

Shocks Abroad, Pain at Home?

Bank-Firm Level Evidence on the International Transmission of Financial Shocks

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Abstract

We study the international transmission of shocks from the banking to the real sector during the 2008-09 financial crisis. For identification, we use matched bank-firm level data, including many small and medium-sized firms, in Eastern Europe and Central Asia. Internationally-borrowing domestic and foreign-owned banks contract their credit more during the crisis than domestic banks that are funded only locally. Firms that are dependent on credit and at the same time have a relationship with an internationally-borrowing domestic or a foreign bank (as compared to a locally-funded domestic bank) suffer more in their financing and real performance. For credit-independent firms there are no differential effects. Single-bank-relationship, small or intangible firms suffer most. Our findings suggest that globalization may have intensified the international transmission of financial shocks with substantial real consequences.

Keywords: international transmission, firm real effects, foreign banks, international wholesale funding, credit shock.

JEL: G01, G21, F23, F36.

1. INTRODUCTION

The U.S. and Western Europe suffered their worst banking crisis since the 1930s with global wholesale liquidity evaporating and Western banks suffering important losses. The crisis followed a period in which the globalization of the financial system dramatically deepened. European banks, in particular, extended their operations in the international wholesale market and increased their presence in many countries through the establishment of a foreign branch or subsidiary. A crucial question on the academic and policy agendas therefore is whether the increased dependency on international wholesale funding and the increased presence of foreign banks intensified the international transmission of financial shocks across national borders with negative implications for the real economy.¹

The existing evidence, which almost invariably compares credit provided by countries or by banks with differential exposures to a shock, suggests that some international transmission through the banking sector may indeed take place.² However, the level of aggregation at which this international transmission is being analyzed is potentially problematic. Banks that rely on international wholesale funding or that are foreign owned may lend to different types of firms,³ in which case measuring the correct overall impact of a shock on the real economy inevitably requires accounting for firm fundamentals. In addition, bank-level analyses (and country-level analyses even more so) can be misleading as aggregate volumes are driven by

¹ See Kalemli-Ozcan, Papaioannou and Peydró (2010) for the determinants of banking globalization, especially in Europe, and Claessens and van Horen (2013a) for an overview of trends in foreign bank ownership. Kalemli-Ozcan, Papaioannou and Peydró (2013) study the international banking data from the Bank for International Settlements (BIS) and document a lower correlation in business cycles across countries following banking sector globalization in the period 1978-2007.

² See the seminal work by Peek and Rosengren (1997) and Peek and Rosengren (2000). Cetorelli and Goldberg (2011a) use BIS data to provide evidence of international contagion through the banking sector during the recent crisis. Several papers find that during the global financial crisis foreign subsidiaries (under certain circumstances) reduced their credit more compared to domestic banks (Claessens and van Horen (2013b); Cull and Martinez Peria (2012); de Haas and van Lelyveld (2013)). Popov and Udell (2012) find that firms in the vicinity of distressed foreign banks became more credit constrained during the recent crisis (see also Clarke, Cull and Kisunko (2012)).

³ For empirical evidence on differential lending by banks with high and low liquidity and capital see Jiménez, Ongena, Peydró and Saurina (2012). For evidence on differential lending by domestic versus foreign banks, see Mian (2006), Berger, Klapper, Martinez Peria and Zaidi (2008), Bruno and Hauswald (2013), Giannetti and Ongena (2009) and Gormley (2010) for example.

changes in lending to large firms, hiding the fact that the credit crunch might only affect small and medium-sized enterprises (SMEs).

Some recent papers have taken initial steps to overcome these problems. Using syndicated loan data, de Haas and van Horen (2012) and Giannetti and Laeven (2012) find that funding constraints lead banks to reduce their cross-border lending. De Haas and Van Horen (2013) find, in addition, that after the collapse of Lehman Brothers banks readjusted their foreign portfolios based on the closeness of the borrower to the bank. As these papers use loan-level data, they can account for country-, bank- and firm-heterogeneity. Yet, these studies focus on global syndicated loans only. Such loans are granted uniquely by ever-changing syndicates of the largest international banks to the largest firms.⁴

Papers using credit registers from a single country find evidence of the international transmission of shocks through the retail banking sector. Puri, Rocholl and Steffen (2011) for example study domestic lending by German savings banks to households during the period 2006 through 2008, and find that banks with substantial (though indirect) U.S. subprime exposures decreased lending more. Schnabl (2012) studies changes in the availability of bank credit to Peruvian firms resulting from the transmission of the 1998 Russian default. He finds that the impact of the negative liquidity shock is strongest for domestically-owned banks that borrow internationally, intermediate for foreign-owned banks, and weakest for domestically-owned but locally-funded banks.

While these papers provide convincing evidence that banks transmit financial shocks across markets, they can say little about how these shocks impact real economic activity as

⁴ Similarly, Claessens, Tong and Wei (2011) study large, publicly-listed companies and find that the global financial crisis spread through trade and business cycle channels with negative consequences for firm performance.

firm-level information is restricted to general firm characteristics without any balance sheet information. Taking this additional step is important, however, as a reduction in bank lending does not necessarily have to have any real effects if firms have ways to substitute bank credit for other forms of financing.

Our paper uniquely builds on and extends these various strands of the literature by studying the impact of the international transmission of financial shocks on the financing and performance of firms, especially SMEs, according to their dependency on credit. We examine the transmission of the 2008 crisis shock through two key channels stemming from financial globalization: The use of international wholesale funding and foreign bank ownership. In particular we aim to answer the following questions: Does the global financial crisis spread through international bank linkages? In particular, do domestic banks that rely on international wholesale funding cut credit to firms when this market dries up? And do financial problems in international banks propagate through their internal capital markets to subsidiaries contracting business lending in domestic markets? Are there consequently real effects for the domestic borrowers? And are there heterogeneous effects across different types of firms? So, ultimately, the question this paper aims to answer: Is a globalized banking sector a shock absorber or a shock propagator, and what are the real effects of the transmitted shocks?

To answer these questions, we use unique, detailed, matched bank-firm-level data of 256 different banks that have relationships with 45,660 firms located across 14 countries in Eastern Europe and Central Asia. This region is especially suitable for identification as banks in this region were initially not affected by the Western banking crisis, foreign bank presence

in this region is large and many domestic banks used the international wholesale market to finance a credit boom at home in the years leading up to the crisis.

Our identification strategy relies on exploiting variation before the crisis at both the bank and firm level. First, we identify three types of banks: (1) Domestic banks that are funded only locally (henceforth, locally-funded domestic banks), (2) domestic banks that borrow on the international wholesale market (henceforth, internationally-borrowing domestic banks), and (3) foreign-owned banks (henceforth, foreign banks). We argue that the global financial crisis affected mostly the internationally-borrowing domestic banks and foreign banks, thus potentially leading to a (relative) reduction in their supply of credit.

Next, we differentiate between firms that are dependent on credit and those that are not. The first group includes firms that borrowed between 2005 and 2007 and the second group includes firms that did not borrow,⁵ i.e., that only relied on a bank for a checking or a savings account for example. We assume that firms with outstanding credit are more dependent on their bank for financing and therefore should be more affected by any negative shock hitting their bank. For firms without outstanding credit, a shock to their bank should have no (or a much more subdued) impact as these firms are simply depositing funds in the bank. Thus, by comparing the performance of “credit-dependent” and “credit-independent” firms linked to the three different types of banks, and controlling for firm observable characteristics, we can

⁵ *À la* financial-dependency in Rajan and Zingales (1998). Credit-dependency in our case is firm-specific and time-predetermined (i.e., during normal times before the financial crisis hits), while in their case it is industry-specific and technology-determined. Santos and Winton (2008) and Chava and Purnanandam (2011) compare bank-dependent borrowers that have no access to public debt markets with borrowers that do have access to these markets. Hence the latter two studies deal with bank-dependency on the opposite side of the “no access – bank – public market” financing spectrum (Berger and Udell (1993), Greenbaum and Emmons (1998)). Chava and Purnanandam (2011) in particular study large, publicly listed firms in the U.S. and find that, following the 1998 Russian crisis, firms that relied primarily on banks for capital suffered larger valuation losses, stronger decline in capital expenditure and larger drop in profitability (compared to firms that had access to private-debt markets).

provide clear and convincing evidence on the occurrence of a credit contraction caused by the international transmission of financial shocks and on its impact on the real economy.

To further understand the role of credit supply-side frictions we continue by exploiting the heterogeneity of the firms in our sample. We rely on corporate finance theory to distinguish firms according to their ability to mitigate a contraction in credit by their bank. For example, credit-dependent firms with multiple bank relationships, that are large or have more tangible assets should be less affected by a shock hitting their main bank, either by relying on their other existing bank relationships or by having better opportunities to establish new ones and obtain financing (as they are more transparent or have more tangible assets to pledge as collateral).

To execute this analysis we link five databases. We start with the comprehensive world-wide bank-ownership dataset compiled by *Claessens and van Horen (2013a)* which distinguishes between domestic and foreign-owned banks. To determine whether a domestic bank borrowed from the international wholesale markets we use information on bond issuance and syndicated lending from *Dealogic*. Bank balance sheet information is taken from *Bankscope*, a database that records world-wide bank balance sheet data. Next, in order to make the connection between banks and firms, we use *Kompass* which records bank-firm connections. Finally, we match this information to *Amadeus* which records balance sheet information on European non-financial firms. Both *Kompass* and *Amadeus* record information for both large and, crucial for our purpose, medium and small firms. Furthermore, the information in *Amadeus* not only allows us to study the real effects of international transmission, but also enables us to control for many firm-level fundamentals that can impact the demand for credit during a crisis.

First, we analyze the bank-level data and find that, compared to domestic banks that are funded only locally, internationally-borrowing domestic and foreign banks contract their lending more during the crisis. However, this result could be driven by these banks lending to firms with a lower demand for credit during the crisis and, therefore, does not provide clear and convincing evidence that transmission took place. Furthermore, the aggregate nature of the data implies that results are driven by adjustments in lending to large firms, potentially hiding the fact that especially credit to SMEs is contracting more.

However, our firm-level regressions confirm the occurrence of an international transmission of financial shocks. Controlling for a large number of firm characteristics, we find that credit-dependent firms with a (lending) relationship with these internationally-borrowing domestic or foreign banks suffer on average worse financial and real effects than those credit-dependent firm linked to locally-funded banks. Specifically, they experience a larger drop in short-term debt, see their profits deteriorate more, and experience a sharper reduction in their total assets and operational revenue growth between 2008 and 2009. For credit-independent firms we do not find a differential impact with respect to the type of bank the firm has a (deposit) relationship with. Moreover, we find that the adverse shock to credit has a much stronger impact on firms with a single bank relationship, that are smaller, or that have less tangible assets they can pledge as collateral.

In sum, we uncover channels of international transmission through domestic banks' reliance on international wholesale funding and through foreign ownership of local banks. Both channels have a significant impact on the real economy. Our main contribution lies in analyzing the real effects associated with the international transmission of financial shocks with matched bank-firm level data focusing on both large firms and SMEs for a sizeable

number of countries, whereas other studies rely on either country- or bank-level data, study (syndicated) lending to large firms, or focus on one particular country without studying the real effects of the shock transmission. The additional step we take is not only crucial for identification purposes, but it allows us to document that there are significant real effects associated with the international transmission of financial shocks and that these effects are especially strong for certain types of firms.

The remainder of this paper is organized as follows. In the next section we describe our identification strategy in more detail. Section 3 describes how we construct our database. Section 4 presents the empirical results at the bank level and Section 5 presents the empirical results at the firm level. Section 6 concludes.

2. IDENTIFICATION

2.1. *International Transmission of Financial Shocks*

We aim to investigate whether the globalization of the financial sector has exacerbated the international transmission of financial shocks and how this affects firm financing and performance and therefore real economic activity. Specifically, we are interested in transmission through two key channels: The use of international wholesale funding and foreign bank ownership.

For this purpose, studying the global financial crisis is particularly useful as it has two important distinguishing features. First, the default of Lehman Brothers on September 15, 2008, led to a collapse of the international interbank market directly affecting the funding position of banks dependent on international wholesale markets. In case these banks were not able to find alternative (local) sources of funding, the collapse of the international interbank

market could negatively affect their domestic credit provisioning, providing a channel through which the crisis could be transmitted to countries initially not affected by the crisis. Indeed, evidence of existence of this channel of transmission is provided by Schnabl (2012) who shows that the reduction in interbank lending resulting from the 1998 Russian default caused Peruvian banks dependent on this market to reduce credit to Peruvian firms.

Second, especially large Western banks with numerous foreign affiliates were affected by the crisis. If parent banks when faced with capital or funding shocks at home reduced lending to their foreign affiliates, this could upset the funding position of these affiliates with negative consequences for their local lending, proving a channel of transmission. The seminal studies of Peek and Rosengren (1997) and Peek and Rosengren (2000) show indeed that (funding) shocks to parent banks negatively affect lending by their foreign affiliates. Therefore, also foreign ownership can function as a transmission channel.⁶

To test the strength of both transmission channels we focus on three groups of banks: Domestic banks that were funded only locally, domestic banks that also borrowed from the international wholesale market and foreign-owned banks. The first group is our benchmark group. If the global financial crisis was transmitted through the channels of international

⁶ At the same time it is possible that parent banks when faced with reduced economic prospects in their home country allocate more funds to their subsidiaries in growth markets. This could reduce the magnitude of the transmission channel through foreign ownership. In addition, not all foreign affiliates may be affected equally when the parent bank faces a shock. Global banks actively manage their inter-office positions and, when faced with a funding shock, they tend to reallocate capital within the holding towards “important” affiliates (Cetorelli and Goldberg (2011b)). Moreover, locally-funded affiliates are less likely affected as they rely less on funding from their parent bank (Claessens and van Horen (2013b); Cull and Martinez Peria (2012); de Haas and van Lelyveld (2013)). We leave this issue for future research.

wholesale funding or foreign ownership, the internationally-borrowing domestic and foreign banks should curtail credit more compared to locally-funded domestic banks.⁷

2.2. *Credit-Dependent and Credit-Independent Firms*

For several reasons our identification strategy does not rely on studying the behavior of *only* the banks. First, to the extent that different banks lend to different firms that are differentially affected by the crisis, the variation in credit across the three types of banks defined-earlier can be driven by demand. Second, the aggregate nature of banks' balance sheets implies that any changes in credit are driven by adjustments in lending to large firms, potentially hiding the fact that especially credit to SMEs is contracting. Third, and even more important, studying the credit contraction of banks alone cannot provide any insights in the real effects of international transmission of financial shocks as such shocks only affect real outcomes if there are credit market imperfections at both the bank and the firm level (Bernanke and Blinder (1988); Bernanke and Gertler (1989); Holmstrom and Tirole (1997); Stein (1998)).

To isolate demand (borrower fundamentals) from the credit supply shock (credit availability), differentiate between different types of firms, and at the same time study the real effects of international transmission, we use firm balance sheet information and exploit the idea that – if financial frictions exist – the financial and real performance of a firm dependent on credit should be sensitive to shocks experienced by its suppliers of credit. At the same time, similar firms that are not dependent on bank credit (and only use a bank for a checking

⁷ It is possible that the liquidity shock faced by internationally-borrowing domestic banks led these banks to reduce interbank lending to locally-funded domestic banks, with direct negative consequences for their lending as well, making our reported estimates conservative.

or savings account) should not be affected by such shocks.⁸ Therefore, if international transmission took place through the channel of international wholesale funding or foreign ownership, then we should, controlling for other firm fundamentals, find that credit-dependent firms with a relationship with an internationally-borrowing domestic or foreign bank should be disproportionately affected in terms of their financing and real performance compared to firms with a relationship with a locally-funded domestic bank, while we should not find a differential impact for firms that have a (deposit) relationship with these two types of banks, but do not depend on credit.

Comparing the financial and real performance of these different types of firms provides the core of our identification strategy. However, to deepen our understanding of the existence of financial frictions as well as to strengthen our identification, we extend our analysis by further differentiating between firms according to their ability to mitigate a credit contraction by their bank. For this we rely on findings in the corporate finance theory.

A first characteristic that potentially affects a firm's ability to mitigate its bank's credit contraction is the number of banks with whom the firm has a relationship. Dell'Ariccia and Marquez (2006) show that switching to new banks during crises is difficult as adverse selection problems are the most severe then. Therefore, firms that have established relationships with multiple banks pre-crisis are more likely to be able to switch when their main bank is curtailing credit and thus will be less likely affected by a shock affecting their

⁸ A strong and valuable bank relationship can exist without (much) credit (Ongena and Smith (2000)). Indeed, the breadth of bank services used by a firm is a measure of the strength of the relationship, in terms of its scope (Boot and Thakor (2000)). The array of classic banking services beyond credit comprises deposits, the management of bank balances and temporary overdrafts, foreign exchange management, and the brokering of many other financial activities.

main bank (see also Sharpe (1990), von Thadden (2004), Detragiache, Garella and Guiso (2000), among others).

A second potential influential firm characteristic is its size. It is well established in the corporate finance literature that large firms have more access to alternative sources of external finance (e.g., bond finance) compared to small firms. Furthermore, it might be easier for large firms, which tend to be less opaque, to switch to another, less funding constraint, bank. Therefore financial frictions are likely less significant for large firms.

Finally, the availability of tangible assets that can be used as collateral can also be an important mitigating factor. When information asymmetries between lenders and borrowers lead to credit rationing, borrowers with higher collateral can obtain funds more easily (Bester (1985)). Collateral can also serve as a mitigating device for moral hazard problems (Tirole (2006)). This suggest that credit-dependent firms with enough assets to pledge as collateral will be less affected by a credit contraction, either because their (funding-constrained) bank is more willing to provide them with credit or because these firms can switch more easily to a new bank.⁹

In other words, if the crisis spreads through bank reliance on international wholesale funding or through foreign bank ownership, then we should expect that, of the group of firms that are dependent on credit and that have a relationship with an internationally-borrowing domestic or with a foreign bank, especially single-bank firms, small firms and firms with limited tangible assets will experience a reduction in their financial and real performance.

⁹ The firm balance-sheet channel implies that larger firm size and tangible assets may reduce agency frictions and thus support credit availability during a crisis or when GDP contracts (see Bernanke and Gertler (1989) and the large literature following this seminal paper).

Again, we should not expect there to exist any differential effects for these same types of firms that do not depend on bank credit.

In sum, our identification strategy relies on the timing of the shock, bank type, firm credit-dependency, and firms' ability to mitigate a credit contraction, and will be underpinned by unique, detailed data (discussed in the next section) on bank-firm connections that link bank and firm balance sheet information.

3. DATA

3.1. Databases

The data set used in the analysis connects five databases lining up yearly information on balance sheet items for banks and firms that have relationships with these banks active in 14 countries in Eastern Europe and Central Asia, i.e., Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Lithuania, Poland, Romania, Serbia and Montenegro, Slovakia, Slovenia, Turkey, and Ukraine. Studying these countries is especially useful for our purpose as banks in this region were initially not affected by the Western banking crisis, foreign bank presence is substantial in many countries and a number of domestic banks in these countries used the international wholesale markets to finance a credit boom at home in the years leading up to the crisis.

We start with the comprehensive world-wide bank-ownership database compiled by *Claessens and van Horen (2013a)*. The database provides panel information on bank ownership (domestic or foreign owned) for virtually all banks in the world and, therefore, is very useful for our analysis. From this database we identify all banks active in one of the countries in our sample at least 3 years prior to the onset of the global financial crisis and still

active in 2009. We take the ownership in 2007 to categorize a bank as being domestic or foreign owned. Foreign owned implies that foreigners hold more than 50 percent of the shares of the bank.

Next, to determine whether a domestic bank borrowed from the international wholesale market we use information on bond issuance and syndicated lending from *Dealogic*. We consider a bank to be an international borrower when it borrowed at least once between 2004 and 2007 from the international syndicated loan or bond market. To complete the bank-level data we use bank balance sheet information from *Bankscope*, a database that records worldwide bank balance sheet data.

Kompass provides the bank-firm connections that are crucial to our investigation. The database provides records for over two million firms in 70 countries including firm address, executive names, industry, turnover, date of incorporation and, critically for our purposes, the firms' (primary) bank relationship(s). Giannetti and Ongena (2012) were among the first to use this database in their investigation which borrowers are able to benefit from foreign bank presence in Eastern European countries (see their paper and also Ongena and Şendeniz-Yüncü (2011) for a more detailed description of the database).

Kompass collects data using information provided by chambers of commerce and firm registries, but also conducts phone interviews with firm representatives. We use the 2010 vintage of the database and observe the (primary) bank relationship for all so-registered firms active in one of our 14 sample countries. In contrast to other Kompass records that are sometimes updated (and time-stamped with a year), bank relationships in general are not

updated and reflect the relationship at the moment the firm entered the database.¹⁰ This however, is of limited concern as firm-bank relationships often last many years, sometimes decades, even during non-crisis periods (Ongena and Smith (2001); Degryse, Kim and Ongena (2009)).¹¹ We match the information in Kompass to our bank-level information and identify the firms whose main bank is one of the banks in our sample.

Unfortunately, Kompass does not provide balance sheet information for the firms. To access this information we match Kompass to *Bureau van Dijk Amadeus* that records balance sheet information on European non-financial firms. This matching process is rather cumbersome as only a small portion of the firms can be matched directly by name (as writing conventions differ between the two databases). We therefore match the rest of the firms using information on website, email address and/or telephone number. For the latter matching we consider a firm matched when we find a matching string of at least 6 consecutive numbers. We carefully checked the matched firms by cross-referencing address information to assure a correct match. In some cases we could match several branches of the same firm. In these instances we only retain the largest branch. In total we could match 45,660 firms active at

¹⁰ Kompass is no longer able to supply historic firm records. The overlap with the 2005 vintage of the database we had access to from an earlier study is unfortunately too small for a meaningful analysis. This small overlap also suggests that most firms in our sample were included in the database after 2005 and that the bank relationship information we have is not stale.

¹¹ If the relationship information predates the crisis and firms managed to switch from shocked to unaffected banks to mitigate the transmitted contraction, our estimates will be conservative (as we will incorrectly link these potentially better financed and performing firms to the shocked banks). If the relationship information is recent, our estimates will also be conservative if worse financed and performing firms were in the end able to switch from shocked to unaffected banks. However, as explained in the previous section we will exploit differences between firms in the probability that they will be able to switch banks. This allows us to use observable firm characteristics to proxy for the probability of switching and provides an additional layer of confidence in our evidence.

least 3 years prior to the onset of the crisis and still active in 2009 and for which balance sheet information is available.¹²

With Amadeus in hand we can access all relevant firm characteristics and determine which firms are credit-dependent and which ones are not. As indicated before, having a bank relationship does not necessarily imply that firms have external financing needs and borrow from banks. Therefore, to distinguish between credit-dependent and credit-independent firms we use balance sheet information. Specifically, we consider a firm to be credit-dependent if its total borrowing was positive in at least one year between 2004 and 2007. Using this classification our sample contains 30,529 credit-dependent and 14,364 credit-independent firms (information on total borrowing was missing for the remaining firms).

3.2. Samples

Our final sample consists of 256 different banks that are connected with 40,409 different firms. Tables 1 and 2 provide the distribution of banks and firms by country. Of the 256 banks 130 are majority-owned by foreigners and are referred to as *Foreign Banks*. Among the 126 domestic banks, 39 banks borrowed at least once from the international syndicated loan or bond market between 2004 and 2007, and are therefore categorized as *Internationally-Borrowing Domestic Banks*. The remaining 87 domestic banks did not borrow internationally, and are therefore categorized as *Locally-Funded Domestic Banks*.

The three bank types are present across the 14 countries in our sample. In 8 countries (Bulgaria, Hungary, Lithuania, Poland, Romania, Slovenia, Turkey and Ukraine) all three bank types are concurrently present, comprising in total 160 banks, of which 40 are locally-

¹² We were able to match more than 100,000 firms, but many firms in Amadeus do not have any balance sheet information available as they are mere legal entities with limited economic activity.

funded domestic banks, 39 internationally-borrowing domestic banks and 81 foreign banks. As this group of countries allows for a better within-country interpretation of the estimates, we will use them in our main analysis.

As is clear from looking at the market shares, foreign banks are important in many countries in the region, sometimes even accounting for more than 90 percent of the assets (Lithuania and Slovakia). However, when looking at countries where all three types of banks are active, it is also clear that internationally-borrowing domestic banks in general play an important role in financial intermediation. As expected, locally-funded domestic banks tend to be smaller but still account for 14 percent of the banking assets in the countries in our sample.

As indicated in the previous section in our sample of 44,893 firms, 30,529 borrowed at least one year between 2004 and 2007 and are therefore categorized as *Credit-Dependent*. Credit-dependent and credit-independent firms are spread fairly equally among each of the three types of banks, providing enough variation across the six groups of firms to perform a meaningful estimation. Of the 44,893 firms in our sample, 6,426 have a relationship with a locally-funded domestic bank, of which 4,268 are credit-dependent. A total of 7,179 firms have a relationship with an internationally-borrowing domestic bank, of which 4,911 are credit-dependent. And 31,288 firms have a relationship with a foreign bank of which 21,350 are credit-dependent. The fact that the majority of firms have a relationship with a foreign bank is representative of the fact that foreign banks hold the lion's share of bank assets in the countries in our sample. In countries that have all three bank types present 15,454 firms are credit-dependent and 10,639 firms are credit-independent, with 3,238 firms having a relationship with a locally-funded domestic bank, 7,179 with an internationally-borrowing domestic bank and 15,676 with a foreign bank.

Table 3 provides an overview of the characteristics of the 6 different types of firms. The table shows that, as expected, credit-dependent firms tend to be much larger compared to credit-independent firms and tend to be more leveraged. They also are more likely to have a relationship with more than one bank and have a lower share of liquid assets. Finally, they are also more likely to be exporting firms.

When we compare within the group of credit-dependent firms we see that firms with a relationship with an internationally-borrowing domestic bank tend to be larger, however this is partly driven by differences in country coverage. When we make the same comparison only looking at the countries where all three bank types are present (bottom part of Table 3), the average firm size is much more equal across the three groups. Similarly, the probability of a credit-dependent firm being an exporting firm is the same across bank types if we make the comparison within the group of countries with all three bank types present. Firms that have a relationship with an internationally-borrowing domestic bank or a foreign bank are more likely to be foreign-owned or have only one bank relationship.

4. RESULTS: BANK LOAN GROWTH BY BANK TYPE

Before turning to our main firm-level regressions, it is insightful to first have a closer look at the bank-level data. Specifically, do internationally-borrowing domestic and/or foreign banks curtail lending more or less during the financial crisis than locally-funded domestic banks? To answer this question directly we estimate the following specification:

$$Loan\ Growth_{b,2009} = \beta_1 International_b + \beta_2 Foreign_b + \gamma' X_b + \varphi_j + \varepsilon_{b,2009} \quad (3)$$

where *Loan Growth* is the growth of loans provided by bank b in 2009, i.e., the log change in loans between year-end 2008 and at year-end 2009. We specifically study the change between 2008 and 2009 as this is the most severe part of the crisis and hence international transmission is most likely taking place in this period. *International* is the abridged name for the dummy *Internationally-Borrowing Domestic Bank* that equals one if the domestic bank borrowed at least once from the international wholesale market (through a syndicated loan or bond issuance) between 2004 and 2007 and equals zero otherwise, and *Foreign* is the abridged name for the dummy *Foreign Bank* that equals one if the bank was foreign-owned in 2007 and equals zero otherwise.

X_b is a matrix of control variables and includes in various and appropriate combinations: *Country Characteristics*, *Bank Characteristics* and the lagged dependent variable. As country characteristics we include: (a) *Growth of Real GDP* and (b) *Inflation*, both of which are measured in 2009. As bank characteristics we include the following dummy variables: (a) *Total Assets* equals one if the bank's total assets are above or equal to the median in 2007, and equals zero otherwise; (b) *Liquidity Ratio* equals one if the bank's liquid assets over total assets are above or equal to the median in 2007, and equals zero otherwise; (c) *Deposit Ratio* equals one if the bank's customers deposits over total assets are above or equal to the median in 2007, and equals zero otherwise; and finally, (d) *Solvency Ratio* equals one if the bank's equity over total assets is above or equal to the median in 2007, and equals zero otherwise.¹³ Furthermore, in some models we also include country fixed effects (φ_j). Exact variable definitions and sources are presented in Table 4. All dependent variables are

¹³ As the bank characteristics may contain outliers they are featured as dummies. However, results are similar if we use the continuous variables.

winsorized at the 1st and 99th percentile to mitigate the impact of possible outliers on the estimates.¹⁴ All regressions include a constant. The model is estimated using OLS and standard errors are always clustered by country (in the bank-level regressions).

The estimates are in Table 5. As the dependent variable is loan growth (i.e., the log change in loans), the estimated coefficients are straightforwardly interpretable. Our first set of regressions focuses on the group of countries where all three bank types are present, as this group of countries allows for better within-country interpretation of the results. The findings in Model (1) indicate that internationally-borrowing domestic banks contract their lending in 2009 by 11.8*** percentage points more than locally-funded domestic banks,¹⁵ the benchmark group, while foreign banks contract their lending by 22.7*** percentage points more than this group.

Not all countries were affected concurrently and equally by the crisis and real GDP growth and inflation might not capture these differences well enough. So Models (2) and (3) include country fixed effects to control for all (un)observable differences between countries. Banks of a different type may of course also differ in their characteristics. For example, domestic banks that also borrow internationally are often larger than domestic banks that are only funded locally. In Model (3) we therefore add bank characteristics and past loan growth. Yet, the differences in lending contraction across bank types remains large, i.e., internationally-borrowing domestic and foreign banks contract loan growth in 2009 by 6.4*** and 14.2*** percentage points more, respectively, than domestic banks that are funded only locally. These differences are clearly sizeable and economically meaningful.

¹⁴ Results are unaffected if we winsorize at the 5th and 95th percentile.

¹⁵ As in the Tables, ***, **, and * indicates statistical significant at the 1, 5, and 10 percent level, respectively.

Finally, in Models (4) to (6) we re-run all regressions for all countries in our sample. Notice however that not all bank types are present in all countries implying that we are also in effect comparing different banks' loan growth across borders. We still continue to find that internationally-borrowing domestic and foreign banks contracted loan growth more than locally-funded domestic banks, although the magnitude of the contraction is somewhat lower (as is the statistical significance).

In sum, our results indicate that internationally-borrowing domestic and foreign banks contracted their lending more than locally-funded domestic banks during the crisis. Next, we investigate if the firms that were dependent on credit and had relationships with these banks were also affected more in their financing and real performance.

5. RESULTS: FIRM FINANCING AND PERFORMANCE

5.1. *Estimated Specification*

We next investigate if firm financing and performance in the crisis differs by bank type and firm dependency on credit prior to the crisis. Recall that a credit contraction should only impact firms dependent on credit. To capture this, we estimate the following specification:

$$\begin{aligned}
 Y_{i,2009} = & \beta_1 International_i + \beta_2 Foreign_i + \beta_3 Credit\ Dependent_i \\
 & + \beta_4 International_i * Credit\ Dependent_i + \beta_5 Foreign_i * Credit\ Dependent_i \quad (4) \\
 & + \gamma' X_i + \varphi_j + \psi_k + \varepsilon_{i,2009}
 \end{aligned}$$

where $Y_{i,2009}$ is the dependent variable and represents, for a firm i , the rate of growth in short-term debt (i.e., current liabilities), the change in return on assets, the rate of growth in

operational revenue, or the rate of growth in assets, in 2009 (i.e., the first or log difference between the variable measured at year-end 2009 and at year-end 2008). *International* is the abridged name for the dummy variable *Firm with an Internationally-Borrowing Domestic Bank* that equals one if the firm has a relationship with a domestic bank that also borrows internationally, and that equals zero otherwise. *Foreign* is the abridged name for the dummy variable *Firm with a Foreign Bank* that equals one if the firm has a relationship with a foreign bank, and that equals zero otherwise. *Credit-Dependent* is the abridged name for the dummy variable *Firm is Credit-Dependent* that equals one if the firm borrowed at least once between 2004 and 2007, and that equals zero otherwise. This variable captures the reliance of the firm on external financing and, therefore, indicates whether the firm is credit-dependent or not.

The two terms of interest are the interactions between the two bank relationship dummies, i.e., *International* and *Foreign*, and our measure of credit dependency, i.e., *Credit-Dependent*. The estimated coefficients on these interaction terms will capture whether there is evidence of transmission, i.e., if firms that are credit-dependent and that have a relationship with an internationally-borrowing domestic or foreign bank are affected more than firms that are credit-dependent and have a relationship with a locally-funded domestic bank. Equally important, however are the two bank relationship dummies, *International* and *Foreign*, that are not in any interaction term. These variables capture the impact of the credit supply shock on firms that are not dependent on credit and therefore the parameters should be insignificant as the financial shock should only affect credit-dependent firms.

X_i is a matrix of control variables and includes *Firm Characteristics* and the lagged dependent variable. As firm characteristics we include the following dummy variables: (a) *Export Activities* equals one if the firm is active in an industry (at the 4-digit SIC level) that

exported in 2007 (exporting industries are determined for each country individually), and equals zero otherwise; (b) *Foreign Owned* equals one if the firm is majority foreign-owned, and equals zero otherwise; (c) *Young Firm* equals one if the firm is established after 1999 but before 2005, and equals zero otherwise; (d) *Total Assets* equals one if the firm's total assets are above or equal to the median in 2007, and equals zero otherwise; (e) *Liquidity Ratio* equals one if the firm's current assets minus stocks over total liabilities are above or equal to the median in 2007, and equals zero otherwise; and finally, (f) *Solvency Ratio* equals one if the firm's shareholder funds over total assets are above or equal to the median in 2007, and equals zero otherwise.

Specifications further include up to 27 industry fixed effects (ψ_k), and – depending on the set of countries considered – 8 to 13 country fixed effects (φ_j). Exact variable definitions and sources are presented in Table 6. All dependent variables are winsorized at the 1st and 99th percentile to mitigate the impact of possible outliers on the estimates.¹⁶ All regressions include a constant. The model is estimated using OLS and standard errors are always clustered at the bank level (in the firm-level regressions).

5.2. Firm Financing

The estimates are in Table 7. Model 1, estimated for the 3-bank type country sample that includes 21,117 observations, indicates that credit-dependent firms having a relationship with an internationally-borrowing domestic or foreign bank experience rates of growth in their

¹⁶ Results are unaffected if we winsorize at the 5th and 95th percentile.

short term debt that are 8.6*** and 6.1*** percentage points lower than credit-dependent firms that have a relationship with a locally-funded domestic bank. By contrast, we find that the rate of growth in short-term debt does not differ from or is even higher for credit-independent firms with a relationship with an internationally-borrowing domestic or foreign bank compared to the short-term debt growth of a credit-independent firm with a relationship to a locally-funded domestic bank.

This is our key result and implies that credit-dependent firms with a relationship with an internationally-borrowing domestic or with a foreign bank, i.e. the two types of banks that contract their credit growth more in 2009, experience a lower rate of growth in their short-term debt than credit-dependent firms with a relationship with a locally-funded domestic bank. These findings suggest that the supply of credit by internationally-borrowing domestic and foreign banks indeed contracted and provides evidence on the international transmission of financial shocks through the channels of international wholesale funding and foreign bank ownership.

Model 5 is estimated for the all-country sample and for 36,521 observations. Results are similar. Now, credit-dependent firms with a relationship with an internationally-borrowing domestic or foreign bank have a rate of growth in their short-term debt that is 5.6*** and 2.6* percentage points lower than credit-dependent firms with a locally-funded domestic bank. Again we do not find that credit-independent firms that have a relationship with an internationally-borrowing domestic or foreign bank see a larger drop in their short-term debt (if anything they experience an increase).

5.3. Firm Performance

The results in the previous section indicate that the global financial crisis led to a credit contraction to firms dependent on external finance and related to banks most exposed to the crisis (either through their pre-crisis dependency on international wholesale funding or because their bank is foreign). Next, we examine whether this credit contraction had any real consequences for these firms. In order to do this we replace in Models 2 to 4 and 6 to 8 in Table 7 the rate of growth in short-term debt as the dependent variable with the change in return on assets, the rate of growth in operational revenue, or the rate of growth in assets, all in 2009.

The results for these firm real performance variables are fully aligned with the estimates for firm financing. For those credit-dependent firms with an internationally-borrowing domestic or foreign bank, the change in return on assets are 1.0** and 1.2** percentage points lower than for credit-dependent firms with an locally-funded domestic bank, while similarly compared the rate of growth in operational revenue is 5.3*** and 3.7*** percentage points lower, and the rate of growth in assets is 3.6*** and 2.5*** percentage points lower. Again, credit-independent firms having a relationship with these two types of banks do not experience a drop in their profitability, operational revenue or asset growth compared to their peers having a relationship with a locally-funded domestic bank. Results are very similar when we look at the all-country sample (although a bit less significant).

This is the second component of our key result which implies that credit-dependent firms with a relationship with an internationally-borrowing domestic or with a foreign bank show lower real performance than credit-dependent firms with a relationship with a locally-funded domestic bank. These findings suggest that the performance by these firms worsens as the

credit they are granted contracts, providing direct evidence that the crisis spread through the international wholesale market and foreign ownership of banks with important consequences for the real economy.

5.4. Firm Possibilities to Offset a Credit Contraction

To provide further evidence that indeed a credit contraction is affecting the financing and performance of firms, we utilize variation across several dimensions that can affect a firm's ability to obtain funds during a credit crunch: The number of banks a firm has established a relationship with, the size of the firm and the share of its assets that are tangible and therefore can be pledged as collateral.

In Table 8 we split our sample of firms according to the three abovementioned firm characteristics (we only report results for the 3-bank type countries but the estimates for all countries are qualitatively equi-directional). In the first set of regressions in Panel A we include the group of firms that maintains a relationship with only one bank. The second set of regressions includes firms who maintain relationships with multiple banks. In panel B the sample is split between small firms (with assets smaller than the median level in 2007) and large firms (with assets above the median level). Finally, in panel C the sample is split between firms with intangible assets (share of tangible assets to total assets is below the median in 2007), i.e., firms with few assets to pledge as collateral, and firms with tangible assets (share of tangible to total assets above the median). The models we estimate are otherwise similar to those reported in Table 7 and include six firm characteristics, the lagged dependent variable, industry fixed effects and country fixed effects.

The three panels in Table 6 show that credit-dependent firms with a single bank relationship, that are smaller or with fewer tangible assets to pledge as collateral suffer most

in terms of their financing and performance from the credit contraction of internationally-borrowing domestic banks or foreign banks. Again, single-bank, small, or intangible firms that are credit-independent and have a relationship with each of these banks do not suffer disproportionately (and in some cases even perform better).

These results strengthen our overall assessment that the findings in the previous section can be interpreted as indicating that financial transmission did occur during the global financial crisis through the channels of international wholesale funding and foreign bank ownership. In addition, they show that important differences exist across firms in how much they are affected by a credit contraction. They show that financing constraints do affect the performance of firms, but especially those firms that have limited possibility to mitigate the contraction in credit by their main bank.

5.5. Robustness

To further check the robustness of our findings, we assess the estimates when we vary the time period over which the dependent variable is calculated for all specifications in Table 7, i.e., for the rate of growth in short-term debt, the change in return on assets, the rate of growth in operational revenue, and the rate of growth in assets across the 3-bank type or all countries. To conserve space Table 9 focuses on the estimates for the rate of growth in short-term debt or operational revenue across the 3-bank type countries, yet the other estimates (for the asset variables and across all countries) are equi-directional.

In Models (1) and (2) we double the length of time period over which the dependent variable is calculated from 08-09 to 07-09. Yet results are most similar. Next, in Models (3) and (4) we first-difference the dependent variable turning it into a rate of growth-in-growth in short-term debt or operational revenue. Again, results are mostly unaffected.

In Models (5) and (6) we run a placebo test by studying the rate of growth in short-term debt or operational revenue in 2006 (i.e., from year-end 2005 to year-end 2006). Now the estimates indicate that there are zero growth differentials between the various groups of firms, i.e., credit-dependent compared to credit-independent firms (with a locally-funded domestic bank) and within the dependency groups firms with a relationship with an internationally-borrowing domestic or a foreign bank as compared to a locally-funded domestic bank. This test highlights the genuinely differential impact of the shock that we identified in our main exercises.

Finally, and similar to the previous placebo test but forward in time, in Models (7) and (8) we study the “long-term” effects of the shock by studying the rate of growth in short-term debt or operational revenue in 2010 (i.e., from year-end 2009 to year-end 2010). The estimates indicate again almost no growth differentials between the various groups of firms indicating that all studied bank- and/or firm-type combinations seemingly similarly accommodated and absorbed the shock within 3 years after its occurrence.

6. CONCLUSION

The recent global financial crisis which was followed by a strong and persistent recession in many advanced countries makes it essential to understand the international transmission of shocks to the real economy through the globalized banking system. In this paper we analyze two key international channels that may have played a crucial role during the recent crisis, i.e., the reliance of domestic banks for their funding on international wholesale markets and foreign bank ownership.

To identify the potency of either channel, we analyze banks and firms located across countries in Eastern Europe and Central Asia. In these countries banks were not immediately affected by the Western banking crisis, but before the crisis there were many domestic banks borrowing from international wholesale markets and foreign banks provided an important share of intermediated lending. Crucial for identification, we use a dataset of *bank-firm* relationships matched with both bank- and firm- balance-sheet data. The matched dataset allows us to circumvent the typical shortcomings that plague the identification of the international transmission of financial shocks with either country- or bank-level data, i.e., to convincingly control for firm fundamentals, and it also enables us to analyze loans to small and medium-sized firms and to analyze both its financial and real effects. This is the key contribution of this paper.

We find that compared to locally-funded domestic banks, internationally-borrowing domestic banks and foreign banks cut back their lending more during the crisis. When we analyze firm-level effects (controlling for firm fundamentals) we find that especially credit-dependent firms borrowing from internationally-borrowing domestic or foreign banks suffer negative financial and real effects on average, especially when having only a single bank relationship, when small and when having limited tangible assets. By contrast, we do not find a differential effect for credit-independent firms.

In sum, the results point towards the existence of an international bank lending channel through international wholesale funding and through foreign ownership. Our findings therefore have important implications for both theory and policy. On the bank side, our findings suggest that domestic banks should be discouraged from overly relying on wholesale borrowing and that further regulatory changes should encourage foreign banks to move

towards a sustainable business model whereby new lending by subsidiaries is more financed by domestic funds (Kolev and Zwart (2013)). On the firm side, our findings qualify past government policies in many developing countries that unilaterally pushed for formal corporate financing, and hence promoted firm credit-dependency while repressing reliance on informal financing (Ayyagari, Demirgüç-Kunt and Maksimovic (2010), Degryse, Lu and Ongena (2013)). These policies come at a cost of exposing firm financing and performance to domestic and international credit shocks and hence by increasing their variability and vulnerability.

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TABLE 1
NUMBER AND MARKET SHARE OF LOCALLY-FUNDED DOMESTIC BANKS, INTERNATIONALLY-BORROWING DOMESTIC BANKS AND FOREIGN BANKS AND WHETHER ALL THREE BANK TYPES ARE PRESENT IN THE COUNTRY

Country	<i>Domestic Bank</i>				<i>Foreign Bank</i>		Total		3 Bank Types Present
	<i>Locally-Funded</i>		<i>Internationally-Borrowing</i>						
	Number	Market Share	Number	Market Share	Number	Market Share	Number	Market Share	
Bosnia-Herzegovina	7	0.11	0	-	7	0.62	14	0.73	No
Bulgaria	4	0.10	4	0.15	8	0.75	16	1.00	Yes
Croatia	18	0.10	0	-	9	0.87	27	0.97	No
Czech Republic	6	0.15	0	-	9	0.80	15	0.95	No
Estonia	2	0.03	0	-	2	0.68	4	0.72	No
Hungary	1	0.01	1	0.38	12	0.61	14	0.99	Yes
Lithuania	1	0.01	2	0.08	5	0.91	8	1.00	Yes
Poland	9	0.08	2	0.20	21	0.72	32	1.00	Yes
Romania	2	0.08	1	0.09	13	0.80	16	0.97	Yes
Serbia and Montenegro	13	0.27	0	-	10	0.70	23	0.97	No
Slovakia	1	0.08	0	-	12	0.92	13	1.00	No
Slovenia	6	0.22	5	0.55	6	0.23	17	1.00	Yes
Turkey	10	0.25	10	0.71	6	0.04	26	1.00	Yes
Ukraine	7	0.04	14	0.52	10	0.28	31	0.83	Yes
Total	87	0.14	39	0.34	130	0.49	256	0.98	
In Countries with 3 Bank Types Present	40	0.11	39	0.34	81	0.29	160	0.74	

NOTE. -- Market shares are based on asset share in 2007. Market shares of the three groups in each country do not have to add up to 100% as not all banks active in a country are included in our sample. Total assets in each country is taken from the bank ownership database of Claessens and Van Horen (2013a). Total market share reflects the market share of the group of banks relative to all bank assets in the 14 countries in our sample.

TABLE 2

THE NUMBER OF CREDIT-DEPENDENT AND CREDIT-INDEPENDENT FIRMS THAT HAVE A RELATIONSHIP WITH LOCALLY-FUNDED DOMESTIC BANKS, WITH INTERNATIONALLY-BORROWING DOMESTIC BANKS AND WITH FOREIGN BANKS , AND THE TOTAL NUMBER OF FIRMS THAT HAVE A RELATIONSHIP WITH A BANK

<i>Number of Firms that Have a Relationship with a</i>		<i>Domestic Bank</i>				<i>Foreign Bank</i>		<i>Total</i>
<i>Country</i>	<i>3 Bank Types Present</i>	<i>Locally-Funded</i>		<i>Internationally-Borrowing</i>		<i>Credit-Dependent</i>	<i>Credit-Independent</i>	
		<i>Credit-Dependent</i>	<i>Credit-Independent</i>	<i>Credit-Dependent</i>	<i>Credit-Independent</i>			
Bosnia-Herzegovina	No	24	7	0	0	10	1	42
Bulgaria	Yes	8	0	42	4	631	70	755
Croatia	No	1,721	222	0	0	10,234	1,994	14,171
Czech Republic	No	0	0	0	0	949	880	1,829
Estonia	No	0	0	0	0	653	155	808
Hungary	Yes	14	9	359	668	1,647	2,114	4,811
Lithuania	Yes	0	0	0	1	21	7	29
Poland	Yes	424	144	847	377	4,818	2,534	9,144
Romania	Yes	158	1,403	16	371	191	1,552	3,691
Serbia and Montenegro	No	1,010	204	0	0	137	31	1,382
Slovakia	No	0	0	0	0	337	231	568
Slovenia	Yes	780	110	2,228	331	1,244	194	4,887
Turkey	Yes	5	0	289	20	6	0	320
Ukraine	Yes	124	59	1,130	496	472	175	2,456
Total		4,268	2,158	4,911	2,268	21,350	9,938	44,893
Countries with 3 Bank Types Present		1,513	1,725	4,911	2,268	9,030	6,646	26,093

NOTE. -- Only firms with non-missing information on total borrowing between 2004 and 2007 are included. For firms with multiple branches we include the largest one.

TABLE 3
CHARACTERISTICS OF THE SIX FIRM TYPES

<i>3-Bank Type Countries</i>						
<i>With a Relationship with a</i>	<i>Credit-Dependent Firms</i>			<i>Credit-Independent Firms</i>		
	<i>Domestic Bank</i>		<i>Foreign Bank</i>	<i>Domestic Bank</i>		<i>Foreign Bank</i>
	<i>Locally-Funded</i>	<i>Internationally-Borrowing</i>		<i>Locally-Funded</i>	<i>Internationally-Borrowing</i>	
Number of Firms	1,513	4,911	9,030	1,725	2,268	6,646
Firm Size (Total Assets, in th EUR)	9,688	11,709	12,319	3,891	3,569	5,120
Multiple Banks	0.41	0.36	0.33	0.28	0.28	0.37
Share Tangible Assets	0.38	0.36	0.34	0.39	0.32	0.28
Export Activities	0.28	0.28	0.28	0.12	0.14	0.15
Foreign Owned	0.12	0.22	0.20	0.22	0.21	0.24
Young Firm	0.17	0.16	0.17	0.20	0.20	0.21
Liquidity Ratio	0.01	0.01	0.01	0.02	0.02	0.02
Solvency Ratio	0.40	0.41	0.43	0.47	0.53	0.50
<i>All Countries</i>						
<i>With a Relationship with a</i>	<i>Credit-Dependent Firms</i>			<i>Credit-Independent Firms</i>		
	<i>Domestic bank</i>		<i>Foreign bank</i>	<i>Domestic bank</i>		<i>Foreign bank</i>
	<i>Locally-Funded</i>	<i>Internationally-Borrowing</i>		<i>Locally-Funded</i>	<i>Internationally-Borrowing</i>	
Number of Firms	4,268	4,911	21,350	2,158	2,268	9,938
Firm Size (Total Assets, in th EUR)	6,210	10,476	7,204	3,314	3,279	3,906
Multiple Banks	0.44	0.36	0.42	0.29	0.28	0.33
Share Tangible Assets	0.35	0.36	0.32	0.35	0.32	0.24
Export Activities	0.17	0.28	0.19	0.10	0.14	0.14
Foreign Owned	0.25	0.22	0.25	0.26	0.21	0.29
Young Firm	0.13	0.16	0.17	0.19	0.20	0.18
Liquidity Ratio	0.01	0.01	0.01	0.02	0.02	0.03
Solvency Ratio	0.36	0.41	0.38	0.48	0.53	0.51

NOTE. -- Only firms with non-missing information on total borrowing between 2004 and 2007 are included. For firms with multiple branches we include the largest one. All firm characteristics are based on 2007 information. Firm size is winsorized at the 1st and 99th percentile. For exact variable definitions and sources see Table 6.

TABLE 4
SUMMARY STATISTICS OF BANK VARIABLES

Variable Type and Name	Unit	Variable Definition	Sample Src.	3-Bank Type Countries				All Countries			
				Nr. of Obs.	Mean	St. Dev.	Median	Nr. of Obs.	Mean	St. Dev.	Median
<i>Dependent Variable</i>											
Δ%Loan	-	Log change in total lending by bank <i>b</i> between 2008 and 2009	<i>B</i>	160	0.01	0.41	0.01	256	0.03	0.34	0.02
<i>Bank Type</i>											
Internationally-Borrowing Domestic Bank	1/0	= 1 if a domestic bank that has borrowed at least once from international syndicated loan or bond market between 2004 and 2007, = 0 otherwise	<i>CvH</i> , <i>D</i>	208	0.21	0.41	0	318	0.14	0.35	0
Foreign Bank	1/0	= 1 if the bank is majority foreign owned in 2007, = 0 otherwise	<i>CvH</i>	207	0.48	0.50	0	317	0.48	0.50	0
<i>Country Characteristics</i>											
Growth Real GDP	-	The rate of growth of real GDP in the country of the bank in 2009	<i>W</i>	208	-0.07	0.06	-0.06	318	-0.06	0.05	-0.05
Inflation	-	The inflation rate in the country of the bank in 2009	<i>W</i>	208	0.09	0.09	0.06	300	0.08	0.08	0.05
<i>Bank Characteristics</i>											
Total Assets	1/0	= 1 if bank <i>b</i> 's total assets are above or equal to the median in 2007, = 0 otherwise	<i>B</i>	158	0.58	0.50	1	254	0.52	0.50	1
Liquidity Ratio	1/0	= 1 if bank <i>b</i> 's liquid assets over total assets are above or equal to the median in 2007, = 0 otherwise	<i>B</i>	156	0.38	0.49	0	252	0.48	0.50	0
Deposit Ratio	1/0	= 1 if bank <i>b</i> 's customer deposits over total assets are above or equal to the median in 2007, = 0 otherwise	<i>B</i>	152	0.41	0.49	0	246	0.50	0.50	0
Solvency Ratio	1/0	= 1 if bank <i>b</i> 's equity over total assets is above or equal to the median in 2007, = 0 otherwise	<i>B</i>	158	0.46	0.50	0	254	0.48	0.50	0

NOTE. -- The data sources (*Src.*) are: *B*: Bureau van Dijk Bankscope; *CvH*: Claessens and van Horen (2013a); *D*: Dealogic; and *W*: Worldbank.

TABLE 5
BANK LOAN GROWTH IN 2009 AND BANK TYPE

Model	(1)	(2)	(3)	(4)	(5)	(6)
<i>Sample</i>	<i>3-Bank Type Countries</i>			<i>All Countries</i>		
Internationally-Borrowing Domestic Bank	-0.118*** (0.000)	-0.120*** (0.000)	-0.064*** (0.003)	-0.056* (0.068)	-0.067** (0.033)	-0.021 (0.372)
Foreign Bank	-0.227*** (0.000)	-0.214*** (0.001)	-0.142*** (0.000)	-0.130** (0.019)	-0.121** (0.032)	-0.084*** (0.005)
Country Characteristics	Yes	--	--	Yes	--	--
Bank Characteristics	No	No	Yes	No	No	Yes
Lagged Dependent Variable	No	No	Yes	No	No	Yes
Country Fixed Effects	No	Yes	Yes	No	Yes	Yes
R-squared	0.281	0.300	0.443	0.181	0.213	0.349
Number of Observations	160	160	140	242	256	226

NOTE. -- The models are estimated using OLS. The dependent variable is individual bank loan growth in 2009 and is winsorized at the 1st and 99th percentile. Country characteristics include Growth Real GDP and Inflation in 2009. Bank characteristics include dummies for: (a) Total Assets, (b) Liquidity Ratio, (c) Deposit Ratio, and (d) Solvency Ratio. All variable definitions are provided in Table 4. Coefficients are listed in the first row, p-values based on robust standard errors that are corrected for clustering at the country level are reported in the row below in parentheses. "Yes" indicates that the set of characteristics or fixed effects is included. "--" indicates that the indicated set of characteristics are comprised in the included set of fixed effects. "No" indicates that the set of characteristics or fixed effects is not included. *** Significant at 1%, ** significant at 5%, * significant at 10%.

TABLE 6
SUMMARY STATISTICS OF FIRM VARIABLES

Variable Type and Name	Unit	Variable Definition	Sample Src.	3-Bank Type Countries			All Countries				
				Nr. of Obs.	Mean	St. Dev.	Median	Nr. of Obs.	Mean	St. Dev.	Median
<i>Dependent Variables</i>											
Δ%Short-Term Debt	-	The log change in short-term debt of firm <i>i</i> (including short term debts to credit institutions, long term financial debts payable within the year, credit to suppliers and other current liabilities of the firm) between 2008 and 2009	A	21,416	-0.10	0.59	-0.07	36,826	-0.09	0.59	-0.06
ΔROA	-	The first-difference change in return on assets of firm <i>i</i> between 2008 and 2009	A	21,178	-2.82	14.64	-1.03	37,422	-3.19	15.19	-1.06
Δ%Operational Revenue	-	The log change in operational revenue of firm <i>i</i> between 2008 and 2009	A	21,386	-0.20	0.49	-0.14	37,261	-0.23	0.56	-0.16
Δ%Assets	-	The log change in total assets of firm <i>i</i> between 2008 and 2009	A	21,447	-0.04	0.32	-0.03	37,825	-0.05	0.33	-0.04
<i>Firm Relationship and Credit Dependency Variables</i>											
Firm with Internationally-Borrowing Domestic Bank	1/0	= 1 if firm <i>i</i> has a relationship with an internationally-borrowing domestic bank, = 0 otherwise	K	23,234	0.28	0.45	0	40,759	0.16	0.36	0
Firm with Foreign Bank	1/0	= 1 if firm <i>i</i> has a relationship with a foreign bank, = 0 otherwise	K	23,234	0.59	0.49	1	40,759	0.70	0.46	1
Firm Is Credit-Dependent	1/0	= 1 if firm <i>i</i> borrowed at least once between 2004 and 2007, = 0 otherwise	A	22,884	0.61	0.49	1	40,409	0.70	0.46	1
<i>Firm Switching Possibility Variables</i>											
Firm with Single Bank	1/0	= 1 if firm <i>i</i> reports to have a single bank relationship, = 0 otherwise	K	23,234	0.66	0.47	1	40,759	0.61	0.49	1
Firm with Multiple Banks	1/0	= 1 if firm <i>i</i> reports to have multiple bank relationships, = 0 otherwise	K	23,234	0.34	0.47	0	40,759	0.39	0.49	0
Small Firm	1/0	= 1 if firm <i>i</i> 's total assets are below the median in 2007, = 0 otherwise	A	23,234	0.35	0.48	0	40,758	0.48	0.50	0
Large Firm	1/0	= 1 if firm <i>i</i> 's total assets are above or equal to the median in 2007, = 0 otherwise	A	23,234	0.65	0.48	1	40,758	0.52	0.50	1
Intangible Firm	1/0	= 1 if firm <i>i</i> 's intangible over total assets are below the median in 2007, = 0 otherwise	A	23,118	0.45	0.50	0	40,635	0.50	0.50	0
Tangible Firm	1/0	= 1 if firm <i>i</i> 's intangible over total assets are above or equal to the median in 2007, = 0 otherwise	A	23,118	0.55	0.50	1	40,635	0.50	0.50	1
<i>Firm Characteristics</i>											
Export Activities	1/0	= 1 if firm <i>i</i> is active in an industry (at the 4-digit SIC level) in a country that exported in 2007, = 0 otherwise	A, ITC	23,234	0.24	0.42	0	40,759	0.19	0.39	0
Foreign Owned	1/0	= 1 if majority of the shares of firm <i>i</i> are held by foreigners, = 0 otherwise	A	23,234	0.21	0.41	0	40,759	0.25	0.43	0
Young Firm	1/0	= 1 if firm <i>i</i> is established after 1999 but before 2005, = 0 otherwise	A	23,234	0.17	0.38	0	40,759	0.17	0.37	0
Total Assets	1/0	= 1 if firm <i>i</i> 's total assets are above or equal to the median in 2007, = 0 otherwise	A	23,234	0.65	0.48	1	40,758	0.52	0.50	1
Liquidity Ratio	1/0	= 1 if firm <i>i</i> 's current assets minus stocks over total liabilities is above or equal to the median in 2007, = 0 otherwise	A	23,234	0.50	0.50	1	40,759	0.51	0.50	1
Solvency Ratio	1/0	= 1 if firm <i>i</i> 's shareholder funds over total assets is above or equal to the median in 2007, = 0 otherwise	A	23,234	0.55	0.50	1	40,759	0.50	0.50	0

NOTE. -- The data sources (Src.) are: A : Bureau van Dijk Amadeus; CvH : Claessens and van Horen (2013a); K : Kompass; and ITC: International Trade Center.

TABLE 7
CHANGE IN FIRM FINANCING AND PERFORMANCE IN 2009, THE TYPE OF BANK A FIRM HAS A RELATIONSHIP WITH, AND THE CREDIT-DEPENDENCY OF THE FIRM

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variables: Firm	Δ%Short-Term Debt	ΔROA	Δ%Operational Revenue	Δ%Assets	Δ%Short-Term Debt	ΔROA	Δ%Operational Revenue	Δ%Assets
<i>Sample</i>	<i>3-Bank Type Countries</i>				<i>All Countries</i>			
Firm with Internationally-Borrowing Domestic Bank	0.055** (0.020)	0.517 (0.178)	0.024* (0.092)	0.014 (0.164)	0.050** (0.025)	0.608* (0.094)	0.025 (0.143)	0.014 (0.183)
Firm with Foreign Bank	0.020 (0.299)	0.487 (0.170)	0.002 (0.787)	-0.002 (0.827)	0.016 (0.380)	0.577* (0.064)	0.023* (0.088)	-0.002 (0.788)
Firm Is Credit-Dependent	0.067*** (0.000)	1.326*** (0.001)	0.035*** (0.003)	0.025*** (0.005)	0.040*** (0.007)	1.497*** (0.000)	0.016 (0.171)	0.007 (0.313)
Firm with Internationally-Borrowing Domestic Bank * Firm Is Credit-Dependent	-0.086*** (0.000)	-1.035** (0.039)	-0.053*** (0.003)	-0.036*** (0.002)	-0.056*** (0.008)	-1.037** (0.015)	-0.031* (0.092)	-0.021* (0.055)
Firm with Foreign Bank * Firm Is Credit-Dependent	-0.061*** (0.000)	-1.200** (0.010)	-0.037*** (0.005)	-0.025** (0.014)	-0.026* (0.064)	-1.073*** (0.003)	-0.034*** (0.007)	-0.006 (0.433)
Firm Characteristics and Lagged Dependent Variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects and Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.053	0.164	0.072	0.031	0.046	0.147	0.050	0.021
Number of Observations	21,117	20,811	21,053	21,122	36,521	37,026	36,886	37,500

TABLE 8
CHANGE IN FIRM FINANCING AND PERFORMANCE IN 2009, BY FIRM RELATIONSHIP MULTIPLICITY, SIZE AND ASSET INTANGIBILITY

Dependent Variables: Firm	(1a)	(2a)	(3a)	(4a)	(1b)	(2b)	(3b)	(4b)
	Δ%Short-Term Debt	ΔROA	Δ%Operational Revenue	Δ%Assets	Δ%Short-Term Debt	ΔROA	Δ%Operational Revenue	Δ%Assets
Panel A	<i>Single Bank Firms</i>				<i>Multiple Bank Firms</i>			
Firm with Internationally-Borrowing Domestic Bank	0.064** (0.020)	0.045 (0.932)	0.021 (0.167)	0.007 (0.552)	0.044* (0.050)	1.432*** (0.010)	0.031 (0.241)	0.035*** (0.002)
Firm with Foreign Bank	0.016 (0.481)	0.782* (0.094)	0.004 (0.753)	-0.011 (0.274)	0.025 (0.165)	-0.385 (0.445)	-0.008 (0.558)	0.015 (0.123)
Firm Is Credit-Dependent	0.086*** (0.000)	1.384*** (0.007)	0.060*** (0.000)	0.030*** (0.008)	0.038* (0.053)	0.975* (0.052)	-0.014 (0.489)	0.016 (0.180)
Firm with Internationally-Borrowing Domestic Bank * Firm Is Credit-Dependent	-0.107*** (0.000)	-0.764 (0.264)	-0.068*** (0.000)	-0.038*** (0.007)	-0.056** (0.023)	-1.613*** (0.004)	-0.032 (0.257)	-0.044*** (0.005)
Firm with Foreign Bank * Firm Is Credit-Dependent	-0.080*** (0.000)	-1.422** (0.013)	-0.053*** (0.001)	-0.026** (0.037)	-0.028 (0.138)	-0.331 (0.541)	-0.001 (0.974)	-0.023* (0.066)
R-squared	0.057	0.176	0.080	0.028	0.053	0.137	0.064	0.049
Number of Observations	14,129	13,910	14,102	14,143	6,988	6,901	6,951	6,979
Panel B	<i>Small Firms</i>				<i>Large Firms</i>			
Firm with Internationally-Borrowing Domestic Bank	0.065** (0.016)	0.393 (0.396)	0.028* (0.084)	0.015 (0.126)	0.014 (0.626)	0.485 (0.490)	0.011 (0.706)	-0.004 (0.779)
Firm with Foreign Bank	0.027 (0.221)	0.861** (0.033)	0.012 (0.338)	-0.005 (0.556)	0.006 (0.796)	-0.725 (0.247)	-0.017 (0.257)	-0.001 (0.948)
Firm Is Credit-Dependent	0.051*** (0.003)	1.878*** (0.000)	0.057*** (0.000)	0.027** (0.011)	0.084*** (0.000)	0.312 (0.727)	0.013 (0.552)	0.028** (0.029)
Firm with Internationally-Borrowing Domestic Bank * Firm Is Credit-Dependent	-0.100*** (0.001)	-1.202** (0.048)	-0.067*** (0.000)	-0.037*** (0.004)	-0.046 (0.104)	-0.658 (0.473)	-0.028 (0.389)	-0.018 (0.203)
Firm with Foreign Bank * Firm Is Credit-Dependent	-0.046*** (0.006)	-2.041*** (0.000)	-0.045*** (0.003)	-0.020* (0.085)	-0.063** (0.011)	0.607 (0.490)	-0.011 (0.651)	-0.021 (0.164)
R-squared	0.059	0.148	0.063	0.029	0.054	0.178	0.086	0.041
Number of Observations	10,558	10,402	10,525	10,561	10,559	10,409	10,528	10,561
Panel C	<i>Intangible Firms</i>				<i>Tangible Firms</i>			
Firm with Internationally-Borrowing Domestic Bank	0.089*** (0.000)	0.627 (0.343)	0.025 (0.257)	0.013 (0.410)	0.019 (0.574)	0.419 (0.483)	0.026 (0.101)	0.016 (0.150)
Firm with Foreign Bank	0.045* (0.070)	0.874** (0.032)	0.006 (0.687)	0.005 (0.700)	0.002 (0.920)	0.552 (0.245)	0.008 (0.386)	-0.002 (0.831)
Firm Is Credit-Dependent	0.116*** (0.000)	1.976*** (0.000)	0.064*** (0.004)	0.056*** (0.000)	0.013 (0.565)	0.351 (0.512)	0.005 (0.805)	-0.002 (0.861)
Firm with Internationally-Borrowing Domestic Bank * Firm Is Credit-Dependent	-0.140*** (0.000)	-1.647** (0.022)	-0.081*** (0.002)	-0.057*** (0.001)	-0.035 (0.262)	-0.402 (0.591)	-0.034 (0.156)	-0.022 (0.133)
Firm with Foreign Bank * Firm Is Credit-Dependent	-0.119*** (0.000)	-2.054*** (0.000)	-0.068*** (0.003)	-0.063*** (0.000)	-0.014 (0.464)	-0.802 (0.189)	-0.019 (0.367)	-0.002 (0.869)
R-squared	0.050	0.146	0.056	0.029	0.064	0.197	0.105	0.042
Number of Observations	10,516	10,369	10,486	10,518	10,517	10,368	10,486	10,519

NOTE. -- The models are estimated using OLS for the 3-bank type countries. The dependent variables are the rate of growth in the firm's short-term debt, the change in return on assets, the rate of growth in operational revenue, and the rate of growth in assets in 2009 and are winsorized at the 1st and 99th percentile. In panel A the sample is split between firms that have a relationship with only one bank (*Single Bank Firms*) and firms that have relationships with multiple banks (*Multiple Bank Firms*). In panel B the sample is split between firms with assets smaller than the median level in 2007 (*Small Firms*) and firms with assets larger than the median level (*Large Firms*). In panel C the sample is split between firms whose share of tangible assets to total assets is below the median in 2007 (*Intangible Firms*) and firms whose share of tangible assets is above the median level (*Tangible Firms*). All regressions include Firm Characteristics, the Lagged Dependent Variable, Industry Fixed Effects and Country Fixed Effects. Firm characteristics include dummies for: (a) Export Activities, (b) Foreign Owned, (c) Young Firm, (d) Total Assets, (e) Liquidity Ratio, and (f) Solvency Ratio. All variable definitions are provided in Table 6. Coefficients are listed in the first row, p-values based on robust standard errors that are corrected for clustering at the bank level are reported in the row below in parentheses. *** Significant at 1%, ** significant at 5%, * significant at 10%.

TABLE 9
FURTHER ROBUSTNESS TESTS

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>Different Time Period: Dependent Variable 07-09</i>		<i>Growth-in-Growth: Dependent Variable (05-06)-(08-09)</i>		<i>Placebo Test: Dependent Variable 05-06</i>		<i>Long-Term Effects: Dependent Variable 09-10</i>	
Dependent Variables: Firm	$\Delta\%$ Short-Term Debt	$\Delta\%$ Operational Revenue	$\Delta\%$ Short-Term Debt	$\Delta\%$ Operational Revenue	$\Delta\%$ Short-Term Debt	$\Delta\%$ Operational Revenue	$\Delta\%$ Short-Term Debt	$\Delta\%$ Operational Revenue
Firm with Internationally-Borrowing Domestic Bank	0.060** (0.030)	0.035** (0.048)	0.034 (0.150)	0.029 (0.192)	0.014 (0.350)	0.015 (0.241)	0.031** (0.025)	0.016 (0.262)
Firm with Foreign Bank	0.033 (0.123)	-0.008 (0.595)	0.030* (0.099)	0.012 (0.415)	0.003 (0.865)	0.001 (0.896)	0.026** (0.022)	-0.006 (0.503)
Firm Is Credit-Dependent	0.100*** (0.000)	0.026 (0.144)	0.096*** (0.000)	0.056*** (0.001)	-0.020 (0.218)	0.003 (0.792)	0.010 (0.545)	-0.000 (0.973)
Firm with Internationally-Borrowing Domestic Bank * Firm Is Credit-Dependent	-0.091*** (0.002)	-0.055** (0.018)	-0.072** (0.020)	-0.057** (0.017)	-0.007 (0.718)	-0.019 (0.259)	-0.004 (0.825)	-0.004 (0.819)
Firm with Foreign Bank * Firm Is Credit-Dependent	-0.082*** (0.000)	-0.030 (0.111)	-0.078*** (0.002)	-0.069*** (0.000)	0.012 (0.501)	0.012 (0.362)	-0.006 (0.730)	0.013 (0.367)
Firm Characteristics and Lagged Dependent Variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects and Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.15	0.20	0.035	0.106	0.068	0.081	0.057	0.047
Number of Observations	19,605	19,545	16,754	16,672	16,604	16,598	20,273	19,626