, 25% quartile, 50% quartile, 75% quartile and the maximum value of the underlying distribution. Observations falling above or below 1.5 times the interquartile range are marked as outliers.

The profit margin box plot (chart 2) suggests that in most countries the distribution of profit margins is fairly concentrated. Exceptions to this rule are Bosnia and Herzegovina (BA) and – in particular – Serbia (RS), where profit margins are also notably higher than in other countries. The sector-specific outliers are concentrated in a few sectors, namely communications (H08), retail sales of miscellaneous goods and services (HR12) and finance (S02). In Poland (PL) and Croatia (HR), a few sectors have negative average profit margins.

As to the concentration of sales, chart 3 shows that across many countries covered by this study, sales in the communications sector (H8) are highly concentrated

Chart 2

**Distribution of Profit Margins across Countries (1999–2007)**




*Source: Authors' calculations.*

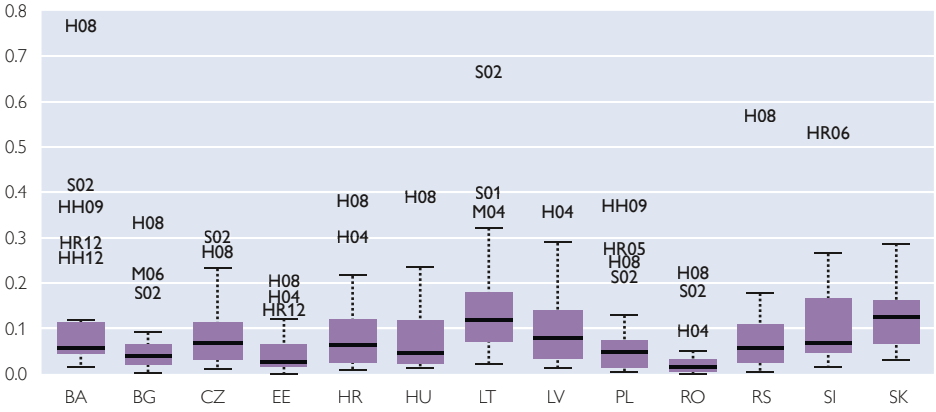
*Note: See table A2 for a description of sector codes used.*

[14] *Standardized accounting and disclosure rules, which cannot automatically be assumed for data in the Amadeus database, are crucial for cross-country comparisons. A further caveat are changes over time in the firms included in the database, which in turn affects the indicators of competition we use. We thus compared the coverage of employment in Amadeus with employment data provided by Eurostat (see annex 1). It turns out that employment coverage is fairly good for most countries. There is no obvious data source against which the representativeness of the profit margin or sales data contained in the Amadeus database can be checked. However, the strong correlation between employment- and sales-based Herfindahl indices suggests that Amadeus sales data are also fairly representative.*

Chart 3

**Distribution of Sales Concentration across Countries (1999–2007)**

*Index of sales concentration (0 = lowest, 1 = maximum)*




*Source: Authors' calculations.*

*Note: See table A2 for a description of sector codes used.*

relative to other sectors. A fairly high degree of sales concentration can also be found in the finance (S02) and housing (H4) sectors. More generally, chart 3 suggests that sales concentration exhibits far more sector-specific outliers than profit margins.

Charts 4 and 5 present the two competition indicators from a sectoral perspective, complementing the country-by-country description above. Examining first the distribution of profit margins across sectors (chart 4) confirms some of the findings outlined above. The communication sector (H08) and the finance sector (S02) are again identified as the sectors with the largest variation in profit margins as well as the highest average profit margin levels. Also, Serbia and to a lesser extent Bosnia and Herzegovina again frequently appear as outliers. In addition, Estonia appears to have particularly high profit margins in some sectors.

Chart 4

**Distribution of Profit Margins across Sectors (1999–2007)**

*Profit margins*

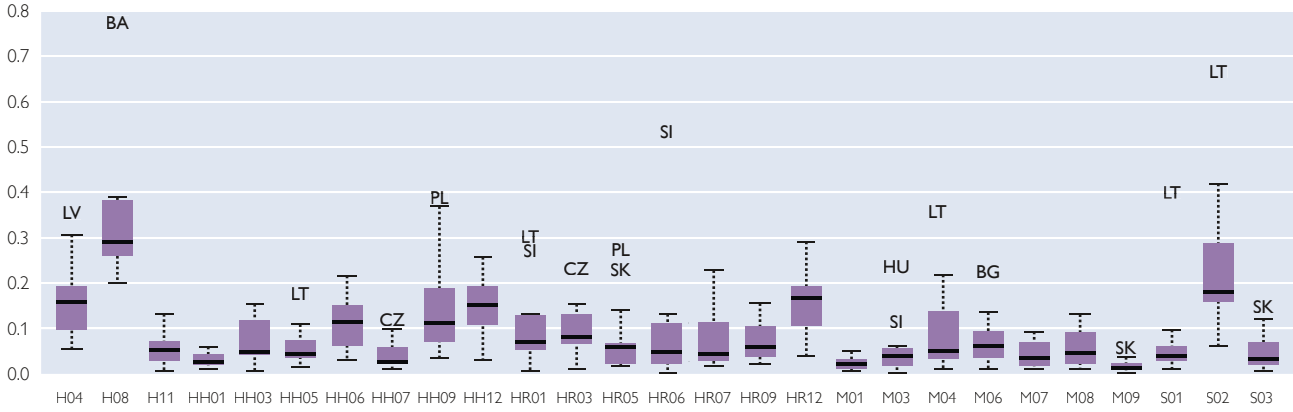

*Source: Authors' calculations.*

*Note: See table A2 for a description of sector codes used.*

Chart 5

**Distribution of Sales Concentration across Sectors (1999–2007)**

*Index of sales concentration (0 = lowest, 1 = maximum)*




*Source: Authors' calculations.*

*Note: See table A2 for a description of sector codes used.*

The Herfindahl concentration index for sales (chart 5) identifies a particularly high level of concentration and/or an above-average degree of dispersion in this competition indicator in the finance (S02), communications (H8) and housing (H4) sectors. A number of other wholesale and retail trade sectors are, however, not far behind. As regards country outliers, chart 5 paints a rather mixed picture. Almost all countries covered in the paper appear at least once, and no countries clearly stand out.

Besides looking at the distribution of our two competition indicators across countries and sectors, it is also interesting to see how the different indicators have evolved over time and whether there are large variations between the different sector groups, namely manufacturing (M), retail and wholesale trade (H, HH and HR) and services (S). In addition, the finance and communications sectors are displayed separately.

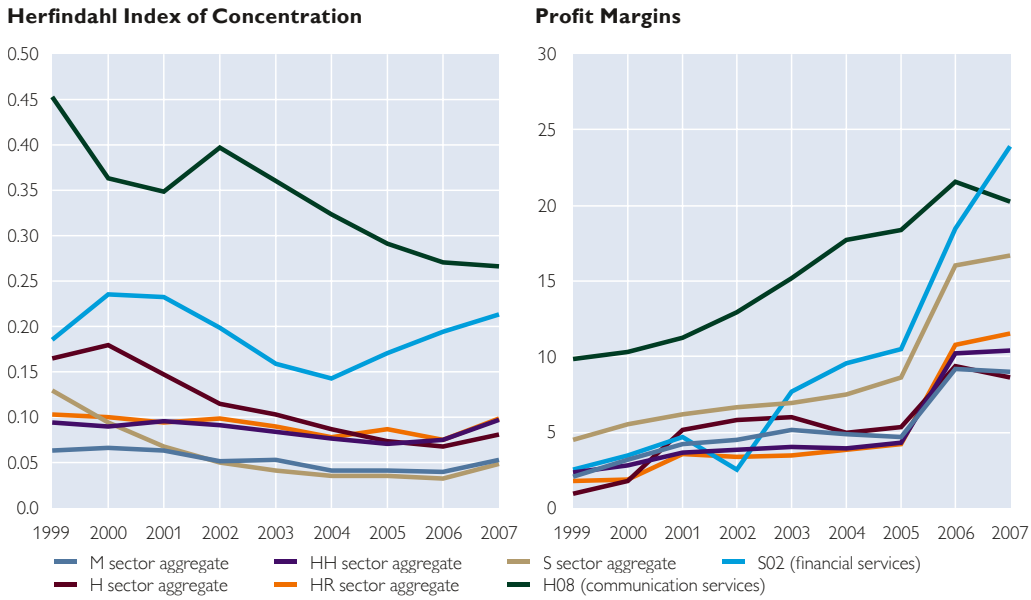
For all sector groups, the charts show an increase in profit margins over time. This increase appears to have accelerated toward the end of the observation period, possibly due to the strong growth and catching-up process in the CESEE countries during these years.[15] The average profit margins for the manufacturing and the wholesale and retail trade sector groups are similar, whereas profit margins in the service sector group were somewhat higher throughout the 1999–2007 period. Profit margins in finance rose sharply from 2002. In 2007, they even exceeded those generated in communication, which displayed the highest profit margins by a rather wide margin in all other years.

The Herfindahl concentration index declined in all sector groups during most of the period under review, a development which was initially particularly pronounced in the service sector group. In the finance sector, the concentration of sales picked up again from 2004, whereas in the other sector groups this did not happen until 2007, and to a much smaller extent. Finally, sales concentration in the communication sector has shown a strong decline since 2002.

[15] *At the time of writing, it was impossible to obtain sufficient data for 2008. It appears very likely, however, that the recession in many CESEE countries during 2008 resulted in a reduction in profit margins.*

Chart 6

**Evolution of the Two Competition Indicators over Time**




*Source: Authors' calculations.*

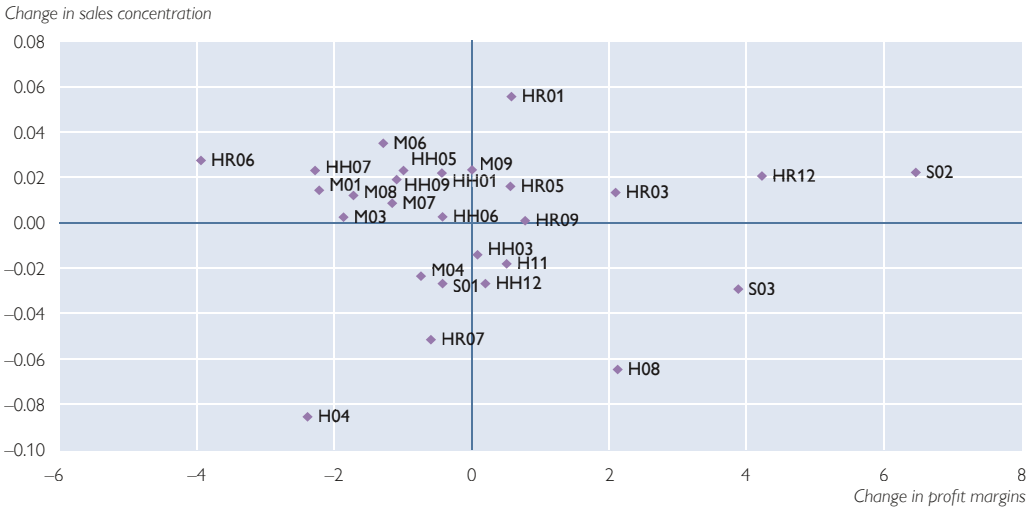
Using the framework for the combined interpretation of key competition indicators introduced in chart 1, we obtain a rather mixed picture across the different sectors. Chart 7 suggests that only a few sectors, notably housing, water, electricity, gas and other fuels as well as passenger transport and information, have seen an increase in the level of competition since 1999. In some of these sectors this could be interpreted as a result of the sector-specific regulatory reforms that have taken place in these industries in recent years. Most of the sectors in which the intensity of competition appears to have fallen are retail trade sectors; the finance sector also displays the same characteristics.[16] In a few other sectors (e.g. real estate and business services, communications, restaurants and hotels) the intensity of is also more likely to have fallen but the picture is less clear given that the two competition indicators point in opposite directions. This also holds for the fourth group of sectors, which consists mainly of manufacturing and wholesale trade industries. For this group, however, the relative decline in profit margins suggests that on balance the intensity of competition has risen despite the increase in the level of market concentration.

In summary, one can say that a number of stylized facts emerge from the descriptive analysis. First, some countries (Bosnia and Herzegovina, Serbia, Romania and Estonia) appear to be outliers as regards some of their competition indicators. In particular, they show high profit margins relative to other countries in the sample, at least in some sectors. The same applies to a number of sectors, notably communications, finance, housing and miscellaneous goods and services,

[16] *Since we are looking at the deviation of each individual sector from the average rise in profit margins, we are quite confident that our graphical description in chart 7 reflects something other than simply the results of rapid catching-up and prosperous economic development. Hence, we attribute this rise in profit margins to a change in competition intensity. A more detailed analysis of possible underlying determinants follows in section 5.*

Chart 7

**Relative Changes in Key Competition Indicators**




*Source: Authors' caclulations.*

*Note: Sector-specific deviations from the average change in profit margins and the concentration index between the periods 1999–2001 and 2005–2007; see table A2 for a description of sector codes used.*

which are characterized by a large degree of concentration and high profit margins, suggesting a more limited intensity of competition than in other sectors. More generally, the distribution of the competition indicators seems to be more varied across sectors than across countries – apart from the exceptions mentioned above. Over time, profit margins tended to increase, whereas concentration rates tended to decline during the observation period. Looking at the two indicators of competition in combination, various sectors display a pattern that diverges from this trend, reflecting great sectoral heterogeneity in the evolution of competition intensity during the observation period.

## 5 Determinants of Competition Intensity

Having identified differences in the distribution of the two competition indicators across sectors and countries, we now empirically investigate possible determinants of these differences. Again, we base our analysis on the two selected competition indicators. We first present country-wide results where all activities are pooled across the whole economy and then results for the different sector groups mentioned above (manufacturing, wholesale and retail trade, business and consumer services). In addition, we analyze the two sectors which emerged as outliers in the descriptive analysis, namely communications and finance, separately.

### 5.1 Estimation Strategy

Just as theory does not deliver a unique and ready-to-use indicator that allows us to unambiguously measure the intensity of competition in a market, it does not give a clear-cut indication of possible determinants of competition either. Given this fuzziness with respect to both our dependent and our explanatory variables, it seems most appropriate to adopt a rather agnostic, data-driven research approach.

The limited literature available suggests a wide range of macroeconomic and institutional and/or political variables which may have an impact on the indicators of competition used in this paper. We have classified the possible explanatory variables into six broad categories:

– The stage of economic development – measured by the per capita GDP level (Glen et al., 2001)[17];
– Economic dynamics – measured by GDP growth (which also reflects catching-up in our sample) (Glen, Lee and Singh, 2001);
– Economic integration – measured by exporting activity (ratio of exports to GDP) and FDI (ratio of inward FDI stocks to GDP) (Francois and Wooton, 2000; Medvedev and Zemplinerova, 2005)[18];
– Country size – measured by population numbers (Badinger, 2007);
– Market size – measured by the sum of total sales in the sector (Vagliasindi, 2006);
– Competition policy – measured by the EBRD transition score as an indicator for the prevailing regulatory framework[19] (Vagliasindi, 2006).

We further interacted the EBRD competition policy indicator with economic growth and the stage of economic development, allowing for possible repercussions between progress on institutional transition and the stage of economic development. Finally, we controlled for possible interdependencies between our two measures of competition by including the concentration ratio in the estimation of profit margins and vice versa.[20]

The descriptive analysis revealed that our indicators of competition are highly persistent. We therefore estimate a dynamic specification, whereby we include the lagged dependent variable. This does not, however, remove the potentially strong endogeneity which is present between economic performance and other market characteristics on the one hand and our measure of competition on the other. In order to address this problem, we include all exogenous variables with a one-period time lag. Taking all these considerations into account, we arrive at the following specification for country *i*, sector *k* and time point *t*:

$$\begin{aligned} PRMA_{ikt} = \alpha + \gamma * PRMA_{ikt-1} + \delta * herfSALE_{ikt-1} + \beta_1 * pop_{it-1} + \beta_2 * gdp\_growth_{it-1} + \\ + \beta_3 * gdp\_pc_{it-1} + \beta_4 * exp_{it-1} + \beta_5 * fdi_{it-1} + \beta_6 * sales_{ikt-1} + \beta_7 * EBRD_{it-1} + \\ + \beta_8 * EBRD_{it-1} * gdp\_growth_{it-1} + \beta_9 * EBRD_{it-1} * gdp\_pc_{it-1} + \varepsilon_{it} \end{aligned}$$

[17] *Alternative indicators for the stage of development, such as the share of agriculture in value added and the share of urban population, also showed a significant correlation with profit margins and sales concentration. However, we decided to include only purely orthogonal determinants in the final regression model, and hence we did not include these two variables along with per capita GDP.*

[18] *We try to capture both outward orientation and inward orientation in our specification. When firms export and serve a foreign market, they are subject to competition from foreign producers in the foreign market. This exposure may also influence their home market behavior and thus introduce changes in home market structure. By contrast, all firms operating in the domestic market are subject to competition from foreign firms through imports by these firms or more directly as a result of foreign-owned firms operating in their respective market. Since import and export ratios are highly correlated, we avoid including them both and use only inward FDI stocks as a proxy for additional competitive pressures through foreign penetration.*

[19] *Since the individual EBRD transition indicators are all highly correlated, the results are not sensitive to the use of alternative EBRD indicators. Moreover, the results achieved by using the overall EBRD indicator are qualitatively similar.*

[20] *The results are not sensitive to the inclusion of the alternative competition measure, reflecting the low correlation between the two measures.*

We estimate this model both for all sectors in the sample together and for each individual sector group mentioned in section 3. Within each category, we pool individual sectors across countries. This increases the number of observations in the estimation and avoids problems related to averaging across sectors.[21] Thus, we have a panel of 13 countries times a varying number of sectors (between three and seven within each sector group) over a nine-year period (1999–2007). All variables apart from the EBRD competition index (EBRD) and economic growth (gdp_growth) are in logarithms.

A priori we would expect a larger market, both in terms of greater country size (population) and industry size (sales), to lead to more intense competition, i.e. lower average profit margins and lower concentration ratios. In sectors that are characterized by large economies of scale, however, profit margins may also be positively correlated with market size.

Rapid market growth is likely to reduce competition in the short run but may increase it in the longer run as more companies exploit expanding business opportunities. The same logic applies if a market is growing as a result of increasing exports. However, greater export orientation also implies that more firms have to compete with foreign firms for market shares abroad, which suggests that the domestic market, too, will be subject to high competitive pressure.

The relationship between the stage of economic development (GDP per capita), the inward FDI ratio and the different indicators of competition is not clear a priori. In our sample of catching-up countries, profit margins expanded strongly with rising per capita incomes. But this cannot be seen as an indication of changes in the degree of competition. Inward FDI is used here as a proxy for competition arising from foreign firms, thus it should have a pro-competitive effect.[22] However, foreign-owned firms are often more efficient and may thus exhibit higher profit margins and drive out inefficient firms. The resulting composition effect might again lead to a positive relationship with profit margins at the industry level.

We expect the EBRD transition indicators to be negatively correlated with profit margins and sales concentration. Countries that are more advanced in regulatory terms should be characterized by a higher degree of competition since firms are closer to operating in an "ideal" market environment.

From an econometric as well as economic point of view, the estimation of dynamic panel models with lagged exogenous variables seems appropriate. Note that several explanatory variables might be considered endogenous. As was mentioned in the introduction, the relevant literature often emphasizes the importance of competition (or highly competitive markets) for economic development and sectoral growth. Variables measuring the stage of development (GDP growth, GDP per capita) might thus be determined together with the level of competition. In the same vein, one can argue that competition policy (measured by the respective EBRD indicator) is linked to certain country-specific characteristics which we have not taken into account in our specification. The simplest way to avoid this endogeneity is to use lags of the right-hand-side variables. A second econometric

[21] *Results for all 27 individual sectors are available from the authors on request.*

[22] *In tradable sectors (by and large manufacturing and business services in our sample), pressure from foreign competition would primarily occur through imports, but also through FDI. Since import and export ratios are too highly correlated, we include only FDI here. In nontradable sectors, such as most consumer services and the distribution sector (wholesale and retail trade), this pressure occurs predominantly through FDI.*

problem relates to the high persistence in our dependent variable. Thus, we also include a lag of our dependent variable. Since we have a panel dataset, we use the Arellano-Bond general method of moments (GMM) estimator to estimate this model, which is an efficient solution to take account of the autocorrelation caused by the inclusion of the lagged dependent variable and of the unobserved panel-level effects, which are by construction correlated with the lagged endogenous variable.[23]

### 5.2 Estimation Results

Before we take a look at the determinants of profit margins and the Herfindahl index of sales concentration in different economic sectors, table 2 provides an overview of the selected economies as a whole.

Our dynamic estimation confirms the high persistence in our dependent variables, in particular with respect to the estimation of profit margins.[24] We further find generally higher profit margins and greater concentration ratios in richer countries, suggesting more efficient and generally larger firms in more developed economies. The positive sign of the coefficient of economic growth corroborates this finding for profit margins. Taken by itself, this evidence is greatly at odds with our expectation that rapid economic growth or a more advanced stage of economic development would have a pro-competitive effect. The highly significant and positive coefficient on export orientation points in the same direction; however, it can easily be reconciled with stylized facts about international trade flows. Traditionally, international trade is dominated by a few large, highly efficient and productive firms. However, the negative coefficient on the inward FDI ratio suggests that more FDI penetration erodes the scope for high profit margins, suggesting competitive pressure arising from a larger share of foreign ownership in a country. Country size as measured by population shows a significant positive effect on concentration ratios, which is again contrary to our expectations. However, the aggregate masks important differences between individual groups, as we will see below. At industry level, we measure market size by the total sales volume and find, in line with our expectations, that this variable has a negative effect on both profit margins and sales concentration.

Finally, we control for the impact of the regulatory environment by including the EBRD indicator of transition progress in competition policy. While almost all countries have achieved the standards of an industrialized market economy in areas such as trade and foreign exchange regime, price liberalization and small-scale privatization, progress on competition policy is somewhat more limited in general. By the end of our sample period, most countries had reached a level of around 3 on

[23] *Since the first-order autoregressive terms – AR(1) – are very far from being close to one in absolute magnitude, the results of the difference GMM estimation should be robust to using the alternative system GMM estimator. The latter was developed to avoid the problem of invalid instruments when using first differences – as is done for the difference GMM – in cases where the lagged dependent variable is close to one. However, the use of the system GMM – which estimates the equation jointly in levels and in first differences, thereby increasing the number of available instruments – also adds to the uncertainty over the invalidity or weakness of all the instruments included. For this reason we decided to rely on the results obtained from the difference GMM.*

[24] *The model for sales concentration is dynamically less well specified, as indicated by the still significant AR(2) test. The inclusion of a second lag of the concentration ratio (i.e. the endogenous variable) did not remedy this result for the pooled sample including all sectors. When pooling only within groups (such as manufacturing, wholesale trade, etc.), the model appears to be correctly specified. In addition, the sector-specific results (available from the authors on request) do not indicate the presence of second-order autocorrelation in these models either. We therefore report the results including one lagged dependent variable here.*

the index scale, which ranges from 1 (no transition progress yet) to 4.3 (standards of an industrialized market economy). While we find no significant direct effect from the regulatory environment, there is a significant negative effect from interacting the EBRD competition policy indicator with economic growth on profit margins. This implies that for a given level of economic growth, progress in competition policy has a competition-enhancing effect. This result also modifies our interpretation of the growth variable above: Beyond a certain level of transitional progress on competition policy, stronger economic growth exerts downward pressure on profit margins. In this sense, the regulatory environment does matter for our measures of market structure and economic policy as it has the potential to influence market structure in the desired direction through institutional and legal reforms. We must consequently keep a close watch on the evolution of competition in a high-growth environment, as was (and will again be) present in CESEE. Moving on to the results for individual sectors, the estimations for profit margins are reported in table 3. The economy-wide results are confirmed on the whole, while at the same time notable differences are revealed between economic groups. The positive correlation between per capita GDP and profit margins holds for business services and wholesale trade only, while the positive correlation with GDP growth is confirmed for all activities except business services. Interestingly, the positive relationship between export orientation and profit margins is not found for manufacturing, or for business and consumer services. It arises from wholesale and retail trade only, which are both highly domestically-oriented activities where exports play only a minor role as compared with manufacturing or business services. Similarly, inward FDI shows a significant negative effect in wholesale trade but also in manufacturing. While we found no significant correlation between profit margins and country size, we did observe some downward pressure on profit margins in retail trade for larger countries. The highly significant negative coefficient with respect to market size as measured by an industry's sales volume can be attributed entirely to the manufacturing sector and consumer services.

Table 2

**Determinants of Competition Indicators – Overview**

| | Profit margins | Sales concentration |
|---|---|---|
| HerfSALE $_{t-1}$ | 0.031 | 0.317*** |
| | *0.89* | *2.00* |
| PRMA $_{t-1}$ | 0.316*** | 0.013 |
| | *7.33* | *0.64* |
| GDP per capita $_{t-1}$ | 1.684*** | 0.843*** |
| | *3.12* | *2.01* |
| GDP growth $_{t-1}$ | 0.045*** | 0.007 |
| | *3.39* | *1.12* |
| Export ratio $_{t-1}$ | 0.020*** | 0.024*** |
| | *5.28* | *6.90* |
| Inward FDI ratio $_{t-1}$ | –0.018*** | –0.003 |
| | *–4.38* | *–1.02* |
| Country size $_{t-1}$ (population) | 0.349 | 8.115*** |
| | *0.12* | *3.43* |
| Industry size $_{t-1}$ (sales) | –0.153*** | –0.279*** |
| | *–3.71* | *–3.33* |
| EBRD competition policy $_{t-1}$ | –0.123 | 0.397 |
| | *–0.12* | *0.36* |
| EBRD $_{t-1}$* GDP growth $_{t-1}$ | –0.036*** | –0.008* |
| | *–4.66* | *–1.87* |
| EBRD $_{t-1}$* GDP per capita $_{t-1}$ | 0.033 | –0.029 |
| | *0.26* | *–0.21* |
| Constant | –17.166 | –130*** |
| | *–0.35* | *–3.57* |
| Number of observations | 1,923 | 1,923 |
| Number of groups | 341 | 344 |
| $Chi^2$ | 179.1 | 75.4 |
| AR(1) z-value | –5.808*** | –4.246*** |
| AR(2) z-value | –0.623 | 2.077** |

*Source: Authors' calculations.*

*Note: GMM estimation (Arellano-Bond linear dynamic panel data estimator); t-values given below coefficients. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively; clustered standard errors used, allowing for correlation within sectors.*

In contrast to the insignificant results observed at the aggregate, economy-wide level, we sometimes find a positive coefficient on the EBRD competition policy indicator, suggesting higher profit margins in countries where more progress has been made toward an ideal market economy in terms of the regulatory environment (i.e. in wholesale trade and financial services). In all cases, this counterintuitive positive effect is dampened by negative interaction terms with economic growth and per capita GDP. Finally, the negative interaction between competition policy and economic growth is confirmed for all groups apart from business services (however, it is found in the financial services sector, which is part of this group).

Table 3

**Determinants of Profit Margins**

| | Manufacturing (M group) | Business services (S group) | Wholesale trade (HH group) | Retail trade (HR group) | Consumer services (H group) | Financial services (S02 sector) | Communication services (H08 sector) |
|---|---|---|---|---|---|---|---|
| PRMA $_{t-1}$ | 0.256*** | 0.288*** | 0.341*** | 0.282*** | 0.138 | 0.149 | –0.104 |
| | *5.87* | *2.82* | *3.98* | *3.39* | *1.23* | *0.75* | *–0.92* |
| HerfSALE $_{t-1}$ | 0.012 | 0.243*** | 0.095 | 0.042 | –0.103 | 0.012 | –1.101*** |
| | *0.26* | *2.73* | *0.9* | *0.59* | *–1.05* | *0.11* | *–2.34* |
| GDP per capita $_{t-1}$ | 0.823 | 4.509*** | 4.118*** | 0.160 | –0.886 | 6.772*** | 1.395 |
| | *1.11* | *3.2* | *3.76* | *0.14* | *–0.64* | *4.48* | *0.58* |
| GDP growth $_{t-1}$ | 0.036** | 0.012 | 0.076*** | 0.048** | 0.073*** | 0.308*** | 0.03 |
| | *2.14* | *0.7* | *2.33* | *2.08* | *2.51* | *2.02* | *1.07* |
| Export ratio $_{t-1}$ | 0.005 | 0.014 | 0.035*** | 0.014* | 0.023 | 0.028 | 0.024 |
| | *0.85* | *1.29* | *4.53* | *1.78* | *1.48* | *0.76* | *1.11* |
| Inward FDI ratio $_{t-1}$ | –0.010** | –0.02 | –0.024*** | –0.015 | –0.014 | –0.012 | –0.037*** |
| | *–2.02* | *–1.55* | *–2.82* | *–1.33* | *–1.21* | *–0.34* | *–2.32* |
| Country size $_{t-1}$ (population) | 5.820 | 0.438 | 4.701 | –10.079** | –1.804 | 24.866 | 4.094 |
| | *0.88* | *0.04* | *1.07* | *–2.07* | *–0.27* | *1.29* | *0.49* |
| Industry size $_{t-1}$ (sales) | –0.136*** | –0.066 | –0.064 | –0.096 | –0.189* | –0.192 | 0.019 |
| | *–2.65* | *–0.4* | *–0.62* | *–0.95* | *–1.69* | *–0.6* | *0.14* |
| EBRD competition policy $_{t-1}$ | –1.984 | 4.846* | 5.035*** | –2.626 | –1.690 | 11.919*** | 2.079 |
| | *–1.57* | *1.82* | *2.5* | *–1.08* | *–0.77* | *3.25* | *0.55* |
| EBRD $_{t-1}$*GDP growth $_{t-1}$ | –0.025*** | –0.011 | –0.056*** | –0.031*** | –0.052*** | –0.122* | –0.027 |
| | *–2.52* | *–0.86* | *–3.17* | *–2.13* | *–2.54* | *–1.66* | *–1.07* |
| EBRD $_{t-1}$* GDP per capita $_{t-1}$ | 0.258 | –0.608* | –0.618*** | 0.367 | 0.264 | –1.290*** | –0.251 |
| | *1.57* | *–1.85* | *–2.48* | *1.21* | *0.92* | *–2.82* | *–0.51* |
| Constant | –95.082 | –40.660 | –110 | 155.911** | 37.467 | –440 | –75.3 |
| | *–0.9* | *–0.22* | *–1.46* | *2* | *0.35* | *–1.46* | *–0.54* |
| Number of observations | 517 | 212 | 531 | 432 | 189 | 52 | 67 |
| Number of groups | 90 | 37 | 90 | 86 | 38 | 11 | 13 |
| $Chi^2$ | 70.408 | 76.204 | 124.119 | 72.651 | 15.851 | 458.769 | 71.94 |
| AR(1) z-value | –3.409*** | –1.858* | –3.145*** | –2.768*** | –2.356*** | –1.288 | –1.752* |
| AR(2) z-value | 0.381 | –1.179 | –0.092 | –0.682 | 0.130 | –0.840 | –1.066 |

*Source: Authors' calculations.*

*Note: GMM estimation; t-values given below coefficients. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively; clustered standard errors used, allowing for correlation within individual sectors.*

The economy-wide results for sales concentration are again by and large confirmed for individual groups (see table 4).[25] While the positive effect of per capita GDP only shows up in individual sectors (financial and communication services), the concentration-enhancing effect of export orientation is confirmed for all groups with the exception of consumer services. As in the pooled results, we find no significant coefficient for GDP growth or inward FDI on concentration ratios. Larger countries show higher sales concentration in manufacturing industries and business services, here in particular in financial services. This can be attributed to the fact that economies of scale play an important role in these sectors and that sufficient scale economies can only be achieved in large countries.

Table 4

**Determinants of Concentration Ratios**

| | Manufacturing (M group) | Business services (S group) | Wholesale trade (HH group) | Retail trade (HR group) | Consumer services (H group) | Financial services (S02 sector) | Communication services (H08 sector) |
|---|---|---|---|---|---|---|---|
| $HerfSALE_{t-1}$ | 0.337 | –0.128 | 0.533*** | 0.060 | 0.558*** | 0.124 | 0.414 |
| | *1.01* | *–0.85* | *3.03* | *0.31* | *3.3* | *0.75* | *1.18* |
| $PRMA_{t-1}$ | –0.007 | 0.091* | 0.031 | 0.005 | –0.062 | –0.118 | 0.012 |
| | *–0.13* | *1.68* | *0.91* | *0.11* | *–1.32* | *–1.52* | *0.4* |
| GDP per $capita_{t-1}$ | 0.832 | –0.236 | 1.064 | 0.837 | 0.313 | 2.731** | –1.465** |
| | *0.87* | *–0.16* | *1.6* | *1.13* | *0.34* | *2.05* | *–2.18* |
| GDP $growth_{t-1}$ | 0.005 | 0.024 | –0.021 | 0.013 | 0.022* | –0.134 | 0.001 |
| | *0.5* | *1.18* | *–1.56* | *0.79* | *1.77* | *–1.18* | *0.12* |
| Export $ratio_{t-1}$ | 0.027*** | 0.034*** | 0.013*** | 0.030*** | 0.017 | 0.010 | 0.002 |
| | *4.53* | *4.74* | *3.11* | *2.7* | *1.25* | *0.58* | *0.19* |
| Inward FDI $ratio_{t-1}$ | –0.009 | –0.003 | –0.002 | –0.009 | 0.005 | 0.009 | –0.004 |
| | *–1.29* | *–0.26* | *–0.28* | *–1.01* | *0.44* | *0.63* | *–0.37* |
| Country $size_{t-1}$ (population) | 14.002*** | 21.993*** | 4.593 | –1.798 | 3.060 | 24.738*** | 2.940 |
| | *2.67* | *3.29* | *1.53* | *–0.29* | *0.56* | *2.59* | *0.5* |
| Industry $size_{t-1}$ (sales) | –0.449*** | –0.048 | –0.090* | –0.177 | –0.435* | 0.144 | –0.091 |
| | *–2.88* | *–0.47* | *–1.67* | *–1.37* | *–1.8* | *1.31* | *–1.24* |
| EBRD competition $policy_{t-1}$ | –0.503 | 0.352 | 1.584 | 0.670 | –0.694 | 6.320* | –3.105* |
| | *–0.31* | *0.12* | *0.85* | *0.35* | *–0.31* | *1.89* | *–1.75* |
| $EBRD_{t-1}$*GDP $growth_{t-1}$ | –0.000 | –0.028* | 0.009 | –0.016 | –0.018** | 0.037 | 0.002 |
| | *–0.02* | *–1.93* | *1.34* | *–1.47* | *–2.11* | *0.72* | *0.23* |
| $EBRD_{t-1}$* GDP per $capita_{t-1}$ | 0.074 | 0.009 | –0.190 | –0.083 | 0.100 | –0.807* | 0.386* |
| | *0.36* | *0.02* | *–0.83* | *–0.35* | *0.34* | *–1.88* | *1.83* |
| Constant | –220*** | –350*** | –81.486* | 19.270 | –46.857 | –4.10*** | –34.206 |
| | *–2.7* | *–3.24* | *–1.76* | *0.2* | *–0.52* | *–2.6* | *–0.36* |
| Number of observations | 527 | 216 | 536 | 447 | 197 | 55 | 70 |
| Number of groups | 91 | 37 | 90 | 88 | 38 | 11 | 13 |
| $Chi^2$ | 71.931 | 53.788 | 44.373 | 17.857 | 91.469 | 1.70E+7 | 5,500 |
| AR(1) z-value | –2.198** | –2.093** | –3.289*** | –2.509*** | –2.049** | –1.320 | –1.933* |
| AR(2) z-value | –0.232 | 1.759 | 1.067 | 1.665 | –1.303 | 1.057 | –0.060 |

*Source: Authors' calculations.*

*Note: GMM estimation; t-values given below coefficients. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively; clustered standard errors used, allowing for correlation within individual sectors.*

[25] *For this indicator the aggregation of individual industries to broader sector categories results in a considerable loss of the model's explanatory power. Sector-specific results are therefore more informative, while being qualitatively similar (results are available from the authors on request).*

Again, industry size as measured by the total sales volume relates inversely to concentration, in particular again in the manufacturing industry.

As with the pooled results, we do not find that the EBRD competition policy indicator has a direct influence on any of the groups. However, a weakly significant coefficient is observed in individual sectors: a counterintuitive positive coefficient in financial services and the expected negative coefficient in communication services. This may point to genuine differences in market structure between those two industries, but it also indicates that the same set of policies has different effects on market structure from sector to sector. Hence, a careful and differentiated design of competition policies is certainly necessary. In both cases, however, the direct effect is dampened by indirect effects working through economic dynamics. Finally, the negative indirect effect of the regulatory environment on concentration for a given stage of economic development observed for the pooled sample (the first interaction term in table 4) stems from responses in consumer and business services. All in all, we find weaker effects for concentration ratios, which is also reflected in the lower chi-squared statistics reported in table 4.

## 5 Conclusions

Given the generally acknowledged difficulties in empirically measuring the intensity of competition, we analyze two widely-used competition indicators, namely profit margins and the concentration of sales. We use the Amadeus firm-level database covering 27 sectors in 13 CESEE countries over the period from 1999 to 2007.

Although these indicators of competition are commonly used in the literature, interpretations of their precise implications for the intensity of competition are not free from theoretical ambiguity. The interaction of different forces (rising efficiency of firms, rapid catching-up of the countries concerned, etc.) may, for instance, imply rising profit margins or rising market concentration without negatively affecting the degree of competition. Our results should be seen as a first comprehensive description of these commonly used competition indicators for the CESEE region rather than an exact description of the intensity of competition in these markets.

The descriptive analysis reveals high profit margins and above-average concentration ratios in a number of CESEE countries, in particular Bosnia and Herzegovina, Serbia, Romania and Estonia, and in a number of sectors, notably communications, finance, and miscellaneous goods and services. Manufacturing, by contrast, tends to display lower profit margins and concentration ratios than other sectors.

In the literature, concentration ratios are traditionally used as a measure of competition in empirical studies based on micro data. At the same time, macro-oriented, often theoretical studies tend to rely on profit margins as the only measure of competition. Recently, the empirical and policy-oriented literature, too, has adopted this view. We find that – at least for the CESEE region – the two indicators do not move in parallel. When we combine both indicators and analyze them in relation to their overall time trend over the 1999 to 2007 period, we find a relative drop in both profit margins and concentration ratios in only a handful of sectors, namely housing and utilities, passenger transport and information services. All these industries are services sectors and end-user oriented. However, there is another group of end-user-oriented sectors, such as many retail trade sectors and

financial services, where both competition indicators increased in relative terms over our sample period, suggesting a trend toward less competitive market structures. For all remaining sectors, we observe diverging trends for the two indicators. While manufacturing and wholesale trade show a relative decline in profit margins coupled with a relative increase in market concentration compared with the general trend, we observe the opposite for business and consumer services, such as communications, and restaurants and hotels. Evidence for the euro area suggests sometimes very diverse conditions in Western European markets. Especially the communications sector emerges here as being highly competitive (Alvarez and Hernando, 2006), which may be related to the differences in the stage of economic development.

Our findings are clear as regards the pronounced absolute dynamics of both indicators over the past decade, which is very likely related to the rapid transformation and catching-up process that has characterized the region over the past two decades. Over time, profit margins have increased. What we observe here, however, may rather be the result of increased efficiency at the firm level than that of less competition. By contrast, concentration ratios have declined over time, suggesting that the number of firm entries remains high following the severe post-transformational recession in the CESEE countries and that the region is still in a phase of rapid market expansion.

We also find that the distribution of the competition indicators shows considerably greater variation across sectors than across countries. There appears to be a certain lack of competitive pressure, particularly in specific service sector activities, such as communication and finance. A potential explanation might be that the still rapidly growing market gives producers in these countries greater scope to raise prices and thus allows even less efficient firms to enter the market.

Finally, to shed more light on the underlying reasons for these diverse developments, we assess the main determinants of our competition indicators, using a dynamic panel model over the period from 1999 to 2007. We find the two measures of market structure to be highly persistent, which justifies using the dynamic approach. Market size as measured by the industry's sales volume has the expected negative effect on our two measures. Moreover, the penetration by foreign firms in the form of inward FDI shows a pro-competitive effect. Other variables reflecting the general macroeconomic environment show a counterintuitive effect on both profit margins and sales concentration. Both the stage of economic development and greater export orientation are positively related to profit margins and concentration ratios. This may be attributable to a composition effect, with only the most efficient firms surviving in such highly developed and highly integrated markets, thus raising average firm size, firm profits and concentration. Economies of scale may also play a role here. According to these arguments, higher profit margins would not necessarily imply a lower degree of competition. Nevertheless policymakers would be well advised to keep a vigilant eye on developments within individual sectors, given their potential to influence economic outcome, as also suggested by our results: The EBRD competition policy indicator does not generally show a significant correlation with any of our measures; when interacted with economic growth, however, it shows a negative correlation. This suggests that an improvement in competition policy as measured by the EBRD policy indicator fosters competition only after a country has reached a

certain stage of development or economic progress. Looking at individual sectors, we find that competition policy has a "stage-dependent" effect on profit margins only in business services, in particular financial services and wholesale trade. Concentration ratios show no strong response to the policy environment in general. Clearly, more research is needed here to assess the impact of competition policy, both in methodological and economic terms (given large sector-specific differences, a more detailed analysis of individual sectors and applicable regulations is needed).

Clearly, more research is necessary, in particular to resolve ambiguities in interpreting some of our explanatory variables. Recent approaches (Boone, van Ours and van der Wiel, 2007; Creusen, Minne and van der Wiel, 2006) suggest that cost structures should also be taken into account, which allows for assessing the response of different indicators to a reallocation of output from inefficient to efficient firms. As mentioned in the paper, the Amadeus database does not allow firm cost structure to be incorporated into the analysis for the country set at hand since the data were unfortunately too patchy. Together with further analyses geared to determining why certain countries and sectors appear to be clear outliers as far as our chosen indicators of competition are concerned, such new approaches open up a wide field of research into the state of competition in CESEE.

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## Annex 1: Employment Coverage in the Amadeus Database

The coverage of industries in the Amadeus database varies considerably across time, countries and sectors. To obtain an indication of the representativeness of the Amadeus database, we compare the employment coverage with official employment figures obtained from Eurostat. Employment appears to be the only variable for which we can find an official alternative data source to serve as a benchmark.

When we look at the weighted average, 2005 turns out to be the year in which the Amadeus database has the greatest employment coverage for the CESEE countries. In that year, about half of all employed persons in the CESEE countries (based on Eurostat figures) are captured by the data contained in the Amadeus database. There are, however, large country-specific differences, presumably as a result of differences in accounting and disclosure rules from one country to another. The total weighted average employment coverage for the CESEE countries during the period from 2002 to 2007 is around 42%. Hungary, Lithuania and Slovakia are the laggards in the sample. In these countries, the employment coverage of Amadeus for the period from 2002 to 2007 is less than 30%. Bulgaria and Estonia, by contrast, are the top performers.

The employment coverage for the manufacturing sector is generally higher in Amadeus, with a weighted average of over 65% in 2005 and around 57% for the 2002 to 2007 period. These figures have to be treated with caution, however, because for these years the underlying NACE classifications employed by Amadeus differ from those used in Eurostat employment figures.[26]

[26] *Large discrepancies arise in particular with respect to trade and repair activities, implying some misallocations in sections D, G and K of NACE Revision 1. The bias goes toward an overrepresentation of business services (K) and, to a lesser extent, trade and repair (G) at the expense of manufacturing (D). Furthermore, sections A to B show inconsistencies. These problems were reduced by a time-consuming careful allocation of individual four-digit codes, but could not be eliminated totally due to a non-uniqueness in the correspondence.*

## Annex 2: Annex Tables

Table A1

### Coverage of Employment in the Amadeus Database by Country

| | 2005 | | Average 2002–2007 | |
|---|---|---|---|---|
| | Total | Manufacturing | Total | Manufacturing |
| Bulgaria | 87.9 | 80.7 | 71.9 | 73.2 |
| Croatia | 56.7 | 82.9 | 54.2 | 76.6 |
| Czech Republic | 56.6 | 81.1 | 47.4 | 64.5 |
| Estonia | 74.5 | 87.9 | 67.9 | 81.5 |
| Hungary | 15.7 | 29.2 | 15.2 | 25.4 |
| Latvia | 39.1 | 64.0 | 34.8 | 55.6 |
| Lithuania | 30.4 | 54.1 | 29.2 | 51.6 |
| Poland | 36.7 | 54.4 | 32.0 | 47.3 |
| Romania | 57.9 | 63.6 | 52.2 | 59.2 |
| Slovak Republic | 36.1 | 54.2 | 24.3 | 36.8 |
| Slovenia | 42.8 | 67.9 | 31.9 | 52.7 |
| Mean | 48.6 | 65.5 | 41.9 | 56.8 |

*Source: Authors' calculations.*

*Note: In % of Eurostat employment data.*

Table A2

### List of Sectors Used in this Paper

| Economic activity | Group | Industrial sector | Description | Including NACE, Revision 2 codes |
|---|---|---|---|---|
| Consumer services | H | H04 | Housing, water, electricity, gas, other fuels | D, E |
| | H | H08 | Communication | 4742; 53; 61 |
| | H | H11 | Restaurants and hotels | I |
| Wholesale trade | HH | HH01 | Wholesale: Food and non-alcoholic beverages | Items of 46 |
| | HH | HH03 | Wholesale: Clothing and footwear | Items of 46 |
| | HH | HH05 | Wholesale: Furnishing, household equipment, routine maintenance of house | Items of 46 |
| | HH | HH06 | Wholesale: Health | 4646 |
| | HH | HH07 | Freight transport | Items of 45, 49–51 |
| | HH | HH09 | Wholesale: Recreation and culture | Items of 46 |
| | HH | HH12 | Wholesale: Miscellaneous goods and services | Items of 46 |
| Retail trade | HR | HR01 | Retail: Food and non-alcoholic beverages | Items of 47 |
| | HR | HR03 | Retail: Clothing and footwear | Items of 47; 9523; 9601 |
| | HR | HR05 | Retail: Furnishing, household equipment, routine maintenance of house | Items of 47; 9524; 9529 |
| | HR | HR06 | Retail: Health | 4773–4774; 86 |
| | HR | HR07 | Passenger transport | Items of 45, 49–51 |
| | HR | HR09 | Retail: Recreation and culture | Items of 47; 75; 79; R; 951; 9521 |
| | HR | HR12 | Retail: Miscellaneous goods and services | Items of 47; 649; 651; 653; 9525; 96 without 9601 |
| Manufacturing | M | M01 | Production: Food and non-alcoholic beverages | 10; 1107 |
| | M | M03 | Production: Textiles, clothing, leather | 13–15 |
| | M | M04 | Wood, coke, paper, printing, minerals, metals and products | 16-19; 23–25 |
| | M | M06 | Chemicals, pharmaceuticals, rubber and plastics | 20–22 |
| | M | M07 | Computer, electronical equipment, machinery, motor vehicles, transport equipment | 26–30 |
| | M | M08 | Furniture, other manufacturing, repair | 31–33 |
| | M | M09 | Construction | F |
| Business services | S | S01 | Information | J without 61 |
| | S | S02 | Finance | K without 649, 651, 653 |
| | S | S03 | Real estate; business services | L, M without 75; N without 79 |

*Source: OeNB.*

Table A3

## Profit Margins by Sector and Country, 2005–2007

| Sesctor | Description | BA | BG | CZ | EE | HR | HU | LT | LV | PL | RO | RS | SI | SK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H04 | Housing, water, gas, other fuels | 6.2 | 4.0 | 9.0 | 13.9 | 3.2 | 3.0 | 4.7 | 4.4 | 5.5 | 7.2 | 23.7 | 3.2 | 14.2 |
| H08 | Communication | 22.9 | 18.6 | 13.7 | 22.0 | 28.4 | 9.8 | 12.7 | 25.9 | 12.9 | 4.6 | 55.1 | 13.2 | 4.7 |
| H11 | Restaurants and hotels | 5.4 | 7.2 | 3.4 | 8.7 | 4.2 | 2.1 | 6.2 | 8.0 | 6.4 | 3.6 | 42.0 | 5.0 | –0.4 |
| HH01 | Wholesale: Food and non-alcoholic beverages | 3.3 | 3.7 | 2.8 | 2.3 | 3.8 | 1.9 | 3.2 | 1.9 | 3.0 | 1.9 | 61.0 | 2.0 | 2.4 |
| HH03 | Wholesale: Clothing and footwear | 9.1 | 5.6 | 6.5 | 7.1 | 5.6 | 5.2 | 5.2 | 6.3 | 6.8 | 6.9 | 57.2 | 3.5 | 4.9 |
| HH05 | Wholesale: Furnishing, household equipment, routine maintenance of house | 7.3 | 4.2 | 2.5 | 6.4 | 3.0 | 1.5 | 5.6 | 4.4 | 4.1 | 5.2 | 49.6 | 4.0 | 3.0 |
| HH06 | Wholesale: Health | 5.1 | 3.9 | 1.9 | 5.0 | 4.2 | 5.4 | 6.1 | 3.7 | 1.9 | 4.4 | 47.1 | 5.4 | 3.2 |
| HH07 | Freight transport | 6.3 | 3.9 | 6.7 | 6.8 | 5.5 | 1.3 | 5.0 | 4.7 | 4.7 | 3.9 | 37.9 | 5.9 | 7.1 |
| HH09 | Wholesale: Recreation and culture | 15.9 | 5.8 | 2.4 | 5.6 | 0.0 | 4.0 | 2.1 | 3.9 | 2.6 | 4.8 | 41.9 | 2.2 | 4.2 |
| HH12 | Wholesale: Miscellaneous goods and services | 6.0 | 4.2 | 6.5 | 8.9 | 10.5 | 3.0 | 8.9 | 3.4 | 8.2 | 13.5 | 60.0 | 7.0 | 5.9 |
| HR01 | Retail: Food and non-alcoholic beverages | 4.1 | 0.6 | 0.5 | 2.4 | 1.5 | 0.6 | 8.7 | 1.8 | 1.3 | 4.3 | 62.9 | 1.5 | 0.3 |
| HR03 | Retail: Clothing and footwear | 6.7 | 7.4 | 7.1 | 11.0 | 5.5 | 3.2 | 6.1 | 6.0 | 9.8 | 4.5 | 57.4 | 8.0 | 2.1 |
| HR05 | Retail: Furnishing, household equipment, routine maintenance of house | 7.5 | 6.2 | 6.3 | 6.1 | 4.2 | 2.3 | 3.0 | 3.7 | 7.0 | 5.5 | 56.8 | 4.7 | 4.9 |
| HR06 | Retail: Health | 11.9 | 1.8 | 4.3 | 5.4 | 2.3 | 5.2 | 1.1 | 4.6 | –0.9 | 7.4 | 22.0 | 5.4 | 4.4 |
| HR07 | Passenger transport | 5.0 | 4.6 | 1.4 | 2.7 | 3.8 | –1.7 | 3.7 | 2.6 | 1.3 | 7.8 | 45.6 | 1.7 | 1.0 |
| HR09 | Retail: Recreation and culture | 8.4 | 8.2 | 3.4 | 9.4 | 4.8 | 4.2 | 3.3 | 12.6 | 3.3 | 4.7 | 61.6 | 2.9 | 9.7 |
| HR12 | Retail: Miscellaneous goods and services | 18.5 | 7.0 | 2.7 | 27.6 | 6.8 | 2.0 | 5.8 | 14.7 | 13.6 | 12.5 | 59.5 | 15.6 | 2.8 |
| M01 | Production: Food and non-alcoholic beverages | 4.5 | 5.0 | 2.7 | 3.1 | 5.1 | 1.6 | 2.5 | 2.4 | 4.1 | 21.1 | 31.8 | 1.2 | 0.2 |
| M03 | Production: Textiles, clothing, leather | 9.3 | 5.8 | 2.8 | 4.8 | 2.4 | 2.9 | 2.8 | 7.6 | 4.3 | 6.1 | 39.8 | 1.0 | –0.1 |
| M04 | Wood, coke, paper, printing, minerals, metals and products | 6.0 | 4.8 | 8.0 | 8.1 | 5.3 | 8.1 | 4.5 | 5.0 | 8.0 | 2.6 | 26.2 | 4.0 | 6.9 |
| M06 | Chemicals, pharmaceuticals, rubber and plastics | 6.7 | 3.8 | 6.9 | 7.9 | 3.1 | 7.6 | 7.1 | 8.2 | 7.0 | 2.6 | 36.4 | 8.8 | 4.1 |
| M07 | Computer, electronical equipment, machinery, motor vehicles, transport equipment | 11.6 | 6.8 | 5.3 | 6.6 | 2.7 | 6.5 | 4.7 | 5.7 | 4.9 | 7.7 | 32.8 | 3.6 | 2.6 |
| M08 | Furniture, other manufacturing, repair | 8.6 | 8.2 | 7.8 | 4.8 | 1.7 | 6.5 | 4.8 | 3.3 | 6.2 | 6.1 | 36.0 | 3.5 | 6.0 |
| M09 | Construction | 10.4 | 7.9 | 4.4 | 9.8 | 4.4 | 4.3 | 8.5 | 6.9 | 6.1 | 5.5 | 47.3 | 2.5 | 4.5 |
| S01 | Information | 14.9 | 11.0 | 7.5 | 12.6 | 4.1 | 3.7 | 14.8 | 9.7 | 9.2 | 5.6 | 51.4 | 5.7 | 13.2 |
| S02 | Finance | 22.8 | 14.6 | 12.7 | 23.5 | 22.9 | 12.5 | 9.3 | 10.7 | 5.5 | 9.6 | 49.2 | 11.1 | 18.4 |
| S03 | Real estate, business services | 14.0 | 11.5 | 6.1 | 21.6 | 7.6 | 7.1 | 15.2 | 11.8 | 7.6 | 12.4 | 57.0 | 5.4 | 5.9 |
| Median | | 7.5 | 5.8 | 5.3 | 7.1 | 4.2 | 3.7 | 5.2 | 5.0 | 5.5 | 5.5 | 47.3 | 4.0 | 4.4 |

*Source: Authors' calculations.*

Table A4

## Sales Concentration by Sector and Country, 2005–2007

| Sector | Description | BA | BG | CZ | EE | HR | HU | LT | LV | PL | RO | RS | SI | SK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H04 | Housing, water, gas, other fuels | 13.8 | 13.0 | 7.9 | 10.2 | 20.3 | 3.6 | 9.7 | 27.9 | 3.7 | 0.4 | 9.9 | 11.0 | 11.7 |
| H08 | Communication | 70.3 | 22.0 | 21.5 | 14.3 | 25.2 | 33.8 | 26.2 | 20.9 | 22.2 | 0.2 | 45.8 | 20.3 | 21.5 |
| H11 | Restaurants and hotels | 4.2 | 2.8 | 2.2 | 0.7 | 1.5 | 0.8 | 7.1 | 6.9 | 8.3 | 0.9 | 2.9 | 5.4 | 3.1 |
| HH01 | Wholesale: Food and non-alcoholic beverages | 3.8 | 1.0 | 6.0 | 2.6 | 5.0 | 1.5 | 3.2 | 2.0 | 0.6 | 1.4 | 3.5 | 2.4 | 2.0 |
| HH03 | Wholesale: Clothing and footwear | 5.4 | 4.1 | 8.9 | 8.0 | 7.2 | 1.1 | 7.1 | 7.7 | 4.3 | 0.4 | 2.7 | 3.3 | 7.1 |
| HH05 | Wholesale: Furnishing, household equipment, routine maintenance of house | 3.7 | 16.0 | 3.9 | 1.9 | 6.4 | 3.0 | 15.3 | 2.7 | 3.5 | 2.3 | 2.8 | 3.1 | 11.8 |
| HH06 | Wholesale: Health | 12.8 | 7.3 | 11.6 | 8.7 | 16.0 | 9.6 | 9.4 | 12.5 | 5.0 | 0.6 | 6.1 | 18.8 | 16.1 |
| HH07 | Freight transport | 4.2 | 2.0 | 12.8 | 2.8 | 1.9 | 1.1 | 5.6 | 3.0 | 0.8 | 3.1 | 9.4 | 3.0 | 10.3 |
| HH09 | Wholesale: Recreation and culture | 33.2 | 4.7 | 8.8 | 5.5 | 0.0 | 5.5 | 14.1 | 30.9 | 33.6 | 3.7 | 12.7 | 11.1 | 11.0 |
| HH12 | Wholesale: Miscellaneous goods and services | 20.7 | 6.3 | 12.5 | 5.6 | 21.6 | 16.6 | 9.8 | 17.5 | 11.4 | 38.5 | 17.5 | 15.9 | 18.1 |
| HR01 | Retail: Food and non-alcoholic beverages | 2.6 | 9.9 | 10.7 | 8.0 | 10.5 | 9.7 | 35.4 | 18.8 | 5.1 | 14.5 | 13.1 | 33.7 | 5.9 |
| HR03 | Retail: Clothing and footwear | 6.4 | 5.1 | 14.7 | 2.5 | 22.0 | 27.9 | 11.3 | 8.8 | 5.2 | 3.0 | 6.8 | 6.8 | 11.8 |
| HR05 | Retail: Furnishing, household equipment, routine maintenance of house | 4.7 | 2.8 | 13.2 | 2.8 | 2.3 | 2.1 | 3.5 | 3.2 | 21.0 | 2.1 | 8.7 | 5.4 | 18.9 |
| HR06 | Retail: Health | 4.3 | 2.9 | 2.1 | 2.1 | 5.8 | 0.2 | 13.0 | 8.5 | 0.4 | 10.1 | 14.1 | 25.7 | 10.0 |
| HR07 | Passenger transport | 3.5 | 4.4 | 3.8 | 2.9 | 2.3 | 2.0 | 4.5 | 4.3 | 2.1 | 2.7 | 4.6 | 16.4 | 5.4 |
| HR09 | Retail: Recreation and culture | 12.0 | 6.0 | 2.3 | 1.9 | 8.3 | 1.9 | 14.3 | 3.6 | 3.6 | 2.7 | 5.9 | 7.2 | 7.0 |
| HR12 | Retail: Miscellaneous goods and services | 41.3 | 5.2 | 10.6 | 10.1 | 7.1 | 16.6 | 12.2 | 14.1 | 5.3 | 0.7 | 18.2 | 14.5 | 20.4 |
| M01 | Production: Food and non-alcoholic beverages | 3.7 | 2.3 | 1.2 | 2.5 | 3.5 | 1.5 | 3.9 | 1.8 | 0.6 | 15.1 | 1.2 | 4.0 | 2.7 |
| M03 | Production: Textiles, clothing, leather | 3.0 | 2.8 | 2.3 | 3.5 | 5.6 | 2.5 | 2.2 | 3.7 | 0.9 | 0.4 | 1.3 | 8.0 | 4.6 |
| M04 | Wood, coke, paper, printing, minerals, metals and products | 2.4 | 5.5 | 1.3 | 0.8 | 20.3 | 21.4 | 10.5 | 3.1 | 7.7 | 2.0 | 6.1 | 1.8 | 5.2 |
| M06 | Chemicals, pharmaceuticals, rubber and plastics | 12.5 | 41.7 | 5.7 | 3.3 | 10.9 | 5.3 | 9.1 | 8.1 | 1.1 | 24.6 | 3.2 | 6.7 | 8.0 |
| M07 | Computer, electronical equipment, machinery, motor vehicles, transport equipment | 2.9 | 2.1 | 5.2 | 2.5 | 2.2 | 7.7 | 3.7 | 3.9 | 1.4 | 0.3 | 1.0 | 5.2 | 6.0 |
| M08 | Furniture, other manufacturing, repair | 14.0 | 2.7 | 10.6 | 1.0 | 3.9 | 2.2 | 2.6 | 4.0 | 2.3 | 1.0 | 7.0 | 2.1 | 8.4 |
| M09 | Construction | 1.7 | 0.5 | 1.5 | 0.6 | 0.9 | 2.4 | 2.0 | 0.8 | 0.7 | 3.9 | 0.8 | 2.2 | 5.5 |
| S01 | Information | 5.0 | 2.1 | 4.4 | 1.3 | 3.6 | 2.0 | 23.1 | 3.8 | 2.3 | 1.0 | 3.1 | 4.8 | 5.4 |
| S02 | Finance | 41.6 | 3.8 | 10.3 | 5.4 | 7.7 | 8.8 | 66.1 | 25.0 | 19.2 | 0.2 | 21.6 | 14.1 | 16.8 |
| S03 | Real estate, business services | 14.2 | 0.3 | 1.3 | 0.4 | 1.5 | 2.7 | 5.4 | 1.4 | 3.6 | 18.1 | 2.1 | 1.3 | 4.5 |
| Median | | 5.0 | 4.1 | 6.0 | 2.8 | 5.8 | 2.7 | 9.4 | 4.3 | 3.6 | 2.1 | 6.1 | 6.7 | 8.0 |

*Source: Authors' calculations.*

# Regional Convergence in Europe and the Role of Urban Agglomerations

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*Using data for EU-27 NUTS 2 regions and major cities, we evaluate empirically the role of urban growth spillovers as a determinant of income dynamics at the regional level. We go beyond the empirically well documented static relationship between national income and productivity in urban agglomerations. We use spatial regression models to quantify the effect of city growth spillovers on neighboring regions and assess the interrelationship between urban and regional growth. Our results indicate that urban growth spillovers play an important role in explaining differences in per capita income growth across European regions: Strong income growth in urban agglomerations provides an additional growth bonus for neighboring regions. This effect is very homogeneous across regions in Western and Eastern Europe. Our results indicate that the industrial composition of the agglomeration also matters for regional growth: Regions hosting urban agglomerations with a relatively high specialization in the primary sector as well as in fuels and chemicals tend to experience lower rates of economic growth. Our study is particularly relevant for policymakers since it indicates a trade-off between fostering income convergence at the regional level on the one hand and spurring national growth on the other hand.*

*JEL classification: C21, R11, O18, O52*
*Keywords: Determinants of economic growth, European regions, urban growth, spatial error model*

## 1 Introduction

Empirical research on the determinants of economic growth at the regional level in Europe tends to find that regions that host a capital city systematically have higher income growth rates after controlling for other factors that affect economic growth. This is particularly true for regions in Central, Eastern and Southeastern European (CESEE)[2] countries (see Crespo Cuaresma et al., 2009). The aim of this paper is to shed light on the interrelationships between regions and urban agglomerations in the growth process in Europe at the level of NUTS 2 regions and to evaluate empirically the role of urban growth as an engine of economic growth and income convergence in Europe. The answer to this question is particularly relevant for policymaking since the quantification of the effect of urban agglomerations on economic growth at the regional (and national) level is a key piece of information to assess the efficiency of regional policy measures. If agglomerations are the source of important growth spillovers economic policy may face a trade-off between growth at the national level and equality in the spatial distribution of activity between and within regions of a given country. Our analysis is linked to two strongly related branches of the academic literature. On the one hand, we investigate the nature of the determinants of economic growth and income convergence at the regional level in Europe in a modelling framework which explicitly takes into account spatial spillovers. On the other hand, we specifically

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[2] *In the empirical part of this study, the CESEE region comprises the following countries: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.*

contribute to the empirical literature on agglomeration economies in the European context. We aim to answer questions such as whether urban characteristics are important determinants of growth at the regional NUTS 2 level, at which European cohesion policy is implemented. We also study the role that the sectoral composition of urban poles plays as a factor affecting regional economic growth and income convergence. We pay particular attention to differences between Western and Eastern regions of the EU and evaluate the scope of the spillovers which emanate from urban agglomerations for entire regions.

Concerning the first branch of literature, the process of regional income convergence in Europe as well as the effect that regional policy has had on economic growth have been studied in detail, and a number of empirical facts have been robustly identified. Regarding conditional income convergence, Barro and Sala-i-Martin (1991) estimated in a seminal contribution the annual speed of income convergence for European regions close to 2%. The role of structural funds has received a lot of attention in the empirical literature, but the mixed econometric evidence for the effectiveness of such policies is plagued with sample selection problems. Recently, Becker et al. (2008) used regression discontinuity methods to deal with the problem of sample selection and found evidence for growth effects in regions receiving structural funds.[3] On the other hand, convergence clusters or clubs have been identified by Canova (2004) and Corrado et al. (2005). Basile (2008) finds positive (nonlinear) effects of schooling for EU-15 regions, whereas the results in LeSage and Fischer (2007) indicate that industry diversity impacts negatively on European growth rates. As for CESEE, a thorough study identifying growth triggers in CESEE regions has been carried out by the European Commission (European Commission, 2004). On the one hand, the results point to decreasing income inequality between regions of different countries. On the other hand income inequality is shown to be increasing *within* CESEE countries. That is, regional divergence and convergence co-exist in Europe, a finding that is confirmed by the results in Szörfi (2007), who shows that in an early stage of catching-up, regional inequalities tend to increase.

The role of agglomerations has so far been relatively underrepresented in regional growth studies for the EU. There are empirical results for European NUTS 3 regions which confirm the existence of *static agglomeration economies* (see, for example, Ciccone, 2002), implying that urban poles tend to have higher levels of productivity. However, concerning effects on the growth rate of income per capita *(dynamic agglomeration economies),* the existing research has delivered ambiguous empirical results hitherto. Empirically, the existence of dynamic agglomeration economies implies that urban centers have an effect on national economic growth (or on income growth at subnational levels, which nest the geographical level at which cities are located), a phenomenon that is usually referred to as the Jacobs hypothesis (Jacobs, 1969). An example of the controversy testing this empirical fact is the discussion between Mario Polèse and Peter Taylor in *Urban Studies* (see Polèse, 2005, 2006, and Taylor, 2006a and 2006b).

There are several theoretical models that underpin the existence of such dynamic agglomeration economies (see Glaeser and Gottlieb, 2009, for an excellent

[3] *See Boldrin and Canova (2001) for a critical assessment of regional economic policies in the framework of empirical models of regional determinants of growth and income convergence.*

review of the literature). The theoretical literature on dynamic agglomeration externalities touches upon the effect that urban poles have on the main variables put forward by endogenous growth theory: ideas and human capital. Cities are considered to be centers which are particularly productive in the creation and transmission of new ideas (see, for example, Duranton and Puga, 2000). Likewise, the implementation of new or significantly improved products, processes and business practices largely takes place in urban areas (De Groot et al., 2008). In parallel, the complementarity of urban agglomeration and human capital plays an important role in expanding growth externalities that originated in urban poles. Thus, in the framework of endogenous growth theory with agglomeration economies, aggregate developments at the national level can depend on the performance of large agglomerations that act as growth poles (Thomas and Robins, 2005).

Some stylized facts underscore the importance of urban hubs for national developments. Looking at GDP levels, the proportion of GDP in urban agglomerations is impressive for some countries: In 2008, around 24% of the respective national GDP in Austria and Bulgaria was earned in the respective capital city; Budapest's GDP amounts to nearly 30% of the total Hungarian GDP. This reflects two trends: First, people tend to cluster in agglomerations, which in turn explains the large capital city share in total economic activity. Second, high-value products tend to be produced in urban areas, whereas manufacturing is largely located in backward regions. The sectoral structure of urban agglomerations thus determines to a high degree the regional industrial composition. An empirical investigation of the urban sectoral structure might therefore yield important insights for regional growth.

The aim of this contribution is to assess whether urban agglomerations in Europe generate growth spillovers in neighboring regions, thus offering empirical evidence for the existence of dynamic agglomeration economies. Crespo Cuaresma et al. (2009) investigate the robustness of regional growth determinants for European regions, concentrating on variables measured at the NUTS 2 level. Their analysis exploits information on more than 50 potential growth drivers, five of which are reported as robustly related to growth. The empirical analysis in Crespo Cuaresma et al. (2009) reaches the conclusion that human capital and income convergence (particularly in CESEE) are robust driving forces of income growth in Europe and that regions with capital cities have a growth bonus as compared to the rest of the regions in a country. In this study, we aim to open the black box behind this last result by examining in more detail the role of urban agglomerations and the characteristics that make them engines of regional growth, i.e. the potential existence of urban agglomeration economies. The paper is structured as follows: Section 2 introduces the measures of urban industrial composition, and section 3 presents the data and the econometric specification we employ. Section 4 summarizes the empirical results and section 5 concludes.

## 2 Urban Agglomerations in Europe: the Stylized Facts

Urban economics[4] concludes that specialization, diversity and competition shape urban growth in employment and productivity and hence economic growth. De Groot et al. (2008) surveys the bulk of the empirical literature on urban agglomerations,

[4] *Rosenthal and Strange (2003) provide an excellent overview of the economics of urban agglomeration.*

concluding that diversity and competition are conducive to the development of patents, innovations and productivity, while the results are mixed for specialization. A potential explanation is that industrial clusters tend to specialize in the whole production process and cannot compete with foreign firms that specialize in a certain stage of the production process (Thomas and Robins, 2005). The theoretical arguments concerning specialization and diversity imply that the concentration of economic activity in a few industries will enhance growth whenever agglomeration externalities work *within the same industry*. In the spirit of Marshall, Arrow and Romer, firms can benefit from firm clusters of the same industry because of labor market pooling, input sharing and knowledge spillovers. Agglomeration externalities can also work in an *inter*sectoral dimension ("urbanization economies"), where the growth bonus of specialization vanishes and a diversified city base is assumed to further spur growth. According to Jacobs (Jacobs, 1969) knowledge spillovers are assumed to work best *across* industries, and, consequently, variety and diversity of proximate industries enhance the innovation process that leads to urban and, ultimately, regional growth.

For the empirical analysis of the role of specialization within urban agglomerations, we start by analyzing statistical measures of industrial composition. Duranton and Puga (2000) propose indicators of overall specialization ($ZI_i$), overall diversity ($DI_i$) and sector specialization (location quotient, $LQ_{ij}$), defined respectively as

$$ZI_i = \max_j (s_{ij}) \quad (1),$$

$$DI_i = (\sum_{j=1}^{m} s_{ij}^2)^{-1} \quad (2),$$

$$LQ_{ij} = \frac{s_{ij}}{s_j} \quad (3),$$

with the shares of economic activity of city $i$ in sector $j$ denoted by

$$s_{ij} = GVA_{ij} / \sum_{j=1}^{m} GVA_{ij},$$

where GVA is gross value added and the respective sector shares given by

$$s_j = \sum_{i=1}^{n} GVA_{ij} / \sum_{i=1}^{n} \sum_{j=1}^{m} GVA_{ij}$$

for $i=1,....,n$ cities and $j=1,....,m$ sectors. The first two indicators are absolute measures of specialization/diversity, while relative measures indicate to what extent the distribution of economic activity among cities deviates from a reference structure (city system). However, as Aiginger and Davies (2004) argue, for drawing policy implications, absolute measures are of particular interest, since they assess the uneven distribution of industrial activity, and this matters most for industry shocks and, consequently, fluctuations of economic performance. Note that the *ZI* indicator has values in the [0,1] interval, whereas *DI* can take values in the range of 1 to *m*. Larger values of ZI (DI) imply more specialization (diversity). Besides the overall degree of specialization, it is also of interest in which sectors agglomerations specialize. This can be assessed by calculating location quotients. A value of $LQ_{ij} > 1$

indicates that city *i*'s share in sector *j* is above that of the city system and thus indicates sector-specific specialization.

Table 1 below summarizes the industrial composition pattern in European cities at the beginning (1995) and the end (2007) of our sample period. The data for our empirical analysis stem from a harmonized city dataset which was set up by Cambridge Econometrics on behalf of the European Economic Research and Advisory Consortium (ERECO) in recent years. The database provides a comparable set of economic indicators for 62 large European cities (see the appendix for the list of cities included in the analysis).[5] With respect to the time dimension and structural detail (14 sectors), this data base goes well beyond all other sources available, and its completeness and topicality is guaranteed by continuous work on the database by national institutes. However, the scarcity of data at the level of "functional" urban regions and the problems of definition associated with this concept apply also here. To proxy functional urban regions, the database therefore collects information on those administrative regional entities which correlate most strongly with a functional delimitation of the city region in question. Data used therefore spread from the NUTS 1 (e.g. London) to the NUTS 3 level (most cities).[6]

Table 1

**Descriptive Statistics of Specialization and Diversity Indicators in Europe**

| | Summary statistics 1995 | | | Summary statistics 2007 | | |
|---|---|---|---|---|---|---|
| | *Mean* | *Min.* | *Max.* | *Mean* | *Min.* | *Max.* |
| ZI* | 0.266 | 0.146 (Lisboa) | 0.393 (Paris) | 0.292 | 0.138 (Lisboa) | 0.440 (Paris) |
| DI* | 6.935 | 4.801 (Hamburg) | 10.590 (Lisboa) | 6.340 | 4.174 (London) | 10.510 (Lisboa) |
| Agriculture, forestry and fishing | 1.940 | 0.001 (Bucureşti) | 14.500 (Lisboa) | 1.742 | 0.046 (London) | 11.920 (Lisboa) |
| Mining and energy supply | 1.230 | 0.000 (Riga) | 5.277 (Edinburgh) | 1.255 | 0.000 (Riga) | 4.205 (Sofiya) |
| Food, beverages and tobacco | 1.258 | 0.000 (Riga) | 4.919 (Bucureşti) | 1.321 | 0.000 (Riga) | 4.747 (Dublin) |
| Textiles and clothing | 1.431 | 0.072 (Stockholm) | 16.530 (Riga) | 1.549 | 0.087 (Edinburgh) | 12.070 (Riga) |
| Fuels, chemicals, rubber and plastic products | 0.916 | 0.000 (Riga) | 1.978 (Torino) | 1.029 | 0.000 (Riga) | 2.578 (Rouen Le Havre) |
| Electronics | 0.964 | 0.000 (Riga) | 2.888 (Budapest) | 1.057 | 0.000 (Riga) | 3.183 (Helsinki) |
| Transport equipment | 0.893 | 0.000 (Riga) | 3.369 (Birmingham) | 1.009 | 0.000 (Riga) | 3.291 (Stuttgart) |
| Other manufacturing | 0.970 | 0.000 (Riga) | 1.855 (Stuttgart) | 1.066 | 0.000 (Riga) | 2.715 (Plzeň) |
| Construction | 1.145 | 0.562 (Bruxelles) | 2.528 (Leipzig) | 1.160 | 0.440 (Hamburg) | 3.207 (Thessaloniki) |
| Wholesale and retail | 1.100 | 0.731 (Brno) | 1.923 (Warszawa) | 1.125 | 0.535 (Thessaloniki) | 2.036 (Poznań) |
| Hotels and restaurants | 0.939 | 0.350 (Sofiya) | 2.371 (Madrid) | 0.878 | 0.317 (Warszawa) | 2.630 (Athina) |
| Transport and communications | 1.084 | 0.691 (Stuttgart) | 2.328 (Riga) | 1.067 | 0.531 (Stuttgart) | 2.057 (Sofiya) |
| Financial services | 0.910 | 0.275 (Brno) | 1.927 (Sofiya) | 0.832 | 0.171 (Brno) | 1.984 (London) |
| Other market services | 0.855 | 0.276 (Bucureşti) | 1.357 (Paris) | 0.866 | 0.337 (Lisboa) | 1.363 (Paris) |

*Source: Authors' calculations.*

* *ZI denotes the specialization index, DI a measure for diversity.*

[5] *We had to impute GVA (gross value added) figures for Warszawa, Krakow, Poznań and Wrocław instead of GDP figures. Due to a lack of data, the unemployment rate for Ljubljana for 1995 constitutes an average over the period 1990–93. Furthermore, the unemployment rate for Kobenhavn is set to the Danish national unemployment rate in 1995.*

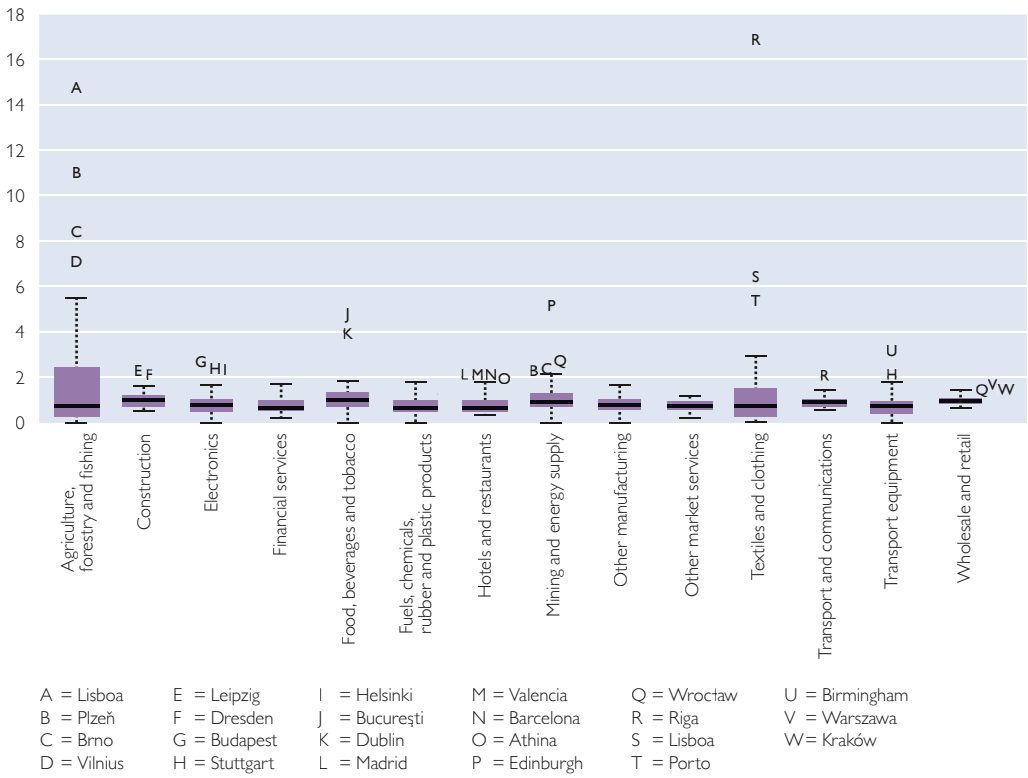
[6] *Note that for the NUTS 2 regions "ie02" and "nl33," the urban data set offers two agglomerations per region (Dublin and Cork for "ie02" and Amsterdam and Den Haag for "nl33"). In both cases we opted for the larger agglomeration, thus excluding Cork and Den Haag from the following descriptive and causal analysis. In the case of London, the urban variables have been assigned to the NUTS 2 region "ukl2" (Outer London), which is assumed to be the center of economic activity in London.*

The table reveals some stylized facts: In 1995, the degree of overall specialization was smallest in Lisbon, while Paris appeared to be the most specialized city. Diversity was most pronounced in Lisbon, while Hamburg showed the lowest level of the diversity indicator (DI). Regarding sector specific specialization, Riga, Brno and Bucharest appear frequently as outliers on both ends of the specialization spectrum. While Riga was the least specialized city in mining, food, fuels, electronics, transport equipment and other manufacturing, it was most specialized in textiles and clothing as well as in transport and communications. The figures for 2007 reveal a rather stable pattern for some cities: Lisbon and Paris continued to be the least and most specialized cities in Europe respectively. Lisbon was also the city with the most diversified industrial base in 2007.

Charts 1 and 2 present boxplots of the location quotient for 1995 and 2007. Some interesting features of the geographical structure of specialization patterns are visible in these graphs. Cities in peripherial countries tend to be specialized in primary sector activities, textiles and clothing as well as food, beverages and tobacco. This is not an exclusive feature of urban agglomerations in CESEE countries but is also visible in cities in Portugal and Ireland. Although some changes took place in the period from 1995 to 2007 in terms of specialization, the persistence of the location quotient differentials across European cities is high, and such specialization clusters tend to persist for the full period under analysis.

Chart 1

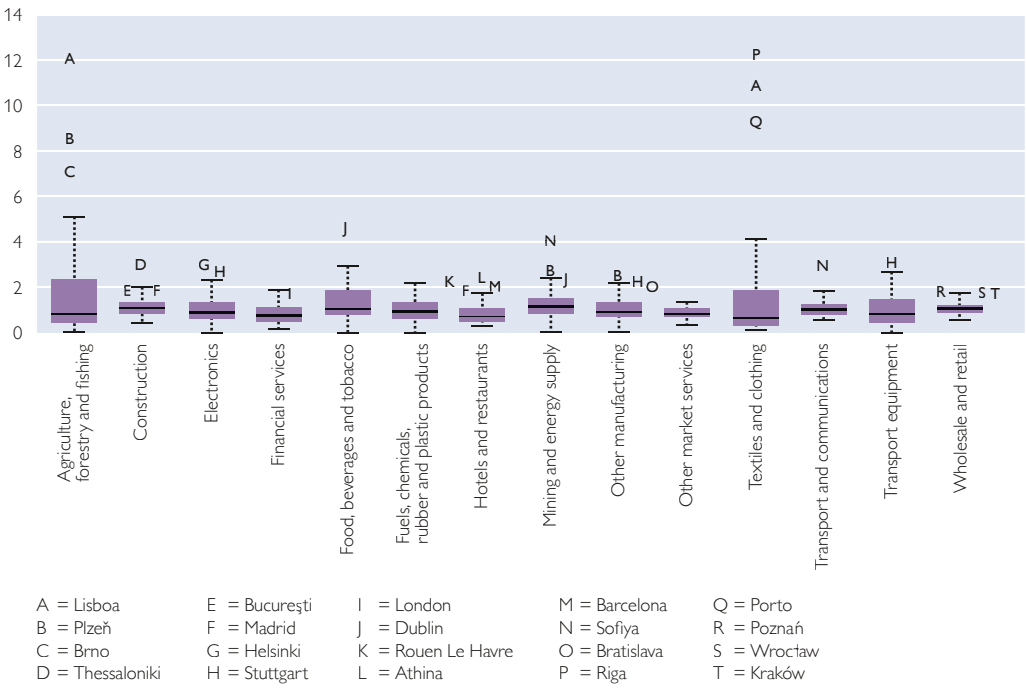
**Boxplot of Location Quotient (1995)**




*Source: Authors' calculations.*

Chart 2

**Boxplot of Location Quotient (2007)**




*Source: Authors' calculations.*

## 3 Econometric Specification and Data

The effects of urban variables on the regional growth process are estimated using a spatial error model (SEM) of the following form

$$y = \alpha \iota_N + X_k \beta_k + \varepsilon, \tag{4}$$

$$\varepsilon = \lambda W \varepsilon + u$$

where $y$ is an $N$-dimensional column vector of growth rates of income per capita for $N$ regions, $\alpha$ is the intercept term, $l_N$ is an $N$-dimensional column vector of ones, $X_k=(x_1 \dots x_k)$ is a matrix whose columns are stacked data for $k$ explanatory variables (both regional and urban) and $\beta_k=(\beta_1 \dots \beta_k)'$ is the $k$-dimensional parameter vector corresponding to the variables in $X_k$. Our observation unit is a NUTS 2 region, and our dataset combines urban and regional characteristics. It should be noted that urban variables are only available for some, but not all of the regions, since sufficiently large urban agglomerations are not present in all regional units. For the remaining regions, the urban variables are filled with zero values (which is essentially the same as premultiplying the corresponding variable with a city dummy variable). This may cause multicollinearity problems among the urban variables, which need to be taken into account when it comes to interpreting the regression results. The above model constitutes a spatial regression model that parametrizes spatial correlation via the error term. The geographical structure in the data is specified via a weighting matrix $W$, and $\lambda$ is a scalar that picks up the

degree of spatial autocorrelation. Positive values of $\lambda$ imply positive spatial correlation, leading to growth clusters in the data. The remaining error term $u$ is then assumed to be an $N$-dimensional shock process that is free of spatial correlation with zero mean and a diagonal variance-covariance matrix $\Omega=\sigma^2 I_N$.

The use of a spatial regression model proves useful since the presence of spatial dependence is well documented in the applied regional convergence literature (see e.g. Niebuhr, 2001, Fischer and Stirböck, 2006, or Crespo Cuaresma and Feldkircher, 2010). Unmodelled spatial autocorrelation may lead to flawed inference (Anselin, 1988), and such a phenomenon may arise due to the economic interaction of countries, regions and cities such as the movement of capital, labor (commuting and migration) and goods (trade flows). Furthermore, locational characteristics, endowments and resources not being restricted to administrative borders can lead to similarity across areas which are close to each other. The resulting spatial correlation is typically parametrized by a weight matrix $W$, where we use two different variants thereof: an inverse distance matrix *W_inv* and distance band matrices *W_db*. The inverse distance matrix assigns a non-zero weight to each neighborhood observation in the sample, with the weights being a decreasing function of distance (smaller weights are given to regions that are far away from each other). Distance band matrices identify neighbors as those regions that are situated within a certain radius.[7] These regions are then assigned equal weights (we thus solely distinguish between neighbors and non-neighbors, with the latter receiving zero weights). We prefer an econometric specification using the SEM (spatial error model) instead of a spatial autoregressive structure (SAR model). On the one hand, statistical tests have indicated that the residuals are free of remaining spatial autocorrelation under the SEM model, so there is no empirically backed reason why one should prefer the SAR model over the SEM. On the other hand, an SAR specification would potentially mask (at least part of) the effect of urban spillovers in the spatial lag of the regional growth variable, thus making the model difficult to interpret.

Our regional dataset covers cross-sectional information on all 255 EU-27 regions,[8] and each income growth observation refers to the average annual growth rate in the period from 1995 to 2007, deflated using national consumer price data. Note that for the majority of the sample period, CESEE regions are yet not EU members. This implies that potential structural breaks related to formal EU membership play a negligible role in this dataset.[9] The regional dataset is complemented by an urban dataset covering information on 62 major European cities, which are listed in table 2. Besides data on employment, our urban dataset covers sectoral GVA for 14 industry sectors.[10] These data serve as proxy for size, wealth and the industrial composition of the respective agglomeration. All explanatory

[7] *The matrices are based on great circle distances between regions' centroids (i.e. economic centers, typically the regions' capital cities) measured in kilometers.*

[8] *See the data appendix in Crespo Cuaresma et al. (2009) for a detailed list of all the 255 regions.*

[9] *See Crespo Cuaresma et al. (2008) for an assessment of EU membership as a growth determinant at the national level.*

[10] *These sectors are agriculture, forestry and fishing, mining and energy supply, food, beverages and tobacco, textiles and clothing, fuels, chemicals, rubber and plastic products, electronics, transport equipment, other manufacturing, construction, wholesale and retail, hotels and restaurants, transport and communications, financial services, and other market services.*

variables (regional and urban) are measured at the beginning of the sample period so as to minimize potential endogeneity problems. To our knowledge, the combined dataset is the most comprehensive used hitherto in terms of the range of variables covered in the regional and urban dimension.

## 4 Empirical Results

We start by including in our model the growth determinants identified by Crespo Cuaresma et al. (2009) as being robust growth drivers, namely initial GDP per capita (income convergence) and the share of highly educated workers in the labor force (which is a proxy for human capital).[11] Crespo Cuaresma et al. (2009) furthermore show that regions situated in CESEE economies as well as those that host a country's capital city have significantly higher income growth rates. This is modelled by including binary variables which identify CESEE regions and capital cities. On top of this, even higher growth rates than those implied by these effects are found in CESEE capital city regions, which suggests that the interaction term of the two aforementioned variables should also be included as a covariate in the econometric model. Capital cities are a subset of our urban dataset, and the effect proposed in our model implies that there is a direct effect on economic growth through the hosting of the capital city and a potential indirect spillover from urban agglomerations in nearby regions. These five variables constitute our baseline regression model and are consequently enriched by certain categories of urban variables. The results of the estimations carried out are summarized in table 2.

We first test whether urban growth spills over to nearby regions after controlling for the regional growth determinants mentioned above. This implies that we test whether European agglomerations act as growth poles. We do this by constructing a spatial lag of the urban growth variable, that is each region's growth process is assumed to be influenced by a (distance-) weighted average of that of neighboring agglomerations. By concentrating on spatially lagged urban growth, we circumvent the potential endogeneity issues – both from an economic as well as an econometric perspective – that would arise in estimating the direct effect of the city on the region where it is located. Furthermore, since our model already imposes spatial autocorrelation through the structure of the error term, we are actually assessing empirically effects that are superimposed to the usual growth spillovers present in regional data. As a neighborhood structure we use an inverse distance matrix, which we multiply with the growth rate of income in the urban agglomeration. This implies that the closer agglomerations are located to the region in question, the more influential they are assumed to be in shaping the regional growth process. The first column in table 2 reveals that European cities are indeed growth engines for entire regions, with the respective coefficient being positive and significant. This implies that regions which are close to urban agglomerations whose income per capita is growing receive an extra growth bonus above the one which is being modelled by imposing spatial autocorrelation in the economic growth process at the subnational level.

In the next step, we look at urban characteristics and the role they play in shaping regional growth processes. We start by testing the two prominent urban

[11] *The source for income per capita is Eurostat, while the human capital data are sourced from Eurostat's Labour Force Survey.*

theories mentioned above: the Jacobs hypothesis stating that diversity (DI) in economic activity is key to superior economic performance and the Marshall-Arrow-Romer hypothesis advocating urban specialization (ZI). It should be stated that both theories are not mutually exclusive and can co-exist, therefore nothing prevents us from using both variables in the regression model. To our knowledge, the two theories have so far not been tested in this context, that is its consequences for regional growth are uninvestigated. We also have data for the industrial composition of regions themselves, although at a far less disaggregated level, but the results in Crespo Cuaresma et al. (2009) demonstrate that there is no robust empirical relationship between sectoral composition and regional growth for the NUTS 2 dataset used here. Column 2 of table 2 presents the results of the model which includes both variables (as explained above, these variables can be interpreted as the interaction between a dummy for urban agglomeration and the respective characteristic of the agglomeration) and reveals that none of the two urban sectoral composition measures is a significant factor when it comes to explaining differences in regional growth robustly.

It may be the case that the specialization indicators are simply too broad and that it is industrial specialization at the urban level that matters most to discern growth patterns at the regional level. We thus add the 14 location quotient variables which capture the degree of industry-specific specialization (columns 3 and 4 of table 2). Three variables turn out to be of empirical relevance: specialization in agriculture (whose partial correlation with economic growth at the regional level is negative), in food, beverages and tobacco (with a positive association) and in fuels, chemical and plastic products (which is negatively related to regional growth).

Finally, we add other urban factors unrelated to the industrial composition to control for size and employment. However, none of these controls survive standard significance tests. Our final specification is thus given in column 4 of table 2, incorporating 5 regional variables and 4 urban factors. Several aspects are worth mentioning: First, the identified variables are all robust determinants of regional growth. Regardless of which other factors are included, the sign and magnitude of the nine variables never change markedly. This is particularly relevant for the variable capturing the spillovers from urban to regional growth. Second, our explanatory variables cannot account for the full spatial autocorrelation present in the European growth process at the regional level. This is reflected in the existence of positive spatial autocorrelation in the residual, which in our case is captured through the spatial error structure; however, it would affect our estimates if the geographical structure of the data were not taken into account when parametrizing the model. This is evident from the last line in table 2, which reports the results on the spatial parameter $\lambda$ and shows that a nonspatial regression model – provided in the last column of the table – would lead to flawed inference.[12] Third, our results are robust with respect to the specification of the spatial weight matrix (and thus the specification of the underlying pattern of economic interaction among regions/agglomerations).[13]

[12] *A Moran's I test on the regression residuals of a standard (nonspatial) linear regression offers significant evidence that spatial correlation is present in the data.*

[13] *The results are available from the authors upon request.*

Table 2

## The Impact of Urban Growth on Regional Economic Growth

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 (OLS) |
|---|---|---|---|---|---|---|
| Constant | 0.105 *** | 0.106 *** | 0.092 *** | 0.092 *** | 0.093 *** | 0.081 *** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Initial income per capita | –0.011 *** | –0.011 *** | –0.009 *** | –0.009 *** | –0.009 *** | –0.008 *** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Share of highly educated workers | 0.034 *** | 0.035 *** | 0.033 *** | 0.029 *** | 0.032 *** | 0.031 *** |
| | (0.000) | (0.000) | (0.001) | (0.001) | (0.001) | (0.000) |
| CESEE dummy | 0.005 | 0.004 | 0.005 | 0.005 | 0.004 | 0.006 ** |
| | (0.098) | (0.123) | (0.080) | (0.055) | (0.138) | (0.018) |
| Capital city | 0.007 *** | 0.007 *** | 0.004 | 0.006 *** | 0.006 ** | 0.006 ** |
| | (0.001) | (0.002) | (0.088) | (0.007) | (0.016) | (0.011) |
| CESEE dummy x capital city | 0.024 *** | 0.023 *** | 0.018 *** | 0.021 *** | 0.020 *** | 0.021 *** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Spatially lagged city growth | 1.709 *** | 1.766 *** | 1.818 *** | 1.859 *** | 1.989 *** | 1.900 *** |
| | (0.002) | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) |
| DI[1] | – | 0.000 | – | – | – | – |
| | – | (0.369) | – | – | – | – |
| ZI[1] | – | –0.007 | – | – | – | – |
| | – | (0.520) | – | – | – | – |
| Agriculture, forestry and fishing | – | – | –0.001 ** | –0.001 ** | –0.001 | –0.001 ** |
| | – | – | (0.023) | (0.025) | (0.053) | –0.039 |
| Mining and energy supply | – | – | –0.001 | – | – | – |
| | – | – | (0.653) | – | – | – |
| Food, beverages and tobacco | – | – | 0.007 *** | 0.007 *** | 0.007 *** | 0.007 *** |
| | – | – | (0.000) | (0.000) | (0.000) | (0.000) |
| Textiles and clothing | – | – | 0.000 | – | – | – |
| | – | – | (0.521) | – | – | – |
| Fuels, chemicals, rubber and plastic products | – | – | –0.008 ** | –0.007 *** | –0.006 ** | –0.007 *** |
| | – | – | (0.012) | (0.000) | (0.002) | (0.000) |
| Electronics | – | – | –0.001 | – | – | – |
| | – | – | (0.598) | – | – | – |
| Transport equipment | – | – | –0.002 | – | – | – |
| | – | – | (0.383) | – | – | – |
| Other manufacturing | – | – | 0.007 | – | – | – |
| | – | – | (0.202) | – | – | – |
| Construction | – | – | –0.002 | – | – | – |
| | – | – | (0.558) | – | – | – |
| Wholesale and retail | – | – | –0.003 | – | – | – |
| | – | – | (0.490) | – | – | – |
| Hotels and restaurants | – | – | 0.000 | – | – | – |
| | – | – | (0.918) | – | – | – |
| Transport and communications | – | – | 0.005 | – | – | – |
| | – | – | (0.222) | – | – | – |
| Financial services | – | – | 0.000 | – | – | – |
| | – | – | (0.903) | – | – | – |
| Other market services | – | – | –0.003 | – | – | – |
| | – | – | (0.535) | – | – | – |
| Population | – | – | – | – | 0.001 | – |
| | – | – | – | – | (0.309) | – |
| Share of economically active population | – | – | – | – | 0.007 | – |
| | – | – | – | – | (0.067) | – |
| Unemployment rate | – | – | – | – | 0.000 | – |
| | – | – | – | – | (0.184) | – |
| City income per capita | – | – | – | – | –0.001 | – |
| | – | – | – | – | (0.198) | – |
| Lambda | 0.516 | 0.510 | 0.704 | 0.687 | 0.668 | – |
| Log-likelihood | 860.558 | 860.994 | 880.57 | 877.078 | 880.183 | 875.507 |

*Source: Authors' calculations.*

*Note: P-values in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.*

[1] *ZI denotes the specialization index, DI a measure for diversity.*

So far we have identified urban growth spillovers to regions that are close to each other. A policymaker could be interested in the extent of the spillovers. Are they rather local phenomena, or does growth really spread far out? To answer this question we construct several distance band weight matrices with the radius ranging from 300 to 700 kilometers. A distance band matrix with a radius of 300 kilometers assumes that cities can influence regions that are up to 300 kilometres apart. Table 3 contains the estimation results. It can be seen that growth spillovers are significant for regions that are not more than 500 kilometers apart. The effect is furthermore sizable for such regions. An increase by 2 percentage points in the growth rate of a city (roughly the long-run mean growth rate in our sample) increases economic growth in a region which is up tp 500 kilometers away by 0.02 percentage points. This is roughly comparable to the effect found when increasing the share of tertiary educated workers by 0.67 percentage points in the respective region. Although the effect is modest for such growth rates, it is widespread and can be sizable for regions close to fast-growing urban poles.

Table 3

**The Spatial Extent of Urban Growth Spillovers**

| | W_DB (300) | W_DB (400) | W_DB (500) | W_DB (600) | W_DB (700) |
|---|---|---|---|---|---|
| Constant | 0.123 *** | 0.130 *** | 0.139 *** | 0.131 *** | 0.127 *** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Initial income per capita | –0.011 *** | –0.012 *** | –0.013 *** | –0.012 *** | –0.012 *** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Share of highly educated workers | 0.031 *** | 0.030 *** | 0.029 *** | 0.030 *** | 0.030 *** |
| | (0.001) | (0.001) | (0.002) | (0.002) | (0.001) |
| CESEE dummy | 0.007 ** | 0.005 | 0.004 | 0.005 | 0.006 ** |
| | (0.016) | (0.070) | (0.218) | (0.074) | (0.041) |
| Capital city | 0.006 *** | 0.007 *** | 0.007 *** | 0.007 *** | 0.007 *** |
| | (0.004) | (0.002) | (0.001) | (0.002) | (0.004) |
| CESEE dummy x capital city | 0.019 *** | 0.019 *** | 0.020 *** | 0.019 *** | 0.019 *** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Agriculture, forestry and fishing | –0.001 ** | –0.001 ** | –0.001 ** | –0.001 ** | –0.001 ** |
| | (0.029) | (0.028) | (0.029) | (0.034) | (0.031) |
| Food, beverages and tobacco | 0.007 *** | 0.007 *** | 0.007 *** | 0.007 *** | 0.007 *** |
| | (0.000) | (0.000) | –0.0004 | (0.000) | (0.000) |
| Fuels, chemicals, rubber and plastic products | –0.007 *** | –0.007 *** | –0.007 *** | –0.007 *** | –0.007 *** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Spatially lagged city growth (300km) | 0.002 | – | – | – | – |
| | (0.781) | – | – | – | – |
| Spatially lagged city growth (400km) | – | 0.008 | – | – | – |
| | – | (0.177) | – | – | – |
| Spatially lagged city growth (500km) | – | – | 0.010 ** | – | – |
| | – | – | (0.037) | – | – |
| Spatially lagged city growth (600km) | – | – | – | 0.005 | – |
| | – | – | – | (0.199) | – |
| Spatially lagged city growth (700km) | – | – | – | – | 0.002 |
| | – | – | – | – | (0.502) |
| Average number of neighbors | 18 | 28 | 41 | 55 | 69 |
| Lambda | 0.800 | 0.787 | 0.794 | 0.800 | 0.804 |
| Log-likelihood | 871.189 | 872.053 | 873.296 | 871.973 | 871.375 |

*Source: Authors' calculations.*

*Note: P-values in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.*

Table 4

**Estimation Results for CESEE Specification**

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| Constant | 0.091 *** | 0.094 *** | 0.092 *** | 0.089 *** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Initial income per capita | –0.009 *** | –0.010 *** | –0.009 *** | –0.009 *** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Share of highly educated workers | 0.029 *** | 0.029 *** | 0.029 *** | 0.030 *** |
| | (0.001) | (0.001) | (0.002) | (0.001) |
| CESEE dummy | –0.006 | 0.004 | 0.005 | 0.004 |
| | (0.550) | (0.117) | (0.072) | (0.211) |
| Capital city | 0.006 *** | 0.013 | 0.006 ** | 0.007 *** |
| | (0.009) | (0.121) | (0.016) | (0.004) |
| CESEE dummy x capital city | 0.022 *** | 0.022 *** | 0.021 *** | 0.016 *** |
| | (0.000) | (0.000) | (0.000) | (0.001) |
| Spatially lagged city growth | 1.542 *** | 2.031 *** | 1.904 *** | 2.149 *** |
| | (0.000) | (0.000) | (0.000) | (0.001) |
| Agriculture, forestry and fishing | –0.001 ** | –0.001 ** | –0.001 ** | –0.001 *** |
| | (0.024) | (0.026) | (0.028) | (0.007) |
| Food, beverages and tobacco | 0.008 *** | 0.007 *** | 0.007 *** | 0.008 *** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Fuels, chemicals, rubber and plastic products | –0.007 *** | –0.006 *** | –0.007 *** | –0.006 ** |
| | (0.000) | (0.000) | (0.008) | (0.026) |
| Spatially lagged city growth x CESEE dummy | 1.341 | – | – | – |
| | (0.243) | – | – | – |
| Spatially lagged city growth x capital city | – | –1.020 | – | – |
| | – | (0.392) | – | – |
| City population | – | – | 0.000 | 0.001 |
| | – | – | (0.825) | (0.216) |
| Spatially lagged city growth x city population | – | – | –0.031 | –0.276 |
| | – | – | (0.818) | (0.096) |
| Spatially lagged city growth x city population x CESEE dummy | – | – | – | 0.544 |
| | – | – | – | (0.072) |
| City population x CESEE dummy | – | – | – | –0.003 |
| | – | – | – | (0.218) |
| Lambda | 0.637 | 0.713 | 0.693 | 0.634 |
| Log-likelihood | 877.742 | 877.439 | 877.104 | 880.303 |

*Source: Authors' calculations.*

*Note: P-values in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.*

The rather large extent of urban spillovers calls for further investigation. Is it large cities that are responsible for the far-reaching spillovers? Are only capital cities growth promoting? To which extent is there a different pattern for CESEE cities? To shed more light on these issues, we re-estimated the model including several interaction terms. The first column in table 4 shows the results separating the effects from CESEE cities. Surprisingly, there are no additional effects from agglomerations located in the CESEE region present in the data. The same holds true for capital cities, which are often assumed to be the center of economic activity in a country. Lastly, we test whether large cities and/or large cities in CESEE are causing the far-reaching spillovers. Again, there is no empirical evidence that

supports parameter heterogeneity of the spillover effect across regions as defined by these factors. The urban agglomeration spillovers found are therefore not statistically different in Western and Eastern European regions. The link between urban and regional growth within regions, however, is significantly different in CESEE countries, where regions hosting capital cities have an overproportional growth bonus compared to their Western European counterparts.

## 5 Conclusions

The empirical analysis carried out in this study assesses the role of urban agglomerations as economic growth engines in Europe by analyzing the effect of economic growth at the city level on neighboring NUTS 2 regions. Our results indicate that urban growth spillovers play an important role in explaining differences in per capita income growth across European regions. Furthermore, we find that the sectoral structure of cities matters for explaining the link between urban and regional growth patterns. In particular, regions with urban agglomerations with a relatively high degree of specialization in the primary sector as well as in fuels and chemicals tend to experience lower rates of economic growth than other such regions where agglomerations display a different sectoral composition.

We move further from analyzing the direct effect of urban growth on income growth at the regional level to assess the role of spatial spillovers originated at the city level across regions. To this end, we concentrate on the spreading of growth impulses from an urban agglomeration in a given region to neighboring regions. Our results indicate that income growth in urban agglomerations affects neighboring regions and that this effect is homogeneous in the EU. This is not the case for the agglomeration effects found within regions hosting the capital city, which tend to be stronger in CESEE economies. It should be noted that since our model explicitly controls for inter-regional spatial dependence in the growth process in Europe, the effect from neighboring urban agglomerations constitutes an extra growth bonus above the standard growth spillovers which are usually modelled in studies related to regional growth.

The existence of such dynamic agglomeration economies bears several implications for regional policymakers: First, regional policy faces a trade-off between maximizing economic growth at the regional level and balancing income differentials within and between countries in Europe. This trade-off, however, is counterbalanced to a certain degree by positive growth spillovers from urban agglomerations to neighboring regions as identified by our empirical analysis. In order to optimize the distribution of economic wealth, regional policies should target an efficient allocation of economic activity (Ottaviano, 2003). Our empirical results identify urban agglomerations as growth engines and thus recommend that the geographical allocation of economic activity should be concentrated in major European cities in order to boost overall growth in Europe. Fostering growth in major European agglomerations would thus comply with the regional policy of the EU, which explicitly aims at improving the economic wellbeing of regions in the EU. Second, the flip side of this coin is that such a policy bears the risk of an increase in wealth divergence within Europe. The lion's share of the budget for regional policy is devoted to the so-called "convergence objective" covering Europe's poorest regions in terms of per capita GDP. This part of regional policy is geared to removing economic, social and territorial disparities across regions within the EU by

enhancing economic growth and improving the regional competitiveness of lagging (peripheral) regions. Our results, however, show that positive growth spillovers of urban hubs can enhance growth in entire regions that are nearby. The effect of these growth spillovers loses significance with distance but is still powerful in the European context, where most regions are located close enough to urban agglomerations. The risk of increasing wealth divergence when allocating economic activity to urban agglomerations may thus – to a certain degree – be mitigated by positive urban growth spillovers.

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## Appendix

### Major European Cities included in the Dataset

| # | City | # | City | # | City |
|---|---|---|---|---|---|
| 1 | Wien | 22 | Helsinki | 43 | Rotterdam |
| 2 | Bruxelles | 23 | Paris | 44 | Warszawa |
| 3 | Sofiya | 24 | Rouen Le Havre | 45 | Kraków |
| 4 | Praha | 25 | Lille | 46 | Poznań |
| 5 | Plzeň | 26 | Nantes | 47 | Wrocław |
| 6 | Brno | 27 | Toulouse | 48 | Porto |
| 7 | Ostrava | 28 | Lyon | 49 | Lisboa |
| 8 | Stuttgart | 29 | Montpellier | 50 | Bucureşti |
| 9 | München | 30 | Aix-Marseille | 51 | Stockholm |
| 10 | Berlin | 31 | Thessaloniki | 52 | Ljubljana |
| 11 | Hamburg | 32 | Athina | 53 | Bratislava |
| 12 | Frankfurt | 33 | Budapest | 54 | Manchester |
| 13 | Düsseldorf | 34 | Dublin | 55 | Leeds |
| 14 | Köln | 35 | Torino | 56 | Birmingham |
| 15 | Dresden | 36 | Milano | 57 | London |
| 16 | Leipzig | 37 | Bologna | 58 | Bristol |
| 17 | Kobenhavn | 38 | Roma | 59 | Cardiff |
| 18 | Tallinn | 39 | Vilnius | 60 | Edinburgh |
| 19 | Madrid | 40 | Riga | 61 | Glasgow |
| 20 | Barcelona | 41 | Utrecht | 62 | Belfast |
| 21 | Valencia | 42 | Amsterdam | | |

# Trade-Enhancing EU Enlargement and the Resurgence of East-East Trade

Cecília Hornok[1]

*This article uses the episode of EU enlargement in 2004 as a natural experiment to identify the trade effect of declining border barriers across otherwise well integrated markets. Despite the fact that traditional trade policy measures (tariffs, quantitative restrictions) were already eliminated for most industrial goods in trade between the pre-enlargement EU-15 countries and eight of the countries that entered the EU in 2004 (EU-8)[2] as well as among the EU-8 themselves, EU enlargement is shown to have caused a significant trade creation. The effect was most pronounced for trade among EU-8 countries, with a magnitude of 4% to 9% in ad valorem tariff-equivalent terms. Technology-intensive industries benefitted most strongly from enlargement, and a significant anticipatory effect can also be detected for 2003. These findings highlight the importance of non-policy related border barriers to trade and may also prove useful in assessing the potential for trade integration in the current EU candidate countries.*

*JEL classification: F13, F15*
*Keywords: Trade costs, border effect, gravity estimation, European integration*

## 1 Introduction

The existence of national borders constitutes an important trade barrier. Even for free trade areas with strong economic integration, trade within a nation is larger than trade across borders. Anderson and van Wincoop (2003) found that trade among Canadian provinces was by a factor of six larger than trade across the U.S. border. Several studies (Nitsch (2000), Head and Mayer (2000) or Chen (2004)) found that, despite their close integration, similarly large border effects existed for the 15 EU Member States prior to EU enlargement (EU-15).

What constitutes the "border effect" is still in the focus of international trade research. Apart from the traditional trade policy measures like tariffs and quotas, the existence of national borders may divert trade through several channels, ranging from differences in product standards or administrative burdens to sometimes largely hidden cultural differences. Such barriers can affect trade not only in a direct way, but also indirectly through the endogenous location of firms: Firms agglomerate to minimize the cost of trade, thus contributing to the increase in intranational relative to international trade.

The entry of the five Central and Eastern European countries and the three Baltic countries (hereinafter EU-8) into the European Union in 2004 provides a reasonably good case for a natural experiment to infer the importance of border barriers across otherwise well integrated markets. Since free trade had been established between the EU-15 and the EU-8 and among the EU-8 countries for most manufactured goods well before enlargement, the trade effect of EU enlargement can be attributed to elements of diminishing border effects that are different from traditional trade policy measures.

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[2] *Namely the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia.*

Despite the numerous earlier studies on the effects of the trade liberalization processes of the 1990s and early 2000s,[3] evidence on the effect of the 2004 enlargement has so far been extremely rare. Antimiani and Costantini (2010), for example, analyze the trade developments around EU enlargement in a dynamic gravity framework, with a special focus on the technological upgrading of trade structures. They find evidence that EU accession brought a change in the export structure of the EU-8 toward more high-technology products.

Exploiting the episode of the 2004 accession as a natural experiment, this paper estimates the magnitude of the trade effect of EU enlargement. The estimation is based on a difference-in-difference strategy, where the treatment group involves country pairs with at least one EU-8 country and the control group contains EU-15 country pairs. Results reveal that the trade-creating effect in the first three years after enlargement is around 14%, which is consistent with a hypothetical 1.5% to 3.3% ad valorem tariff reduction. In other words, bilateral exports accelerated as if ad valorem tariffs in the export markets went down by 1.5% to 3.3%.

When allowing for varying treatment effects across country pair groups (trade within the EU-8, exports from the EU-8 to the EU-15, and exports from the EU-15 to the EU-8) estimates for trade within the EU-8 are by far the highest. The tariff equivalent for export growth within the EU-8 is estimated to be in the range of 4% to 9%, which is similar in magnitude to the total tariff reductions during the trade liberalization process of the 1990s. The effect is also sizeable and significant for exports from EU-8 to EU-15 countries, while often not different from zero for EU-15 to EU-8 exports.

Moreover, a significant anticipatory effect is identified for the immediate pre-accession year. Such an effect is justified by the fact that the decision on enlargement had been known already in 2003. Industry-specific estimates reveal that almost all technology-intensive industries (NACE 30 to 34) recorded a significant effect, though some other industries (such as "Basic metals") were also important contributors to the overall effect.

The remainder of the paper is structured as follows: Section 2 briefly discusses the pre-accession trade integration process. Section 3 presents basic stylized facts. Section 4 describes the empirical strategy, formulates the estimating equation and discusses issues on the timing of the trade effect of enlargement. Section 5 presents the results, complemented with placebo experiments and robustness checks. Section 6 provides a summary discussion, pointing out possible causes for the enlargement effect.

## 2 The European Trade Liberalization Process

The EU-8 countries had undergone a massive trade liberalization process already prior to EU accession. The Europe Agreements, which were signed between the EU and each of these countries mostly in the first half of the 1990s, granted mutual market access free of duties and quantitative restrictions for all nonagricultural

[3] *Numerous gravity studies estimated the current and potential level of trade integration between the EU-15 and the EU-8 countries before EU enlargement. See e.g. Bussiére et al. (2005), De Benedictis et al. (2005) and Herderschee and Qiao (2007).*

products.[4] At the same time, the free trade of manufactures was also extended to trade within the EU-8 itself by the formation of the Central European Free Trade Agreement (CEFTA) and the Baltic Free Trade Agreement (Baltic FTA).[5] Finally, free trade among the CEFTA and Baltic countries was established by several bilateral trade agreements which entered into force sequentially during the second half of the 1990s.[6] CEFTA, the Baltic FTA and the bilateral free trade agreements basically extended the Europe Agreements to bilateral trade within the EU-8.[7]

Meanwhile trade of the EU-8 countries with third countries was subject to individual national trade policies up until 2004, when the EU-8 had to apply the common external trade policy of the European Communities. Third-country tariffs of most CEFTA members before EU accession were higher than the level of common EU external protection, while those of the Baltic countries were lower. Hence, with EU accession the CEFTA countries had to decrease and the Baltic countries had to increase their third country tariffs, which – apart from having an effect on trade with third countries – might have influenced the trading patterns within the enlarged EU as well.

Against this background, one can conclude that – apart from changes in trade restrictions vis-à-vis third countries – EU enlargement brought no further trade liberalization with respect to the traditional trade policy measures within the now-enlarged EU.

## 3 Trade Developments around Enlargement

In the following, basic raw data evidence on the developments of trade flows around 2004 is documented. The dataset contains annual bilateral export flows in the nine years from 1999 to 2007.[8] The range of products is restricted to a subset of manufactures (corresponding to around 80% of all trade flows) which was freely traded throughout the whole sample.[9] 22 countries are considered: 14 countries of the EU-15 (Greece is omitted because its late euro area entry may complicate matters) and the EU-8 countries.

[4] *The so-called Interim Agreements, which regulated the removal of trade barriers, entered into force in 1992 with the Czech Republic, Hungary, Poland and Slovakia, in 1995 with the three Baltic countries, and in 1997 with Slovenia, and remained in force until their EU accession in 2004. In the first couple of years after the agreements entered into force, the removal of restrictions was asymmetric: While the elimination of import duties was immediate for goods from the EU-8 to the EU-15, it was subject to a three-year (five-year in the case of textiles and clothing) phase-in period for goods from the EU-15 to the EU-8.*

[5] *CEFTA was formed in 1993 by the Czech Republic, Hungary, Poland and Slovakia, with Slovenia joining in 1996. The Baltic FTA was established in 1994 by Estonia, Latvia and Lithuania.*

[6] *See Herderschee and Qiao (2007) for exact dates of bilateral FTAs.*

[7] *A further step toward free trade was the establishment of the pan-European system of rules of origin with diagonal cumulation in 1997 across the whole region consisting of the EU, CEFTA, the Baltic FTA and the European Free Trade Association (EFTA).*

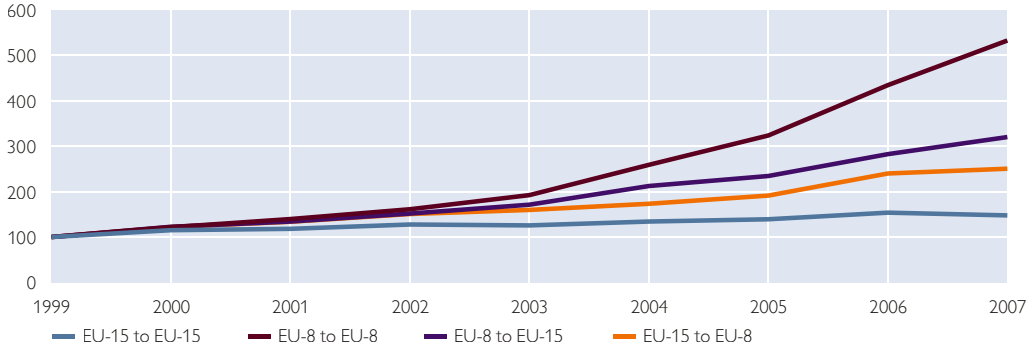
[8] *Trade data either stem from the Eurostat Comext or the United Nation's Comtrade database and are reported in euro value terms. Exports rather than imports were chosen mainly in order to decrease the possible statistical distortions due to VAT fraud activities of trading enterprises.*

[9] *Manufactured goods excluding food, beverages and tobacco (NACE groups 15 and 16) and coke, refined petroleum products and nuclear fuel (NACE 23).*

Chart 1

**Export Value Flows in Different Relations**

*1999=100*

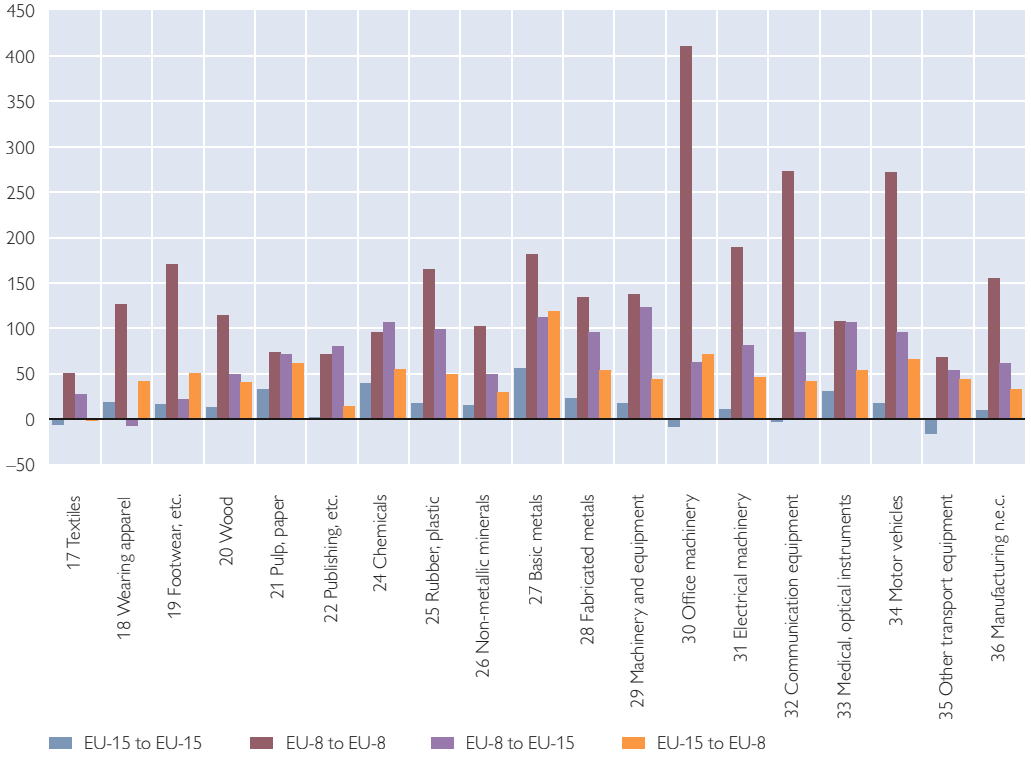



*Source: Eurostat, UN Comtrade, author's calculations.*

Chart 2

**Export Growth by Branches**

*Growth of period averages from 2000–2003 to 2004–2007, %*




*Source: Eurostat, UN Comtrade, author's calculations.*

Four country pair groups are differentiated: trade within the EU-15 (denoted as EU-15 to EU-15), trade within the EU-8 (EU-8 to EU-8), exports from the EU-8 to the EU-15 (EU-8 to EU-15) and vice versa (EU-15 to EU-8). A first look at export flows reveals strong trade creation on the part of the EU-8 countries following enlargement. Most apparently bilateral export flows within the EU-8

and, to a lesser extent, between the EU-8 and EU-15 countries accelerated after 2004. In contrast, exports within the EU-15 remained relatively stable.

The differences in the growth rates across country pair groups are also evident for individual industries. Exports in trade relationships that contain at least one EU-8 country, and especially trade within the EU-8, grew considerably faster than trade within the EU-15. This is found for all industries, although to a varying extent. The most remarkable increase occurred in trade within the EU-8 of office machinery, communication equipment and motor vehicles, the export value of which in the four years from 2004 to 2007 was by 300% to 400% larger than in the four years from 2000 to 2003.[10]

## 4 Measuring the Effect of EU Enlargement

In the following, I measure how much of this apparent boost in trade flows can be attributed to EU enlargement itself. The identification of the trade-enhancing effect is based on a difference-in-difference strategy and the estimation is carried out within a gravity model framework. The application of the gravity model to a panel dataset requires a disclaimer: As the gravity model is set up for the steady state, a panel data application needs to assume that the gravity equation holds for each time period. The analysis is therefore a comparative statics exercise.

### 4.1 The Difference-in-Difference Estimation Strategy

I take the episode of EU enlargement as a quasi natural experiment where the treatment group includes country pairs of which at least one country was not an EU member before enlargement (EU-8 to EU-8, EU-8 to EU-15, EU-15 to EU-8), while the control group includes EU-15 country pairs. The time period under observation is divided into pre-accession and post-accession years.

The corresponding treatment effect is derived from the change in exports for the treatment group from the pre- to the post-accession years relative to the similar change in exports for the control group. Formally, the treatment effect in logarithmic terms is

$$\left(x_{t=1}^{treatment} - x_{t=0}^{treatment}\right) - \left(x_{t=1}^{control} - x_{t=0}^{control}\right)$$

where $x$ is the logarithm of exports and $t=0$ and $t=1$ denote the pre- and post-accession periods, respectively.

Taking the EU-15 country pairs as the control group rests on the assumption that their export dynamics (the change from the pre- to the post-accession period) is not affected by EU enlargement. This assumption may be justified by the raw data evidence that exports within the EU-15 were quite stable during the sample period. Also, for the difference-in-difference setup, the treatment and control groups should be sufficiently similar or at least heterogeneity should be appropriately controlled for. The EU-15 and EU-8 countries are close to each other geographically and, at least at the time covered in this sample, had become sufficiently close institutionally. Nevertheless, the two groups are far from being

[10] *The strong growth of exports in these typically high value/low volume goods requires closer examination, because this category contains the products which are most prone to be subject to VAT fraud. Robustness checks below ensure that the results are qualitatively unaltered after removing the suspicious items.*

homogeneous. Controlling for their differences – most notably differences in the real convergence trends and in third country trade protection changes – becomes an important issue in this analysis.[11]

### 4.1 The Anderson and Van Wincoop Gravity Equation

In order to fully account for the factors that affect international trade, I resort to the gravity theory of Anderson and Van Wincoop (2003), a workhorse trade model. The model assumes identical constant elasticity of substitution (CES) preferences and differentiated goods by place of origin, i.e. every country is specialized in the production of one good. The supply side of the model is fixed. Prices differ between locations only due to trade costs, which are not observable directly. Under the assumption that all bilateral trade costs are symmetric and markets clear, the gravity equation in logarithmic form and for time $t$ becomes

$$x_{ijt} = y_{it} + y_{jt} - y_t^W + (1-\sigma)t_{ijt} - (1-\sigma)\pi_{it} - (1-\sigma)p_{jt}$$

where $x_{ijt}$ is the logarithm of exports from country $i$ to country $j$ in year $t$, $y_{it}$ and $y_{jt}$ are the logs of output levels in the exporting and importing countries in the same year, respectively, $y_t^w$ is world output, $t_{ijt}$ is the log of the bilateral trade barriers between the exporting and the importing countries and $\sigma$ is the elasticity of substitution between all goods.

The terms $\pi_{it}$ and $p_{jt}$ are the logarithms of the so-called multilateral trade barriers for the exporting and the importing country, respectively. More precisely, $\pi_{it}$ is a measure of trade barriers that country $i$'s exports face in the rest of the world, while $p_{jt}$ is a measure of trade barriers that country $j$ imposes on imports from the rest of the world. Introducing the multilateral trade barriers into the gravity equation is an important novelty of the model of Anderson and Van Wincoop relative to earlier models. Bilateral trade barriers matter for trade only in relative terms, i.e. in relation to the level of multilateral trade barriers. An increase in bilateral trade barriers ceteris paribus reduces bilateral trade, while an increase in the trade barriers vis-à-vis the rest of the world for either the exporter or the importer ceteris paribus increases it.

### 4.2 The Estimating Equation

The difference-in-difference strategy is carried out by performing a fixed-effects estimation of the gravity equation, where the treatment effect is captured by a dummy variable taking value 1 for treated country pairs and years. To make the gravity equation operational for estimation purposes, I need to solve two issues.

First, it is necessary to assume some form for the log of the bilateral trade barrier ($t_{ijt}$) term. As it is normally assumed, I take $t_{ijt}$ to be a linear function of different trade barrier components.

[11] *An ideal control group would include countries which have gone through the same process of preparation for EU accession, but did not enter the EU in 2004. The closest examples are Bulgaria and Romania. Using them as a control group is, however, problematic – not only because of the small number of observations, but also because of the fact that their would-be accession in 2007 was decided in 2004, which could have initiated some anticipatory trade effect early on.*

$$t_{ijt} = \delta_1 Z_{ij} + \delta_2 EU_{ijt} + \delta_3 EA_{ijt} + \varepsilon_{ijt}$$

The first term ($Z_{ij}$) denotes all the time-invariant determinants of trade costs, including distance and other typical gravity variables like common border, common language, common historical ties. They become unimportant in this analysis, since the country pair-fixed effects fully control for all time-invariant factors. $EU_{ijt}$ is the treatment dummy; it takes the value of 0 in the pre-accession years for all country pairs and the value of 1 in the post-accession years for the treatment country pairs.

$$EU_{ij,t=0} = 0$$

$$EU_{ij,t=1} = \begin{cases} 0 & if \quad control \\ 1 & if \quad treatment \end{cases}$$

$EA_{ijt}$ captures euro area membership, which is time varying only due to Slovenia's adoption of the euro in 2007.[12] An error term $\varepsilon_{ijt}$ enters the expression, accounting for the fact that some bilateral trade barriers are not observed or are proxied by the above variables with an error.

The second step is to tackle the problem that the two multilateral trade barrier terms in the gravity equation ($\pi_{it}$ and $p_{jt}$) are not observable. If they remain in the error term and are correlated with some of the right-hand-side variables, they may cause an omitted-variable bias in the estimates.[13] Country pair-fixed effects control for the time-invariant part of the multilateral trade barriers, but not for the time-varying one. In order to control for the time-varying part, I opt for the solution to include additional control variables, namely third country tariffs and real effective exchange rates.[14]

The estimating equation, after substituting the trade cost function, becomes

$$x_{ijt} = \gamma_{ij} + \delta_t + \beta_1 gdp_{it} + \beta_2 gdp_{jt} + \beta_3 EU_{ijt} D_{ij} + \beta_4 EA_{ijt} + \beta_5 tar_{it} + \beta_6 tar_{jt} + \beta_7 reer_{it} + \beta_8 reer_{jt} + u_{ijt}$$

On the left-hand side, $x_{ijt}$ is the log of bilateral exports in euro value terms. On the right-hand side, the (direction-specific) country pair-fixed effects ($\gamma_{ij}$) control for all time-invariant factors, and year dummies ($\delta_t$) control for common business cycle trends. $gdp_{it}$ and $gdp_{jt}$ are the logs of nominal GDPs, for which, as it is customary in empirical gravity studies, nonunitary coefficients are allowed.

The EU treatment dummy enters the equation in a way that allows for estimating both common and varying treatment effects. The term $EU_{ijt}D_{ij}$ is the interaction of the treatment dummy and a set of dummy variables ($D_{ij}$) indicating which group (EU-8 to EU-8, EU-8 to EU-15, EU-15 to EU-8) the treatment country

[12] *In other applications, bilateral tariffs or quotas, as other important observable trade barriers, may also be part of the trade cost function. In the current exercise, however, the trade flow is restricted to products for which tariffs and quantitative restrictions were already eliminated.*

[13] *Such fears are highly realistic since, as Anderson and Van Wincoop (2003) show, the multilateral trade resistance terms are functions of all the bilateral trade barriers with countries in the rest of the world.*

[14] *Baldwin and Taglioni (2006) suggest that a full set of country-specific time dummies should be included. In general, a drawback of this approach is that it involves a lot of dummies to be estimated and, hence, a significant degree of freedom loss. Moreover, in the varying treatment case identification is infeasible with country-specific time dummies, as they are perfectly collinear with the treatment dummies.*

pair belongs to. Estimating a common EU effect is the special case when $D_{ij}=1$ for all treatment country pairs. The varying treatment effect gives separate EU effect estimates for each of the three country pair groups, while the common treatment effect is an average across all treatment country pairs.

The two variables that are meant to control for the time-varying part of the multilateral trade barriers are the third country average tariff rates ($tar_{it}$, $tar_{jt}$) for both the exporting and importing countries and their real effective exchange rates ($reer_{it}$, $reer_{jt}$). Real effective exchange rates can also control for differences in the real convergence trends of individual countries.

### 4.3 Timing Issues

When identifying the trade effects of accession, one needs to have a view on when exactly these effects are likely to appear. Considering such timing issues brings up four considerations to the current analysis:

1. EU enlargement occurred in the middle of the year, on May 1, 2004. Having annual frequency data, one needs to decide how to treat the year 2004.
2. The data only allow for analyzing the first three years after accession. This naturally restricts the measured effect to being only of a short-term nature. Firms responding to the reduction in trade costs need time to adjust their production, build up new capacities or redirect their sales to new markets. Some of these responses may appear already in the first months, while others might take several years to unfold.
3. It cannot be ruled out that there was some early trade effect in anticipation of accession, since decisions on accession became certain already in 2003. On the part of the EU, the decision was made at the Copenhagen Summit in December 2002, which was followed by referendums in individual acceding countries during the following year. Against this background, one cannot exclude the possibility that part of the accession effect appeared already as early as in 2003.
4. The fourth potentially important timing issue relates to the late effect of earlier liberalization measures. Though most of the trade liberalization occurred until the millennium, the consequences – especially when considering the phase-in periods for abolishing import duties on EU-15 products in the EU-8 – may have unfolded only gradually. Hence, export growth rates around accession could still have been affected to some extent by these earlier liberalization measures.

I address the above timing issues in the following ways. In order to tackle the problem of the mid-year accession date, I keep only the odd years in the sample. Hence, the restricted dataset contains three years' data before (1999, 2001, 2003) and two years' data after accession (2005, 2007).

The three years of data before accession provide a possibility to test for the presence of anticipatory EU effects. This can be done by leading the treatment dummy with two years as if accession occurred in the period from 2001 to 2003.

In a similar way, a "placebo experiment" can also be carried out by leading the treatment dummy with four years as if accession occurred in the period from 1999 to 2001. The placebo experiment is a way to test the presence of a significant treatment effect for nontreated observations, i.e. in the current case, to test the presence of an EU effect in the period from 1999 to 2001, when no decisions on EU enlargement had been made yet. Only if the placebo effect is *not* significant

can I claim that the empirical strategy is well designed. Otherwise, it must be the case that the EU effect is blurred by some other factor(s). The placebo experiment is therefore a valid test for the fourth issue above.

## 5 Results

The estimation is carried out on a panel of annual export flows in euro value terms for the five odd years between 1999 and 2007. The number of direction-specific country pairs is (22*21=) 462, of which 182 is in the control group and 280 is in the treatment group. Among the right-hand-side variables, nominal GDP and real effective exchange rates (relative to 35 industrial countries and based on unit labor costs) are from Eurostat. Third country tariffs are the average applied tariff rates for all goods from the World Bank.

### 5.1 Aggregate Estimates

The main estimates for the EU effect are presented in table 1 either with common treatment (columns 1 and 2) or varying treatment (columns 3 and 4). The two-year lead of the treatment, EU(+2), intends to capture an anticipatory accession effect. In this case the EU dummy for the treatment group takes the value of 1 already in 2003.

Table 1

**Aggregate Estimation Results**

| Variable | Common treatment | | Varying treatment | |
|---|---|---|---|---|
| EU | 0.133*** | 0.071** | | |
| | [0.041] | [0.035] | | |
| EU_8-8 | | | 0.357*** | 0.298*** |
| | | | [0.087] | [0.079] |
| EU_8-15 | | | 0.264*** | 0.165*** |
| | | | [0.056] | [0.047] |
| EU_15-8 | | | 0.038 | 0.000 |
| | | | [0.053] | [0.046] |
| EU(+2) | | 0.122*** | | |
| | | [0.032] | | |
| EU(+2)_8-8 | | | | 0.167*** |
| | | | | [0.059] |
| EU(+2)_8-15 | | | | 0.218*** |
| | | | | [0.051] |
| EU(+2)_15-8 | | | | 0.066** |
| | | | | [0.033] |
| Gravity variables | yes | yes | yes | yes |
| Country pair-fixed effects | yes | yes | yes | yes |
| Common year effects | yes | yes | yes | yes |
| Number of observations | 2,310 | 2,310 | 2,310 | 2,310 |
| Number of groups | 462 | 462 | 462 | 462 |
| Within R-squared | 0.66 | 0.66 | 0.67 | 0.67 |

*Source: Author's calculations.*

*Note: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country pair level. The sample includes every odd year between 1999 and 2007. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.*

The coefficient on the common EU dummy shows a 14% acceleration of trade for the treatment group, i.e. for all country pairs that contained at least one EU-8 country.[15] When accounting for a possible anticipatory effect it turns out that a considerable part of this increase occurred already in 2003. The differences between the common and the varying treatments reveal a strong country-specific nature of the EU effect. The relatively moderate common effect masks a large effect for trade within the EU-8 and, to a lesser extent, for exports from the EU-8 to the EU-15, while no significant effect is detected for exports from the EU-15 to the EU-8. The coefficient for trade within the EU-8 is around 0.35, i.e. it shows a more than 40% increase in the value of bilateral exports following EU enlargement. Although this group also experienced a significant anticipatory effect, its magnitude is only half of the measured post-accession acceleration. The EU effect for exports from the EU-8 to the EU-15 is somewhat lower (30%) than for EU-8 pairs, with an anticipatory effect of a similar magnitude.

The estimate on the EU effect can be decomposed as $\beta_3=(1-\sigma)\delta_2$, i.e. the product of one minus the elasticity of substitution and the effect of EU enlargement on bilateral trade costs. The latter is here expressed as a so-called "ad valorem tariff equivalent," i.e. the magnitude of a hypothetical tariff reduction that would have generated the same trade creation as EU enlargement did. Assuming that $\sigma$ falls in the range of 5 to 10, the estimated ad valorem tariff equivalent of not being EU members at the same time ranges from 1.5% to 3.3% according to the common treatment estimate.[16] For trade within the EU-8 the same measure gets as large as 4% to 9%.

Tables 4 and 5 give a more detailed presentation of the estimation results, including estimates for the coefficients of the other gravity variables. The coefficients on the GDP variables are, as expected, in most of the cases around or above unity. The coefficients of the third country tariff variables are significant with the expected sign only in shorter sample estimations. In contrast, coefficients on the real exchange rate variables are strongly significant and negative in most of the regressions.[17]

### 5.2 Industry Estimates

I carry out the estimation for each of the 19 NACE manufacturing industries separately. The estimating equation is modified as follows. Instead of the country GDPs, I use industry gross output for both the exporting and the importing countries. In addition, however, the importer's total GDP is also added in order to account for the fact that products of an industry are also purchased by other sectors of the economy.[18] Apart from these changes the estimation is the same as before. The estimated common treatment effects and their ad valorem tariff equivalents

[15] *Percentage change = 100 (exp(coeff)–1).*

[16] *Anderson and Van Wincoop (2004) assess the literature on the empirical estimates of the elasticity of substitution and put $\sigma$ within the range of 5 to 10.*

[17] *This negative effect mainly reflects a valuation effect: If the exchange rate of countries not in the euro area appreciates, the value of their trade in euro should decrease for simple accounting reasons, unless their trade pricing is fully in euro.*

[18] *Industry gross output data stem from Eurostat.*

Table 2

**Industry-Level Common Treatment Results (coefficient estimates and ad valorem equivalent effects)**

| Industry (NACE codes) | Coefficient | Standard error | Effect (%, $\sigma$=8) | Effect (%, industry $\sigma$) | Industry $\sigma$ |
|---|---|---|---|---|---|
| 17 Textiles | 0.082 | [0.064] | –1.2 | –1.3 | 7.3 |
| 18 Wearing apparel | –0.098 | [0.110] | 1.3 | 1.9 | 5.7 |
| 19 Leather, luggage, footwear, etc. | 0.052 | [0.127] | –0.7 | –0.8 | 7.3 |
| 20 Wood, except furniture | –0.056 | [0.094] | 0.7 | 1.8 | 3.8 |
| 21 Pulp, paper products | 0.144 | [0.118] | –2.1 | –4.3 | 4.4 |
| 22 Publishing, printing and reproduction of recorded media | 0.468*** | [0.114] | –6.7 | –11.3 | 5.1 |
| 24 Chemicals and chemical products | 0.277*** | [0.092] | –4.0 | –4.5 | 7.2 |
| 25 Rubber and plastic products | 0.133** | [0.068] | –1.9 | –3.2 | 5.2 |
| 26 Other non-metallic mineral products | 0.063 | [0.082] | –0.9 | –3.2 | 3.0 |
| 27 Basic metals | 0.621*** | [0.116] | –8.9 | –24.5 | 3.5 |
| 28 Fabricated metal products | 0.069 | [0.084] | –1.0 | –1.8 | 4.9 |
| 29 Machinery and equipment n.e.c. | 0.124 | [0.079] | –1.8 | –2.0 | 7.2 |
| 30 Office machinery and computers | 0.325** | [0.161] | –4.6 | –3.3 | 10.9 |
| 31 Electrical machinery and apparatus | 0.564*** | [0.086] | –8.1 | –11.2 | 6.0 |
| 32 Radio, television, communication equipment | 0.630*** | [0.150] | –9.0 | –12.9 | 5.9 |
| 33 Medical, precision and optical instruments | 0.401*** | [0.087] | –5.7 | –7.2 | 6.6 |
| 34 Motor vehicles, trailers and semi-trailers | 0.519*** | [0.177] | –7.4 | –8.3 | 7.3 |
| 35 Other transport equipment | –0.078 | [0.199] | 1.0 | 1.1 | 7.4 |
| 36 Furniture, manufacturing n.e.c. | –0.066 | [0.117] | 0.9 | 2.0 | 4.1 |

*Source: Author's calculations.*

*Note: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country pair level. The sample includes every odd year between 1999 and 2007. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Industry $\sigma$ estimates are from Hummels (2001).*

are reported for each industry in table 2.[19] Tariff equivalents are calculated by either assuming $\sigma$=8 or by taking the industry-specific $\sigma$ estimates of Hummels (2001).[20]

Significant and large positive EU effects are found for most of the technology-intensive industries (NACE 30 to 34) such as "Radio, TV, communication equipment," "Electrical machinery" or "Motor vehicles." Large effects are detected also for "Basic metals" (27), "Publishing and printing" (22) and "Chemicals" (24). In the case of motor vehicles, for instance, the estimated common treatment effect is around 0.5, consistent with a 65% growth in exports and a 7% to 8% hypothetical tariff reduction. The varying treatment estimates in table 3 reveal that this effect stems almost entirely from increased exports of the EU-8 countries to both EU-8 and EU-15 markets.

[19] *Estimates for the anticipatory effects are available upon request.*

[20] *Hummels (2001) estimates the elasticity of substitution for a two-digit SITC product breakdown. Estimates are transformed to the four-digit NACE industry classification by Chen and Novy (2009). The reported industry $\sigma$'s at the two-digit industry level are weighted averages of the four-digit figures, where weights are based on intra-EU export shares.*

Table 3

**Industry-Level Varying Treatment Results (ad valorem equivalent effects)**

| Industry (NACE codes) | EU-8 to EU-8 | | EU-8 to EU-15 | | EU-15 to EU-8 | |
|---|---|---|---|---|---|---|
| | Effect (%, $\sigma$=8) | Effect (%, industry $\sigma$) | Effect (%, $\sigma$=8) | Effect (%, industry $\sigma$) | Effect (%, $\sigma$=8) | Effect (%, industry $\sigma$) |
| 17 Textiles | –2.4 | –2.6 | –3.6*** | –3.9*** | 2.9** | 3.2** |
| 18 Wearing apparel | 3.3 | 4.9 | 2.6 | 3.8 | –0.6 | –0.9 |
| 19 Leather, luggage, footwear, etc. | –9.0** | –10.0** | 0.6 | 0.6 | –2.6 | –2.9 |
| 20 Wood, except furniture | –3.9* | –10.0* | –1.0 | –2.5 | 2.6 | 6.5 |
| 21 Pulp, paper products | 2.0 | 4.1 | –2.9 | –6.0 | –0.7 | –1.5 |
| 22 Publishing, printing and reproduction of recorded media | –4.0 | –6.7 | –13.0*** | –22.1*** | 1.3 | 2.2 |
| 24 Chemicals and chemical products | –2.9 | –3.3 | –7.0*** | –7.9*** | 0.1 | 0.2 |
| 25 Rubber and plastic products | –3.6** | –6.0** | –5.9*** | –9.9*** | 2.1* | 3.6* |
| 26 Other non-metallic mineral products | –1.3 | –4.6 | –4.5*** | –15.7*** | 2.7* | 9.5* |
| 27 Basic metals | –17.6*** | –48.6*** | –9.9*** | –27.3*** | –6.8*** | –18.7*** |
| 28 Fabricated metal products | –1.9 | –3.5 | –3.3* | –5.9* | 1.1 | 2.1 |
| 29 Machinery and equipment n.e.c. | –3.8* | –4.3* | –5.5*** | –6.2*** | 1.7 | 1.9 |
| 30 Office machinery and computers | –19.7*** | –13.8*** | –7.0** | –4.9** | –2.4 | –1.7 |
| 31 Electrical machinery and apparatus | –11.1*** | –15.4*** | –10.7*** | –14.9*** | –4.4*** | –6.1*** |
| 32 Radio, television, communication equipment | –15.2*** | –21.8*** | –11.2*** | –16.1*** | –5.1 | –7.3 |
| 33 Medical, precision and optical instruments | –2.7 | –3.4 | –9.1*** | –11.5*** | –0.7 | –0.9 |
| 34 Motor vehicles, trailers and semi-trailers | –16.0*** | –17.9*** | –14.8*** | –16.6*** | 0.3 | 0.3 |
| 35 Other transport equipment | 7.7 | 8.4 | –0.5 | –0.6 | 3.6 | 3.9 |
| 36 Furniture, manufacturing n.e.c. | 0.1 | 0.3 | –1.9 | –4.2 | 4.4* | 10.1* |

*Source: Author's calculations.*

*Note: ***, ** and * denote significance of the underlying coefficient estimate at the 1%, 5% and 10% level, respectively. Industry $\sigma$ estimates are from Hummels (2001).*

### 5.3 Placebo Experiment and Robustness Checks

I carried out a "placebo experiment" in order to check to what extent the estimates reflect the effect of EU enlargement alone. The placebo EU dummy is created as the four-year lead of the original EU dummy (EU(+4)). Tables 4 and 5 report the placebo estimates. The estimation is done on both the whole sample (column 3) and a sample comprising data until 2001 (column 5). In general, the placebo estimates are numerically small and not different from zero statistically. This suggests that the main results are most probably not driven by other sources of heterogeneity across country groups that could have been present even in the early years of the sample. Some discrepancy appears however in the varying treatment case, where the placebo effect is significantly different from zero at a 10% significance level for the EU-8 to EU-15 and the EU-15 to EU-8 groups.[21] No significant placebo effect is found, though, for EU-8 country pairs.

The main results remained qualitatively the same after carrying out several robustness checks. In order to control for the possible export-inflating effect of intra-EU trade-related VAT fraud, I carried out the estimations on a sample excluding the typically VAT fraud-sensitive products.[22] The results are basically unaltered. The analysis was also reproduced for export volumes and real GDPs, where exports were deflated by national producer price indices (from the IMF's

[21] *In the case of EU-15 to EU-8 exports, the significance can at least partly be explained by the end of the Europe Agreements' phase-in periods for eliminating import duties on EU-15 products in some of the EU-8 countries.*

[22] *I exclude the two-digit NACE categories 30 (Manufacturing of office machinery and computers), 32 (Manufacture of radio, television and communication equipment and apparatus), 33 (Manufacture of medical, precision and optical instruments, watches and clocks).*

IFS database). In this regression, the EU effects are somewhat larger and a significant effect is detected also for EU-15 to EU-8 trade. Finally, the results are robust to including dummies for countries neighboring Russia. Such a test is motivated by the boost in the Russian economy that characterized this period and could significantly alter the trade patterns of countries having close trade links with Russia.

## 6 Summary

This paper provides empirical evidence on the magnitude of the trade effect of EU membership by taking the episode of the 2004 enlargement as a quasi-natural experiment. It shows that the trade creation through EU enlargement can be sizeable even after tariffs and quantitative restrictions of trade have been completely removed. The effect was considerably larger for EU-8 than for EU-15 exports, i.e. exporters in countries entering the EU seemed to reap most of the gain. Moreover, EU enlargement reduced the technological gap between the EU-15 and the EU-8 economies, since trade of more technology-intensive industries grew fastest. Finally, part of the effect occurred as early as the announcement of prospective enlargement, as captured by a significant effect recorded in 2003.

Apart from highlighting the importance of nontraditional border barriers to trade in general, the results may also convey useful lessons for assessing the potential for trade integration in current and would-be EU candidate countries (the countries of the Western Balkans, Turkey and Iceland). The main lesson to be drawn is that their scope for trade integration with the EU and with each other can be considerably larger than what may follow (or what has followed so far) from explicit trade liberalization measures. In order to conjecture to what extent the above findings are applicable to future acceding countries, however, it is necessary, first of all, to be more specific about the causes of the trade effect. Possible factors for the increase in trade may be the following:

- A decline in the time cost of trading and the cost of customs administration. EU accession practically eliminated border waiting time and the entire customs procedures in intra-EU trade. The cost of border waiting time is not necessarily negligible if trading is frequent and/or several borders must be crossed.
- The further harmonization of technical barriers to trade. Even today, differences in national technical and labeling requirements are trade-distorting policy measures within the EU.[23] From 1997 onward, the EU-8 countries had been involved in the process of harmonizing these requirements through the so-called PECAs[24] although they had the possibility to postpone full implementation until the date of accession at the latest.
- Lower legal and informational cost for enterprises. The reduction in legal and informational costs due to the adoption of the acquis communautaire can facilitate cross-border trade and encourage the setting-up of businesses abroad. Although legal harmonization in the EU-8 had been a gradual process spanning more than one decade, the ultimate adoption of some parts of community legislation was most probably concentrated at the date of accession.

[23] *See e.g. Chen (2004) or Manchin and Pinna (2007) for empirical evidence.*

[24] *Protocols to the Europe Agreement on Conformity Assessment and Acceptance of Industrial Products.*

– Reduced political risk. A less well-defined, but presumably not the least important, source of cost reduction is the increased confidence in the political stability of the EU-8 region following their entry into the EU.

Many of these factors are not directly observable or very hard to quantify. Hence, explicitly assessing their individual importance in the total trade effect caused by EU accession is not a straightforward exercise and is out of the scope of this paper. It remains a subject for future research.

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## Appendix: Tables

Table 4

### Common Treatment Results

| Variable | | | | Sample until 2003 | Sample until 2001 |
|---|---|---|---|---|---|
| EU | 0.133*** | 0.071** | 0.076** | | |
| | [0.041] | [0.035] | [0.035] | | |
| EU(+2) | | 0.122*** | 0.095*** | 0.159*** | |
| | | [0.032] | [0.031] | [0.031] | |
| EU(+4) | | | 0.058 | | 0.054 |
| | | | [0.037] | | [0.049] |
| gdp_i | 1.722*** | 1.644*** | 1.629*** | 1.085*** | 0.773** |
| | [0.167] | [0.173] | [0.175] | [0.210] | [0.370] |
| gdp_j | 1.209*** | 1.135*** | 1.120*** | 0.931*** | 1.306*** |
| | [0.132] | [0.139] | [0.142] | [0.152] | [0.292] |
| EA | 0.022 | 0.012 | 0.008 | | |
| | [0.059] | [0.058] | [0.059] | | |
| tar_i | –0.034*** | –0.034*** | –0.034*** | 0.014 | 0.005 |
| | [0.010] | [0.010] | [0.010] | [0.011] | [0.025] |
| tar_j | 0.003 | 0.003 | 0.003 | 0.022*** | 0.034* |
| | [0.011] | [0.011] | [0.011] | [0.008] | [0.020] |
| reer_i | –1.237*** | –1.176*** | –1.182*** | –0.778*** | 0.049 |
| | [0.226] | [0.226] | [0.226] | [0.211] | [0.415] |
| reer_j | –0.328** | –0.273* | –0.280* | –0.097 | –0.432 |
| | [0.156] | [0.160] | [0.160] | [0.164] | [0.271] |
| Constant | –7.452*** | –6.240*** | –5.838** | –0.240 | –3.220 |
| | [2.248] | [2.365] | [2.468] | [2.818] | [5.324] |
| Country pair-fixed effects | yes | yes | yes | yes | yes |
| Common year effects | yes | yes | yes | yes | yes |
| Number of observations | 2,310 | 2,310 | 2,310 | 1,386 | 924 |
| Number of groups | 462 | 462 | 462 | 462 | 462 |
| Within R-squared | 0.66 | 0.66 | 0.66 | 0.57 | 0.48 |

*Source: Author's calculations.*

*Note: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country pair level. The sample includes every odd year between 1999 and 2007. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.*

Table 5

## Varying Treatment Results

| Variable | | | | Sample until 2003 | Sample until 2001 |
|---|---|---|---|---|---|
| EU_8-8 | 0.357*** | 0.298*** | 0.311*** | | |
| | [0.087] | [0.079] | [0.079] | | |
| EU_8-15 | 0.264*** | 0.165*** | 0.174*** | | |
| | [0.056] | [0.047] | [0.049] | | |
| EU_15-8 | 0.038 | 0.000 | 0.005 | | |
| | [0.053] | [0.046] | [0.048] | | |
| EU(+2)_8-8 | | 0.167*** | 0.149*** | 0.195*** | |
| | | [0.059] | [0.054] | [0.058] | |
| EU(+2)_8-15 | | 0.218*** | 0.171*** | 0.239*** | |
| | | [0.051] | [0.050] | [0.049] | |
| EU(+2)_15-8 | | 0.066** | 0.031 | 0.072** | |
| | | [0.033] | [0.031] | [0.033] | |
| EU(+4)_8-8 | | | 0.048 | | –0.027 |
| | | | [0.068] | | [0.093] |
| EU(+4)_8-15 | | | 0.102* | | 0.059 |
| | | | [0.053] | | [0.063] |
| EU(+4)_15-8 | | | 0.073* | | 0.040 |
| | | | [0.040] | | [0.065] |
| gdp_i | 1.358*** | 1.154*** | 1.121*** | 0.851*** | 0.850** |
| | [0.178] | [0.194] | [0.200] | [0.225] | [0.392] |
| gdp_j | 1.253*** | 1.222*** | 1.209*** | 1.102*** | 1.464*** |
| | [0.143] | [0.163] | [0.171] | [0.176] | [0.377] |
| EA | 0.054 | 0.045 | 0.041 | | |
| | [0.057] | [0.056] | [0.056] | | |
| tar_i | –0.017 | –0.016 | –0.015 | 0.012 | 0.007 |
| | [0.012] | [0.012] | [0.012] | [0.011] | [0.025] |
| tar_j | 0.001 | 0.001 | 0.002 | 0.023*** | 0.038* |
| | [0.011] | [0.011] | [0.011] | [0.008] | [0.020] |
| reer_i | –1.124*** | –0.983*** | –0.989*** | –0.657*** | 0.072 |
| | [0.213] | [0.213] | [0.214] | [0.218] | [0.425] |
| reer_j | –0.316** | –0.295* | –0.304* | –0.183 | –0.413 |
| | [0.153] | [0.163] | [0.163] | [0.175] | [0.274] |
| Constant | –4.320* | –2.340 | –1.730 | 0.390 | –6.165 |
| | [2.443] | [2.616] | [2.813] | [2.867] | [6.088] |
| Country pair-fixed effects | yes | yes | yes | yes | yes |
| Common year effects | yes | yes | yes | yes | yes |
| Number of observations | 2,310 | 2,310 | 2,310 | 1,386 | 924 |
| Number of groups | 462 | 462 | 462 | 462 | 462 |
| Within R-squared | 0.67 | 0.67 | 0.67 | 0.57 | 0.49 |

*Source: Author's calculations.*

*Note: Robust standard errors (in brackets) are adjusted for clustering at the direction-specific country pair level. The sample includes every odd year between 1999 and 2007. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.*

# Selected Abstracts from Other OeNB Publications

The selected abstracts below alert readers to studies on CESEE topics in other OeNB publications. You may find the full-length contributions at www.oenb.at.

### From Stormy Expansion to Riding Out the Storm: Banking Development in Kazakhstan

Stephan Barisitz,
Mathias Lahnsteiner

Pushed by expanding income (on the back of rising oil prices) and by rapid external debt accumulation, the Kazakh banking sector featured one of the most dynamic credit booms in Central, Eastern and Southeastern Europe (CESEE) until 2007. Following the U.S. subprime crisis, banks' access to external funding plummeted and credit expansion ground to zero. The Great Recession forced credit institutions to drive down their external indebtedness. Moreover, the collapse of the oil price in late 2008 and the devaluation of the tenge in February 2009 cut domestic demand, liquidity and solvency. The share of nonperforming loans skyrocketed from 7% at end-2008 to 38% a year later. Large losses stemming from real estate exposure (burst of the housing bubble), lending to dubious partners and fraud played a role. Loan loss provisions were sharply ramped up, profitability was all but wiped out in 2008 and hefty losses were incurred in 2009 (return on assets at end-2009: –24%). Sector capital even turned negative. The authorities' crisis-response measures inter alia provided for the recapitalization of four, including the nationalization of two, of the largest banks (which accounted for two-thirds of sector assets). The two nationalized banks then defaulted on their high foreign liabilities and initiated debt restructuring negotiations that are currently in the process of completion. They promised steep haircuts for creditors, which should reduce the sector's debt burden and positively impact its capital. Very high credit risk and a weak institutional environment weigh on investor sentiment. But there are also important shock-absorbing factors: the (oil price-driven) recovery of the real economy, depositor confidence, record-level official foreign currency reserves and the oil stabilization fund and modest public debt.

Published in *Financial Stability Report 19*.

# Event Wrap-Ups

# Results of the OeNB Workshop "Macrofinancial Stability in CESEE: Have We Learned All the Lessons?"

Compiled by Maximilian Fandl, Johannes Pann and Thomas Reininger

On June 21, 2010, the Oesterreichische Nationalbank (OeNB) hosted a workshop entitled "Macrofinancial Stability in CESEE: Have We Learned All the Lessons?" More than 50 invited participants took part in the event, including representatives of commercial banks operating in Central, Eastern and Southeastern Europe (CESEE), home and host country supervisory authorities, EU institutions and international financial institutions. The workshop focused on three issues related to macrofinancial stability in CESEE: (1) recent developments in cross-border lending and cross-border capital and liquidity allocation, (2) implications of the credit cycle for banks' business models and credit risk management as well as (3) foreign currency lending in CESEE. Each session featured valuable presentations, followed by questions and answers as well as open and frank discussions, in which participants also put forward policy suggestions.

In his introductory statement, OeNB Governor Ewald Nowotny pointed out the lessons to be learned from the boom and the crisis in CESEE and addressed current risks and challenges for the banking sectors in the region. In the longer term, the main risks are the re-emergence of overheating and bubbles during the catching-up process and the failure to learn from the crisis and the previous boom (moral hazard). The main challenge consists in striking a balance between coping with the current temporary contraction of private sector credit demand and a potentially sluggish recovery on the one hand and addressing the long-term structural deficiencies (i.e. enhancing prudent lending policies, developing domestic currency markets and decreasing the reliance on foreign funding) on the other hand.

The workshop reached the following conclusions on macrofinancial stability in CESEE and the lessons to be learned from the market developments in recent years:

- The rise in *direct cross-border lending* in CESEE before the outbreak of the crisis received a rather critical assessment by several participants. These loans were largely denominated in foreign currency and, on average, more difficult to monitor, supervise and regulate than loans by local subsidiaries. Bank representatives argued that the cross-border channel was primarily chosen for large loans and due to the lower costs of funding.
- Refinancing considerations are now playing a bigger role in banks' *capital and liquidity allocation* than in previous years. Bank representatives pointed out the following funding trends in the CESEE banking business: (1) a renewed focus on local deposit gathering activities (partly in already highly competitive deposit markets), (2) a trend toward centralizing wholesale funding activities on the parent level, (3) a stronger reliance on secured bond issuance activities and (4) the longer-term refinancing of foreign currency positions via currency swaps and other instruments.
- The years preceding the crisis were characterized by a *boom in foreign currency lending* in most, though not all, CESEE countries. This development could have been partly fuelled by foreign bank ownership, the banks' funding structure and several macroeconomic parameters (high domestic interest rates, volatile inflation, etc.). In addition, recent empirical work on the subject has identified

two "contagion" effects that have affected foreign currency lending by banks in the region: contagion within multinational banks (i.e. foreign currency lending levels of subsidiaries were converging toward the group average) and contagion within countries (i.e. foreign currency lending levels at banks were converging toward the country average).

- A *panel discussion* explored the question whether foreign currency lending poses a threat to stability in CESEE and suitable policy options. The panelists expressed quite different views on the issue. While it remained highly debated whether foreign currency lending was beneficial or undesirable, the participants agreed that foreign currency lending to unhedged borrowers (especially households) should be discouraged given the existence of reasonable alternatives. Thus, policymakers should pursue a differentiated approach to foreign currency lending, promoting the establishment of proper local currency markets and improving cross-border cooperation, not only to curb foreign currency lending but to avoid excessive lending in general.
- The economic recovery in the CESEE region is likely to be gradual, uneven and coupled with continued high volatility in financial markets, while banks are set to proceed with balance sheet restructuring and the gradual resumption of lending. However, the consensus view at the workshop was that the *long-term growth potential in CESEE remains intact* and that the EU convergence anchor continues to be of paramount importance for the region. In this context, a higher disbursement rate of EU funds for infrastructure projects was suggested as a concrete policy objective to support economic growth, in particular in the SEE region.

# IMF Regional Economic Outlook for Europe: Fostering Sustainability

Compiled by
Christina Lerner

Europe was different – this was one of the main conclusions of a lecture on the IMF's "Regional Economic Outlook: Europe"[1] held at the OeNB on May 17, 2010, by Johan Mathisen, Senior Economist of the European Department of the IMF and one of the report's authors. Mathisen's presentation was followed by a lively discussion, in which economists from the OeNB and experts from various economic institutions and commercial banks as well as journalists took part.

The lecture was chaired by the Head of the OeNB's European Affairs and International Financial Organizations Division, Franz Nauschnigg. In his opening remarks, Nauschnigg pointed out that in the course of the financial crisis, the IMF had become a systemically important institution for Central, Eastern and South-eastern European (CESEE) countries by providing timely and adequate liquidity and hence stabilizing the region. He further elaborated on the IMF's latest financial arrangements, i.e. the provision of EUR 30 billion to Greece and of approximately EUR 250 billion under the European Stabilization Mechanism (ESM).[2]

## Recovery in Low Gear

Mathisen stated that in Europe, recovery had returned but was still much weaker than in other parts of the world. Europe has benefited from large capital inflows and experienced a deeper recession. Tightly integrated economies and the dependence of Europe's largest countries on exports had made the region particularly vulnerable to the collapse in global trade. Growth is uneven, and within the emerging market economies, the heterogeneity is even more pronounced. Lending conditions are still very tight, and unemployment is high and still rising.[3]

The risk situation meanwhile had become clearer, Mathisen continued. The failure to address sovereign concerns represents a major downside risk. Mathisen furthermore noted that the risk picture had changed favorably following the launch of the Greek austerity program.

The challenges to be addressed include getting public finances back on a sustainable track, reforming the financial system and improving the efficiency of labor and product markets. Moreover, emerging Europe is facing the additional challenge of attracting and managing healthy capital flows to restore economic growth. Many countries in CESEE had suffered from excessive inflows prior to the crisis, which had been associated with booming credit markets and overheated growth.

## Managing Capital Flows

Mathisen said that there were two main sources of capital flows, i.e. cross-border loans in banks and corporations on the one hand and foreign direct investment (FDI) on the other hand. The key policy questions are how to ensure a healthy level of foreign investment into emerging Europe, how to prevent excessive capital

[1] *The Regional Economic Outlook can be downloaded at http://www.imf.org/external/pubs/ft/reo/2010/EUR/eng/ereo0510.htm.*

[2] *The Regional Economic Outlook was drawn up in April 2010 and hence does not reflect the IMF's latest financial arrangements.*

[3] *The growth projections for advanced European economies amount to 1% for 2010 and to 1.5% for 2011, while for emerging European economies, they are around 3.3% for 2010 and 3.4% for 2011.*

flows and how to improve the stability of an increasingly internationally integrated financial sector.

He further analyzed that there were different drivers for different capital flows: While FDI is determined by convergence factors such as structural and growth factors, cross-border loans are more closely related to exchange rate policies as well as to monetary and fiscal policies. Mathisen stated that inflows sometimes exceeded the healthy levels required by convergence, reflecting, for example, unsustainable asset and credit booms.

## Policy Implications

When analyzing the exchange rate policy effects in more detail, it was found that stable exchange rates generally attracted more inflows, Mathisen explained. Countries without pegged exchange rates experienced a surge in bank-related inflows in times of slower appreciation, while countries with pegged exchange rates witnessed more bank-related inflows as the nominal exchange rate appreciated.

As regards fiscal policy, better fiscal balances generally seemed to attract more inflows, with the exception of countries with a pegged exchange rate, where higher deficits led to higher capital inflows.

## Policies Matter

In conclusion, Mathisen pointed out that policies mattered: Flexible exchange rates often helped avoid excessive inflows and the unsustainable booms they fuelled. Fiscal policy mattered, in particular under managed or fixed exchange rate regimes. And some macroprudential tools and capital controls influenced inflows at least temporarily; macroprudential policies altered the composition of inflows, as prudential tools temporarily slowed inflows and changed their composition. As a result, capital controls proved partly successful in restricting portfolio debt inflows.

In the discussion following the presentation, Mathisen clarified that the IMF did not generally recommend moving towards a flexible exchange rate and underlined once more that the IMF supported sustainable polices, especially when it comes to fiscal policy: A sustainable recovery requires sustainable policies. Given the magnitude of the required fiscal retrenchment and the risk of slowing the recovery, the stabilization of public debt in the short run is neither feasible nor desirable. Instead, governments should seek to consolidate their budgets over the medium term.

Moreover, Mathisen underlined that without the IMF's financial rescue packages in Europe and CESEE, there would have been a sudden stop in capital flows.[4]

When asked about the issue of foreign currency loans, Mathisen stated that the IMF – in pursuing its mission of promoting financial stability – did not recommend such credit but acknowledged that this assessment should be based on a country-by-country basis.

[4] *As regards Europe, the IMF has signed financial arrangements totaling EUR 93 billion with ten countries (this sum includes a Flexible Credit Line (FCL) for Poland amounting to EUR 15 billion, which is to be treated as precautionary, as well as the latest Stand-By Arrangement for Greece in the amount of EUR 30 billion).*

# Notes

# Legend, Abbreviations and Definitions

## Legend

x = No data can be indicated for technical reasons
. . = Data not available at the reporting date

Discrepancies may arise from rounding.

## Abbreviations

| | |
|---|---|
| BIS | Bank for International Settlements |
| BOFIT | Bank of Finland Institute for Economies in Transition |
| CEE | Central and Eastern Europe(an) |
| CEEI | Conference on European Economic Integration (OeNB) |
| CESEE | Central, Eastern and Southeastern Europe(an) |
| CDS | credit default swap |
| CIS | Commonwealth of Independent States |
| CPI | consumer price index |
| EA | euro area |
| EBRD | European Bank for Reconstruction and Development |
| ECB | European Central Bank |
| Ecofin | Council of Economic and Finance Ministers (EU) |
| EMU | Economic and Monetary Union |
| ERM (II) | exchange rate mechanism (II) |
| ESA 95 | European System of Accounts 1995 |
| ESCB | European System of Central Banks |
| EU | European Union |
| FDI | foreign direct investment |
| FEEI | Focus on European Economic Integration (OeNB) |
| FYR Macedonia | former Yugoslav Republic of Macedonia |
| GDP | gross domestic product |
| HICP | Harmonised Index of Consumer Prices |
| ILO | International Labour Organization |
| IMF | International Monetary Fund |
| LFS | Labour Force Survey |
| MFI | monetary financial institution |
| NACE | Nomenclature statistique des Activités économiques dans la Communauté Européenne |
| NCB | national central bank |
| NPL | nonperforming loan |
| OECD | Organisation for Economic Co-operation and Development |
| PPI | producer price index |
| PPP | purchasing power parity |
| SEE | Southeastern Europe(an) |
| SME | small and medium-sized enterprise |
| SUERF | Société Universitaire Européenne de Recherches Financières (SUERF – The European Money and Finance Forum) |
| ULCs | unit labor costs |
| VAT | value-added tax |

| | |
|---|---|
| wiiw | Wiener Institut für internationale Wirtschaftsvergleiche (The Vienna Institute for International Economic Studies) |

## National Central Banks

| | |
|---|---|
| BNB | Bulgarian National Bank |
| BoA | Banka e Shqipërisë (Bank of Albania) |
| BOF | Suomen Pankki – Finlands Bank (Bank of Finland) |
| BNR | Banca Naţională a României (National Bank of Romania) |
| BS | Banka Slovenije (Bank of Slovenia) |
| CBBH | Centralna banka Bosne i Hercegovine (Central Bank of Bosnia and Herzegovina) |
| CBCG | Centralna banka Crne Gore (Central Bank of Montenegro) |
| CBR | Central Bank of the Russian Federation (Bank of Russia) |
| CNB | Česká národní banka (Czech National Bank) |
| HNB | Hrvatska narodna banka (Croatian National Bank) |
| MNB | Magyar Nemzeti Bank (Hungary's central bank) |
| NBP | Narodowy Bank Polski (National Bank of Poland) |
| NBS | Národná banka Slovenska (Slovakia's central bank) |
| NBS | Narodna banka Srbije (National Bank of Serbia) |
| NBU | National Bank of Ukraine |
| OeNB | Oesterreichische Nationalbank (Austria's central bank) |
| TCMB | Türkiye Cumhuriyet Merkez Bankası (Central Bank of the Republic of Turkey) |

## ISO Currency Codes

| | |
|---|---|
| ALL | Albanian lek |
| BGN | Bulgarian lev |
| CZK | Czech koruna |
| EUR | euro |
| HRK | Croatian kuna |
| HUF | Hungarian forint |
| PLN | Polish złoty |
| RON | Romanian leu |
| RSD | Serbian dinar |
| RUB | Russian ruble |
| SFR | Swiss franc |
| TRY | Turkish lira |
| USD | U.S. dollar |

## ISO Country Codes

| | |
|---|---|
| AL | Albania |
| BA | Bosnia and Herzegovina |
| BG | Bulgaria |
| CZ | Czech Republic |
| EE | Estonia |
| HR | Croatia |
| HU | Hungary |
| LT | Lithuania |
| LV | Latvia |
| ME | Montenegro |
| MK | FYR Macedonia |
| PL | Poland |
| RO | Romania |
| RS | Serbia |
| RU | Russia |
| SI | Slovenia |
| SK | Slovakia |
| TR | Turkey |
| UA | Ukraine |

## Definitions

*Croatia, FYR Macedonia* and *Turkey* are candidate countries within the EU enlargement process. Candidate countries are countries which have formally applied to the European Union for membership and have been officially recognized by the European Council as a candidate for membership. Accession negotiations with Croatia and Turkey were opened in October 2005. No date has been set yet for the opening of accession negotiations with FYR Macedonia.

*Albania, Bosnia and Herzegovina, Montenegro, Serbia* and *Kosovo under UNSC Resolution 1244/99* are potential EU candidate countries, i.e. countries that may become officially recognized candidates for membership. Western Balkan countries involved in the Stabilisation and Association process are recognized as potential candidate countries.

# Periodical Publications of the Oesterreichische Nationalbank

For further details on the periodical publications of the OeNB see *www.oenb.at*

## Monetary Policy & the Economy — quarterly

This quarterly publication, issued both in German and English, offers analyses of current cyclical developments, medium-term macroeconomic forecasts and studies on central banking and economic policy topics. It also summarizes the findings of macroeconomic workshops and conferences organized by the OeNB.

## Focus on European Economic Integration — quarterly

The Focus on European Economic Integration (FEEI) is a channel for communicating the OeNB's ongoing research on Central, Eastern and Southeastern European (CESEE) countries, thus reflecting a strategic regional research priority of the OeNB. Contributions to the quarterly FEEI include peer reviewed studies dealing primarily with macrofinancial and monetary integration as well as economic country analyses and cross-regional comparisons.

## Statistiken – Daten & Analysen — quarterly

This publication contains brief reports and analyses focusing on Austrian financial institutions, cross-border transactions and positions as well as financial flows. The contributions are in German, with executive summaries of the analyses in English. The statistical part covers tables and explanatory notes on a wide range of macroeconomic, financial and monetary indicators. The tables and additional information and data are also available on the OeNB's website in both German and English. This series also includes special issues on selected statistics topics published at irregular intervals.

## Research Update — quarterly

The quarterly English-language newsletter is published only on the Internet and informs an international readership about selected findings, research topics and activities of the OeNB's Economic Analysis and Research Department. This publication is addressed to colleagues from other central banks or international institutions, economic policy researchers, decision makers and anyone with an interest in macroeconomics. Furthermore, the Research Update offers information on publications, studies or working papers as well as events (conferences, lectures and workshops).
For further details see *www.oenb.at/research-update*

## Financial Stability Report — semiannual

Issued both in German and English, the Financial Stability Report contains first, a regular analysis of Austrian and international developments with an impact on financial stability and second, studies designed to provide in-depth insights into specific topics related to financial market stability.

## Workshops – Proceedings of OeNB Workshops

three to four issues a year

The Proceedings of OeNB Workshops were introduced in 2004 and typically comprise papers presented at OeNB workshops at which national and international experts, including economists, researchers, politicians and journalists, discuss monetary and economic policy issues. Workshop proceedings are generally available in English only.

## Working Papers

about ten papers a year

The OeNB's Working Paper series is designed to disseminate, and provide a platform for discussing, findings of OeNB economists or outside contributors on topics which are of special interest to the OeNB. To ensure the high quality of their content, the contributions are subjected to an international refereeing process.

## Conference Proceedings of the Economics Conference

annual

The Economics Conference hosted by the OeNB is an international platform for exchanging views and information on monetary and economic policy as well as financial market issues. It convenes central bank representatives, economic policy-makers, financial market players, academics and researchers. The conference proceedings comprise all papers presented at the conference.

## Conference Proceedings of the Conference on European Economic Integration

annual

The OeNB's Conference on European Economic Integration (CEEI) focuses on Central, Eastern and Southeastern European issues and the ongoing EU enlargement process. The Conference Proceedings comprise contributions to the CEEI and are published in English by a renowned international publishing house. For further details see *http://ceec.oenb.at*

## Annual Report (Sustainability Report)

annual

The Annual Report of the OeNB provides a broad review of Austrian monetary policy, economic conditions, new developments in the financial markets in general and in financial market supervision in particular as well as of the OeNB's changing responsibilities and its role as an international partner in cooperation and dialogue. It also contains the OeNB's financial statements, its Intellectual Capital Report and its Environmental Statement.

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