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

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

JEL classification: E44, G21, G32
Keywords: Financial stability, banking sector, Central and Eastern Europe, refinancing, funding, capital flows, roll-over, financial crisis

1 Introduction and Literature Overview

Policymakers and researchers began to focus on the issue of Western European banks' cross-border lending to Central, Eastern and Southeastern Europe (CESEE) at the onset of the financial crisis. High net external liabilities of their banking sectors (see Walko, 2008) and economies made some CESEE countries vulnerable to negative spillovers, in particular following the bankruptcy of Lehman Brothers on September 15, 2008. At the time, a key question was whether Western European parent banks would roll over their exposure to help mitigate the destabilizing effect of capital outflows and thereby contribute to avoiding balance-of-payments and banking crises in CESEE.

Several studies (see Berglöf et al., 2009, as well as EBRD, 2009) came to the conclusion that the existence of European banking networks in the CESEE banking sectors was a crisis-mitigating factor in the immediate post-Lehman period, as parent bank financing remained stable and thus attenuated negative capital flow dynamics. Similarly, Vogel and Winkler (2011) conclude that a higher share of foreign banks' assets stabilized cross-border flows in CESEE, in particular bank-to-bank lending, during the crisis. However, the authors argue that foreign banks did not stabilize cross-border bank flows to emerging economies in general during the global crisis. CESEE might have been different in this respect due to its special context of European integration. Hermann and

Refereed by: Neeltje van Horen, De Nederlandsche Bank, and Stefan Kavan, OeNB

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Mihaljek (2010) study the nature of spillover effects in bank lending flows from advanced to emerging market economies. They conclude that the decline in cross-border loans to CESEE was more limited during the 2007/08 crisis period than the decline in cross-border loans to Asia and Latin America, largely because of the high degree of financial integration in Europe and the CESEE region's comparatively sound banking systems. Hoggarth et al. (2010) show that, inter alia, cross-border lending to banks fell more sharply than cross-border lending to nonbanks. However, they also note that cross-border intra-group lending held up better than lending to nonrelated banks. Lahnsteiner (2011) concludes that capital outflows from CESEE banking sectors were most pronounced in countries with a low level of foreign ownership and in countries that had very large net external liabilities when the financial crisis deepened in the fall of 2008. Analyzing the relationships between adverse liquidity shocks to developed countries' banking systems and loan supply in emerging markets across Europe, Asia and Latin America, Cetorelli and Goldberg (2010) argue that cross-border lending and internal capital markets are both channels for international shock transmission.

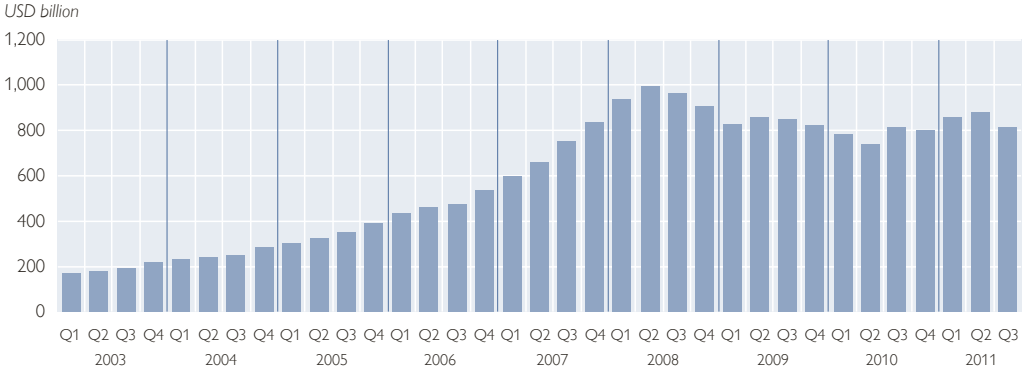
While the above-mentioned papers are based on aggregated data, De Haas and Van Horen (2011) use bank-level data on syndicated lending volumes from the time before and after the Lehman event. They focus on the role of information asymmetries and banks' access to borrower information. Their dataset does not cover lending from parents to subsidiaries. They conclude that distance, experience and access to a network of domestic co-lenders stabilized cross-border lending. In another paper based on bank-level syndicated lending data, De Haas and Van Horen (2012) find that banks that were hit by shocks (write-down of subprime assets, high roll-over needs, sharp decline of equity valuations) transmitted these shocks across borders via a reduction of cross-border lending. Turning to the parent bank-subsidiary relationship, Cetorelli and Goldberg (2011) examine how U.S. global banks' intra-group lending was affected by the crisis. They differentiate between subsidiaries with respect to their function within the banking group and show that parent banks, when hit by a funding shock, reallocate liquidity within the organization. Focusing on internal capital market dynamics, they do not analyze differences between lending to affiliated and nonaffiliated banks.

The lack of systematic, publicly available data on parent bank funding obviously represents a difficulty in analyzing the role the parent bank-subsidiary relationship plays in stabilizing direct cross-border credit in turbulent times. In this paper, we aim to pin down this role for Austrian banks' cross-border lending to banks and nonbanks in CESEE[2]. In doing so, our work contributes to the above-mentioned literature by examining a dataset from

[2] *Our sample includes the CESEE countries Albania, Bosnia and Herzegovina, Bulgaria, Belarus, Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Moldova, Montenegro, FYR Macedonia, Poland, Romania, Serbia, Russian Federation, Slovenia, Slovakia, Turkey and Ukraine plus nine countries in Central Asia and the Caucasus, namely Armenia, Azerbaijan, Georgia, Kirgizstan, Kazakhstan, Mongolia, Tajikistan, Turkmenistan and Uzbekistan. Nevertheless, we will use the term "CESEE" for our sample for the sake of simplicity and to enhance the readability of our paper. The intention behind including countries in Central Asia and the Caucasus in our sample was to increase the number of observations. Yet, it should be noted that only a very small part of Austrian banks' direct cross-border credit goes to borrowers in these countries.*

Chart 1

External Asset Positions of BIS Reporting Banks vis-à-vis Banks and Nonbanks in CESEE (including CIS)



Source: BIS locational statistics, table 6A.

the Austrian Central Credit Register (CCR)[3] that allows us to distinguish between lending to affiliated entities (parent-subsidiary relationship) and nonaffiliated entities, both in the bank and nonbank sectors. On the basis of bank-level data, we econometrically analyze whether roll-over risks were lower for intra-group lending than for lending to nonaffiliated parties in the period from January 2008 through March 2009. While we cannot adequately analyze the period before January 2008 due to data limitations, the available dataset is suited well for studying the impact of the shock emanating from the collapse of Lehman Brothers in September 2008. As chart 1 shows, this period is particularly interesting as foreign banks started to reduce their external asset positions vis-à-vis banks and nonbanks in CESEE in the third quarter of 2008.

We hypothesize that during a financial crisis period, direct cross-border credit by Austrian banks is more stable, i.e. decreases less, vis-à-vis affiliated borrowers than vis-à-vis nonaffiliated entities. Lower information asymmetries between parent banks in Austria and their bank and nonbank subsidiaries as well as parent banks' willingness to guard their investments lead to a more stable provision of liquidity to affiliated borrowers. Our econometric results show that while the outstanding credit vis-à-vis nonaffiliated banks and OFIs decreased significantly during the financial crisis, affiliated borrowers even experienced an increase in their liabilities to their Austrian parent banks.

This paper is structured as follows: In section 2 we describe the main features of the CCR and how we construct our dataset. Section 3 provides a descriptive overview of the data with a special focus on the developments of credit to affiliated and nonaffiliated borrowers. In section 4 we examine whether lending to affiliated entities differed significantly from lending to

[3] *Puhr et al. (2009) also base their work on this data source and focus on the characteristics and determinants of Austrian banks' direct cross-border credit to nonbanks. They find support for the relevance of geographic proximity and conclude that direct lending seems to follow nonfinancial FDI by Austrian corporates in CESEE and CIS. They also highlight a complementary effect between direct (i.e. by Austrian headquarters) and indirect (i.e. by local subsidiaries) cross-border lending.*

nonaffiliates after the collapse of Lehman Brothers. We present the results of differences-in-differences and cross-sectional regressions based on bank-level data. Section 5 summarizes the main findings and discusses the related policy implications.

2 Data

The primary data source of this study is the Austrian Central Credit Register (CCR), which is administered by the Oesterreichische Nationalbank (OeNB). All credit and financial institutions[4] as well as all insurance companies established in Austria and all Austrian branches of foreign credit institutions are obliged to submit data on major credit exposures to this register according to Article 75 Federal Banking Act.[5] The purpose of the CCR is to provide quick and accurate information about major borrowers' lines of credit and actual credit drawdowns based on the sum of borrowing reported by credit and financial institutions as well as insurance companies.

The CCR provides detailed information on Austrian banks' credit exposures vis-à-vis individual domestic and foreign borrowers. The reporting obligation is triggered if the exposures and liquidity facilities vis-à-vis a single obligor (including lending commitments), the ownership interests, interbank exposures, securitized exposures and other credit derivatives attributable to such obligor reach or exceed a total of EUR 350,000. Banks have to split the reported data into on-balance sheet items, i.e. securitized and nonsecuritized lending, as well as off-balance sheet items, which comprise exposures arising from off-balance sheet transactions[6] and counterparty default risk arising from derivatives.[7]

This study focuses on exposures reported on balance by banks.[8] Lines of credit that are not drawn have to be reported off balance and are therefore not included in our dataset. Furthermore, we deduct ownership interests because this subitem does not constitute a common credit position. The total credit amount is calculated as follows:

Total credit amount = Exposures to be reported on the balance sheet – Ownership interests

Exposures arising from off-balance sheet transactions are generally not taken into account in this study because such positions (e.g. bank A guarantees claims of bank B on an obligor in Ukraine) do not entail a liquidity transfer to a borrower in CESEE. The local credit exposures, i.e. indirect cross-border credit, of Austrian banks' subsidiaries are not taken into account, either. By focusing on direct cross-border credit, this analysis concentrates on the specific part of Austrian banks' business that is associated with capital flows from Austrian banks to the CESEE countries.

[4] *Austrian branches of EU Member State credit institutions pursuant to Article 9 Federal Banking Act.*

[5] *The reporting of major credit exposures is regulated by the Austrian Federal Banking Act (Bankwesengesetz – BWG), the Major Loan Reporting Regulation (Großkreditmeldungs-Verordnung – GKMVO) and the Regulation on the International Exchange of Data from the Central Credit Register (Verordnung über den internationalen Austausch von Daten der Großkreditevidenz). Pursuant to Article 75 para 1 Federal Banking Act (Federal Law Gazette No. 141/2006), credit and financial institutions as well as contract insurance undertakings are required to report information on their exposure to single obligors to the OeNB on a monthly basis.*

[6] *Exposures arising from off-balance sheet transactions pursuant to Annex 1 to Article 22 Federal Banking Act.*

[7] *Counterparty default risk arising from derivatives pursuant to Annex 2 to Article 22 Federal Banking Act and from credit derivatives (Article 22 para 5 nos 2 to 4 Federal Banking Act).*

[8] *I.e. credit institutions only; all other financial institutions and insurance companies are excluded.*

On the creditor side, our data capture major credit exposures of banks located in Austria, including foreign credit institutions' Austrian branches and subsidiaries. However, we do not include the Austrian branches and subsidiaries of foreign banks headquartered in CESEE. Our dataset covers every bank that reported credit exposures to borrowers in CESEE during the review period (January 2008 to August 2011). The spectrum of banks included in the sample ranges from larger banks that hold the bulk of credit exposure to CESEE borrowers (three banks on average held about 50% of the total CESEE exposure in the review period) to small and medium-sized banks that mainly lend to neighboring countries (see Puhr et al., 2009).

On the borrower side, the recipients of direct cross-border credit are split into groups and the total credit amount is aggregated.[9] First, we distinguish between credit to banks and credit to nonbanks. As this study focuses on intra-group credit transactions, further differentiations have to be made in the segment of credit to banks. Direct cross-border credit to banks is split up into credit to banks' own subsidiaries (intra-group exposures), credit to subsidiaries of other Austrian banks and credit to other (foreign-owned) banks. Regarding the nonbank segment, we differentiate between other financial institutions (OFIs), nonfinancial corporates (NFCs) and the public sector. Within the nonbank segment (OFIs and NFCs, respectively), we make a further distinction between exposures to entities owned by Austrian banks, entities owned by Austrian enterprises, and other enterprises. Within the entities owned by Austrian banks, a differentiation can be made between exposures to Austrian banks' own subsidiaries (intra-group exposures) and exposures to subsidiaries of other Austrian banks. While banks' subsidiaries (banks and nonbanks) are identified on the basis of whether there is a control relationship between the respective Austrian bank and the obligor, the definition "majority-owned by Austrian corporates" takes the holding company structure into account. If the majority of holding companies (number of holding companies > 70%) of a CESEE company are located in Austria, the company itself falls into the category "majority-owned by Austrian corporates."

Our dataset contains gross positions vis-à-vis each recipient group. The database does not allow for taking into account credit running from CESEE entities to Austrian banks, which could be particularly relevant for banks in CESEE that have a liquidity surplus. Therefore, we focus on gross positions.

Over the last decade, the CCR was subject to several revisions of data reporting standards. A major revision took place in January 2008. As a consequence of this revision – most importantly – banks were required to report short-term interbank lending held in settlement accounts (i.e. lending that is not based on a credit agreement) if another type of credit line had been extended to the same counterparty (bank). As short-term interbank credit exposures make up a substantial part of total cross-border credit, we decided to focus on the period from January 2008 to August 2011. Since the April 2011

[9] *The data sources for building the borrower groups are the master data of each borrower (company name, company ID, company country of origin, commercial register number, economic sector, legal form) and the group of connected clients (pursuant to Article 27 paras 4 and 4.a Federal Banking Act) reported by each creditor.*

revision, banks have been required to report short-term interbank credit exposures, irrespective of the existence of other claims on the same counterparty. Furthermore, banks have started to report long-term interbank lending as a separate position. To obtain time-consistent data series, credit exposures that were reported only according to the April 2011 revision were deducted from the total credit amount analyzed in this study.

The dataset on direct cross-border credit is denominated in euro. However, no currency breakdown is available for major credit exposures in the CCR. In order to adjust data for exchange rate changes, additional data from the OeNB's monetary statistics were used. For these statistics, banks have to report the currency decomposition of their cross-border credit volumes at the aggregation level of banks and nonbanks. The OeNB's monetary statistics cover the following currencies: euro, U.S. dollar, Swiss franc, Japanese yen, Canadian dollar, Norwegian krona, Australian dollar as well as all non-euro area EU currencies. The currency structure of Austrian banks' cross-border credit to CESEE countries varies widely across countries. The euro dominates credit exposures to most countries, but the U.S. dollar (in particular with respect to credit to the CIS countries), Swiss franc, Japanese yen as well as local currencies have considerable shares in the currency structure of cross-border credit to some other countries. To adjust for exchange rate changes, the monetary statistics data were matched with the primary data from the CCR in the following way:

1. On the basis of each creditor's individual currency breakdown obtained from the OeNB's monetary statistics, we calculated, for each bank, the share of each currency position in the credit exposures to banks and nonbanks.
2. We then took these calculated currency shares and split the credit exposures obtained from the CCR into their currency components. As the data from the OeNB's monetary statistics are available on the level of banks and nonbanks only, we assume that the shares are equivalent in the subsegments. For example, credit exposures in the segment "credit to subsidiaries" are split up into their currency components using the same currency decomposition as for credit exposures in the segment "credit to other banks."
3. Finally, we calculated data series at constant, i.e. January 2008, exchange rates. At each point in time and for each available non-euro currency component, we calculated the equivalent amount in the original currency (e.g. from euro back to U.S. dollar) and then recalculated the euro amount with the respective January 2008 exchange rate (e.g. from U.S. dollar to euro).

3 Descriptive Analysis

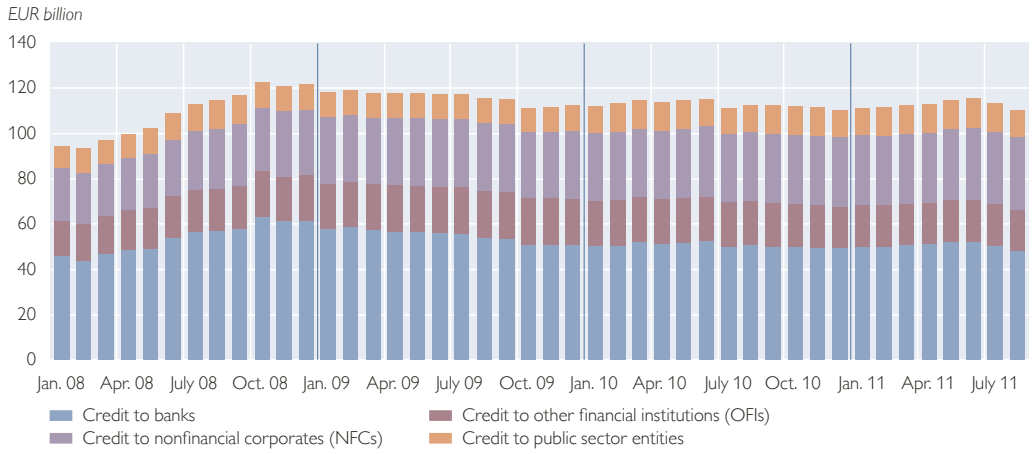
Before turning to the empirical analysis of bank-level data, we take a closer look at the aggregated data to get first insights into the main features of our dataset.

3.1 Direct Cross-Border Credit by Country

According to our data source, total outstanding credit by Austrian banks vis-à-vis all borrowers in CESEE averaged EUR 113 billion in the review period from January 2008 to August 2011. Following an increase up to the third quarter of 2008, the total credit stock tended to decline (see chart 2). With an average share of 10% to 15%

Chart 2

Austrian Banks' Direct Cross-Border Credit to CESEE



Source: OeNB.

in total credit per country over the review period, the top recipient countries were Romania, Croatia, Hungary and Slovenia. Poland, the Czech Republic, Russia, Ukraine and Slovakia each made up 4% to 8% of Austrian banks' total direct cross-border credit on average, while Bulgaria, Turkey, Bosnia and Herzegovina, Serbia and Kazakhstan accounted for 1% to 3%. The share of all other countries in our sample was below 1%.

Austrian banks are important creditors for the CESEE region and their cross-border credit volumes are of macroeconomic relevance for many CESEE economies. Austrian banks' share in CESEE countries' total external debt was highest in Croatia (39% on average), Slovenia (27%) and Romania (21%) and stood between 10% and 15% in the Czech Republic, Hungary, Slovakia and Bulgaria. In all other countries, Austrian banks had a share of less than 10% in total external debt. External credit provided by Austrian banks can be considered substantial also in terms of some countries' GDP. In Croatia and Slovenia, Austrian banks' direct cross-border credit accounted for more than 30% of GDP over the review period. In Hungary, Romania and Bulgaria, Austrian banks' cross-border credit made up 10% to 16% of GDP; in the Czech Republic, Ukraine and Latvia, the ratio was between 5% and 10%. These figures underpin the importance of avoiding sharp fluctuations in the outstanding direct cross-border credit stock as these could have severe macroeconomic consequences. In this context, cross-border coordination initiatives such as the Vienna Initiative can play an important stabilizing role.

The recipient structure shows that, on average, 90% of Austrian banks' direct cross-border credit to CESEE was granted to the private sector, and of these 90%, 52% were granted to banks and 48% to nonbanks.

3.2 The Importance of Intra-Group Credit

A large part of Austrian banks' direct cross-border credit to the private sector goes to affiliated entities.

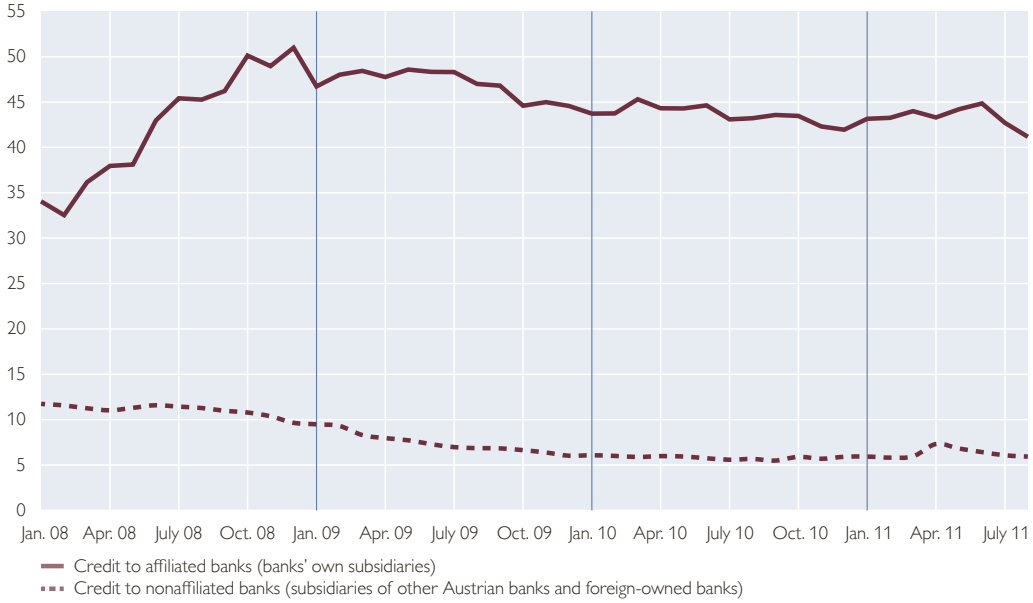
3.2.1 Intra-Group Credit to Banks

In fact, intra-group lending – i.e. parent banks providing funding to their subsidiaries – dominates Austrian

Chart 3

Austrian Banks' Direct Cross-Border Credit to Banks

EUR billion, foreign exchange components at January 2008 exchange rate



Source: OeNB.

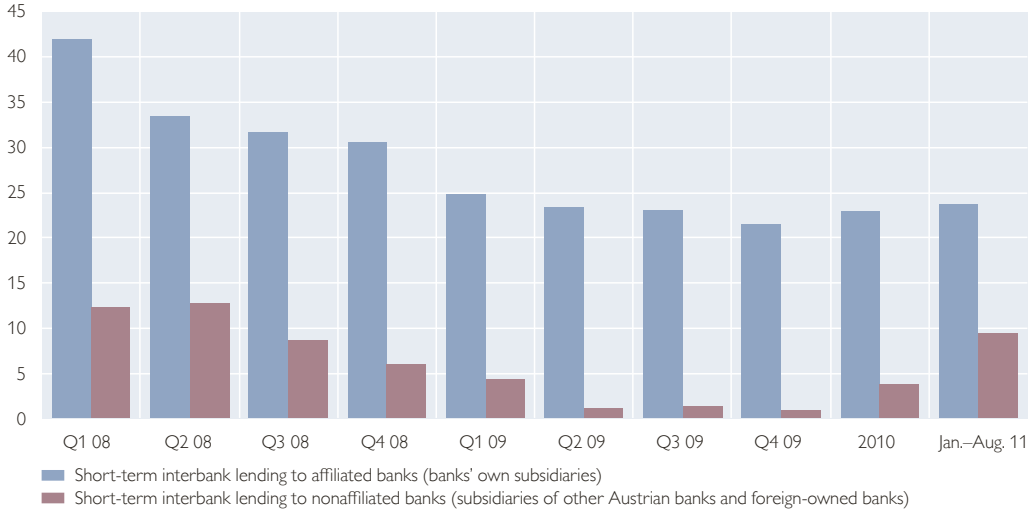
banks' lending to banks in CESEE. Direct cross-border lending to banks' own subsidiaries in CESEE accounted, on average, for 85% of total outstanding credit vis-à-vis banks in the region over the review period. Another 4% was lent to subsidiaries of other Austrian banks, which can partly be explained by the lending activities of (regional) banks operating within the Raiffeisen and Volksbank credit cooperatives or savings bank sector that lend to CESEE subsidiaries of the sector's CESEE headquarters. This part of direct cross-border lending to subsidiaries of other Austrian banks might be virtually regarded as intra-group lending. Please note that we will apply a strict definition of affiliation and only treat banks' own subsidiaries as affiliates (both in the case of banks and nonbanks). An average of 11% of Austrian banks' direct cross-border lending to banks was directed to other (foreign-owned) banks.

Looking at developments over time, the most important observation is that the share of direct cross-border lending to banks' own subsidiaries increased from about 74% in early 2008 to 87% in mid-2009. This increase was mirrored by a decline of direct cross-border lending to all other banks (subsidiaries of other Austrian banks and foreign-owned banks) from about 26% to 13% over the same period. Since then, the composition of direct cross-border credit to banks has remained relatively unchanged. In absolute terms (see chart 3), our data show that credit exposures vis-à-vis banks' own subsidiaries increased from January to December 2008. This means that subsidiaries received additional funds from their parent banks in the months following the bankruptcy of Lehman Brothers. In January 2009, the credit volume granted to banks' own subsidiaries started to decline. Credit to all other banks was relatively stable before the collapse of Lehman Brothers, but

Chart 4

Share of Short-term Interbank Lending to Affiliated and Nonaffiliated Banks

% of total credit exposure to borrower group (period averages)



Source: OeNB.

Note: Until April 2011, short-term interbank lending only had to be reported if another type of credit line had been extended to the same counterparty (bank).

declined immediately afterwards and continuously before stabilizing in 2010.

It is worth noting that the share of short-term (less than one year) interbank lending held in settlement accounts (i.e. lending that is not based on credit agreements) in Austrian banks' total amount of credit to banks is considerable, particularly within the segment of credit to banks' own subsidiaries. On average, short-term interbank lending amounted to 23% of total credit to banks over the review period. Within the segment of credit to banks' own subsidiaries, its share was 26%. By contrast, only about 7% of cross-border credit to subsidiaries of other Austrian banks and to other foreign-owned banks were granted in the form of short-term interbank lending. It should be noted, however, that until April 2011 banks were only required to report short-term interbank lending if another type of credit line had been extended to the same counterparty (bank). The fact that the CCR did not record information on all short-term interbank credit exposures is more relevant for nonaffiliated banks as in the case of subsidiaries usually other types of credits are granted as well. Despite data limitations, it is worth noting that from August 2008 to April 2009 short-term interbank lending to banks' own subsidiaries declined by 24%, while short-term interbank lending to other banks dropped by about 90% and only made up about 1% of total credit to banks from the second quarter of 2009 through the fourth quarter of 2009 (see chart 4). This means that after the bankruptcy of Lehman Brothers, short-term interbank lending to banks' own subsidiaries held up much better than short-term interbank lending to nonaffiliated banks.

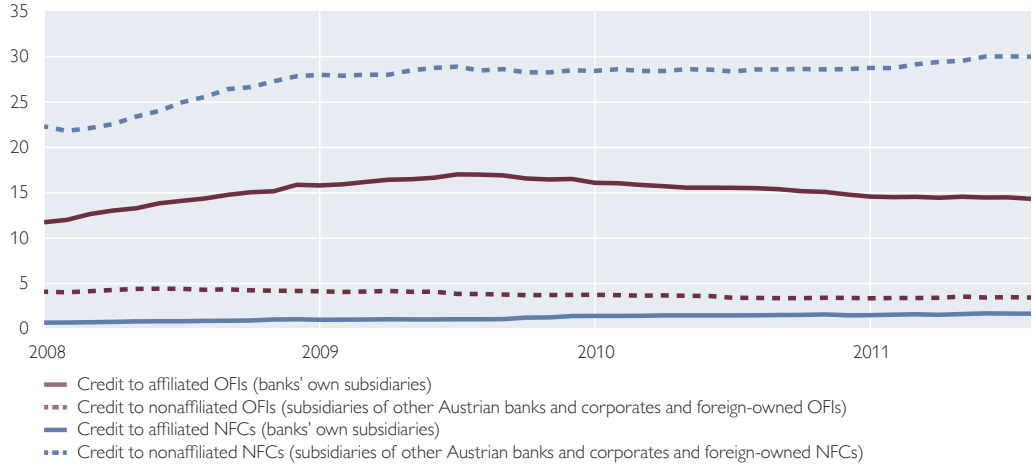
3.2.2 Intra-Group Credit to Nonbanks

Our data reveal that a substantial part of cross-border credit to nonbanks is directed to affiliates, in particular to OFIs. On average, 80% of Austrian

Chart 5

Austrian Banks' Direct Cross-Border Credit to Nonbanks

EUR billion, foreign exchange components at January 2008 exchange rate



Source: OeNB.

banks' direct cross-border credit to OFIs was granted to their own subsidiaries (primarily to leasing companies). Moreover, 4% of Austrian banks' direct cross-border credit to OFIs went to subsidiaries of other Austrian banks and 1% to subsidiaries of Austrian corporates. On average, only 15% of direct cross-border credit to OFIs were granted to entities which are not majority-owned by Austrian banks or corporates. In line with the development of lending to banks, the share of lending to banks' own OFI subsidiaries rose from 74% in early 2008 to 80% in mid-2009 at the expense of the share of lending to other nonaffiliated OFIs, which fell from 26% to 20%. From mid-2009 to the end of our review period, the composition of direct cross-border credit to OFIs only changed marginally.

Focusing on the development of the absolute volumes of credit to banks' own OFI subsidiaries versus those of credit to all other types of OFIs, it is interesting to see that credit to banks' own subsidiaries gradually rose until summer 2009, while credit exposure to nonaffiliated OFIs declined gradually over the review period (see chart 5).

For NFCs, the share of Austrian banks' cross-border credit to affiliated entities is obviously much smaller than for OFIs, as NFC activities are not usually part of banks' business models. Yet, lending to corporates that are majority-owned by Austrian banks is not negligible, as it accounted for about 10% of average cross-border lending to corporates, of which 40% went to banks' own NFC subsidiaries and 60% to NFC subsidiaries of other Austrian banks. Many of these bank-owned NFCs are active in the real estate sector. 14% of Austrian banks' direct cross-border credit to NFCs were allocated to Austrian corporates' NFC subsidiaries, while the bulk (76% on average) was granted to foreign-owned NFCs.

In the case of NFCs, interestingly, both cross-border credit to banks' own subsidiaries and cross-border credit to other NFCs – i.e. entities that are not affiliated to the respective Austrian creditor bank – did not decline after the collapse of Lehman Brothers, but

only stagnated in late 2008 (see chart 5).

4 Empirical Analysis

We examine whether the stability of cross-border lending differs in dependence of the relationship between the lending bank and the borrower, i.e. in dependence of whether bank and borrower are affiliated or not. We regard the bankruptcy of Lehman Brothers as an external shock that affected all borrowers regardless of their affiliation and which marks the point in time when the financial turmoil spilled over from mature economies to emerging markets. To compare credit to Austrian banks' affiliates and credit to nonaffiliated borrowers before and after the bankruptcy of Lehman Brothers, we first apply a difference-in-differences (DID) model.

4.1 Difference-in-Differences (DID) Model

In a DID analysis, two groups are compared at two points in time: the treatment group and the control group, before and after a treatment. Thus, the DID methodology allows for drawing conclusions about the impact of a treatment while controlling for a potential selection bias (significant pre-treatment differences between the treatment and control groups) and a general time trend for both groups. In our setting, the two groups to be compared are the borrowers in CESEE that are affiliated to Austrian banks (i.e. banks' subsidiaries, OFIs or NFCs that are fully or majority-owned by Austrian banks) and those that are not affiliated. Both groups experienced the collapse of Lehman Brothers as a common external shock. We are interested in whether this shock had different effects on lending to the two groups. Econometrically, our test can be written as

$$credit_{ijt} = \beta_1 \cdot affiliate_{ij} + \beta_2 \cdot lehman_t + \\ + \beta_3 \cdot (affiliate_{ij} * lehman_t) + \sigma_i + \mu_j + \varepsilon_{ijt} \quad (1)$$

The dependent variable credit is the *ln* of the average outstanding credit of bank i $(=1,...,392)$[10] vis-à-vis borrowers in country j $(=1,...,30)$ before and after the bankruptcy of Lehman Brothers (time $t=1,2$). The period before the collapse of Lehman Brothers covers the time from January 2008 through August 2008, and the period after the collapse of Lehman Brothers covers the time from October 2008 through March 2009. We select the observed time periods in such a way that they cover approximately the same length of time and exclude other events that might have a divergent impact on both groups, like the Vienna Initiative.[11] *Lehman* is a dummy variable that equals zero for observations in the period before the bankruptcy of Lehman Brothers and one for those in the period after.

Affiliate is a dummy variable that equals one if the borrower in country j is affiliated to the lending bank (fully or majority-owned) and zero otherwise. We expect β_1 to be positive as Austrian banks' external position is higher, on average, vis-à-vis affiliates than vis-à-vis nonaffiliates, and β_2 to be negative as

[10] *Our sample includes all banks located in Austria that were involved in cross-border lending to CESEE during the observation period.*

[11] *The Vienna Initiative was initiated in early 2009. As part of the overall balance-of-payments support to five countries (Bosnia and Herzegovina, Hungary, Latvia, Romania and Serbia) where IMF-EU support programs were in place, parent banks publicly committed to keeping their overall exposure stable and recapitalizing their subsidiaries if necessary. Parent banks signed the first of the relevant commitments in March 2009 (for Romania and Serbia). Commitments for other countries were signed in the subsequent months.*

the collapse of Lehman Brothers was followed by a significant decline in cross-border bank lending.

Our main interest is in β_3, the coefficient estimate of the interaction term. It provides information on whether lending to affiliated entities differed significantly from lending to nonaffiliates after the collapse of Lehman Brothers, accounting for the overall change in cross-border lending (DID of outstanding credit). We hypothesize that the reduction of cross-border lending is lower vis-à-vis affiliated entities such as bank subsidiaries, OFIs and NFCs owned by Austrian banks than vis-à-vis nonaffiliated borrowers. We see the following two reasons for this assumption (see also Vogel and Winkler, 2011): First, information asymmetries between parent banks based in Austria and their subsidiaries and other affiliated borrowers in CESEE are lower than between lending Austrian banks and nonaffiliated borrowers and therefore, during times of increased uncertainty, Austrian banks are more likely to lend to their affiliates than to nonaffiliated borrowers. Second, Austrian parent banks are likely to provide liquidity support to their subsidiaries in times of financial and economic distress as they will seek to guard their investments. Therefore, we expect β_3 to be positive. With δ_i and μ_j we control for time-invariant bank and country characteristics such as type of bank, ownership, bank size, country size, geographic distance to Austria, etc. ε_{ijt} is the error term. Note that this estimation is carried out separately for each borrower group, i.e. banks, OFIs and NFCs.

We observe that, on average, the outstanding credit of Austrian banks' vis-à-vis affiliated banks and OFIs is higher than vis-à-vis unaffiliated entities (table 1). As expected, after the collapse of Lehman Brothers, outstanding credit is significantly lower than before, but only for nonaffiliated borrowers. Banks and OFIs that are fully or majority-owned by Austrian banks even record an increase in their outstanding liabilities vis-à-vis Austrian banks (as the coefficient estimate of the interaction term more than offsets the coefficient estimate of the *lehman* dummy). In terms of economic significance for lending to banks and OFIs we observe that before the Lehman event, outstanding credit to affiliates was, on average, 272% (banks) and 141% (OFIs) higher than the average outstanding credit to nonaffiliated borrowers. After the Lehman event, outstanding credit to nonaffiliated borrowers was, on average, 32% (banks) and 44% (OFIs) lower than before. For affiliated borrowers, it was about 90% higher than for nonaffiliates and around 60% higher than before the Lehman bankruptcy.

For credit to NFCs, we observe a different pattern. While the volume of credit to affiliates, on average, was 139% lower than that of credit to nonaffiliated borrowers, outstanding credit was significantly higher after the bank-

Table 1

The Stability of Credit Relationships – DID Analysis

	Banks	OFIs	NFCs
Affiliate	2.7243 ***	1.411 ***	–1.3868 ***
	(0.3951)	(0.3194)	(0.4693)
Lehman	–0.3193 **	–0.4441 **	0.3322 ***
	(0.145)	(0.2007)	(0.1128)
Affiliate x Lehman	0.9185 **	0.9104 **	0.6939
	(0.384)	(0.3592)	(0.5112)
Bank-specific fixed effects	yes	yes	yes
Country-specific fixed effects	yes	yes	yes
Adjusted R-squared	0.477	0.447	0.359
Number of observations	1,100	622	1,890

Source: Authors' calculations.

*Note: The dependent variable is the ln of the average outstanding credit of an Austrian bank vis-à-vis a borrower group in the host country either for the period January to August 2008 (lehman=0) or for the period October 2008 to March 2009 (lehman=1). *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively. Robust standard errors are given in parentheses below.*

ruptcy of Lehman Brothers and did not significantly differ in terms of stability across the two groups.

While the DID analysis allows us to examine the time dimension together with the differences between affiliated and nonaffiliated borrowers, this approach suffers from some drawbacks. By including fixed effects, we are able to control for time-invariant bank and country characteristics. However, countries and banks may have been hit differently by the financial crisis – a time-variant effect that would impact cross-border lending. Therefore, we further added a variable for GDP developments to the above estimations, which left the results unchanged (not reported). As we use anonymized credit data, we cannot take into account time-variant bank-level variables to measure the extent to which banks were hit by the crisis. Thus, we cannot rule out a potential omitted variable bias. To deal with this issue, we also estimate a cross-sectional regression.

4.2 Cross-Sectional Analysis

We make use of an identification strategy suggested by Khwaja and Mian (2008) and recently adopted by Cetorelli and Goldberg (2010) as well as De Haas and Van Horen (2011). This approach exploits the structure of data on borrowers that have liabilities vis-à-vis different banks and banks that have claims on several borrowers. The dependent variable is the change in outstanding cross-border credit, measured as the difference between the average outstanding credit in the months before the collapse of Lehman Brothers (i.e. January through August 2008) and the average outstanding credit in the months after the collapse of Lehman Brothers (i.e. October 2008 through March 2009) for each bank-borrower relationship in our sample. We deduct the average outstanding credit before the Lehman event from the average outstanding amount after the Lehman event to obtain $\Delta credit$. Thus, a negative value for our dependent variable indicates a decrease in credit while a positive value indicates that outstanding credit increased over the observation period. As we take the *ln* of average credit, the first difference gives us approximately the percentage change in outstanding credit of bank *i* vis-à-vis borrowers in country *j*. In our estimation we include bank- and country-specific fixed effects that neatly control for all (time-variant and time-invariant) unobservable bank and country specifics. These include e.g. the extent to which banks and borrowers were hit by the financial crisis, and allow us to isolate loan supply and loan demand effects. Thus, we can focus on the characteristics of bank-borrower relationships (e.g. affiliation) and their impact on the stability of cross-border credit. Our econometric model is

$$\Delta credit_{ij} = \beta * affiliate_{ij} + \delta_i + \mu_j + \varepsilon_{ij} \qquad (2)$$

Looking at the estimations for the different borrower groups, the positive coefficients of the dummy variable

Table 2

The Stability of Credit Relationships – Cross-Sectional Analysis

	Banks	OFIs	NFCs
Affiliate	1.2662 ***	1.0696 ***	0.8351 *
	(0.4221)	(0.3548)	(0.4975)
Bank-specific fixed effects	yes	yes	yes
Country-specific fixed effects	yes	yes	yes
Adjusted R-squared	0.238	0.262	0.153
Number of observations	550	311	945

Source: Authors' calculations.

*Note: The dependent variable is the difference between the ln of the average outstanding credit of an Austrian bank vis-à-vis a borrower group in the host country before the bankruptcy of Lehman Brothers (January through August 2008) and after (October 2008 through March 2009). *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively. Robust standard errors are given in parentheses below.*

"affiliate" indicate that outstanding credit decreased significantly less (or even increased) vis-à-vis affiliated borrowers across all borrower groups than vis-à-vis nonaffiliates (table 2). The estimates for banks and OFIs exceed one and thus confirm the results of the DID analysis that affiliated banks and OFIs seem to experience an increase in cross-border credit during the observation period rather than a decrease like their nonaffiliated counterparts. On average, affiliated banks (OFIs) record an increase in outstanding liabilities of 26% (7%) of the amount of the decrease experienced by their counterparts which are unaffiliated to the respective lending banks. NFCs fully or majority-owned by Austrian banks record a decrease in outstanding liabilities that is 84% lower than that of the nonaffiliated corporates.

In addition to the affiliation between Austrian banks and borrowers in CESEE, we also test for other characteristics of bank-borrower relationships: We examine whether the presence of a bank subsidiary stabilized direct cross-border credit to OFIs and NFCs in the respective country, as the presence of a subsidiary could reduce the information asymmetries between the Austrian bank and the foreign nonbank borrower. However, we do not find support for such a stabilizing effect. Moreover, we test whether bank borrower groups (affiliates and nonaffiliates) that receive a larger share of total cross-border credit from an Austrian bank experience lower instability. Again, we do not find a significant impact. Finally, including those variables in the above estimations does neither change the size and significance of the coefficients nor does it lead to a substantial increase in the explanatory power of the models.

5 Concluding Remarks

During the past decade, countries in the CESEE region experienced a steady increase in cross-border credit. Our paper focuses on direct cross-border credit granted by Austrian banks, which belong to the main creditors to the CESEE region. For some of the CESEE countries, liabilities vis-à-vis Austrian banks have reached substantial levels when measured as a share of total debt or compared to GDP. To our knowledge, this is the first paper that examines differences between direct cross-border lending to affiliates and direct cross-border lending to nonaffiliates, both in the bank and nonbank sectors. Our datasource is the Austrian Central Credit Register. We highlight that a large part of Austrian banks' cross-border credit goes to affiliated borrowers, i.e. entities that are fully or majority-owned by the lending Austrian banks.

At the core of this study, we examine whether affiliation, i.e. full or majority ownership of the borrower by the lending Austrian bank, reduced roll-over risks in the period from January 2008 through March 2009. Hence, we cover the period during which the global financial crisis spilled over to CESEE after the bankruptcy of Lehman Brothers. More specifically, we compare two periods: the period before the Lehman event, i.e. January through August 2008, and the period afterward, i.e. October 2008 through March 2009. On the basis of our unique data on affiliated and nonaffiliated borrower groups, we find that credit between lenders and affiliated borrowers was more stable than between nonaffiliates. While the literature on capital flows often assumed that parent bank funding was an important factor that helped increase the stability of cross-border lending during the crisis, our dataset

enables us to pin down this issue empirically for Austrian banks' direct cross-border credit vis-à-vis borrowers in CESEE. Our findings support the hypothesis that lower information asymmetries and the efforts of parent banks to provide a stable source of funding for their subsidiaries were effective mechanisms in stabilizing cross-border credit during times of financial distress.

In general, the CESEE countries have improved their external position since the deepening of the financial crisis in 2008/09. However, the fact that some countries' external liabilities are still high continues to contribute to their external vulnerability. Hence, a continued roll-over of direct cross-border credit would be an important contribution to macrofinancial stability in CESEE. In late 2011, market participants became increasingly concerned that the European Banking Authority's recommendation to raise banks' risk-weighted capital ratio[12] (European Banking Authority, 2011) could lead to a reduction of direct cross-border credit, including credit to CESEE. From the CESEE region's perspective, it is important that parent banks – as recommended by the European Banking Authority – use private sources of funding to strengthen their capital levels (including retained earnings, reduced bonus payments, new issuances of common equity and other liability management measures) and do not achieve the required capital ratios through an excessive reduction of direct cross-border credit. More recently, within the framework of the Vienna Initiative 2.0, home and host country officials as well as private sector banks agreed on principles how to avoid disorderly deleveraging in CESEE in March 2012 (EBRD, 2012). More specifically, the agreement aims to better coordinate banking sector regulation and supervision and to contain negative spillovers between the euro area and CESEE.

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