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Regional Financial Interlinkages and Financial Contagion Within Europe

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Abstract

This paper focuses on financial interlinkages within Europe and potential contagion channeled through these interlinkages. It discusses the increased role of external financing as a source of funding for credit growth; analyzes potential channels of contagion through financial linkages; and assesses the magnitude of cross-border exposures between emerging and western European countries. Based on the stylized facts on these exposures, the paper provides simple indices of exposure to regional contagion that could help identify the likely pressure points and capture potential spillover effects and propagation channels of a regional shock originating from a given country.

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I. INTRODUCTION

1.   **With the significant increase in foreign ownership of the banking systems in Central, Eastern, and Southeastern Europe (CESE), the degree of financial inter-linkages among Western European and CESE countries has grown markedly**. Foreign ownership of CESE banking systems has brought important benefits to the host countries, including advanced technology and risk management techniques and increased access to cross-border funding, and contributed to rapid financial deepening in CESE countries. At the same time, the rapid growth of financial links has also raised susceptibility to contagion for the host countries, as well as the home countries of the foreign banks active in many CESE countries. Better capturing spillovers has been identified as a priority for the Fund's surveillance work, including through regional approaches to surveillance.[2] This issue has gained particular importance in light of the ongoing global financial turmoil.

2.   **A number of IMF initiatives have indeed been ongoing in this direction**. Wajid and others (2007), for example, studied financial links in the Nordic-Baltic region. A number of recent Financial Sector Stability Assessments (FSSA) have focused on cross border exposures of domestic financial systems and regional feedback linkages, as well as on appropriate supervisory policies to address the associated risks (e.g., Austria, Bulgaria, Croatia, Lithuania). The European Regional Economic Outlooks (2007 and 2008) discussed spillover effects as part of the ongoing efforts for regional surveillance of financial sector linkages. In a contemporaneous study, Maechler and Ong (2009) analyze the structure of bank claims and its potential implications for financial stability, both in the creditor and borrower countries of CESE. In a related paper, Mitra and Ong (2008), analyze the impact of shocks to short-term cross-border interbank lending on domestic credit and GDP growth.

3.   **The present paper's contribution is to analyze the magnitude of cross-border financial exposures between Western and emerging countries in Europe, and discuss the associated risks in terms of exposure to potential regional contagion**. It provides information on the major banking groups active in the CESE region and their exposures to different subregions. Based on country-level data from BIS reporting banks, it explores the magnitude of home-host exposures and provides stylized facts that could help assess the extent to which shocks from foreign markets can affect a given country. Similar to an earlier paper by Sbracia and Zaghini (2001), it focuses on possible contagion through a "common lender" which may be a key funding source for a number of countries. It explores how the presence of a common lender could transfer a shock in one country to other countries in the region in which the parent bank has significant direct or indirect operations.

4.   **To this effect, the paper computes indices of exposure to regional contagion based on the stylized facts provided by the magnitude of the interlinkages between Western European and CESE countries**. Under alternative assumptions about the common lender, trigger countries, and different measures of financial exposure, the indices attempt to

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[2] See the recent Report by Max Watson, an External Consultant on "IMF Surveillance in Europe: Progress in Refocusing," in the Triennial Review of IMF Surveillance.

gauge countries' susceptibility to contagion originating from potential problems in another country in the region (be it a parent bank or its subsidiary). In general, high exposure to such contagion measured this way would require that: the common lender's exposure to the country initially affected by a problem is large (implying substantial losses, and in turn a need to retrench funding); that the same lender is an important source of funds for other countries; and that these other countries must not have significant additional sources of funding readily available.

5.   **The key findings are as follows**: The financial interlinkages within Europe are economically significant. Most CESE countries are highly dependent on Western European banks, either directly by their private sector or through the local banking sectors, and the exposures are fairly concentrated. Austria, Germany, and Italy account for the largest share of these claims for the CESE region as a whole (for the Baltics, mainly Sweden), though some CESE economies have relatively more diversified sources of funds. By contrast, the magnitude of Western European bank exposures to CESE is far smaller, except in the case of Austria and Sweden. Where the exposures to host countries is economically non-negligible, their concentration also raises concerns. Even where the exposures are well diversified, potential economic and financial spillovers within CESE could bring the overall exposure to a more considerable magnitude.

6.   **The analyses also suggest that the larger the dependence of a CESE country on funds from a common lender and the greater the latter's exposure to a trigger country, the higher is its exposure to regional contagion**. In general, Austria, Italy, and Germany as common lenders have the largest effect in propagating shocks across a wide range of CESE countries. Susceptibility to regional contagion is the largest when the common lender has activities substantially concentrated in the CESE region. And the larger the dependence of a country on funds from home country banks, the higher is its contagion exposure. A broadly similar group of CESE countries appear to be more exposed to regional contagion than other CESE countries under alternative assumptions about the common lender, trigger countries, and different measures of financial exposure.

7.   **Crucially, the contagion exposure indices do not represent an assessment of the financial or macroeconomic vulnerability and stability of individual countries studied.** Instead, they gauge their susceptibility to contagion originating from potential problems in another country in the region and help identify the likely pressure points to capture potential spillover effects and propagation channels of a regional shock originating from a given country. The actual vulnerability of a country will depend on the country's macroeconomic fundamentals, the capitalization, liquidity, and general soundness of the individual banking systems and its key institutions, the maturity structure of foreign claims on CESE countries, and the nature of the institutional regulations that affect financial relations between home and host institutions. In that sense, the indices should only be seen as a first step to a full vulnerability exercise.

8.   **The remaining parts of the paper are organized as follows**. Section II provides a brief background on credit growth in the region, the increased reliance of CESE banking sectors on foreign funding to finance the rapid credit growth, and the risks associated with relying on concentrated foreign funding. Section III discusses possible channels of regional

contagion. Section IV provides stylized facts on the magnitudes of cross-border exposures between CESE and Western European countries, based on which Section V computes indices of exposure to regional contagion. Section VI discusses possible implications for financial sector surveillance in the Fund and provides concluding remarks.

II. BACKGROUND

9.   **The banking sectors of CESE countries have gone through a profound transformation since the second half of the 1990s**. Foreign ownership levels are among the highest in the world (Figure 1) and bank credit to the private sector has expanded rapidly in recent years. This well-documented process, which was already apparent at the beginning of the decade, became even stronger from 2004.[3] During 2000-07, credit increased by about 23 percent a year on average in real terms across the region. During 2004-07, credit to the private sector increased on average by about 30-50 percent in real terms in nine of the 19 CESE countries (Table 1). As a result, the ratio of private sector credit to GDP has been rising significantly, with the cumulative increase exceeding 20 percentage points in seven CESE economies.[4]

Figure 1. Asset Share of Foreign-Owned Banks, 2000-06, in percent
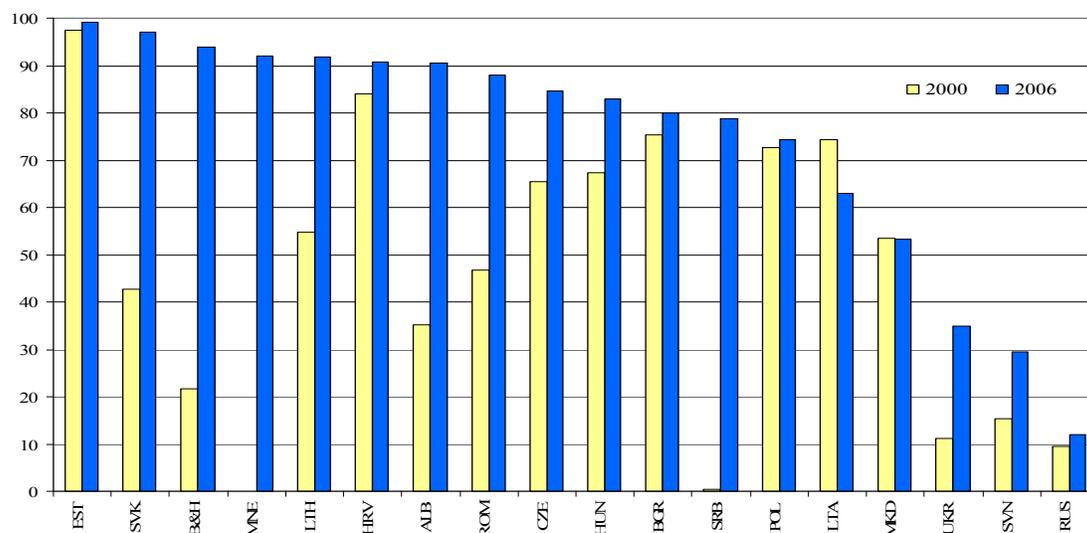
Source: European Bank for Reconstruction and Development; and IMF staff calculations.

10.   **Part of this phenomenon reflects the process of catching up from low levels of financial intermediation.** The CESE countries with low levels of financial intermediation at the end of the 1990s have experienced faster credit growth compared to the CESE countries

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[3] See Arpa, Reininger, and Walko (2005); Backe, Égert, and Zumer (2006); Barisitz (2005); Cottarelli, Dell'Ariccia, and Vladkova-Hollar (2003); Duenwald, Gueorguiev, and Schaechter (2005); Enoch and Ötker-Robe (2007); Hilbers, Ötker-Robe, Pazarbasioglu, and Johnsen (2005); and Kiss, Nagy, and Vonnák (2006).

[4] The pace of credit growth has slowed in a number of countries in CESE during 2008, following the intensification of the global financial crisis and growing indications of a slowdown in economic activity.

with higher credit–to–GDP ratios (Figure 2). Even so, there are concerns that rapid credit growth may pose risks to financial stability in some cases. The fast convergence in credit ratios is mainly driven by similar and aggressive business strategies of (mostly) Western European banking groups that dominate the banking sectors of most CESE countries (see Figure 3 and Appendix I for more details).

Table 1. Evolution of Credit to the Private Sector in Ratio to GDP, 1998-2007
(Percentage point change from the previous year)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007 1/	Cummulative increase (since 2004)	Average real credit growth (2004-2007)
Estonia	-0.9	0.5	-1.0	1.1	1.6	4.8	9.3	16.4	21.0	6.5	53.2	46.6
Latvia	3.9	0.8	3.6	7.1	6.3	7.7	10.5	17.4	18.6	4.7	51.3	40.5
Bulgaria	1.2	1.5	0.5	2.2	4.7	7.7	8.9	7.3	3.8	19.7	39.7	32.5
Lithuania	1.4	1.8	-1.3	0.4	2.6	6.7	5.9	12.5	9.3	10.6	38.4	41.8
Ukraine	5.3	0.7	2.6	2.0	4.6	6.9	0.6	7.0	12.7	14.8	35.1	43.9
Albania	-0.4	0.2	0.8	1.3	0.4	1.1	2.0	5.6	6.7	8.0	22.3	50.5
Bosnia & Herzegovina	-7.6	-6.3	-1.9	-10.8	5.3	4.4	2.3	7.0	4.1	7.8	21.1	19.9
Croatia	3.9	-3.9	0.0	4.9	8.1	2.6	3.0	4.8	8.1	3.4	19.3	14.1
Moldova	7.0	-2.1	0.8	2.1	2.4	3.1	0.9	2.4	4.3	10.5	18.1	22.4
Hungary	-0.1	1.9	5.3	1.5	1.9	7.3	3.6	5.3	4.3	4.8	18.0	12.1
Czech Republic	-10.1	-6.1	-5.7	-8.1	-9.7	1.1	1.1	4.5	4.6	7.3	17.5	18.3
Russia	4.9	-2.5	0.2	3.2	1.2	3.3	3.2	1.6	5.0	7.1	16.8	31.9
Turkey	-3.2	-0.6	1.3	-3.1	-2.3	0.1	4.0	5.6	6.1	---	15.7	28.0
Serbia, Republic of	1.5	1.8	19.3	-14.6	-16.4	2.0	3.6	5.7	-1.0	6.0	14.4	24.8
Romania	3.2	-3.5	-0.9	1.5	1.4	3.6	1.9	4.3	6.3	---	12.6	39.4
Belarus	7.8	-6.9	-0.5	-0.6	0.9	2.7	2.1	1.6	4.0	4.5	12.2	38.2
Poland	1.7	3.0	1.1	0.7	0.2	0.6	0.1	0.8	4.4	6.7	11.9	16.1
Slovak Republic	-2.2	1.0	-3.4	-13.8	2.0	-8.3	-1.2	5.3	3.5	3.7	11.3	15.3
Macedonia, FYR	-9.6	3.2	-3.0	-0.2	0.1	2.2	3.3	2.5	4.8	---	10.6	25.2
Median	*1.4*	*0.5*	*0.2*	*1.1*	*1.6*	*3.1*	*3.0*	*5.3*	*4.8*	*6.9*	*18.0*	*29.6*
Average	*0.4*	*-0.8*	*0.9*	*-1.2*	*0.8*	*3.1*	*3.4*	*6.2*	*6.9*	*7.9*	*23.1*	*28.0*

Sources: IFS, WEO, staff calculations
1/ Third quarter growth rate for Estonia

Figure 2. The CESE Region: Catching Up from Low Levels of Intermediation
(in percent)
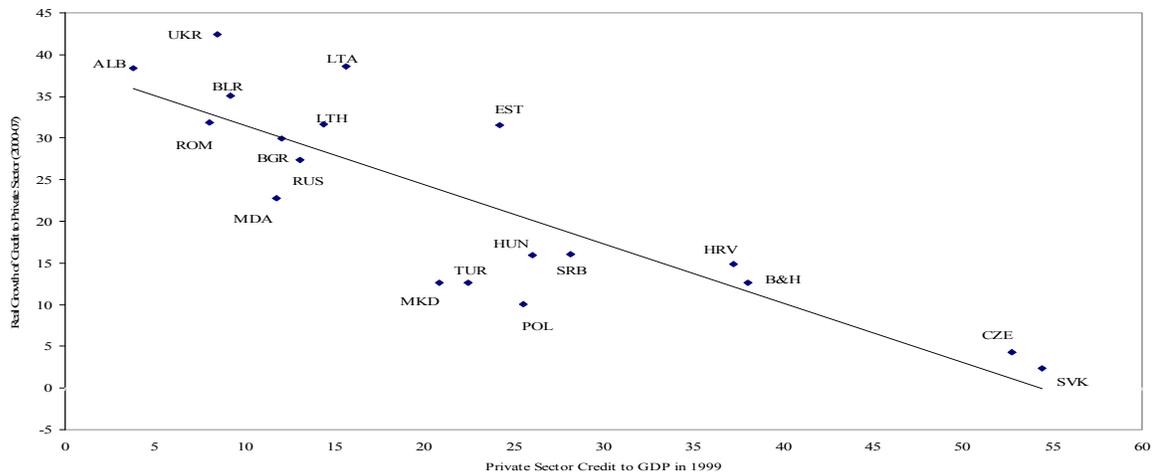
Source: IFS, WEO, authors' calculations.
[1] ALB = Albania; BLR = Belarus; B&H = Bosnia and Herzegovina; BGR = Bulgaria; CZE = Czech Republic; EST = Estonia; HUN = Hungary; HRV = Croatia; LTA = Latvia; LTH = Lithuania; MDA = Moldova; MKD = Macedonia, FRY; POL = Poland; ROM = Romania; RUS = Russia; SRB = Serbia; SVK = Slovakia; TUR = Turkey.

Figure 3. Major Banking Groups Active in CESE, end-2007[1]

(asset share of the region in total group assets)
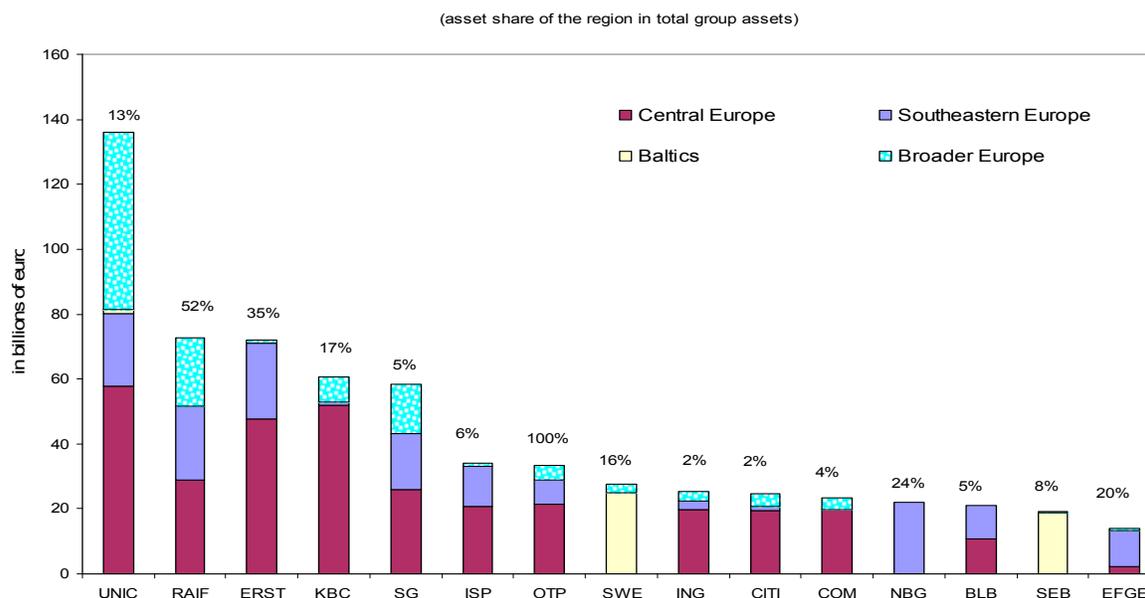
Source: Annual reports. For some smaller subsidiaries and branches the figures are estimates.
[1] UNIC = Unicredit; RAIF = Raiffeisen; ERST = Erste; SG = Societe Generale; ISP = Intesa Sanpaolo; SWE = Swedbank;
CITI = Citibank; COM = Commerzbank; NBG = National Bank of Greece; BLB = Bayerische Landesbank; EFGB = EFG
Eurobank.

11.　**With the pace of private sector credit growth remaining brisk, dependence on
non-deposit funding has increased in many countries in emerging Europe**. Loan–to–
deposit ratios (LTD) have been rising in most countries, particularly in the Baltics where
LTDs roughly doubled since the early 2000s, and in Ukraine, Hungary, and Russia where
they ranged from 120–150 percent in 2007. Except in a few cases (Moldova, Serbia,
Macedonia, and Bosnia), the changes in bank credit–to–GDP ratios significantly exceeded
those in the ratio of bank deposits–to–GDP, suggesting that deposit growth has not been able
to keep up with the rapid credit growth in recent years (Figure 4).

12.　**High and rising LTDs therefore have required increasing reliance on foreign
funding channeled through the banking sector.** The latter reflects the relatively
undeveloped state of domestic capital markets as a funding source in these countries, and
easy access by the mostly foreign-owned banks to cheap funding from their parents.[5][6] Net
foreign liabilities (NFL)[7] as a ratio to private sector credit have been rising sharply since the
beginning of the decade in many countries (most notably in the Baltics, most of the South

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[5] In a few cases (e.g., Latvia, Lithuania, and Hungary), the relatively high volume of money market instruments
and bond issuance by banks has provided some support for funding.

[6] In many cases, the business model of the banks (e.g., granting borrowers long-term FX loans without long
term FX financing) made the increasing reliance on foreign funding particularly risky.

[7] Note that net foreign liabilities of the banking systems do not represent banks' net foreign currency exposures.

Eastern Europe, and Belarus, Russia, and Ukraine), although the rising trend has turned around more recently in a few countries (Croatia, Hungary, Serbia, and Slovakia—see Figure 5).[8] Foreign funding through the banking sector has played a smaller role in Bosnia, the Czech Republic, Macedonia, Albania, Moldova, and Poland, although net foreign liabilities as a ratio to credit to the private sector have also been rapidly growing in these countries as well; by mid-2008, Albania, the Czech Republic, and Macedonia, FYR, were the only countries with a negative ratio of NFL to bank credit.

Figure 4. The CESE Region: Funding of Credit Expansion, 2003-2007

Change in deposit and credit to GDP (2003-2007)
(in percentage points)
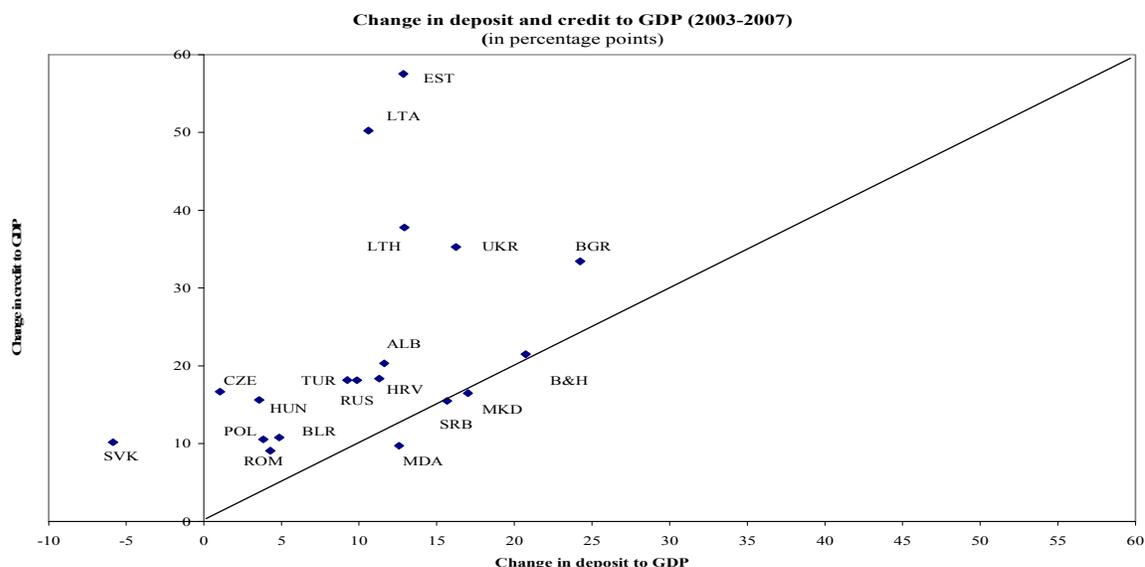
13.   **The differences in funding structures suggest that some countries are more exposed than others to financial market disturbances originating from advanced markets or to spillovers from problems in other countries in the region**. Banking systems that are heavily dependent on foreign funding to support credit growth could face a sudden shortfall of, or costly access to, funds, and experience difficulties in expanding credit, if there were a sudden reassessment of exposure to a host country (e.g., due to concerns about vulnerabilities in that country or the region). While reputational risks and long-term business plans may render it unlikely that parent banks would not support their daughters, the degree of their support depends on market conditions; as funding conditions in home countries become more difficult, they may be pressured to slow lending and liquidity provision abroad as well as at home.[9] Liquidity or solvency problems in a parent could hence be transmitted to local banks in a concentrated and largely foreign-owned banking system. Banks can also experience difficulties in expanding credit if their access to foreign syndicated lending are curtailed, or due to a deleveraging process across markets, as observed more recently.

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[8] This may be the result of a number of factors, including controls on foreign borrowing to contain credit growth and external imbalances (Croatia) or a weak macroeconomic environment (Hungary), or exchange rate changes.

[9] The mature financial market turmoil, the problems of some banking groups with subsidiaries in CESE, and re-assessment of exposures to host countries have indeed resulted in reduced parent funding since late 2008.

Figure 5. The CESE Region: External Funding of Credit Expansion, 2002-June 2008
Net Foreign Liabilities Relative to Credit to the Private Sector
(In percent)
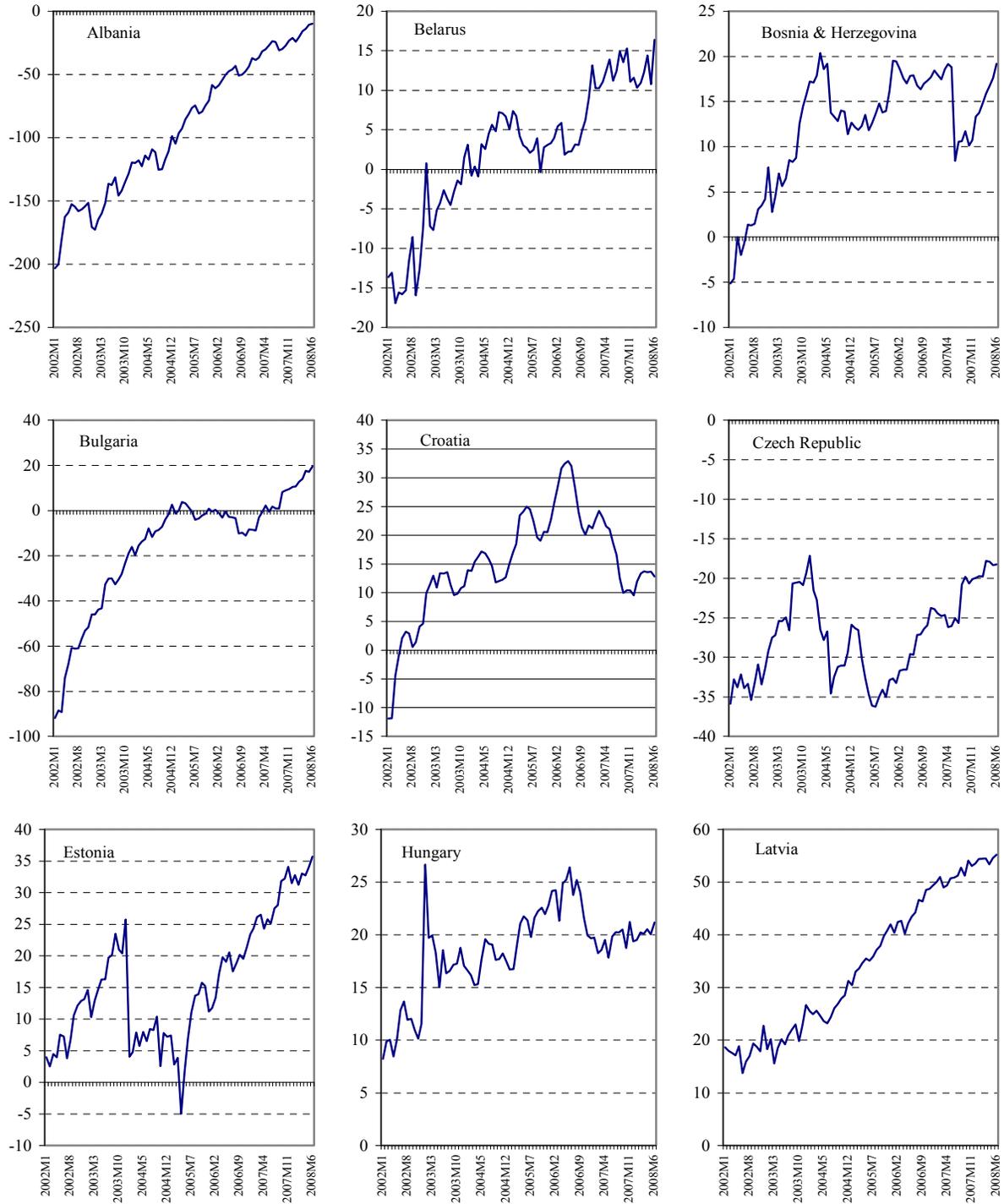
Source: IFS and staff calculations.

Figure 5. The CESE Region: Funding of Credit Expansion, 2002-June 2008 (concluded.)
Net Foreign Liabilities Relative to Credit to the Private Sector
(In percent)
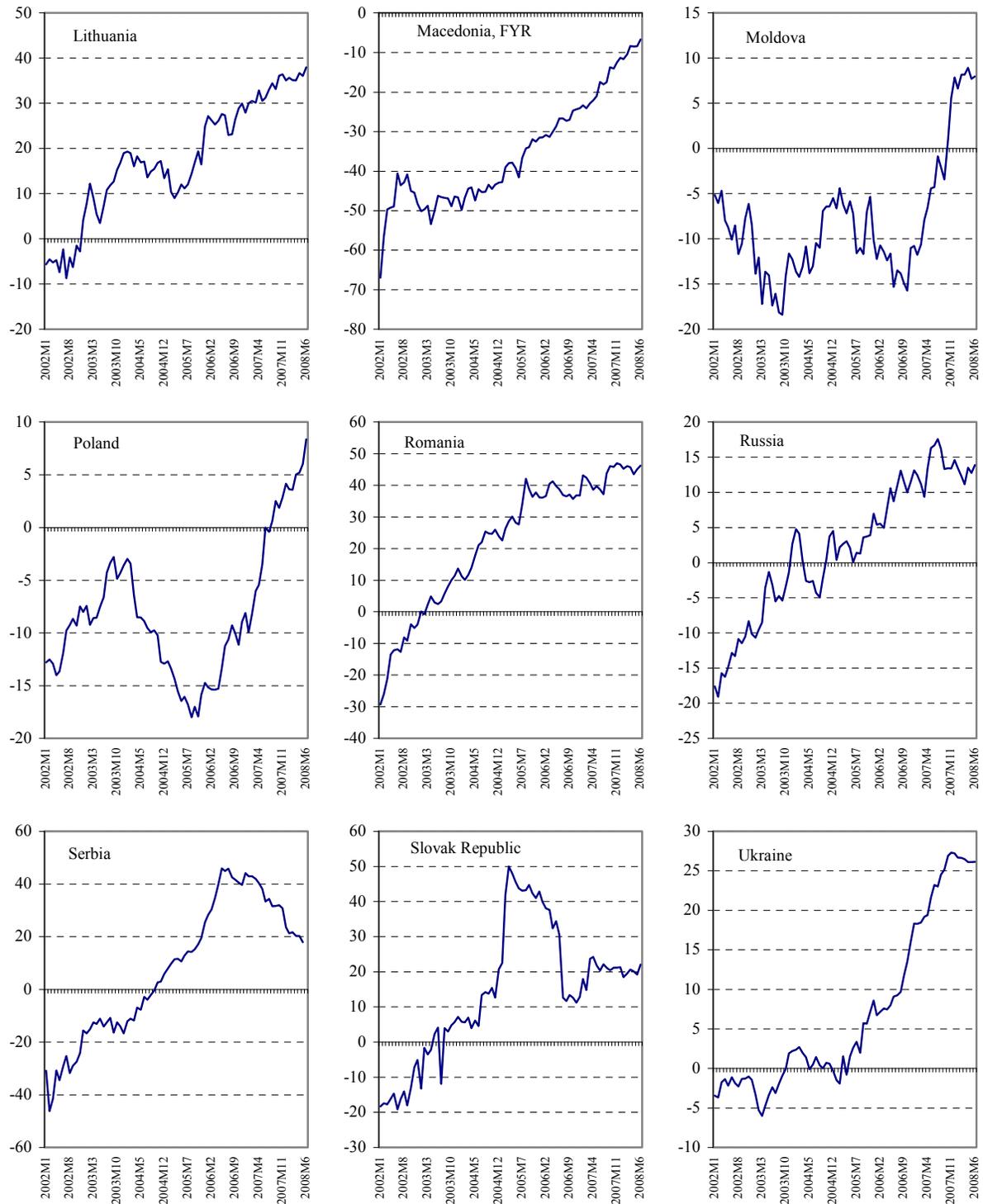
Source: IFS and staff calculations.

14.   **The impact of such a credit crunch would be amplified if funding from other (nonbank) sources were also limited.** Some emerging European countries that had been turning to international capital markets for funding in recent years have indeed seen demand for financial sector bonds drying up since the subprime crisis in August 2007 (e.g., Eurobond issuance by the Russian and Ukrainian financial sectors) and some banks in CESE reportedly postponed their planned bond issues as a result of higher spreads. International bond issuance has been a negligible source of funding for most other countries in the region. Direct borrowing from abroad by the nonfinancial private sector is also likely affected by a tightening of credit conditions in international markets.

III. POSSIBLE PROPAGATION CHANNELS OF REGIONAL SHOCKS

15.   **This section discusses the various channels through which a financial shock can be transmitted between home and host countries** (Diagram 1). The contagion channels described here are not different from such channels among other groups of countries. What elevates the importance of this discussion is the significance of cross-border interlinkages among Western and CESE banking sectors compared to other regions of the world. Many Western European banks have been taking advantage of the opportunity to expand their presence in CESE banking systems, with such operations accounting for a substantial share of their profits (Appendix I). Given the strong links, adverse developments in CESE banking sectors (and economies) could have adverse implications for home financial systems. Problems in home countries can similarly affect the host countries with a high risk of spillover to other countries in the region.

16.   **One channel through which financial contagion could be transmitted is the presence of a "common lender" that may be the main funding source for a number of countries.**[10] The private sectors of two countries in the region, A and B, for instance, may borrow mainly from the banking system of a third country, C (the common lender). A shock affecting A (e.g., due to a problem in a foreign-owned bank in A) may result in liquidity or solvency pressures in the banks of C, provided that the parent bank is highly exposed to A. The problems in A could then spillover to B, even when B's economy is not directly linked to A's, simply because of the presence of the third country, C, in both A and B. The parent bank's presence in the region could therefore transfer a shock in one country to other countries in the region in which the parent bank has significant (direct or indirect) operations. Other parent banks exposed to each of the affected host countries (directly or indirectly through their daughters) could in turn be affected, creating second-round effects.

17.   **Similarly, a sudden reassessment of a parent bank's exposure to a host country could expose its daughter to sudden liquidity problems.**[11] Banks that are heavily dependent on parent bank funding to support credit growth could face a sudden shortfall of, or costly access to, credit, if the parent bank either withdraws its deposits or lending to the subsidiary or charges a much higher interest rate on its funding. In banking systems that are

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[10] See Sbracia and Zaghini (2001) for a discussion of such channel of transmission of international shocks.

[11] For instance due to concerns about vulnerabilities in that country or a set of countries in the region.

heavily concentrated and where interbank market linkages are substantial, liquidity problems can spread to other domestic or foreign-owned banks, affecting in turn the parents of the latter and the banking systems in which the parent is active—again, generating second-round effects on other banking systems in the region.[12]

Diagram 1. Possible Channels of Regional Financial Contagion

Problem Originating from a Subsidiary

	liquidity risk		liquidity problems	
Problems in a foreign bank subsidiary		Spillover to the parent bank	solvency problems	Spillover to other CEE countries where the parent banks and other banks in home country have subsidiaries or engage in direct lending to the private sector
	credit risk			

Spillover to other banks in home country

Spillover to home banks with exposure to the affected subsidiary or CEE country

Problem Originating from a Subsidiary

| Parent bank reassessment of exposure to its subsidiary | Withdrawal of deposits at subsidiary Withdrawal of credit lines Reduced lending to subsidiary | Liquidity problems at the subsidiary | Confidence effects Interbank linkages | Spillover of liquidity problems to other banks in the host country |

Spillover to subsidiaries of the affected parent in other host countries

Liquidity problems

Spillover to other home banks with exposure to the affected host country banks

Problem Originating from a Parent Bank

	liquidity problems		interbank exposures	
Solvency or liquidity problems in a parent bank		Spillover to the parent's subsidiaries in CEE countries		Spillover to other banks in a given CEE country
	solvency problems		confidence effects within the banking system	

Possible spillover to other parent banks that are exposed to the affected subsidiaries

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[12] The same reasoning applies not only to foreign funding through the parent bank but also to host country bank borrowing through syndicated lending from a group of lender countries.

18.   **Contagion could also go in the other direction, with host countries affected by problems in a parent bank**. Liquidity or solvency problems experienced by a parent could spread to its subsidiaries or branches in other countries. Host country banking systems could be affected through a deterioration of confidence in the daughter banks and/or through direct funding exposure to the parent bank. A spillover to a host banking system could also be propagated through a change in the market's risk assessment of a parent bank that belongs to a banking group with a deteriorated financial standing. Other foreign banks that are exposed to the affected host banks could in turn experience problems, spreading their (liquidity or solvency) pressures onto those countries dependent on funding from the affected parent banks.[13]

19.   **The magnitude of potential contagion effects through these channels depends in general on:** (i) the size of the exposures of home banks (common lender) to the host country with a problem; and (ii) the dependence of the host country on funds from the home country. As pointed out in Sbracia and Zaghini (2001), three conditions must be satisfied for such channels of transmission to operate: (1) the common lender's exposure to the country initially affected by a problem must be large, implying substantial losses, and in turn a need to restore capital; (2) the lender must be an important source of funds for other countries; and (3) the potentially affected countries must not have other sources of funding readily available. The following section provides stylized facts on these elements, to get a sense of the magnitude of the exposures between CESE and Western European countries so as to assess the significance of these transmission channels for contagion.

IV. STYLIZED FACTS ON CROSS BORDER EXPOSURES AND FINANCIAL LINKAGES

20.   **To get a sense of the magnitudes of cross-border exposures between CESE and Western European countries, the paper uses consolidated foreign claims of BIS reporting banks on individual CESE countries.** The foreign claims reported in the BIS international banking statistics include outstanding consolidated claims of the reporting banks on local banking systems, as well as claims on the nonbank sector (i.e., direct lending, which has increased in significance in recent years—see Appendix II).[14] From the lenders'

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[13] Direct linkages between home and host country banking systems through the European interbank market are of smaller scale than in advanced countries. Although generally an important channel, contagion via direct host country bank exposure to foreign interbank markets is likely to be less significant than between advanced countries. The importance of direct funding from European money markets by CESE subsidiaries of foreign banks is generally small compared to parent bank and syndicated lending, since such direct funding is more expensive for the subsidiary, given the risk premia and counterparty risks. Nevertheless, it is not negligible in some cases (e.g. Baltics).

[14] The BIS statistics differentiate between (a) cross-border claims, (b) local claims of foreign affiliates in foreign currency in a host country, (c) local claims of foreign affiliates in local currency, and (d) domestic claims in the reporting country. In BIS terminology, (a) + (b) refers to "international claims," while (a) + (b) + (c) refers to "foreign claims." That is, foreign claims include local claims of foreign-owned subsidiaries in local currency which, to a very large extent, are financed by local deposits in local currency (see BIS, 2005, and BIS, 2008). Foreign claims correspond to the direct gross on-balance sheet exposure of foreign banks to individual countries, while international claims represent the level of foreign bank claims that could result in foreign exchange outflows.

perspective, the statistics provide the exposures of Western European countries to a given CESE economy. From the borrowers' perspective, they give an idea of the magnitude and distribution of the dependence of CESE economies on Western European banking systems, and illustrate the magnitude of control over a country's assets and liabilities by foreign banks. They do not necessarily give an indication of exposure to potential funding risks through the banking sector.[15]

21.   **The analyses of foreign claims show that most CESE countries are indeed heavily exposed to Western European banks, either directly by their private sector or through their local banking sectors**.[16] Austria, Germany, and Italy account for the largest share of foreign claims for CESE countries as a whole, while non-European reporting banks hold less than 10 percent of the total claims on CESE (Figure 6). The exposures are significant for many countries, both in relation to the recipient countries' GDP and the size of their banking system assets (Figure 7, upper panel). Outstanding foreign claims owed to reporting banks in all western European countries are substantial (in excess of 80 percent of GDP) for Bosnia and Herzegovina, Croatia, Latvia, Estonia, Lithuania, Czech Republic, Hungary, and Slovakia. Exposures are also significant in terms of host country banking sector assets for many countries, but much less so for Russia, Turkey, Ukraine, Albania, Belarus, Moldova, and Macedonia.[17] Focusing only on international claims on CESE banking systems also suggests heavy reliance of CESE banks on external funding to support rapid expansion of lending to the private sector (Figure 8).

22.   **On the contrary, the magnitude of western European bank exposures to CESE is far smaller, compared with that of the latter, with a few exceptions** (Figure 7, lower panel). For Austria, the foreign claims of the reporting banks on emerging Europe amounts to

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[15] Exposure to funding risk may be overestimated not only by the inclusion, in foreign claims, of the local claims of foreign affiliates in local currency, but also of direct foreign borrowing by CESE nonbank private sector, since a large share of CESE companies borrowing directly from abroad are owned by large foreign companies that can have access to other funding sources. The exposures have also been computed by using only international claims on banks, to have a better sense of the funding risk.

[16] This is even more so, given that BIS consolidated banking statistics do not include CESE-owned domestic banks among the reporting banks. For instance, the Hungarian OTP Bank with no foreign strategic owner has subsidiaries in several CESE countries, accounting for a large share of their foreign liabilities, especially in Bulgaria and Montenegro. The same point applies to Slovenian and Greek banks some of which have been very active in the region, but are not among the reporting or listed reporting banks, respectively, in BIS statistics.

[17] These figures are based on consolidated banking statistics in Table 9b of the BIS International Banking Statistics. These statistics do not include lending between head office and branches/ subsidiaries, with inter-office business netted out. The statistics do not provide information on how the claims are funded: domestically—principally through deposits, or from abroad—including through loans from the parent bank. Assets of foreign-owned CESE subsidiaries are also included in foreign claims, which explains why the exposures of some countries may be higher than the external debt of the private sector. The magnitude of the exposures are also significant in relation to alternative economic and financial indicators (e.g., current account balance, gross FDI inflows, or banking system capital), and for a similar set of countries, albeit with different rankings depending on the indicator used (not reported here).

Figure 6. Foreign Claims of All BIS Reporting Banks on Emerging Europe, December 2007*

Shares in Foreign Claims of All BIS Reporting Banks on Emerging Europe
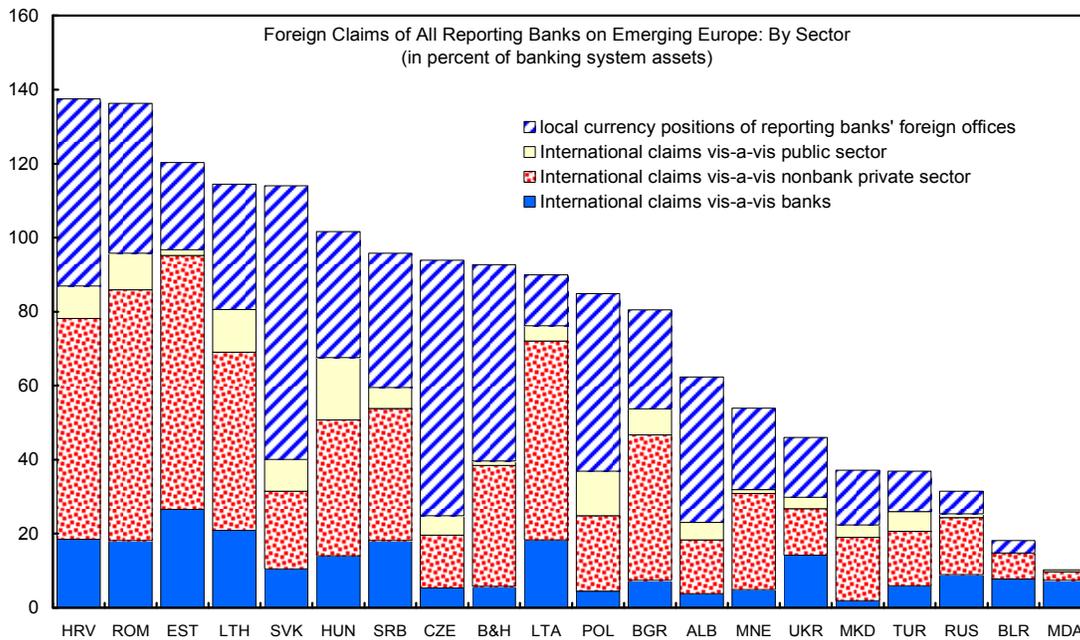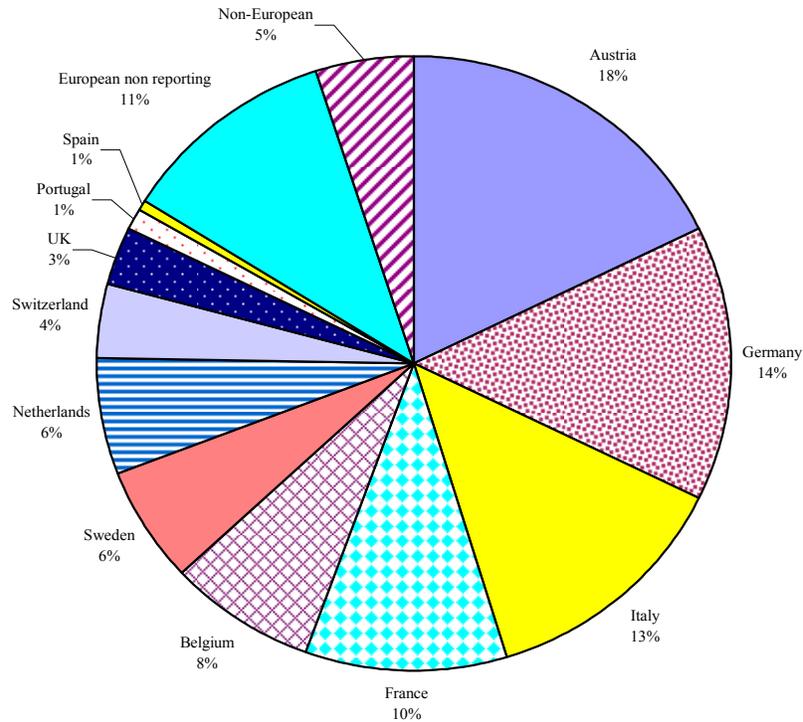
Sources: BIS Quarterly Review, June 2008, Table 9A (immediate borrower basis) and authors' calculations.

* BIS statistics do not provide detailed data on foreign claims on the private sector (e.g., to distinguish between corporates and households. Household sector direct borrowing from abroad is in general not significant.

Figure 7. Relative Magnitude of Exposure for CESE and Western Europe, December 2007

Borrower Country Exposure (Dependence)

☐ Exposure to all reporting banks in % of the country's GDP
☒ Exposure to all reporting banks in % of the country's banking sector assets
● Share in total claims on CESE

HRV EST LTA SVK LTH HUN B&H CZE BGR ROM MNE SRB POL ALB UKR MKD TUR RUS BLR MDA

Lending Country Exposure

☐ Exposure to CESE in % of lenders' GDP
☒ Exposure to CESE in % of lenders' banking sector assets
● Share of each country's claims in total EUR claims on CESE

AUT BEL SWE SWI NETH ITA GER PGL FRA UK ES

Source: BIS, International Banking Statistics, Table 9B, June 2008, IFS, WEO, authors' calculations.

Figure 8. CESE Banks' Exposure to Foreign Banks—International Claims on Banks,
in percent of:
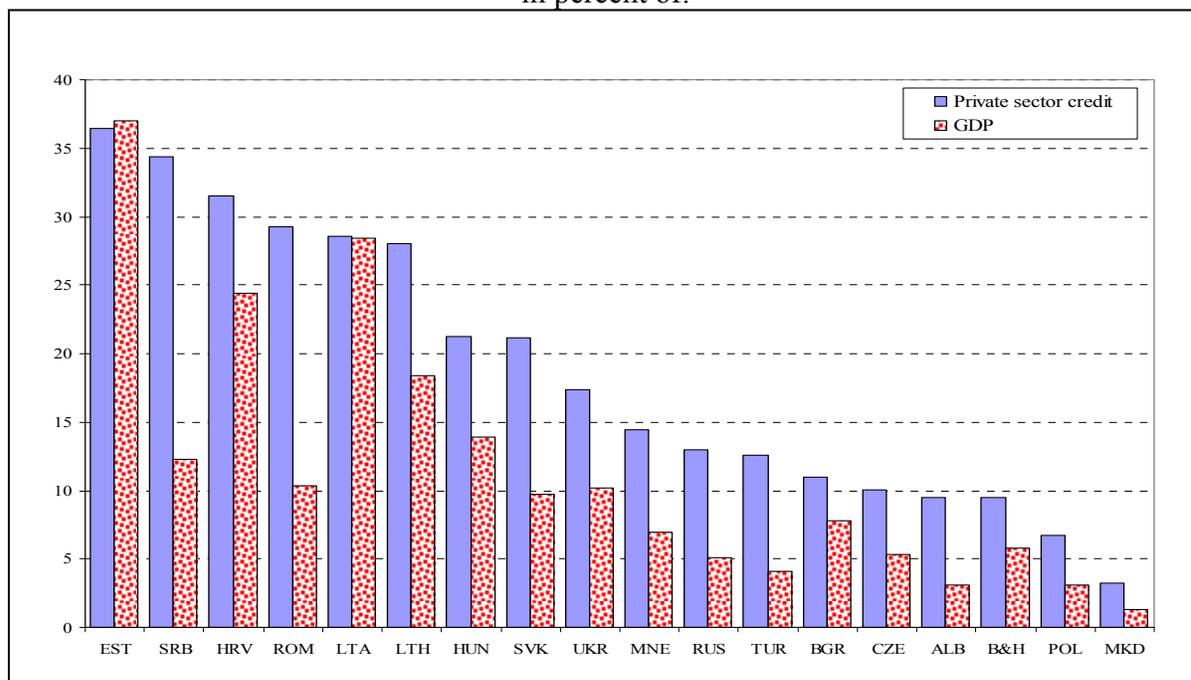
Source: BIS, International Banking Statistics, WEO, and authors' calculations.

over 70 percent of Austria's GDP and 26 percent of its banking system assets at end-2007.
The exposures of banks in Belgium and Sweden are also relatively high in terms of their
GDP (25 percent and 20 percent, respectively), but much less so in terms of banking system
assets (at most 10 percent). For the remaining countries, the exposures are negligible,
including for France, Germany, and Italy with active presence in the CESE.

23.   **These exposures could contribute to the potential vulnerabilities if their
composition reflects heavy reliance on foreign funding and if the exposures are heavily
concentrated**. Most CESE countries have concentrated exposures measured by foreign
claims, particularly to banks in Austria and Italy, as well as to France and Germany, and the
Baltic countries have large exposures to Sweden (Figure 9 and Table 2 in Appendix III). The
same conclusion applies when exposures are measured by the reporting banks' international
claims on CESE (i.e., excluding the local claims of foreign owned subsidiaries in local
currency) or by their international claims only on the CESE banks.[18]

24.   **Among the countries with higher foreign claims on their economies, some have
relatively more diversified sources while others rely on a few sources.** For example,

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[18] A slight difference to note is that when bank-to-bank claims are used, Germany and Austria have the greatest
shares in the claims on many CESE countries' banks, while with foreign and international claims, Austria and
Italy have the largest shares; nevertheless, Italy is still an important source. In addition, exposures of Latvian
banks (and to a smaller extent, Lithuanian banks) are concentrated on Germany, as well as on Sweden.

Czech Republic, Poland, and, to some extent, Hungary, have relatively diversified sources of funds. On the other hand, Bosnia and Herzegovina, Croatia, Romania, Serbia, and Slovakia have at least one third of their exposure to Austrian banks. Similarly, Italy accounts for 20-35 percent of the foreign claims on Bosnia and Herzegovina, Bulgaria, Croatia, Poland, and Slovakia, and the Baltic countries have at least about 60 percent of their total exposures to Sweden at the end of 2007. Such concentration of claims makes a large number of CESE countries heavily exposed to potential adverse developments in the Austrian, Italian, and Swedish banks active in the region.

25.   **Where the exposure to host countries is non-negligible economically, heavy concentration of the Western European exposures also gains importance** (Table 3 in Appendix III). For example, the three Baltic countries together represent about 73 percent of Sweden's exposure to all developing countries (about 20 percent and 10 percent of Sweden's GDP and banking system assets, respectively, at end-2007). Such an exposure would make Sweden vulnerable to adverse developments in any one of the Baltic countries, which could spill over to the other two economies. The exposures to CESE for other Western European countries are either well-diversified (e.g., Austria, Belgium), and/or the size of the absolute exposure is not economically significant (e.g., France, Germany, Italy, Portugal).

26.   **However, even where the exposures seem well diversified across countries, potential economic and financial contagion may bring the overall exposure to a more considerable magnitude**. For example, contrary to the case of Sweden, the exposures seem well diversified across several countries for Austria, which is highly exposed to the CESE region (Table 3 in Appendix III) and exposure to a single country seems relatively small (up to17 percent).[19] However, the ultimate impact of possible adverse developments in one country may be more significant, as troubles in one country can spill over to others and markets may not, at least initially, differentiate between countries based on their economic and financial vulnerabilities. Such regional spillovers could increase Austria's vulnerability to the CESE region in spite of its diversified exposure.

V. IMPLICATIONS FOR EXPOSURE TO REGIONAL CONTAGION RISKS

27.   **What do these stylized facts on the exposures of Western and CESE countries say in terms of exposure to contagion risks?** We explore two forms of contagion affecting a CESE country: (i) exposure to a shock originating from the home country of a foreign bank, and (ii) exposure to regional contagion triggered by a problem in another CESE country to which a Western European country has significant exposures. The stylized facts discussed in Section IV give an indication of both the borrowers' liabilities and the lenders' exposures to these countries, and can help assess the relative exposures of the CESE countries to regional contagion.

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[19] For example, while Austria makes up 36 percent of Croatia's exposure to all reporting country banks in end-2007, Croatia constitutes only 12 percent of Austria's exposure to all developing countries. The largest exposure of Austria is to the Czech Republic (17 percent), while the latter owes about 30 percent of all its foreign claims to Austria at end-2007.

28.   **The first contagion channel involves a shock transmitted from a home to a host country, taking as trigger a country in Western Europe with active banks in the CESE region**. In general, the larger a CESE country's exposure to the trigger home country, the stronger would be the adverse effects from developments in the home country banks. The measure of absolute dependence, defined as the amount of claims owed to a home country as a share of the CESE country's GDP (Table 4 of Appendix III) provides an indication of the extent to which a given CESE country will be affected. To illustrate, the table suggests that any potential adverse developments in Austrian (or Italian) banks would be felt most significantly in Croatia, Bosnia and Herzegovina, and Slovakia; similarly, any adverse developments in Swedish banks would be felt most strongly in Estonia, Latvia, and Lithuania (see Figure 10 for an illustration).

Figure 9. CESE: Concentration of Funding Dependence to BIS Reporting Banks in Western Europe, December 2007

(in percent)
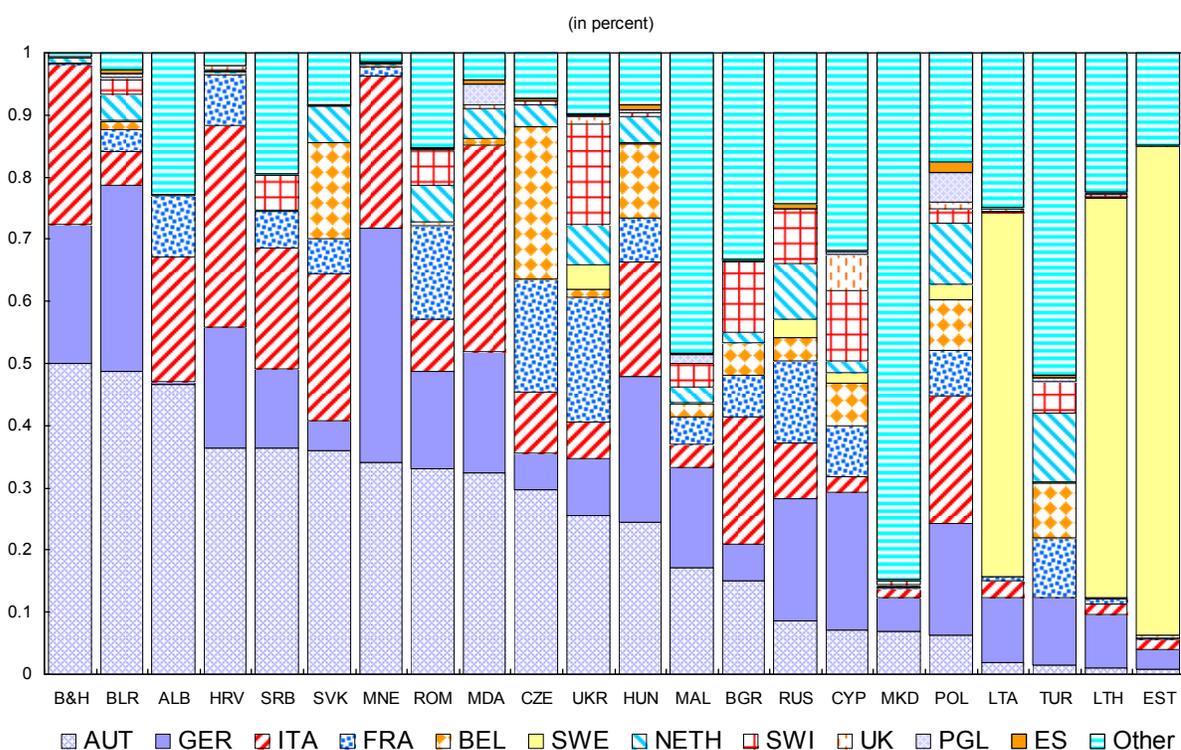
Source: BIS, International Banking Statistics, Table 9B, June 2008, and author's calculations.

29.   **The second contagion channel analyzes how problems in one CESE country might spread to others in the region.** One such mechanism is provided by the "common lender channel," in which a Western European banking sector has a large exposure to a trigger CESE country and is an important source of credit for other countries in the region. A shock affecting the trigger country may result in pressures in the banks of the common lender, given its high exposure to the trigger country, and could spill over to another CESE country, simply because of the large presence of the common lender in both countries.

30.   **For this propagation channel, we follow a simple approach suggested in Sbracia and Zaghini (2001)**. Using BIS international banking statistics, the authors summarize the

stylized facts discussed in Section IV in the form of indices of exposure to the common lender channel of contagion for emerging market countries in Eastern Europe, Asia, and Western Hemisphere, where Germany, Japan, and the United States, respectively, are assumed as the most common lenders. The indices attempt to evaluate contagion exposure in terms of dependence of each country on a common lender that is exposed to another country experiencing a problem. Since the calculation of such an index requires the knowledge of the trigger country, which can only be known ex-post, an ex-ante indicator is computed, instead, using as trigger the country to which the common lender has the highest exposure.

Figure 10. The Impact of a Shock from Home to Host Country—An Illustration
(Foreign claims owed relative to the recipient's GDP, in percent)
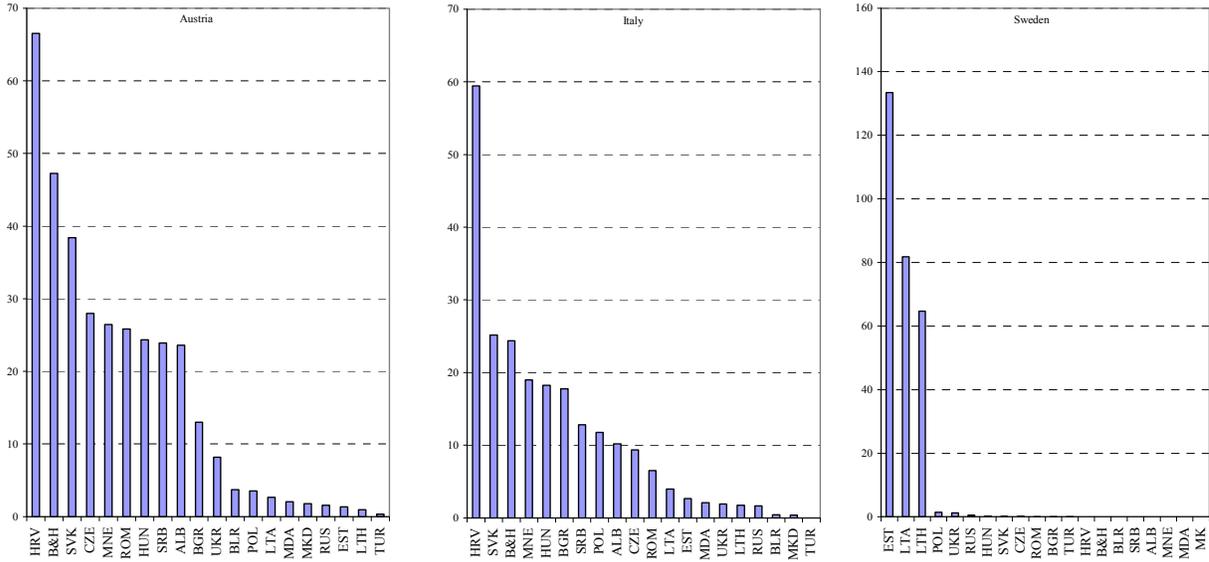
Source: Table IV in Appendix III.

31. **This paper adopts this approach, with some variations, to the CESE countries, to compute indices of exposure to regional contagion**. In particular, the following two indices have been computed:

(1) $I_i^1 = ad_{CL}^i AE_j^{CL}$

(2) $I_i^2 = ad_{CL}^i AE_j^{CL} REB_i^{CL}$; where $REB_i^{CL} = \dfrac{A_i^{CL}}{\sum\limits_{h \in DC} A_h^{CL} - \max\limits_{j \neq i} A_j^{CL}}$

- In (1), ad_{CL}^i is the "absolute dependence" of country i on the common lender, defined as foreign claims owed by country i to the common lender (CL)'s banks in country i's GDP (Table 4 of Appendix III). AE_j^{CL} is the ex-ante "absolute exposure" of the common lender to the trigger country (the country with which it has the highest exposure). The absolute exposure of the common lender to country j (Table 5 of Appendix III) is defined as the ratio (in percentage terms) of the common lender's

claims vis-à-vis country j to it's own funds (for the latter we use the common lender's banking system assets). Both magnitudes are expressed in percentage terms.

- In (2), REB_i^{CL} indicates some measure of rebalancing, that is, the amount of funds that may be cut from a borrower country i, following a problem in a trigger country the common lender has exposure to. It is defined as the amount of claims of the common lender on country i, A_i^{CL} in ratio to the total amount of funds lent to all other developing countries, excluding the amount of claims on the trigger country. This ratio is an increasing function of the amount of funds that the common lender provides to country i and to the trigger country j.

32. **In computing the indices of contagion exposure, we somewhat deviated from Sbracia and Zaghini (2001), in particular in the choice of the common lender and the trigger country**. Judging from Table 2 and Figure 9, there is no single country that could be unambiguously identified as the unique common lender for the CESE region. Most countries in the region are highly dependent on Austria, but many also depend on Italy and Germany; the Baltic countries are dependent predominantly on Sweden. The indices have therefore been computed under different assumptions for the common lender. In choosing the trigger country, we focused on 3 countries that the common lender has the largest exposures within the CESE group; as Table 5 in Appendix III suggests, the absolute exposures of the common lender(s) are not overwhelmingly high with respect to any one of the borrower countries than the others in the group. Indices have been computed using both the foreign and international claims concepts, as well as international claims on banks only, to see how contagion exposures would change based on the nature of the home and host country links.

33. **Accordingly, the indices have been computed under several cases for the common lender and associated trigger countries.** In particular, Austria, Italy, Sweden, and Germany have been chosen as the common lenders, and the three countries to which each common lender has the largest exposure among the other CESE countries have been chosen as the triggers.[20] Appendix Tables 6a, 6b present the values of the indices under these cases for the foreign claims concept, and Figure 11 illustrates them for a selected group of common lenders and trigger countries: Austria, Italy, Sweden, and Germany as common lenders, and the country to which each common lender has the largest exposure to as the trigger country. Appendix Tables 7a and 7b and Figure 12 repeat the same exercise for the international claims concept. Figure 13 illustrates exposures to regional contagion when international claims only on the CESE banking sectors are used.

34. **The indices provide some interesting results for the degree of exposure of the CESE countries to regional contagion and their sensitivity to the source of contagion:**

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[20] Czech Republic, Romania, and Croatia are the largest three exposures for Austria; Russia, Poland, and Hungary for Germany; Poland, Croatia, and Hungary for Italy; Czech Republic, Russia, and Romania for France, and Estonia, Lithuania, and Latvia for Sweden.

- In general, the larger the dependence of a country on funds from home country banks (directly or indirectly through the domestic banking systems), and the larger the exposure of home country banks to the trigger country, the higher the values of the contagion indices. Taking into consideration the possibility of rebalancing in the common lender's funding through a potential cutback in credit lines reduces the value of the index significantly (Index 2 vs. Index 1). The countries for which absolute dependence on foreign banks is lower drop out of the group of most exposed countries under the second index.

- Contagion indices are the highest when the common lender has activities substantially concentrated in the region. In turn, the indices are smaller when the common lender has large presence in, but smaller exposure to, CESE in terms of its economic size, since in the latter case, the exposures to any country in the region are economically too small to affect the funds available to others when problems emerge in a trigger country. Austria as the common lender would hence have the highest effect in propagating shocks across a wide range of CESE countries.

- The indices also suggest that potential contagion between Sweden and the Baltic countries is highly concentrated. Although the Baltic countries exhibit the highest exposure indices for a hypothetical problem triggered in Estonia, Latvia, or Lithuania, a potential spillover to the other CESE countries through the common lender channel seems to be contained within the Baltic region. This is because the dependence of non-Baltic CESE countries on Sweden is immaterial, making the likelihood of any rebalancing effect rather small. Contagion from the Baltics to the rest of the CESE countries therefore seems to be fairly unlikely, at least based purely on the common lender channel.[21] Similarly, potential problems triggered in other CESE countries do not seem to impact the Baltic countries, except when Germany is the common lender.

35.   **Using the international claims concept produces significantly lower contagion exposure indices (given the smaller magnitude of the exposures), but the group of countries more exposed to regional contagion remains broadly the same** (Figure 12). With significant foreign ownership of CESE banking systems, the foreign claims of the reporting banks, including local currency assets of foreign–owned affiliates, produce much higher indices than when international claims are used (the latter only include cross-border lending and foreign currency assets of foreign-owned affiliates). While the group of countries susceptible to regional contagion remains broadly the same, the ranking of countries within the group differs somewhat, in particular for Austria and Italy as common lenders, compared to Germany.[22] Contagion indices based on international claims on CESE banks are

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[21] Psychological contagion, associated with a potential worsening of market sentiment against emerging Europe in general, could, however, trigger a round of problems even though financial linkages across the countries, directly or indirectly, may be small.

[22] This likely reflects the significantly higher share of cross-border claims in foreign claims for Germany than for Austria and Italy. Widespread and large subsidiary network of Austrian and Italian banks magnifies and alters the order of the vulnerability ranking of many CESE countries.

Figure 11. CESE Countries: Indices of Contagion Exposure – Foreign Claim Concept

Foreign claims on CESE countries - Common Lenders: Austria, Italy, Sweden, Germany

Hypothetical trigger countries are those to which the common lender has the largest absolute exposure 1/
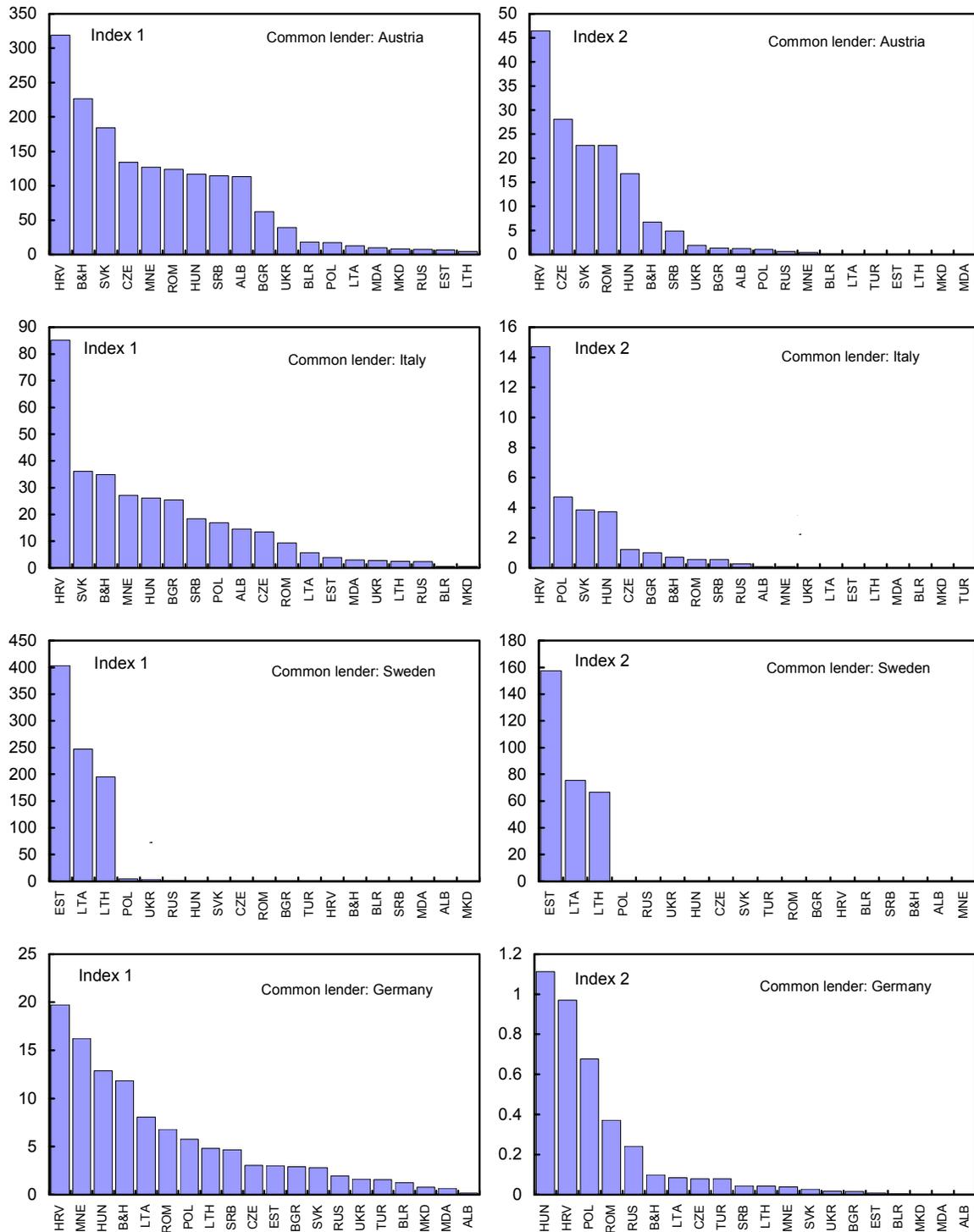
Sources: Tables 6a,b in Appendix III based on BIS December 2007 data, and authors' calculations.

1/ The figures illustrate the regional impact of a hypothetical shock to a country, which each common lender has the largest absolute exposure to.

Figure 12. CESE Countries: Indices of Contagion Exposure – International Claims Concept

International claims on CESE countries - Common Lenders: Austria, Italy, Sweden, Germany

Hypothetical trigger countries are those to which the common lender has the largest absolute exposure 1/
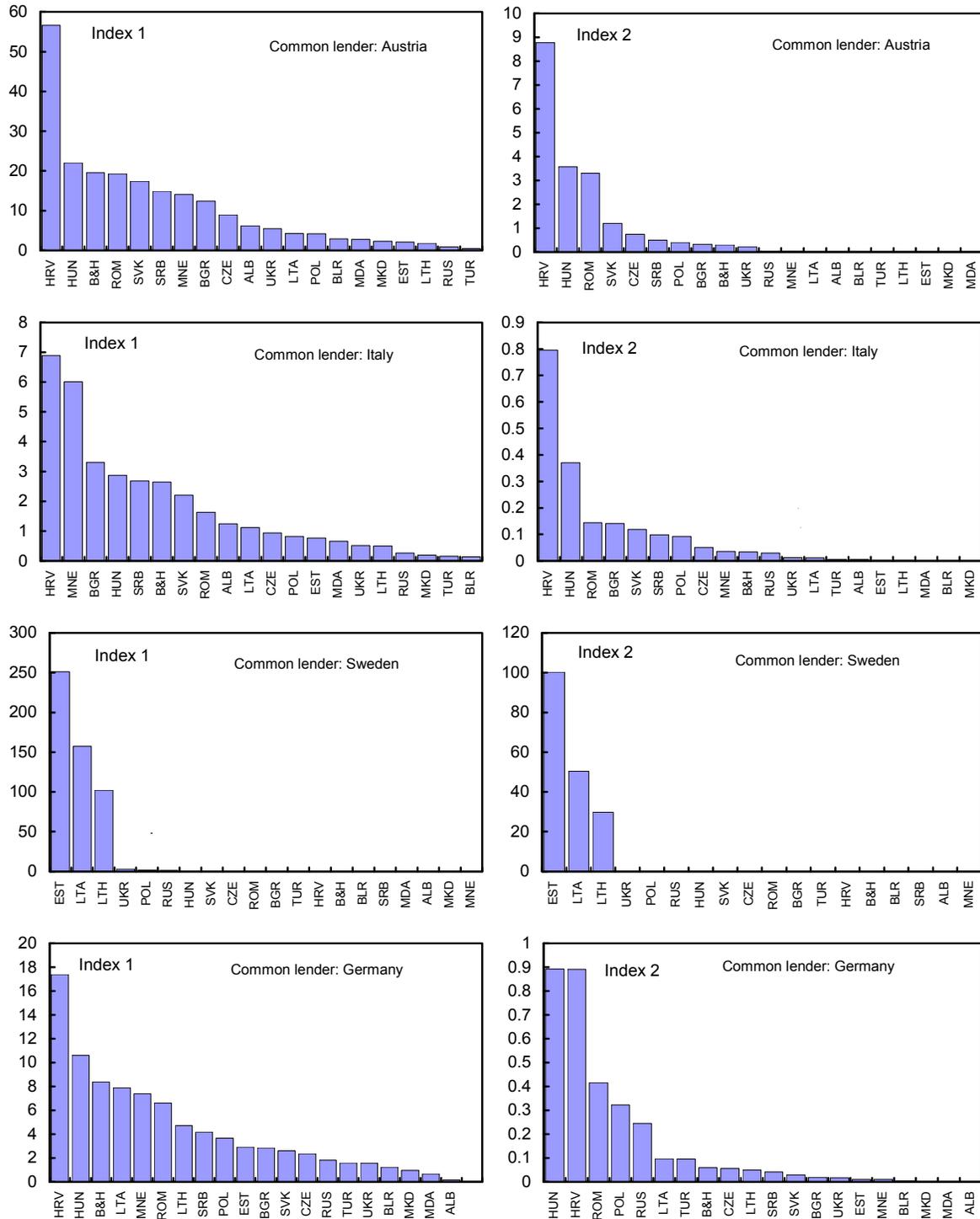
Sources: Tables 7a,b in Appendix III, based on BIS December 2007 data, more detailed bilateral data for international claims provided by the BIS, and authors' calculations.

1/ The figures illustrate the regional impact of a hypothetical shock to a country, which each common lender has the largest absolute exposure to.

Figure 13. CESE Countries: Indices of Contagion Exposure – International Claims on CESE Banks Only

International Claims only on CESE banks - Common Lenders: Austria, Italy, Sweden, Germany

Hypothetical trigger countries are those to which the common lender has the largest absolute exposure 1/
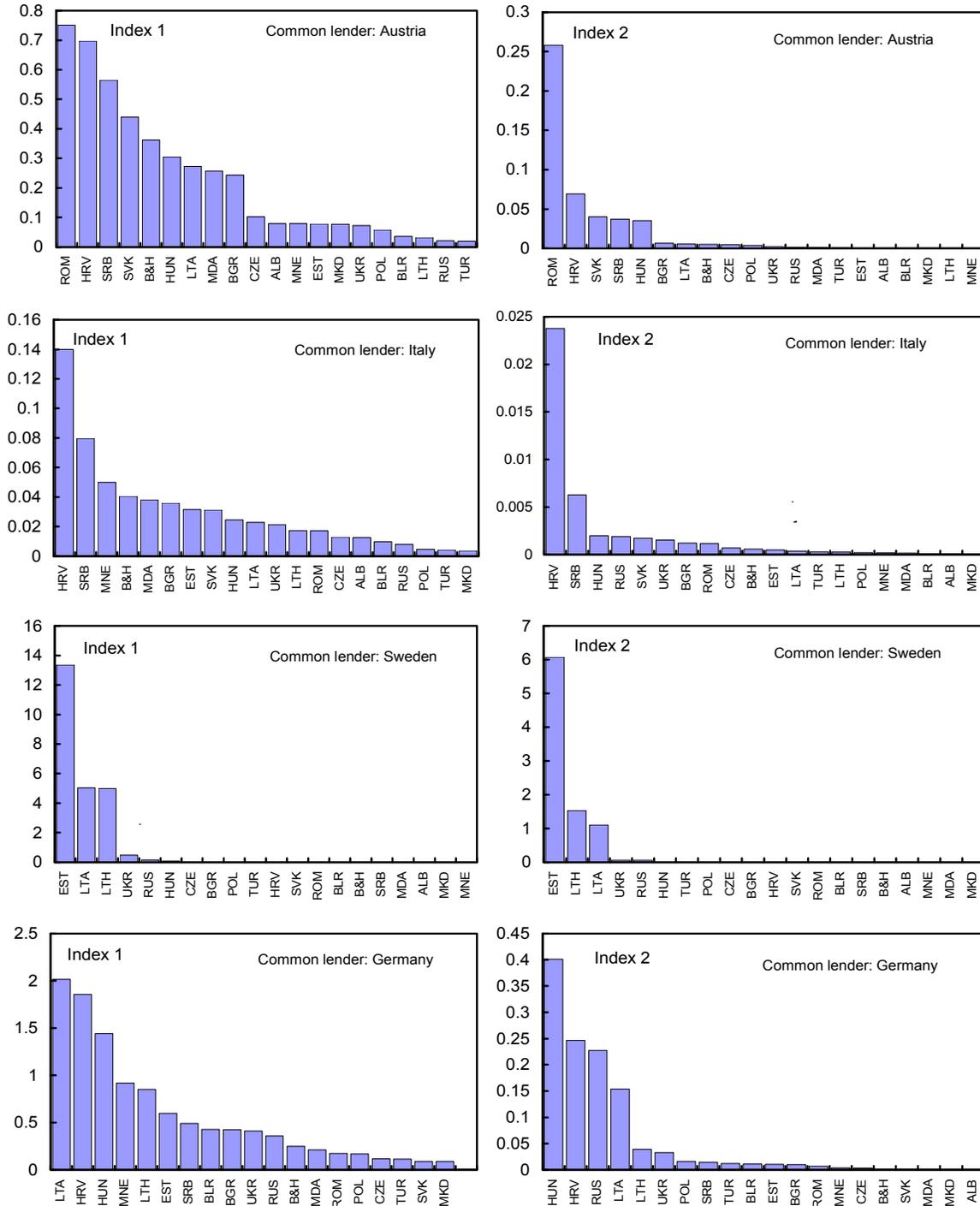
Sources: Authors' calculations, BIS December 2007 data, and more detailed bilateral data for international claims provided by the BIS.

1/ The figures illustrate the regional impact of a hypothetical shock to a country, which each common lender has the largest absolute exposure to.

even smaller in magnitude, but do not dramatically alter the group of most exposed countries (Figure 13).

36.   **Although differences in magnitude of the exposure indices across scenarios signal varying degrees of spillover effects among countries, the group of countries most exposed to regional contagion remains broadly similar.** The differences in the magnitude of the indices across different exposure concepts reflect the fact that international claims and claims on banks are a subset of the foreign claim concept, while differences across alternative triggers and common lenders reflect the differing sizes of financial exposures between home and host countries. Nevertheless, for the purposes of the paper, what matters more is the information the indices contain in terms of the group of countries that appear as more exposed under various scenarios. The group of countries most exposed to regional contagion remains broadly similar regardless of the financial claims concept used, or assumptions about the common lender and trigger country.

VI. Conclusions, Caveats, and Policy Implications

37.   **This paper has focused on the cross-border financial interlinkages across Europe**. It has explored the channels through which financial contagion could be transmitted. Based on BIS country-level data on the outstanding foreign and international claims on a host economy, as well as on international claims on host economy banks, it assessed the magnitude of home-host exposures and provided some stylized facts that subsequently fed into the analyses of countries' exposure to regional financial contagion. As one important channel through which such shocks could be transmitted, it has focused on the "common lender" channel and explored how the presence of a common lender could transfer a shock in one country to other countries in the region in which the parent bank has significant direct or indirect operations.

38.   **The analyses corroborate the belief that the financial interlinkages within Europe are economically significant.** The financial sectors of most CESE countries are dominated by institutions which belong to a limited number of financial groups that have active presence in the region, some with significantly concentrated exposures. Most CESE countries are highly exposed to Western European banks, either directly by their private sector or through the local banking sectors. Austria, Germany, and Italy account for the largest share of these claims for the CESE region as a whole (for the Baltics, mainly Sweden), though some CESE economies have relatively more diversified sources of funds. Where the exposure to host countries is non-negligible in terms of magnitude, heavy concentration of the Western European exposures also gains importance. Even where the exposures are well diversified, potential economic and financial contagion within CESE could bring the overall exposure to a more considerable magnitude, if one of the countries in the region were to trigger a regional stress.

39.   **The contagion analyses offer the following conclusions**: The larger the dependence of a CESE country on funds from a regional common lender, the higher is its exposure to problems triggered in the common lender's banks. Moreover, the larger the dependence on a common lender, and the greater the latter's exposure to a trigger country, the higher is the susceptibility to regional contagion. Contagion indices are the highest when the common

lender has activities substantially concentrated in the region, and are smaller when the common lender has large presence in, but smaller exposure to, the CESE in terms of its economic size. In the latter case, the exposures to any country in the region are economically too small to affect the funds available to others when problems emerge in a trigger country. A potential spillover of Baltic-originated problems to the other CESE countries may hence be limited, at least based purely on the common lender channel, since Sweden's small exposure to non-Baltic CESE makes the likelihood of any rebalancing effect small.

40. **It is important to note that the contagion exposure indices computed here do not represent an assessment of the financial or macroeconomic vulnerability and stability of individual countries studied.** While the group of countries most exposed to regional contagion remains broadly similar regardless of which financial claims concept is used, these indices only measure the degree to which shocks from foreign markets can affect a given country, and help identify the likely pressure points associated with a regional shock originating from a given country.

41. **The actual vulnerability of a country, on the other hand, will depend on a number of other factors.** These include the capitalization, liquidity, and general soundness of the individual banking systems and its key institutions, as well as the country's macroeconomic fundamentals. The actual vulnerability will also be a function of the "true ability of the common lender to rebalance," which would depend, among other things, on the maturity structure of the common lender's claims on the borrower, and the nature of the institutional regulations that affect financial relationships between home/host institutions, and hence the liquidity of funds. The exposure indices should therefore be seen as a first step to a full vulnerability exercise.[23]

42. **The high degree of financial interlinkages in the region and the risk of regional contagion argue strongly for a more regional approach to managing potential vulnerabilities**. The findings of this paper, along with the experiences gleaned from the financial sector stability assessments (FSSA) of a number of countries in Europe, highlight a number of policy implications.

43. **First, in addition to strengthening bank supervision and prudential regulation where warranted, close cooperation between home and host supervisory authorities is needed**. At a minimum, this calls for conducting coordinated inspections of internationally active banks and undertaking joint risk assessments. Initiatives are needed to develop cooperative arrangements for crisis management, some of which are already taking place.

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[23] Availability of more detailed information would certainly help improve the quality of analyses on exposures (e.g., on the maturity composition of the claims, amount and composition of funding of domestic subsidiaries from their parents, with information provided on a bilateral basis (e.g., subsidiary funding from Austrian, Italian, German, Swedish banks, etc). Some countries that appear most exposed may turn out to be less so based on such information. For example, the much smaller share of short-term foreign claims in total foreign claims on Croatia, as well as high capitalization and liquidity buffers of its banking sector, could reduce the degree of vulnerability to regional contagion.

44.   **Second, given the extent of susceptibility to regional contagion that can spread very quickly, better contingency planning is essential.** There is a need to develop contingency plans to deal with more systemic disturbances associated with regional spillovers of financial troubles and contagion, including those triggered by individual financial institutions that are highly active with concentrated exposures in the region. Crisis simulations for regional spillovers could be conducted by monetary and financial supervisory authorities in both domestic and cross-border contexts. Such exercises have become common tools to help develop coordinating procedures in crisis management and to test the adequacy of internal and international processes, potential weaknesses in communication and coordination channels and procedures, the understanding of the responsibilities within and between countries, and the nature of information and data needs.

45.   **Third, the rapid growth and cross-border integration of the CESE financial sectors require that stress tests conducted to asses the stability of financial systems take greater account of regional spillovers**. This could be done both through the balance sheets of financial institutions and through the "real economy," especially with the growing importance of direct exposures of internationally active financial institutions to the private sectors in the host economies. Many recent FSSAs have focused on such cross border exposures of domestic financial systems and regional feedback linkages (e.g., the FSSAs for Austria, Bulgaria, Croatia, Latvia, and Lithuania), though there is a need to carry out such analyses at the regional level, in addition to conducting them on an individual country basis.

46.   **The analysis of the cross-border financial linkages and contagion channels discussed in this paper could provide a starting tool the Fund could exploit in its regional surveillance activities**. The magnitude of cross-border exposures could help in assessing the extent of susceptibility to regional contagion arising from the reliance on foreign banks. Contagion indices can be used to identify the likely pressure points, to capture potential spillover effects and propagation channels of a regional shock originating from a given country. It could in particular help in evaluating the risks a home or a host country might face in light of the vulnerabilities that may be building up elsewhere in the region. Regular updates of the indices could also provide a warning signal about a likely build-up of pressures, providing an operational tool to feed into regional surveillance activities.

47.   **Such information could also be useful in conducting crude stress tests with different regional scenarios**. For example, the information could help assess the particular scenarios that should be used in assessing the resilience of individual country banking systems, and in gauging the risks associated with a potential problem in a third country to which the most significant home country banks' are exposed to. This type of information could provide more realistic scenarios and assumptions in conducting stress tests to liquidity and contagion risks. Availability of more detailed information on exposures of individual banks active in the region would of course improve the quality of the assumptions and analyses. Such an analysis could be the focus of further research in this area.

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APPENDIX I. MAJOR BANKING GROUPS ACTIVE IN THE CESE REGION

48.   **Major European banking groups are active in, and show a wide range of exposures to, the CESE region, and the examination of these exposures could complement the analyses of aggregate home and host country exposures**. Over a dozen banking groups have an extensive network of bank and nonbank subsidiaries in CESE countries. The exposures of these banking groups to the region can be quantified in many ways, but here we focus on the simplest definitions, namely, asset exposure, with two dimensions: absolute exposure of the banking groups to CESE (total assets in the region) and relative exposure (ratio of assets in the region to total banking group assets).

49.   **There is significant variation across banking groups in terms of their absolute and relative exposures to the region** (Figure 3). The seven largest institutions each had total assets over €30 billion and an asset share of over five percent in the CESE region in 2007. There are several banking groups that have similarly large absolute exposures but the region's importance in their total assets is negligible (e.g. ING, Commerzbank, and Citibank). There is a separate group of banks with significant relative exposure but low absolute exposure to the whole CESE region. Several of these banks have substantial exposures and concentration in subregions (e.g. Swedbank with a large presence in the Baltics, or several Greek banks in Southeastern Europe). Although banks with large absolute and relative exposure to the region are likely to be more important for potential spillover effects across the whole region, cross-country linkages and potential contagion should not be ignored for the "subregional" banks.

50.   **The seven largest regional banking groups can be classified in two groups**: (i) "truly" regional banks—thereafter referred to as CESE-focus banking groups—with their activities concentrated in their home countries and in CESE (Erste Bank, Raiffeisen, and OTP Bank, each with over 30 percent of total assets in CESE); and (ii) large European banking groups with large absolute exposure but smaller relative exposure to CESE (Unicredit, KBC, Societe Generale, and Intesa SanPaolo). This differentiation is indeed important for potential financial interlinkages within the region. For the banks with smaller relative presence in the region, vulnerability to contagion from mother to subsidiary banks (home to host) is more relevant, while in the case of truly regional banks contagion is likely in both directions with potential spillover across subsidiaries as well. Simple contagion exposure analyses conducted in Section V support this view.

51.   **Within-region diversification also shows significant differences.** OTP is a purely CESE bank, with all its major subsidiaries located in the region. At end-2007, Raiffeisen maintained 50 percent of its overall asset base in the CESE region, followed by Erste with 35 percent. On the contrary, Unicredit's wide presence in 20 countries in the region accounted for only about 11 percent of its asset base. Beside having the most extensive networks, Unicredit and Raiffeisen are well-diversified within the region as well, with relatively large

subsidiaries in several countries.[24] These two banking groups are also well-represented in other CESE countries by subsidiaries that are among the largest in their markets. The other banking groups' regional activities are more concentrated: The Czech Republic and Romania account for the bulk of regional activities for Erste; OTP is most active in Hungary, Bulgaria and Ukraine; KBC has a strong presence in the Czech Republic and Slovenia; the Czech Republic and Russia are the most important markets for Societe General; and Slovakia and Hungary are the most important markets for Intesa SanPaolo.

52.   **The region's very high income generation capacity gives prominence to the region in the groups' business strategies.** For the largest seven banking groups (except for purely CESE-based OTP), the share of the CESE region in income generation is substantially higher than the share of CESE assets in total group assets (Figure 14). In the case of CESE-focus banking groups, over 50 percent of operating income came from the region in 2007. For Unicredit and Societe Generale, the region's share in operating income and net banking income, respectively, are approximately twice as high as their share in total group assets.

Figure 14. Income Exposure of Major Banking Groups to the CESE Region, 2007[1]

Source: Annual reports of banking groups. Societe Generale: Net banking income.
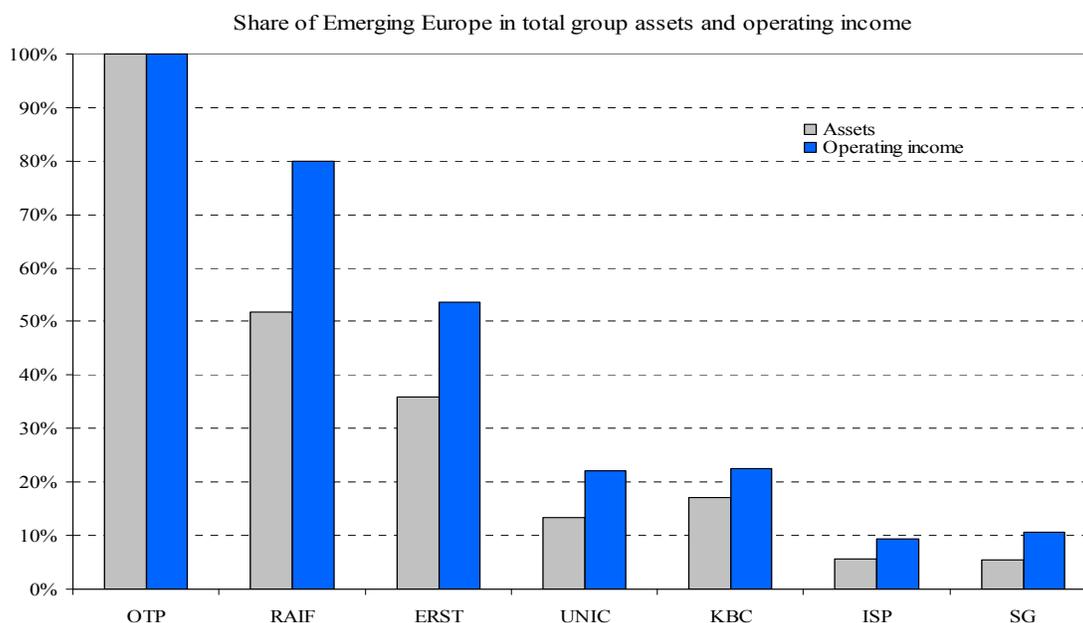
[1] RAIF = Raiffeisen; ERST = Erste; UNIC = Unicredit; ISP = Intesa Sanpaolo; SG = Societe Generale.

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[24] The biggest subsidiaries are in Poland, the Czech Republic, Croatia, Russia and Kazakhstan for Unicredit, and in Russia, Hungary, Slovakia and Ukraine for Raiffeisen.

APPENDIX II: A GROWING ROLE FOR LENDING TO NONBANK INSTITUTIONS

53.   **The composition of cross-border lending has recently shifted away from bank-to-bank lending towards lending to nonbank institutions**. The share of lending by European reporting banks to banks in CESE economies in their total outstanding claims on the CESE region fell by 3.9 percentage points over the period (from 27.2 percent in end-2005 to 23.3 percent in end-2007), while the share of lending to nonbank institutions increased by 8.6 percentage points (from 52.9 percent in 2005 to 61.6 percent in 2007 during the same period).

54.   **Most CESE economies experienced growing nonbank shares in their outstanding liabilities owed to European reporting banks**. For some CESE countries (Latvia, Romania, Macedonia, Turkey, Estonia, and Croatia), the observed increases were large, exceeding 10 percentage points; these increases were broadly offset by a falling share of direct bank-to-bank lending. Other CESE countries with large exposures to reporting banks had similar shifts in the composition of lending.

55.   **These shifts may in some cases reflect regulatory arbitrage**. Concerns about high credit growth in some countries have prompted measures to slow the growth of foreign bank funding, which in turn may have invited growth in direct cross-border lending to nonbank institutions (for an overview of the measures to stem rapid credit growth, see Enoch and Ötker-Robe, 2007).[25]

56.   **However, reporting banks with wide regional presence did not observe a shift away from bank-to-bank lending**. For Austria, Italy, Germany, and Sweden, the share of bank-to-bank lending increased over the 2005 – 2007 period, even though for individual countries experiencing rapid credit growth a notable shift towards nonbank lending took place.

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[25] Some countries bucked the trend due to lower initial levels of lending. Countries with increasing shares of bank lending (including Ukraine, Moldova, Belarus, Montenegro) typically started from low levels of dependence on foreign funding, and a significant share of lending to the public sector.

APPENDIX III. COMPUTATION OF EXPOSURE TO REGIONAL CONTAGION

Table 2. Host Country Exposure to Home Country Banks: Measure of Relative Dependence, end-2007, Foreign Claims Concept

(Foreign claims owed by a CESE country to a Western European country's banks as a share of total foreign claims owed to all reporting banks, in percent) 1/

	Austria	Germany	Italy	France	Belgium	Sweden	Netherlands	Switzerland	UK	Portugal	Spain
Poland	6.19	18.10	20.51	7.36	8.04	2.54	9.94	2.22	1.13	4.68	1.62
Russia	8.66	19.64	9.04	13.13	3.66	2.94	8.96	8.81	0.00	0.12	0.84
Czech Republic	29.73	5.83	9.94	18.21	24.29	0.10	3.60	0.50	0.00	0.05	0.36
Hungary	24.56	23.37	18.41	7.00	11.99	0.22	4.28	0.63	0.00	0.30	0.78
Romania	33.12	15.70	8.33	15.03	0.65	0.07	5.76	5.60	0.19	0.06	0.12
Croatia	36.37	19.43	32.52	8.21	0.41	0.01	0.18	0.17	0.57	0.01	0.00
Turkey	1.41	10.96	0.00	9.64	8.72	0.17	11.08	5.04	0.00	0.75	0.26
Slovakia	36.05	4.72	23.62	5.76	15.35	0.13	5.78	0.08	0.00	0.03	0.08
Ukraine	25.61	9.06	5.91	20.12	1.26	3.97	6.37	16.21	1.30	0.19	0.13
Latvia	1.90	10.36	2.85	0.59	0.02	58.59	0.01	0.13	0.51	0.03	0.08
Estonia	0.79	3.19	1.57	0.32	0.32	78.68	0.07	0.11	0.01	0.00	0.06
Lithuania	0.95	8.62	1.72	0.79	0.18	64.38	0.22	0.45	0.11	0.14	0.02
Bulgaria	15.00	6.02	20.42	6.79	5.06	0.05	1.77	11.25	0.23	0.00	0.17
Serbia	36.35	12.83	19.50	5.82	0.17	0.01	0.03	5.66	0.05	0.00	0.04
Bosnia and Herzegovina	49.93	22.52	25.73	0.07	0.13	0.01	0.68	0.33	0.04	0.00	0.01
Albania	46.59	0.53	20.07	9.80	0.04	0.00	0.07	0.07	0.07	0.00	0.00
Belarus	48.83	29.74	5.49	3.55	1.32	0.09	4.23	2.44	0.29	0.70	0.68
Montenegro	34.10	37.60	24.46	1.49	0.47	0.00	0.21	0.26	0.00	0.00	0.00
Moldova	32.49	19.49	33.21	0.00	1.08	0.00	4.69	0.00	0.72	3.25	0.72

1/ Relative dependence of country i on country j = rd (i; j)

Source: BIS Quarterly Review: June 2008, Table 9B: Consolidated foreign claims of reporting banks - immediate borrower basis on individual countries by nationality of reporting banks / Amounts outstanding (end-Dec 2007 data); author's calculations.

Table 3. Home Country Exposure to Host Countries: Measure of Relative Exposure, end-2007, Foreign Claims Concept

(Foreign claims of a Western European country on a CESE country as a share of its total claims vis-à-vis all developing countries, in percent) 1/

	Austria	Germany	Italy	France	Belgium	Sweden	Netherlands	Switzerland	UK	Portugal	Spain
Poland	5.267	10.468	21.855	4.541	11.865	6.060	8.109	2.487	0.433	38.379	1.176
Russia	7.096	10.947	9.285	7.809	5.195	6.757	7.040	9.492	0.000	0.970	0.586
Czech Republic	17.307	2.306	7.244	7.690	24.513	0.159	2.007	0.380	0.000	0.282	0.179
Hungary	11.896	7.697	11.169	2.461	10.071	0.300	1.988	0.400	0.000	1.385	0.321
Romania	15.139	4.879	4.770	4.984	0.518	0.094	2.523	3.364	0.038	0.276	0.046
Croatia	12.048	4.376	13.494	1.974	0.238	0.007	0.056	0.074	0.085	0.041	0.001
Turkey	0.844	4.454	0.000	4.180	9.039	0.293	6.346	3.963	0.000	4.292	0.132
Slovakia	10.177	0.905	8.350	1.180	7.509	0.104	1.563	0.031	0.000	0.068	0.018
Ukraine	4.082	0.982	1.180	2.326	0.348	1.770	0.973	3.394	0.093	0.293	0.017
Latvia	0.255	0.944	0.479	0.057	0.004	21.991	0.001	0.022	0.031	0.044	0.009
Estonia	0.101	0.277	0.250	0.029	0.070	28.095	0.009	0.019	0.001	0.000	0.007
Lithuania	0.129	0.797	0.294	0.078	0.042	24.524	0.028	0.080	0.007	0.180	0.002
Bulgaria	1.820	0.497	3.104	0.598	1.065	0.018	0.206	1.795	0.013	0.000	0.017
Serbia	3.519	0.844	2.365	0.409	0.028	0.002	0.003	0.721	0.002	0.000	0.003
Bosnia and Herzegovina	2.447	0.750	1.579	0.003	0.011	0.001	0.032	0.021	0.001	0.000	0.000
Albania	0.895	0.007	0.483	0.137	0.001	0.000	0.001	0.002	0.001	0.000	0.000
Belarus	0.588	0.243	0.083	0.031	0.028	0.003	0.049	0.039	0.002	0.082	0.007
Montenegro	0.282	0.212	0.254	0.009	0.007	0.000	0.002	0.003	0.000	0.000	0.000
Moldova	0.032	0.013	0.041	0.000	0.002	0.000	0.004	0.000	0.000	0.031	0.001
Macedonia	0.047	0.025	0.012	0.001	0.004	0.000	0.001	0.006	0.000	0.000	0.001
TOTAL CESE	**91.607**	**48.110**	**86.847**	**37.151**	**68.029**	**89.332**	**30.433**	**23.127**	**7.031**	**44.682**	**2.524**

1/ Relative exposure of country j to country i = re (j; i).

Source: BIS Quarterly Review: June 2008, Table 9B: Consolidated foreign claims of reporting banks - immediate borrower basis on individual countries by nationality of reporting banks / Amounts outstanding (end-Dec 2007 data, in millions of US dollars).

Table 4. Host Country Exposure to Home Country Banks: Measure of Absolute Dependence, end-2007, Foreign Claims Concept

(Foreign claims owed by a CESE country to a Western European country's banks as a share of the CESE country's GDP, in percent) 1/

	Total foreign claims	Austria	Germany	Italy	France	Belgium	Sweden	Netherlands	Switzerland	UK	Portugal	Spain
Poland	57.3	3.5	10.4	11.8	4.2	4.6	1.5	5.7	1.3	0.7	2.7	0.9
Russia	18.0	1.6	3.5	1.6	2.4	0.7	0.5	1.6	1.6	0.0	0.0	0.2
Czech Republic	94.2	28.0	5.5	9.4	17.1	22.9	0.1	3.4	0.5	0.0	0.0	0.3
Hungary	99.1	24.3	23.2	18.2	6.9	11.9	0.2	4.2	0.6	0.0	0.3	0.8
Romania	77.9	25.8	12.2	6.5	11.7	0.5	0.1	4.5	4.4	0.1	0.0	0.1
Croatia	182.8	66.5	35.5	59.5	15.0	0.8	0.0	0.3	0.3	1.0	0.0	0.0
Turkey	25.7	0.4	2.8	0.0	2.5	2.2	0.0	2.9	1.3	0.0	0.2	0.1
Slovakia	106.6	38.4	5.0	25.2	6.1	16.4	0.1	6.2	0.1	0.0	0.0	0.1
Ukraine	32.0	8.2	2.9	1.9	6.4	0.4	1.3	2.0	5.2	0.4	0.1	0.0
Latvia	139.6	2.7	14.5	4.0	0.8	0.0	81.8	0.0	0.2	0.7	0.0	0.1
Estonia	169.7	1.3	5.4	2.7	0.5	0.5	133.5	0.1	0.2	0.0	0.0	0.1
Lithuania	100.5	0.9	8.7	1.7	0.8	0.2	64.7	0.2	0.5	0.1	0.1	0.0
Bulgaria	86.9	13.0	5.2	17.7	5.9	4.4	0.0	1.5	9.8	0.2	0.0	0.1
Serbia	65.7	23.9	8.4	12.8	3.8	0.1	0.0	0.0	3.7	0.0	0.0	0.0
Bosnia and Herzegovina	94.6	47.2	21.3	24.3	0.1	0.1	0.0	0.6	0.3	0.0	0.0	0.0
Albania	50.7	23.6	0.3	10.2	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Belarus	7.6	3.7	2.3	0.4	0.3	0.1	0.0	0.3	0.2	0.0	0.1	0.1
Montenegro	77.6	26.5	29.2	19.0	1.2	0.4	0.0	0.2	0.2	0.0	0.0	0.0
Moldova	6.3	2.1	1.2	2.1	0.0	0.1	0.0	0.3	0.0	0.0	0.2	0.0
Macedonia	25.8	1.8	1.4	0.4	0.0	0.1	0.0	0.1	0.2	0.0	0.0	0.1

1/ Absolute dependence of country i on country j = ad (i; j).

Source: BIS Quarterly Review: 'June 2008, Table 9B: Consolidated foreign claims of reporting banks - immediate borrower basis on individual countries by nationality of reporting
 in millions of US dollars).

Table 5. Home Country Exposure to Host Countries: Measure of Absolute Exposure, end-2007, Foreign Claims Concept

(Foreign claims of a western European country on a CESE country as a ratio to the Western European country's banking sector assets, in percent) 1/

	Austria	Germany	Italy	France	Belgium	Sweden	Netherlands	Switzerland	UK	Portugal	Spain
Poland	1.459	**0.532**	**1.432**	0.276	**1.179**	0.651	**0.817**	0.269	0.022	**2.029**	**0.105**
Russia	1.966	**0.556**	0.609	**0.475**	0.516	0.726	**0.710**	1.028	0.000	0.051	0.053
Czech Republic	**4.795**	0.117	0.475	**0.468**	2.437	0.017	0.202	0.041	0.000	0.015	0.016
Hungary	3.296	**0.391**	**0.732**	0.150	**1.001**	0.032	0.200	0.043	0.000	0.073	0.029
Romania	**4.194**	0.248	0.313	**0.303**	0.051	0.010	0.254	**0.364**	0.002	0.015	0.004
Croatia	**3.338**	0.222	**0.884**	0.120	0.024	0.001	0.006	0.008	0.004	0.002	0.000
Turkey	0.234	0.226	0.000	0.254	0.898	0.031	**0.640**	0.429	0.000	**0.227**	0.012
Slovakia	2.819	0.046	0.547	0.072	0.746	0.011	0.158	0.003	0.000	0.004	0.002
Ukraine	1.131	0.050	0.077	0.142	0.035	0.190	0.098	0.368	0.005	0.015	0.002
Latvia	0.071	0.048	0.031	0.003	0.000	**2.364**	0.000	0.002	0.002	0.002	0.001
Estonia	0.028	0.014	0.016	0.002	0.007	**3.020**	0.001	0.002	0.000	0.000	0.001
Lithuania	0.036	0.040	0.019	0.005	0.004	**2.636**	0.003	0.009	0.000	0.010	0.000
Bulgaria	0.504	0.025	0.203	0.036	0.106	0.002	0.021	0.194	0.001	0.000	0.002
Serbia	0.975	0.043	0.155	0.025	0.003	0.000	0.000	0.078	0.000	0.000	0.000
Bosnia and Herzegovina	0.678	0.038	0.104	0.000	0.001	0.000	0.003	0.002	0.000	0.000	0.000
Albania	0.248	0.000	0.032	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belarus	0.163	0.012	0.005	0.002	0.003	0.000	0.005	0.004	0.000	0.004	0.001
Montenegro	0.078	0.011	0.017	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Moldova	0.009	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000
Macedonia	0.013	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Total	**25.379**	**2.443**	**5.692**	**2.261**	**6.762**	**9.602**	**3.068**	**2.506**	**0.364**	**2.362**	**0.226**

1/ Absolute exposure of country j to country i = ae (j; i).

Source: BIS Quarterly Review: June 2008, Table 9B: Consolidated foreign claims of reporting banks - immediate borrower basis on individual countries by nationality of reporting banks / Amounts outstanding (end-Dec 2007 data, in millions of US dollars).

Table 6a. CESE Countries: Index of Exposure to Regional Contagion without Rebalancing, end-2007, Foreign Claims Concept

Exposure index (1) = ad (i, CL) * AE (CL, i) 1/

CL - Austria, Italy, Germany, France, Sweden -- most common lenders

With three hypothetical trigger countries for each common lender

	Austria			Germany			Italy			France			Sweden		
	Cze	Rom	Hrv	Rus	Pol	Hun	Pol	Hrv	Hun	Cze	Rus	Rom	Est	Lth	Lta
Poland	17.0	14.9	11.8	5.8	5.5	4.1	16.8	10.4	8.6	2.0	2.0	1.3	4.4	3.8	3.4
Russia	7.5	6.5	5.2	2.0	1.9	1.4	2.3	1.4	1.2	1.1	1.1	0.7	1.6	1.4	1.3
Czech R	134.2	117.4	93.4	3.0	2.9	2.1	13.4	8.3	6.8	8.0	8.1	5.2	0.3	0.2	0.2
Hungary	116.7	102.1	81.2	12.9	12.3	9.1	26.1	16.1	13.4	3.2	3.3	2.1	0.7	0.6	0.5
Romania	123.8	108.3	86.2	6.8	6.5	4.8	9.3	5.7	4.8	5.5	5.6	3.6	0.2	0.2	0.1
Croatia	318.8	278.9	221.9	19.7	18.9	13.9	85.2	52.6	43.5	7.0	7.1	4.6	0.0	0.0	0.0
Turkey	1.7	1.5	1.2	1.6	1.5	1.1	0.0	0.0	0.0	1.2	1.2	0.8	0.1	0.1	0.1
Slovakia	184.2	161.2	128.3	2.8	2.7	2.0	36.1	22.3	18.4	2.9	2.9	1.9	0.4	0.4	0.3
Ukraine	39.2	34.3	27.3	1.6	1.5	1.1	2.7	1.7	1.4	3.0	3.1	1.9	3.8	3.3	3.0
Latvia	12.7	11.1	8.9	8.0	7.7	5.7	5.7	3.5	2.9	0.4	0.4	0.2	247.0	215.6	193.4
Estonia	6.4	5.6	4.5	3.0	2.9	2.1	3.8	2.3	1.9	0.3	0.3	0.2	403.2	351.9	315.6
Lithuania	4.6	4.0	3.2	4.8	4.6	3.4	2.5	1.5	1.3	0.4	0.4	0.2	195.3	170.5	152.9
Bulgaria	62.5	54.6	43.5	2.9	2.8	2.0	25.4	15.7	13.0	2.8	2.8	1.8	0.1	0.1	0.1
Serbia	114.6	100.2	79.8	4.7	4.5	3.3	18.4	11.3	9.4	1.8	1.8	1.2	0.0	0.0	0.0
Bosnia	226.5	198.1	157.7	11.8	11.3	8.3	34.9	21.5	17.8	0.0	0.0	0.0	0.0	0.0	0.0
Albania	113.3	99.1	78.9	0.2	0.1	0.1	14.6	9.0	7.5	2.3	2.4	1.5	0.0	0.0	0.0
Belarus	17.8	15.6	12.4	1.3	1.2	0.9	0.6	0.4	0.3	0.1	0.1	0.1	0.0	0.0	0.0
Montenegro	126.9	111.0	88.3	16.2	15.5	11.4	27.2	16.8	13.9	0.5	0.6	0.4	0.0	0.0	0.0
Moldova	9.8	8.6	6.8	0.7	0.7	0.5	3.0	1.9	1.5	0.0	0.0	0.0	0.0	0.0	0.0
Macedonia	8.6	7.5	6.0	0.8	0.7	0.5	0.5	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0

1/ The highlighted values indicate when the index is for the country which is assumed to be the first country experiencing trouble.

Source: The authors' calculations, based on Tables 2-5.

Table 6b. CESE Countries: Index of Exposure to Regional Contagion with Rebalancing, end-2007, Foreign Claims Concept

Exposure index (2) = ad (i, CL) * AE (CL, i) * REB (CL,i) 1/

CL - Austria, Italy, Germany, France, Sweden -- most common lenders

With three hypothetical trigger countries for each common lender

	Austria			Germany			Italy			France			Sweden		
	Cze	Rom	Hrv	Rus	Pol	Hun	Pol	Hrv	Hun	Cze	Rus	Rom	Est	Lth	Lta
Poland	1.08	0.92	0.71	0.68	0.64	0.46	4.71	2.63	2.12	0.10	0.10	0.06	0.37	0.31	0.27
Russia	0.64	0.55	0.42	0.24	0.23	0.16	0.28	0.15	0.12	0.09	0.10	0.06	0.15	0.12	0.11
Czech R	28.09	23.94	18.39	0.08	0.08	0.05	1.24	0.69	0.56	0.67	0.68	0.42	0.00	0.00	0.00
Hungary	16.79	14.31	10.99	1.11	1.06	0.75	3.73	2.08	1.68	0.09	0.09	0.05	0.00	0.00	0.00
Romania	22.66	19.31	14.83	0.37	0.35	0.25	0.57	0.32	0.26	0.30	0.30	0.19	0.00	0.00	0.00
Croatia	46.45	39.59	30.40	0.97	0.92	0.66	14.71	8.20	6.61	0.15	0.15	0.09	0.00	0.00	0.00
Turkey	0.02	0.02	0.01	0.08	0.07	0.05	0.00	0.00	0.00	0.05	0.05	0.03	0.00	0.00	0.00
Slovakia	22.67	19.33	14.84	0.03	0.03	0.02	3.85	2.15	1.73	0.04	0.04	0.02	0.00	0.00	0.00
Ukraine	1.94	1.65	1.27	0.02	0.02	0.01	0.04	0.02	0.02	0.08	0.08	0.05	0.09	0.08	0.07
Latvia	0.04	0.03	0.03	0.09	0.08	0.06	0.03	0.02	0.02	0.00	0.00	0.00	75.55	62.83	54.51
Estonia	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	157.53	131.00	113.65
Lithuania	0.01	0.01	0.00	0.04	0.04	0.03	0.01	0.01	0.00	0.00	0.00	0.00	66.61	55.39	48.06
Bulgaria	1.37	1.17	0.90	0.02	0.02	0.01	1.01	0.56	0.45	0.02	0.02	0.01	0.00	0.00	0.00
Serbia	4.88	4.16	3.19	0.04	0.04	0.03	0.56	0.31	0.25	0.01	0.01	0.00	0.00	0.00	0.00
Bosnia	6.70	5.71	4.39	0.10	0.09	0.07	0.70	0.39	0.32	0.00	0.00	0.00	0.00	0.00	0.00
Albania	1.23	1.05	0.80	0.00	0.00	0.00	0.09	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Belarus	0.13	0.11	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Montenegro	0.43	0.37	0.28	0.04	0.04	0.03	0.09	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Moldova	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Macedonia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1/ The highlighted values indicate when the index is for the country which is assumed to be the first country experiencing trouble.

Source: The authors' calculations, based on Tables 2-5.

Table 7a. CESE Countries: Index of Exposure to Regional Contagion without Rebalancing, end-2007, International Claims Concept

Exposure index (1) = ad (i, CL) * AE (CL, i) 1/

CL - Austria, Italy, Germany, France, Sweden -- most common lenders

With three hypothetical trigger countries for each common lender

	Austria			Germany			Italy			France			Sweden		
	Cze	Rom	Hrv	Rus	Pol	Hun	Pol	Hrv	Hun	Cze	Rus	Rom	Est	Lth	Lta
Poland	4.2	8.7	7.9	3.7	2.4	2.3	0.8	0.8	0.9	0.1	0.4	0.2	1.5	1.1	1.2
Russia	0.9	1.8	1.6	1.8	1.2	1.1	0.3	0.3	0.3	0.1	0.7	0.3	1.2	0.9	1.0
Czech R	8.9	18.3	16.6	2.4	1.5	1.5	0.9	1.0	1.1	0.1	0.7	0.3	0.2	0.2	0.2
Hungary	22.0	45.3	41.1	10.6	7.0	6.6	2.9	2.9	3.3	0.2	1.5	0.6	0.5	0.4	0.4
Romania	19.3	39.8	36.0	6.6	4.3	4.1	1.6	1.7	1.9	0.3	2.4	1.0	0.1	0.1	0.1
Croatia	56.7	116.6	105.7	17.4	11.4	10.9	6.9	7.1	8.0	0.5	4.1	1.8	0.0	0.0	0.0
Turkey	0.4	0.9	0.8	1.6	1.0	1.0	0.2	0.2	0.2	0.1	0.6	0.3	0.1	0.1	0.1
Slovakia	17.3	35.7	32.3	2.6	1.7	1.6	2.2	2.3	2.5	0.1	0.5	0.2	0.3	0.2	0.3
Ukraine	5.4	11.2	10.1	1.6	1.0	1.0	0.5	0.5	0.6	0.1	0.5	0.2	2.8	2.0	2.2
Latvia	4.2	8.7	7.9	7.9	5.2	4.9	1.1	1.2	1.3	0.0	0.1	0.0	157.4	115.1	126.1
Estonia	2.1	4.3	3.9	2.9	1.9	1.8	0.8	0.8	0.9	0.0	0.0	0.0	251.1	183.6	201.1
Lithuania	1.8	3.8	3.4	4.7	3.1	2.9	0.5	0.5	0.6	0.0	0.1	0.0	101.9	74.5	81.6
Bulgaria	12.4	25.6	23.2	2.9	1.9	1.8	3.3	3.4	3.8	0.2	1.3	0.5	0.1	0.1	0.1
Serbia	14.9	30.6	27.7	4.2	2.7	2.6	2.7	2.8	3.1	0.1	1.0	0.4	0.0	0.0	0.0
Bosnia	19.6	40.3	36.5	8.4	5.5	5.2	2.6	2.7	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Albania	6.2	12.7	11.5	0.1	0.1	0.1	1.2	1.3	1.4	0.1	1.1	0.5	0.0	0.0	0.0
Belarus	2.9	6.0	5.4	1.2	0.8	0.8	0.1	0.1	0.2	0.0	0.1	0.0	0.0	0.0	0.0
Montenegro	14.2	29.1	26.4	7.4	4.9	4.6	6.0	6.2	6.9	0.0	0.4	0.2	0.0	0.0	0.0
Moldova	2.8	5.7	5.1	0.7	0.4	0.4	0.7	0.7	0.8	0.0	0.0	0.0	0.0	0.0	0.0
Macedonia	2.3	4.7	4.3	0.9	0.6	0.6	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0

1/ The highlighted values indicate when the index is for the country which is assumed to be the first country experiencing trouble.

Source: The authors' calculations.

Table 7b. CESE Countries: Index of Exposure to Regional Contagion with Rebalancing, end-2007, International Claims Concept

Exposure index (2) = ad (i, CL) * AE (CL, i) * REB (CL,i) 1/
CL - Austria, Italy, Germany, France, Sweden -- most common lenders
With three hypothetical trigger countries for each common lender

	Austria			Germany			Italy			France			Sweden		
	Cze	Rom	Hrv	Rus	Pol	Hun	Pol	Hrv	Hun	Cze	Rus	Rom	Est	Lth	Lta
Poland	0.40	0.90	0.80	0.32	0.20	0.19	0.09	0.09	0.11	0.00	0.01	0.00	0.07	0.05	0.06
Russia	0.05	0.12	0.11	0.24	0.15	0.15	0.03	0.03	0.04	0.01	0.08	0.03	0.14	0.09	0.11
Czech R	0.74	1.67	1.48	0.06	0.04	0.03	0.05	0.05	0.06	0.00	0.01	0.00	0.00	0.00	0.00
Hungary	3.57	8.06	7.18	0.89	0.56	0.53	0.37	0.38	0.44	0.00	0.04	0.02	0.00	0.00	0.00
Romania	3.30	7.44	6.63	0.42	0.26	0.25	0.14	0.15	0.17	0.01	0.12	0.05	0.00	0.00	0.00
Croatia	8.77	19.78	17.61	0.89	0.56	0.53	0.80	0.82	0.94	0.01	0.11	0.04	0.00	0.00	0.00
Turkey	0.01	0.02	0.01	0.10	0.06	0.06	0.01	0.01	0.01	0.00	0.03	0.01	0.00	0.00	0.00
Slovakia	1.20	2.71	2.41	0.03	0.02	0.02	0.12	0.12	0.14	0.00	0.00	0.00	0.00	0.00	0.00
Ukraine	0.22	0.50	0.45	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.08	0.05	0.07
Latvia	0.03	0.06	0.05	0.10	0.06	0.06	0.01	0.01	0.01	0.00	0.00	0.00	50.33	33.23	40.30
Estonia	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	100.25	66.20	80.28
Lithuania	0.01	0.02	0.01	0.05	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	29.74	19.64	23.82
Bulgaria	0.33	0.73	0.65	0.02	0.01	0.01	0.14	0.15	0.17	0.00	0.01	0.00	0.00	0.00	0.00
Serbia	0.49	1.11	0.99	0.04	0.03	0.02	0.10	0.10	0.12	0.00	0.01	0.00	0.00	0.00	0.00
Bosnia	0.30	0.67	0.60	0.06	0.04	0.04	0.03	0.03	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Albania	0.02	0.05	0.04	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Belarus	0.02	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Montenegro	0.03	0.07	0.06	0.01	0.01	0.01	0.04	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00
Moldova	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Macedonia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1/ The highlighted values indicate when the index is for the country which is assumed to be the first country experiencing trouble.

Source: The authors' calculations.