Internal capital markets and crisis transmission: evidence from foreign bank subsidiaries in CESEE

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The aim of this paper is to analyze the impact of European bank deleveraging on the asset growth of European banks' CESEE subsidiaries. Our estimation of the effects of parent bank funding on subsidiaries' asset growth relies on the instrumental variables strategy, instrumenting for intragroup flows with exposure to the sovereign debt of Ireland, Greece, Spain and Portugal. The novelty of this analysis is the differentiation between equity and nonequity intragroup flows and the inclusion of a significant number of countries in the sample. Previous studies in this area either did not analyze the role of equity flows or focused on one country only. The present study finds that intragroup flows have a significant effect on subsidiaries' asset growth. A 1 percentage point increase in equity flows leads to a 6.1 percentage point increase in assets; the same increase in nonequity flows leads to a 1.7 percentage point increase in assets. This finding has significant policy implications for the regulation of domestic banks and cross-border regulatory cooperation.

Foreign banks play a dominant role in Central, Eastern and Southeastern Europe (CESEE). According to Claessens and Van Horen (2014), the share of foreign bank assets in total banking sector assets in CESEE is higher than 50% while in countries like Bosnia and Herzegovina or Lithuania it is even above 90%. A strong presence of foreign banks has its advantages and disadvantages. The major benefit of being part of a multinational banking group is easy access to internal capital and credit markets and to cheap funds from abroad. This proved beneficial for credit growth in CESEE in the precrisis period. By relying on parent funding, foreign banks financed domestic investment and consumption to a much higher extent than would have been possible using just domestic sources. Some countries, like Hungary and Estonia, experienced a mortgage lending boom and a house price bubble in the early 2000s and in the run-up to the 2008 crisis, as households borrowed heavily in what was considered to be "cheaper" foreign currency to finance housing. However, the 2008 financial crisis and especially the subsequent euro area sovereign debt crisis brought to light the negative aspects of this model and revealed many imbalances that had accumulated in the previous period. Concerns arose that foreign parent banks would withdraw funds from their international subsidiaries in order to cover their own losses and meet higher regulatory capital requirements at home. In that way, financial contagion would spread from markets where parent banks are headquartered to markets where subsidiaries operate, leading to a slowdown in credit growth and economic activity.

The aim of this paper is to describe and analyze the effects of the deleveraging process during the euro area sovereign debt crisis that started at the end of 2009 when concerns arose that Greece would not be able to service its mounting public

debt. Market panic spread to the other countries under stress: Ireland, Spain and Portugal. Rating downgrades, increases in credits spreads and decreases in these countries' sovereign bond prices had a negative impact on the profits of the banks that kept such bonds on their balance sheets. Thus, exposure to stressed countries' sovereign debt was a negative liquidity shock to the parent banks. This paper looks at the effects of such exposures on the functioning of subsidiaries' internal capital markets. In particular, it analyzes whether negative shocks to Western European parent banks led to the withdrawal of funds from their CESEE subsidiaries. Both equity and nonequity (assets and liability) flows were used to measure the withdrawal of funds. Equity flows include share issues, share repurchases and dividends paid. Nonequity flows include all other claims on and liabilities to the rest of the group – loans, deposits, borrowing, securities purchased and sold, and the like. In a second step, this paper examines the impact of the withdrawal of funds on the subsidiary's credit activity. Unfortunately, loan growth could not be used as a dependent variable because loans to the parent bank and to other related parties are included in the total amount of loans reported on the balance sheet, and very few banks report the breakdown of loans by related and nonrelated parties. Most banks report just total related party assets instead. That is why this paper looks at the growth of the subsidiary's balance sheet after deducting claims on the rest of the group as a measure of banks' credit activity. This measure represents the change in assets that nonrelated parties owe to the bank, i.e. the change in nonrelated party assets. The paper also analyzes whether equity or nonequity flows have a higher impact on the growth of the subsidiary's nonrelated party assets. While this is the first study that examines nonrelated party assets as a variable, the size of the balance sheet is a good proxy for financial intermediation activity of the subsidiary and has been often used in the literature as a measure of bank performance. One recent example is Cornett et al. (2010), who compare the performance of private banks with that of state-owned banks and who use asset growth as a dependent variable. To control for credit demand, country fixed effects are added in this study. Thus, it compares the change in the nonrelated party assets of two subsidiaries that operate in same country but whose parent banks have different amounts of sovereign exposure to countries under stress.

The author finds that the higher exposure of the parent bank to countries under stress is associated with the higher withdrawal of intragroup funds from the subsidiary. Moreover, this withdrawal of funds caused the subsidiary's balance sheets to shrink as the subsidiary could not substitute intragroup funds with external funds. As expected, equity flows are found to have a greater effect on the subsidiary's balance sheet than nonequity flows.

The rest of the paper is organized as follows. Section 1 introduces the reader to the relevant literature and defines the contribution this paper makes. Section 2 provides an overview of the euro area sovereign debt crisis and the bank deleveraging process. Section 3 presents the data and the estimation strategy and section 4 provides a discussion of the results and robustness checks. The paper concludes with section 5, acknowledging some limitations of this study, making suggestions for further research and discussing policy implications.

1 Literature review

The role of banks' internal capital markets in the international transmission of shocks is a relatively new area in economics literature, and most contributions are empirical. First studies aimed at finding indirect evidence of the operation of internal capital markets because data on intragroup transactions were unavailable. Thus, these studies tried to establish correlations between some measure of the shock to the parent bank and the outcome at the subsidiary level, usually loan growth. The assumption was that the withdrawal of intragroup funds from the parent was the link between shock and outcome. Examples of this literature include Houston et al. (1997, 1998). These papers are based on a sample of banks that operate in the U.S.A. and find that bank holding companies indeed operate internal capital markets. Subsidiaries' lending is less sensitive to their own cash flows and more responsive to local conditions than the lending of independent banks that rely only on external funds. Thus, members of holding companies can rely on the internal capital market in case they need additional funds to seize new profit opportunities. Peek and Rosengren (1997, 2000) take an international perspective and analyze the lending behavior of branches of Japanese banks in the U.S.A. They find that the branch's lending is correlated with the risk-based capital ratio of the parent. Peek and Rosengren (2000) expand on their previous research and look at the consequences of the drop in Japanese bank lending for real economic activity. They find that areas more strongly penetrated by Japanese banks experienced a stronger decline in construction activity after the Japanese real estate and equity bubble burst in the early 1990s.

More recent contributions based on the correlation between parent bank shocks and subsidiary lending are those of De Haas and van Lelyveld (2010, 2014). Using a rich sample of 45 multinational banks from 18 home countries with 194 subsidiaries across 46 host countries, they find that the financial strength of the parent positively influences the lending growth of the subsidiary. They also find that foreign banks do not have to rein in their credit supply during a financial crisis in the host country while domestic banks do. However, when the crisis hits the home country – the country in which the headquarters of the parent are located – foreign banks experience lower credit growth than domestic banks.

The main limitation of the studies mentioned above is that they do not observe the flows of intragroup funds within a bank holding group, so they cannot rule out other channels of shock transmission such as e.g. trade linkages between two countries. The first paper to address this limitation, albeit at the country level, was Cetorelli and Goldberg (2011). Using BIS data on cross-border loans, they find that there was a significant decrease in cross-border lending to emerging markets from developed countries as a consequence of the 2007–08 financial crisis. Cetorelli and Goldberg (2012a, 2012b) use a regulatory reporting data set that contains data on financial transactions as well as borrowing and lending between branches and parent banks. Using exposure to asset-backed commercial paper (ABCP) as a negative liquidity shock to the parent, they find (2012a) that parent banks with a higher ABCP exposure withdrew more funds from their subsidiaries than parents that were less exposed to ABCP. This withdrawal of funds in turn led to a decrease in subsidiaries' lending supply. Cetorelli and Goldberg (2012b) examine how banks that are registered in the U.S.A. and have branches abroad manage liquidity across the whole banking group. They find that parent banks that

were hit harder by the 2007–08 crisis withdrew more funds from their subsidiaries than banks that were more immune to the crisis. Moreover, the withdrawal of funds was not linear across all subsidiaries. Fewer funds were withdrawn from subsidiaries that are important generators of revenues and more funds were withdrawn from subsidiaries that could fund themselves externally in a local market.

On a related topic, the study by Hameter, Lahnsteiner and Vogel (2012), which examines cross-border lending of Austrian banks to CESEE, is also noteworthy. They find that during the crisis, Austrian banks' lending to their subsidiaries was more stable than lending to other CESEE that were not affiliated with the respective banking group. They explain this phenomenon with lower within-group information asymmetry and the willingness of parent banks to support the business of their subsidiaries abroad.

Aiyar (2012) makes further contribution to the literature. Besides using data on intragroup lending between parents and subsidiaries, the main innovation of his paper is an attempt to disentangle credit demand effects from credit supply effects. The previous literature had partially left open the question whether the decrease in lending by subsidiaries was due to a decrease in the parents' funding or whether parent banks withdrew funding because subsidiaries faced lower credit demand from firms and households. Aiyar tackles this issue by instrumenting for credit demand using banks' exposure to different sectors (households, businesses, other banks, other financial institutions). An even better estimation strategy for disentangling credit demand from credit supply is provided by Schnabl (2012), who studies exposure to the 1998 Russian default as a negative shock to the parent bank and looks at its transmission to Peru through bank-to-bank lending of the exposed international banks. To isolate credit demand, Schnabl analyzes firms that borrow from several banks. He finds that banks that were more exposed to a negative liquidity shock reduced their lending more than other banks that were lending to the same firm but were hit less hard by the liquidity shock.

One more study related to this paper is by Allen, Gu and Kowalewsky (2013). In their descriptive paper, the authors use data of a similar nature but on a limited sample of banks, so they are not able to conduct a rigorous statistical analysis. The study argues that corporate governance at the subsidiary level might be partially responsible for financial contagion that occurred during the crisis, as the management boards of subsidiaries have only few independent members, which means that they represent the interests of the parent bank rather than those of the subsidiary.

All in all, the literature has found that transactions between parent banks and their international subsidiaries provide a mechanism for the transmission of financial shocks from one economy to another. Moreover, after a shock, subsidiaries are not able to compensate for drops in internal funds by relying more on external capital markets or by attracting more deposits. Thus, they curb lending to domestic firms and households, which leads to a drop in overall economic activity.

This paper differs from the previous literature in several ways. First, it accounts not only for lending and borrowing as a way to transfer funds within a group, but also for changes in equity: share issues and dividends paid. Previous papers looked just at lending to, and borrowing from, the parent bank, which may have left some transfers in the form of equity uncaptured. This paper also tries to establish whether equity and nonequity group funding have a different impact on the balance

sheet and intermediation activity of the subsidiary. It is reasonable to expect that equity increases have higher multiplier effects, as they loosen regulatory capital constraints on bank lending. Moreover, depositors might perceive well-capitalized banks as less risky and may decide to increase their deposits with the subsidiary, which leads to a further increase in the banks's lending potential. This is consistent with the finding of Forbes and Warnock (2012) that most episodes of extreme capital flow movements over the world are led by debt rather than by equity flows.

The other novelty of this study is its substantial international dimension, as it covers subsidiaries located in 19 CESEE countries. De Haas and Van Lelyveld (2010, 2014) use data from even more countries, but they are not able to observe intragroup transactions. On the other hand, studies that do have data on intra-group flows are focused on the outcome in a particular country – the U.K., U.S.A. or Peru. Focusing on several countries allows for the use of country fixed effects that partially control for changes in credit demand. The final distinction from the previous literature is the outcome variable. This paper uses "change in total bank assets after deducting claims to the rest of the group" as an outcome variable, while most of the other studies used "lending at subsidiary level" as the dependent variable. The issue with that approach is that lending to the parent and to the rest of the group is included and represents a significant part of the subsidiary's lending. This means one might misinterpret an increase in loans as an increase in banks' credit activity when in fact it represents a withdrawal of group funds. This can be seen from Allen, Gu and Kowalewski's analysis (2013) and from banks' financial reports. Thus, using the total lending of a subsidiary as an outcome variable might be flawed, as an increase in lending might represent an increase in lending to the parent bank instead of lending to domestic banks and households.

2 Background on the euro area sovereign debt crisis and deleveraging

In the precrisis period before 2008, Western banks were eager to enter CESEE markets. After the fall of communism, these countries were undergoing restructuring, experienced high growth rates and had good growth prospects. Moreover, their financial sectors were underdeveloped, with very low levels of household and firm leverage. These factors, together with the ongoing political and economic integration of Europe, provided a great growth opportunity for Western European banks operating in saturated markets where there was little room for expansion.

In their expansion toward CESEE, most banks relied on the following business model: The first step was to buy some formerly state-owned bank in the process of privatization or to build a subsidiary from scratch. Next, parent banks would borrow wholesale in the West, where interest rates were low, and would transfer these funds to their CESEE subsidiary by extending loans or increasing equity. The CESEE subsidiary could then use these relatively cheap funds jointly with more expensive and insufficient funds raised locally to extend loans to local customers. To hedge the exchange rate risk, as the wholesale funds are usually euro- or U.S. dollar-denominated, the lion's share of these loans is denominated in, or indexed to, foreign currency. In this way banks were able to make significant profits on the interest rate differential between significantly higher interest rates in CESEE and lower interest rates in the Western European home market.

However, the advent of the 2007–08 subprime mortgage crisis and subsequently the euro area's sovereign debt crisis made this business model unsustain-

able. Wholesale markets froze, bank credit default swap (CDS) spreads increased, and investors withdrew money from European banks (see e. g. Chernenko and Sunderam, 2014). Thus, the banks were not able to roll over their short-term liabilities and were faced with funding problems. Banks with a high exposure to the sovereign debt of Greece and other stressed countries were especially affected. With public finances deteriorating, investors perceived these countries as unable to service their public debt, which led to an increase in sovereign CDS spreads and a decrease in the price of sovereign bonds. Banks that had these bonds on their balance sheets had to recognize losses. Due to high leverage and reliance on wholesale markets before the crisis, this recognition had a negative impact on their leverage and equity ratios. In order to calm the markets and restore financial stability, regulators in Western Europe increased regulatory capital requirements, and the preparations for the introduction of Basel III started. Moreover, the European Banking Authority (EBA) conducted stress tests in 2010 and 2011 to examine the ability of banks to endure various market scenarios. Thus, banks had to find a way to increase their capital ratios to meet new, tighter capital standards and to pass the stress tests.

Banks had the following two main options to increase solvency ratios: They could either sell part of the assets on their balance sheet and use the proceeds to increase equity, i. e. deleverage, or they could increase equity by issuing new shares. However, not many investors, except the state, were ready to subscribe for new shares, so banks had to cut down on their assets. This led to the concern that banks might decide to withdraw their funds from CESEE subsidiaries or to shut down their CESEE operations completely. Most CESEE subsidiaries were well capitalized, partly also due to relatively more stringent regulation in the host countries. Also, the crisis in the euro area, CESEE most important trading partner and investor, reduced the growth prospects of the CESEE countries, bringing down demand for credit, too. In some cases, like that of Belgium's KBC Bank N.V., the explicit condition on which state help was granted was that they sell off some CESEE subsidiaries and focus on core European markets.

Policymakers and international financial and development organizations immediately recognized the danger of financial contagion spreading to CESEE through relations between parent banks and subsidiaries. Their response was to organize the "Vienna Initiative,"[2] a joint framework for safeguarding the stability of CESEE. In the first phase, in early 2009, the European Bank for Reconstruction and Development (EBRD), the European Investment Bank (EIB) Group, and the World Bank Group provided over EUR 33 billion in support for the banks and economies of CESEE in 2009 and 2010. Above and beyond this financial support, the Vienna Initiative facilitated the coordination of national support packages and a policy dialogue involving other key stakeholders in the region and conducted in close cooperation with the International Monetary Fund (IMF) and the European Commission. Participation of banks and countries was voluntary, and more details on the setup and the results of the program can be found in De Haas et al. (2014). Later on, the Vienna Initiative focused more on providing a platform for policy

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[2] *See http://vienna-initiative.com.*

coordination and for the exchange of experience and information, as well as at collecting data and monitoring the deleveraging process.

3 Data and estimation strategy

This analysis is based on a unique hand-collected data set on intragroup flows between CESEE subsidiaries and the rest of their respective banking groups. The data were collected from the subsidiaries' annual financial statements. Two variables were constructed to measure intragroup transactions, one that captures nonequity flows, and one that captures equity flows.

Measures of nonequity flows come from the section of the financial statements that reports transactions with related parties. This section includes all claims – loans, deposits, interest receivable and securities – of the subsidiary on the parent and other members of the group (related party assets). In a similar vein, all liabilities – current accounts, loans received and subordinated loans – owed to the parent and fellow subsidiaries are reported (related party liabilities). Subtracting related party assets from related party liabilities results in net related party liabilities. If positive, this measure represents the net amount the subsidiary owes to the rest of the group and if negative, it represents the net claims of the subsidiary on the rest of group. To measure nonequity flows, the author looked at the change in net related party liabilities between two given years. If this change is positive, it means that the subsidiary received more funds from the group than it gave to the parent bank and other subsidiaries. And conversely, if it is negative, the funds were withdrawn from the subsidiary and the subsidiary was a net creditor of the group. To illustrate this point, table 1 presents an excerpt from the financial statement of UniCredit Romania, the Romanian subsidiary of UniCredit. Notes to table 1 contain a calculation of the change in net related party liabilities, i.e. nonequity flows, based on the data from this excerpt. The fact that the change in net related party liabilities was positive shows that the subsidiary received additional funding from the parent group in 2012.

Equity flows consist of transactions that affect equity and are equal to inflows from share issues minus outflows from dividends paid and share repurchases. Data on these transactions may be found in the section of the financial statements that reports changes in equity. It is important to differentiate between equity and nonequity flows because of their different maturity and regulatory implications. Equity does not have a fixed maturity and has an almost unlimited life. Therefore, it is not subject to bank runs and cannot be easily withdrawn, as dividends can be paid out only if the subsidiary has made a profit, the amount of dividends cannot be greater than the amount of profit made, and dividends can only be paid out on certain dates when the profit is declared; moreover, the amount of dividends is limited by the amount of profit made. On the other hand, banking is a strictly regulated activity and banks' lending is constrained by the amount of capital banks possess. Increases in equity lead to a decrease in regulatory constraints and make it possible to expand lending.

The change in nonrelated party assets serves as an outcome variable and a proxy for banks' credit activity. The author defined nonrelated party assets as the difference between total assets and related party assets, so this variable represents the claims the subsidiary has on entities outside its parent company. Most of the related literature uses loan growth as an outcome variable, but this method is not

Table 1

Illustration of the calculation of nonequity flows

The following transactions were carried out with UniCredit Italiano S.p.A, UniCredit Bank Austria AG and their subsidiaries:

	December 31, 2012	December 31, 2011
	RON	*RON*
Derivative assets at fair value through profit and loss	27,295,492	33,210,703
Current accounts and deposits to banks	189,721,240	627,699,734
Loans to customers	27,632,921	22,983,107
Other assets	13,263,837	20,796,322
Total assets (related party assets)	257,913,490	704,689,866
Derivative liabilities at fair value through profit and loss	130,454,608	99,832,352
Derivatives used for hedging	94,235,076	58,812,857
Current accounts	96,377,729	96,829,119
Deposits attracted	2,562,769,544	3,084,839,289
Loans received	7,557,103,200	7,500,461,670
Subordinated liabilities	598,474,296	498,124,892
Other liabilities	28,707,574	14,767,868
Total liabilities (related party liabilities)	11,068,122,027	11,353,668,047

Source: Financial statements for 2012 of UniCredit Țiriac Bank.

Note: Net related party liabilities are equal to RON 10,810,208,537 (=11,068,122,027–257,913,490) in 2012 and to RON 10,648,987,181 (=11,353,668,047–704,689,866) in 2011, so the change in net related party liabilities is RON 161,230,356 (=10,810,208,537– 10,648,987,181).

viable in this setting because loans reported on the balance sheet include loans to the rest of the group, so that one could erroneously conclude that banks are increasing lending while they are actually tunneling funds abroad to the rest of the group. However, nonrelated party assets are a good measure of financial interme-diation activity, as it makes no substantial difference whether a bank issues a loan to a company, buys a company's corporate bonds or directly invests in a company's equity. All these transactions increase financing available to firms. Before running regressions, the author converted all amounts to euro using end-of-year exchange rates and standardized all variables by dividing them by beginning-of-period as-sets. If the purchasing power parity holds, this currency translation should also correct for the effects of inflation on amounts reported in financial statements. The regression equation aims to capture the effect of group funding (equity, non-equity and total flows) on the change in nonrelated party assets of subsidiary i that operates in the country c. It has the following form:

$$\frac{\Delta nonrelated\_party\_assets_{i,c,\,11-09}}{L.assets_{i,c,09}} = \alpha + \beta * \frac{group\_funding_{i,\,c,11-09}}{L.assets_{i,c,09}} + \tag{1}$$
$$+ controls_{ic} + country\_dummy_c + \varepsilon_{i,c}$$

Where:
nonrelated_party_assets = assets – related party assets
group_funding = equity flows or nonequity flows or total flows = equity + non-equity flows
equity_flows = share issues – share repurchases – dividends paid
nonequity flows = Δnet related party liabilities = Δ(related party liabilities – related party assets).
L.assets$_{i,c,09}$ = total assets of subsidiary i in country c as at end-2009

The time period covered is from 2009, when the crisis started to unfold in CESEE, to 2011, when most of the adjustment occurred. Thus, all variables in differences represent the difference between stock amounts as in 2011 and at end-2009, while flow variables, for instance share issues, are the sum of flows during 2010 and 2011. All values were converted to euro using year-end exchange rates, and all variables are standardized by dividing them by the value of bank assets as at end-2009. Converting values to euro makes sense because most parent banks are located in the euro area and because most cross-border lending was denominated in euro. Moreover, as mentioned above, foreign subsidiaries were heavily engaged in foreign currency lending. If values in domestic currencies were used, one would wrongly interpret the effects of inflation and exchange rate depreciation as growth in bank assets. This growth would just be in nominal but not in real terms. On the other hand, converting noneuro-denominated assets to euro might introduce a similar bias if purchasing power parity does not hold, so that the exchange rate depreciation is greater than the inflation differential. This is what probably occurred, as most of the floating CESEE currencies depreciated sharply during the crisis. Thus, converting domestic currency-denominated assets underestimates the growth of those assets. However, a look at subsidiaries' balance sheets shows that the majority of assets are denominated in euro, part is denominated in domestic currencies, and a minor share is denominated in Swiss francs or in U.S. dollars. Therefore, converting values into euro introduces the smallest exchange rate valuation bias.

Controls include the bank's return on assets (the ratio of net profit to assets), the liquidity ratio (the ratio of cash plus balances with the central bank to assets), the solvency ratio (the ratio of equity to assets) and riskiness (the ratio of provisions for loan losses to assets). All these controls are averaged over the 2009 to 2011 period.
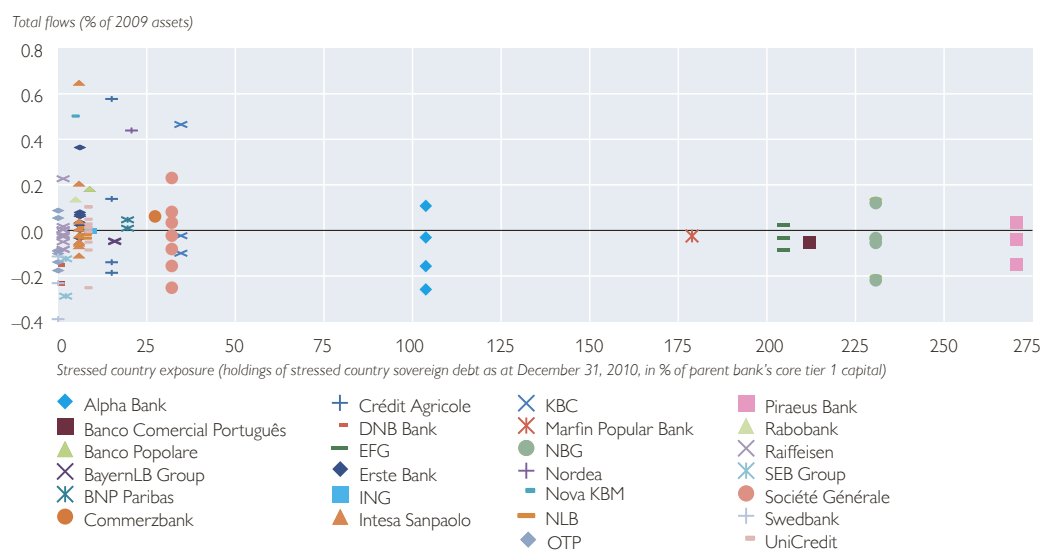
The issue with estimating equation (1) is that the amount of intragroup funding might be correlated with the error term and thus be endogenous because the subsidiary usually gets intragroup funds when it can invest them profitably. This makes establishing the direction of causation difficult. Do nonrelated party assets increase because more intragroup funding is available, or do intragroup funds increase because clients' credit demand is high? To isolate the effect of the demand for and supply of intragroup funds, the author applied an instrumental variable (IV) regression, instrumenting for the supply of intragroup funds. The exposure of parent banks to the euro area sovereign debt crisis served as an instrument. The measure of crisis exposure was constructed by dividing holdings of stressed country (Ireland, Greece, Spain and Portugal) sovereign debt as at December 31, 2010, by the parent bank's core tier 1 capital. Thus, the exposure captures what percentage of the core capital would be lost if the stressed countries defaulted completely on their sovereign debt. The data on sovereign debt exposures are taken from the results of the EBA's EU-wide stress test[3] in 2011. The exposure to stressed countries represents a good instrument because (1) it is correlated with intragroup funding, as parent banks that experienced higher sovereign losses are less able to support their subsidiaries and might even withdraw funds from abroad to cover losses at home, and (2) the decision of the parent on how much to invest in stressed country sovereign debt should not be too strongly correlated with the credit

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[3] *For further details, see http://www.eba.europa.eu/risk-analysis-and-data/eu-wide-stress-testing/2011/results.*

demand of its international subsidiaries. The author allowed for a nonlinear effect of exposure to stressed country sovereign debt and therefore also included the squared term at the first stage of the instrumental variable (IV) estimation.

Chart 1

Scatterplot of stressed country exposure and total flows from 2009 to 2011

Total flows (% of 2009 assets)

Stressed country exposure (holdings of stressed country sovereign debt as at December 31, 2010, in % of parent bank's core tier 1 capital)

◆ Alpha Bank	+ Crédit Agricole	✕ KBC	▪ Piraeus Bank
▪ Banco Comercial Português	▬ DNB Bank	✻ Marfin Popular Bank	▲ Rabobank
▲ Banco Popolare	▬ EFG	● NBG	✕ Raiffeisen
✕ BayernLB Group	◆ Erste Bank	+ Nordea	✻ SEB Group
✻ BNP Paribas	▪ ING	▬ Nova KBM	● Société Générale
● Commerzbank	▲ Intesa Sanpaolo	▬ NLB	+ Swedbank
	◆ OTP		▬ UniCredit

Source: EBA, annual financial statements from 2009 to 2011 of all banks considered in this study.

Table 2

Overview of bank holding groups and countries

	Banking group	Home country	Number of subsidiaries	Host countries
1	Alpha Bank	Greece	4	AL, MK, RS, UA
2	BNP Paribas	France	2	PL , RS
3	Banco Comercial Português	Portugal	1	PL
4	Banco Popolare	Italy	1	HR
5	BayernLB Group	Germany	2	BG, HU
6	Commerzbank	Germany	1	PL
7	Crédit Agricole	France	4	AL, BG, RO, RS
8	DNB Bank	Norway	2	LV, LT
9	EFG	Greece	3	BG, RS, UA
10	Erste Bank	Austria	9	BA, HR, CZ, ME, RO, RS, SK, SI, UA
11	ING	Netherlands	1	PL
12	Intesa Sanpaolo	Italy	9	AL, BA , HR , HU, RO, RS, SK, SI, UA
13	KBC	Belgium	3	CZ, PL, RS
14	Marfin Popular Bank	Cyprus	1	RS
15	NBG	Greece	4	BG, MK , RO , RS
16	Nordea	Sweden	1	PL
17	Nova KBM	Slovenia	1	RS
18	NLB	Slovenia	3	BA , MK, RS
19	OTP	Hungary	7	BG, HR, ME, RO, RS, SK, UA
20	Piraeus Bank	Greece	3	AL, BG, RS
21	Rabobank	Netherlands	1	PL
22	Raiffeisen	Austria	10	AL, BA, BG, HR, CZ, HU, KS, RO, SK, SI
23	SEB Group	Sweden	2	EE, LV
24	Société Générale	France	8	AL, BG, CZ, MK, ME , RO, RS, SI
25	Swedbank	Sweden	3	EE, LV, LT
26	UniCredit	Italy	11	BA, BG, HR, CZ, LV, PL, RO, RS, SK, SI, UA

Source: Annual financial statements from 2009 to 2012 of all banks considered in this study, author's calculations.

Note: The countries in column 4 are cited using ISO codes.

Table 3

Summary statistics

	Mean	Median	Standard deviation	Count
Assets2011 (EUR thousands)	4,796,813	1,897,812	6,783,208	97
Equity2011 (EUR thousands)	530,111	248,844	728,404	97
Net_related_party_liabilities 2011 (EUR thousands)	527,594	150,682	1,020,609	97
Δnon_related_party_assets 2011–2009 (% of assets2009)	8.22	6.12	23.95	97
roa_average 2011–2009 (%)	−0.11	0.51	1.83	97
liquidity_average 2011–2009 (%)	11.93	10.91	8.47	97
solvency_average 2011–2009 (%)	12.75	11.52	7.14	97
riskiness_average 2011–2009 (%)	5.11	4.16	3.40	97
total_flows 2011–2009 (% of assets2009)	0.58	−1.59	17.00	97
equity_flows 2011–2009 (% of assets2009)	2.00	0.00	5.01	97
non_equity_flows 2011–2009 (% of assets2009)	−1.42	−2.04	15.06	97
Stressed countries (% of core tier 1 capital)	40.79	7.68	74.57	97

Source: Annual financial statements from 2009 to 2012 of all banks considered in this study, EBA.

Chart 1 is a scatterplot of stressed country exposure and of total flows for all subsidiaries in the sample. The chart shows that Greek banks and one Portuguese bank have the largest stressed country exposure. This is as expected, because it is natural that banks invest mostly in sovereign bonds of their home country. Conversely, Swedbank, which is headquartered in Sweden, had no stressed country exposure at all, but still removed substantial funds from its Baltic subsidiary, probably due to the financial crisis that hit the Baltics.

The final data set consists of 26 multinational banking groups that operate a total of 97 subsidiaries in 19 CESEE countries. Table 2 shows an overview of the bank holding groups and countries. The Italian bank UniCredit is most heavily represented in the sample (11 subsidiaries), followed by the Austrian Raiffeisen banking group (10 subsidiaries) and Austria's Erste Bank (9 subsidiaries). The country with the largest number of parent banks is Greece, but each of these parent banks has only 3 or 4 subsidiaries, typically in Balkan countries. Scandinavian banks, in turn, do business mostly in the Baltic countries.

Table 3 shows summary statistics. Subsidiaries of foreign banks in CESEE relied heavily on internal capital markets, as these countries' capital markets were

Chart 2

Histogram of equity and nonequity flows

Frequency (number of banks)
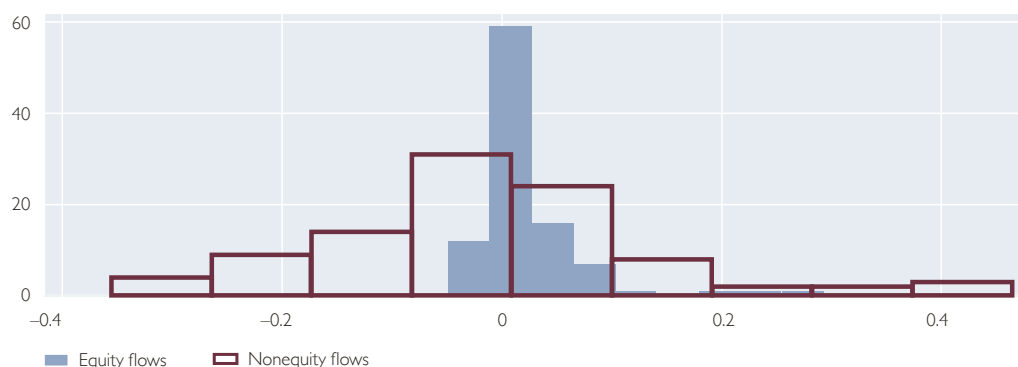
Equity flows Nonequity flows

Source: Annual financial statements from 2009 to 2012 of all banks considered in this study.

underdeveloped and domestic savings were small. On average, net related party liabilities amounted to 10% of subsidiaries' total assets. Most of the subsidiaries did not receive any equity transfers, as the median value of equity transfers is zero, but those that issued new shares did so in significant amounts, pushing the mean to 2% of 2009 total assets. On average, nonequity flows were negative in the 2009 to 2011 period, with the mean equal to –1.42 % of subsidiaries' 2009 total assets. Thus, subsidiaries were net creditors for the rest of the group in this period. Chart 2 presents a histogram of equity and nonequity flows. The distribution of equity flows is centered around zero, which is the mode and the median, and has very slim tails. Nonequity flows are more evenly distributed over the entire range from –35% to 45%. Despite the crisis, subsidiaries expanded their balance sheet, as nonrelated party assets increased by 8.22 % on average.

4 Estimation results

Table 4 presents the estimation results of the impact of parent bank funding on the asset growth of subsidiaries. The coefficient on intragroup flows is positive, greater than 1 and statistically significant in all specifications. A 1 percentage point increase in total flows, as measured by the share of total flows in end-2009 assets, led to a 1.17 percentage point increase in nonrelated party assets over the 2009 to 2011 period, as measured by the share of total flows in end-2009 assets. The effect of equity flows is higher and equals 2.3 percentage points, while the impact of non-equity flows is 1.2 percentage points. The higher coefficient on equity is consistent with expectations and the reasoning in the previous section.[4] An increase in equity relaxes the regulatory constraints of the subsidiary, enhances depositors' confidence, making it easier for the subsidiary to attract deposits and expand lending.

After instrumenting for intragroup flows, the estimated coefficients further increase in absolute value to 1.34 percentage points for total flows, 6.14 percentage points for equity flows and 1.71 percentage points for nonequity flows. The difference in coefficient estimates, which is especially pronounced for equity flows, shows that ordinary least squares (OLS) estimates underestimated the effect of intragroup flows.

First-stage results shown in columns 2, 5 and 8 of table 4 show that stressed country exposure is an important determinant of intragroup funding, as the coefficients on stressed countries and squared-term stressed countries$^{\wedge 2}$ are statistically significant. The value the of the F-test of excluded instruments of 14.96 suggests that stressed country exposure is a strong instrument for total flows, as it has a value greater than 10 (Stock, Wright and Yogo, 2002). However, specifications with equity and nonequity flows reject the hypothesis that stressed countries and stressed countries$^{\wedge 2}$ are strong instruments, as the value of the F-test of excluded instruments is less than 10. Nevertheless, one needs to bear in mind that this test of excluded instruments was derived using asymptotic approximations and that the estimation in this study was conducted on a sample size of just 97 observations. Average marginal effects, assessed at the mean, of stressed country exposure are –0.22, –0.04 and –0.17 for total, equity and nonequity flows, respectively. Negative values of the coefficient estimate on stressed countries confirm

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[4] *In a statistical sense, a higher coefficient on equity flows is also due to a much lower variation in equity flows, as most of the distribution is concentrated around 0 (chart 2).*

Chart 3

Predicted values of total flows for various levels of stressed country exposure

Prediction of total flows, at means

Stressed country exposure
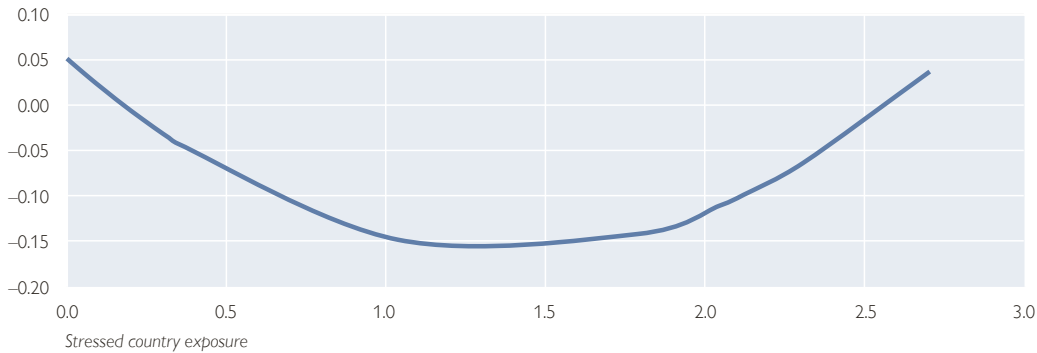
Source: Author's calculations.

Note: Prediction of total flows for various levels of stressed country exposure using estimates from the first stage regression (equation 2 in table 4).
All other variables that enter the equation are at their means.

Table 4

Estimation results

	Group funding: total flows			Group funding: equity flows			Group funding: nonequity flows		
	OLS	FS	IV	OLS	FS	IV	OLS	FS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stressed countries		−0.310***			−0.068**			−0.242**	
		(0.100)			(0.030)			(0.089)	
Stressed countries		0.113***			0.024**			0.089**	
		(0.039)			(0.011)			(0.035)	
Total flows	1.170***		1.344***						
	(0.084)		(0.320)						
Equity flows				2.303***		6.139**			
				(0.773)		(2.345)			
Nonequity flows							1.199***		1.705***
							(0.099)		(0.503)
ROA	3.021***	−5.205***	3.752**	3.517	−2.558***	12.540**	0.322	−2.647*	1.261
	(0.728)	(1.511)	(1.409)	(2.884)	(0.444)	(5.298)	(1.077)	(1.432)	(1.199)
Liquidity	−0.181	0.825**	−0.310	0.412	0.140	−0.040	−0.061	0.685*	−0.376
	(0.302)	(0.399)	(0.416)	(0.576)	(0.186)	(0.957)	(0.351)	(0.345)	(0.481)
Solvency	−0.303	0.463**	−0.345*	−0.141	0.105	−0.349	−0.245	0.358**	−0.341*
	(0.180)	(0.200)	(0.187)	(0.290)	(0.075)	(0.408)	(0.201)	(0.164)	(0.195)
Riskiness	−1.509*	−4.093***	−0.948	−3.759**	−0.843***	−1.215	−2.211**	−3.250***	−0.913
	(0.882)	(0.728)	(1.395)	(1.660)	(0.245)	(1.644)	(0.947)	(0.756)	(1.688)
Constant	0.293***	−0.058	0.301***	0.156	0.031	0.016	0.338***	−0.089	0.380***
	(0.089)	(0.064)	(0.088)	(0.138)	(0.024)	(0.191)	(0.091)	(0.077)	(0.094)
Country dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	97	97	97	97	97	97	97	97	97
R-squared	0.809	0.583	0.802	0.568	0.655	0.320	0.771	0.533	0.719

Source: Author's calculations.

Note: The table contains the regression results of estimating equation (1). In equations (1), (3), (4), (6), (7) and (9), the dependent variable is the change in nonrelated party assets from 2009 to 2011 divided by total assets at end-2009. Equations (1), (4) and (7) present ordinary least squares (OLS) estimates of the impact of total, equity and nonequity flows on the change in nonrelated party assets, respectively. Equations (3), (6) and (9) present estimates of the effects after instrumenting for intragroup flows with stressed country exposure. Equations (2), (5) and (8) show the first stage (FS) of instrumental variable (IV) estimation; hence, the dependent variable is one of the endogenous internal flows: total flows in equation (2), equity flows in equation (5) and nonequity flows in equation (8). Country dummies are included. Robust standard errors clustered by parent bank are given in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

that parent banks with higher sovereign exposure did indeed curtail intragroup funding to their international subsidiaries. A 10 percentage point increase in the sovereign exposure of stressed countries, as measured by the share in the tier 1 capital ratio, on average leads to a decrease of 2.2 percentage points in total flows, 0.4 percentage points in equity flows and 1.7 percentage points in nonequity flows. Given that the stressed country exposure varies widely from 0 in case of Swedbank to 270 in case of Piraeus Bank, this effect is economically significant as well. Chart 3 shows predicted values of total flows for various levels of stressed country exposure, while replacing all other regression variables with their mean values. We see that the relation between exposure and the withdrawal of funds is nonlinear, as posited by equation (1) and as can be deduced from chart 1. The issue here is that some banks, like Swedbank, deleveraged heavily although they did not have any exposure to stressed countries, while Greek banks were substantially hit by the shock but still kept most of their CESEE exposure. However, even if one imposes a linear instead of a nonlinear model,[5] the effect on stressed country exposure is still negative and statistically significant.

4.1 Discussion of estimates on control variables

Coefficient estimates on control variables show that there is a strong association between the performance of the subsidiary and intragroup flows. Unfortunately, in this setting one can only examine correlations, so it remains unclear whether the performance of the subsidiary is the determinant of intragroup flows or whether the increase in intragroup funds leads to better performance ratios of the subsidiary.

Table 4 shows that less profitable, more liquid, more solvent and less risky subsidiaries received more intragroup funds. This relation holds for all kinds of flows: equity, nonequity and total. A 1 percentage point increase in the return on assets is associated with a 5.2 percentage point decrease of total flows received in the period from 2009 to 2011. An explanation for this relation might be that more profitable subsidiaries generate more internal funds and thus have less of a need for funds from the parent group. Conversely, subsidiaries with more risky portfolios received fewer intragroup funds. A 1 percentage point increase in the ratio of loan loss provisions to total assets is associated with a 4 percentage point decrease in total flows. This result suggests that parent banks were cautious in providing funds to more risky subsidiaries. An alternative explanation is that subsidiaries with a bad credit portfolio have less of a need for funds, as they do not have good credit growth opportunities.

The results also provide some weak evidence that more profitable subsidiaries experienced higher growth in nonrelated party assets. Thus, bank growth seems to have been profitable, and subsidiaries did not have to sacrifice profitability in order to grow faster. Surprisingly, riskier subsidiaries grew more slowly. One might expect that the easing of credit standards and the provision of loans to subprime borrowers leads to faster asset growth. However, in this case, it seems that the negative effects of the recognition of losses and high regulatory requirements for loan loss provisions outweighed the positive effects of more loans on the balance sheet.

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[5] *This is part of the robustness checks described in section 4.2 below.*

4.2 Robustness checks

As a robustness check, specification (1) was estimated with year-on-year changes for 2010/09, 2011/10 and 2012/11. Furthermore, in the first stage of IV estimation, the square term was dropped and just the linear impact of stressed country exposure was allowed for. Table 5 presents the estimation results for the impact of total flows on the change in nonrelated party assets. As expected, the coefficients on total flows are positive across all specifications. IV estimates are higher than OLS estimates, but statistically significant just in 2010, suggesting that OLS estimates underestimated the effect of intragroup funding, like in the 2009 to 2011 results reported above. Moreover, OLS coefficient estimates are lower than 1, which implies that intragroup funds do not have a big multiplication effect. On the other hand, IV estimates are greater than 1, which suggests that there is complementarity between intragroup and external funds, so an inflow of EUR 1 of additional intragroup funds leads to an increase of more than EUR 1 in assets. The coefficient on stressed country exposure is negative in all specifications, but statistically significant just in 2010 and 2012. Thus, it seems that negatively affected parent banks withdrew most of the funds from subsidiaries in these two years. This is consistent with the assumption that budgets and plans for the next year are made at year-end and in line with the timing of negative market reactions: They were greatest in autumn 2009 and in summer 2011.

Table 5

Robustness checks using a regression specification with one-year total flows and linear effect of stressed country exposure

	2010			2011			2012		
	OLS	FS	IV	OLS	FS	IV	OLS	FS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stressed countries		−0.031***			−0.003			−0.015**	
		(0.011)			(0.011)			(0.007)	
Total flows	0.720***		1.315**	0.776***		10.947	0.460**		1.207
	(0.129)		(0.514)	(0.146)		(34.777)	(0.178)		(1.002)
ROA	−0.283	−2.613**	1.341	2.057**	−0.925	11.283	0.747	−0.403	0.969
	(0.650)	(1.123)	(1.321)	(0.783)	(0.914)	(29.809)	(0.483)	(0.685)	(0.898)
Liquidity	0.077	0.249	−0.047	0.118	0.385	−3.765	0.223	−0.324	0.484
	(0.260)	(0.314)	(0.368)	(0.193)	(0.236)	(13.816)	(0.236)	(0.242)	(0.638)
Solvency	−0.044	0.155	−0.107	−0.128	0.132	−1.407	0.189	0.002	0.228
	(0.132)	(0.165)	(0.144)	(0.150)	(0.145)	(4.424)	(0.130)	(0.158)	(0.206)
Riskiness	−1.889***	−1.695**	−0.878	−0.729	−0.734**	6.679	0.118	−0.536	0.482
	(0.320)	(0.756)	(1.002)	(0.524)	(0.344)	(24.771)	(0.369)	(0.633)	(1.037)
Constant	0.147***	−0.063	0.156**	0.093	−0.077	0.537	−0.011	0.023	−0.064
	(0.049)	(0.082)	(0.063)	(0.059)	(0.048)	(1.608)	(0.054)	(0.077)	(0.139)
Country dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	97	97	97	102	102	102	100	100	100
R-squared	0.649	0.433	0.478	0.663	0.377	.	0.445	0.277	0.218

Source: Author's calculations.

Note: The table contains the regression results of estimating the effect of total flows on the change in nonrelated party assets in a one-year period. The dependent variable is the change in nonrelated party assets between 2010/09 (equations (1) and (3)), 2011/10 (equations (4) and (6)) and 2012/11 (equations (7) and (9)) standardized by the division by total assets at end-2009, end-2010 and end-2011. Equations (1), (4) and (7) are ordinary least squares (OLS) estimates. Equations (3), (6) and (9) present estimates after instrumenting for total flows with stressed country sovereign exposure in a linear way, i.e. without the squared term. Equations (2), (5) and (8) show the first stage (FS) of instrumental variable (IV) estimation, hence the dependent variable is total flows in 2010, 2011 and 2012, respectively. Robust standard errors clustered by parent bank are given in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

5 Conclusion

The analysis presented in this paper provides evidence of the importance of group funding in financing the asset growth of the subsidiaries of foreign banks that operate in CESEE. By distinguishing between equity and nonequity flows, the study shows that equity flows are more beneficial for the growth of the subsidiary than nonequity flows. Equity flows have a higher multiplier, and changes in equity flows are associated with higher growth in nonrelated party assets than changes of the same size in nonequity flows. However, in both cases, the multiplier is greater than 1, which implies that there is some complementarity between intragroup and external funds. It is easier for the subsidiary to attract external funds after it has received intragroup funds. By contrast, subsidiaries that are faced with the withdrawal of internal funds have difficulties in attracting external funds to compensate for this withdrawal. These results hold after instrumenting for group funding with the exposure of the parent bank to the sovereign debt of stressed countries. The first stage of the IV estimation shows that parent banks that were more exposed to the sovereign debt of stressed countries withdrew more funds from their CESEE subsidiaries than banks that had fewer stressed countries' sovereign bonds on their balance sheet. Thus, there is some evidence that the internal capital markets of foreign banks were indeed a transmission channel of the euro area sovereign debt crisis shock from Western Europe to CESEE.

The study has some limitations that could be overcome by using more detailed data on intragroup flows and the financing activities of subsidiaries. First, the analysis in this paper was based on yearly intragroup flows. However, many flows between parents and subsidiaries occur at intervals of less than one year or even daily. Next, the focus of the paper was on the balance sheet exposure of the subsidiary and the rest of the group. However, some transactions, like certain financial derivatives and the provision of credit guarantees and commitments, represent off-balance sheet exposures, whose effects are not accounted for in this paper. Last but not least, with matched data on lending between subsidiaries and firms, one could control neatly for credit demand, like Schnabl (2012) did. Unfortunately, due to the proprietary and confidential nature of the intragroup flow data and the need to gather data from several national credit registries, it is very unlikely that this kind of data would be made available for future research.

The results of the presented analysis have important policy implications. Even in 2014, five years after this crisis, most CESEE countries were still in recession. Although this problem is due partly to lower demand for CESEE exports in the West, weak public finances and the lack of structural reforms, one cannot deny that weak banking sectors are responsible as well. After years of credit expansion financed by inflows from the West, banks are now faced with high ratios of non-performing loans as well as difficulties in obtaining funding from abroad, which made them retrench lending to sectors that needed it most. The lion's share of banks' portfolios consists of loans to governments and to big and established companies rather than to small and medium-sized enterprises.

With more coordination and resolute action by policymakers, a similarly hard landing could be avoided in the future. For example, regulators could limit the amount of funds a subsidiary can get from the group and in this way force the subsidiary to rely more on local funds. Alternatively, one could prescribe a minimum duration of the liabilities received from the parent to prevent sudden

outflows of parent funds. The drawback of these policies is that although they may prevent recession, they prevent expansion as well. One cannot deny that CESEE was growing quite fast during the precrisis period and that this growth was fueled by growth of credit financed from abroad. Whether the precrisis growth was enough to compensate for the postcrisis fall and whether the foreign banks did more good than harm remains a topic to be covered by future research.

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