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When Arm's Length Is Too Far. Relationship Banking over the Credit Cycle*

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Abstract

We conduct face-to-face interviews with bank CEOs to classify 397 banks across 21 countries as either relationship or transaction lenders. We then use the geographic coordinates of these banks' branches and of 14,100 businesses to analyze how the lending techniques of banks in the vicinity of firms are related to credit constraints at two contrasting points of the credit cycle. We find that while relationship lending is not associated with credit constraints during a credit boom, it alleviates such constraints during a downturn. This positive role of relationship lending is stronger for small and opaque firms and in regions with a more severe economic downturn. Moreover, our evidence suggests that relationship lending mitigates the impact of a downturn on firm growth and does not constitute evergreening of loans.

JEL codes: F36; G21; L26; O12; 016

Keywords: Relationship banking, credit constraints, credit cycle

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1. Introduction

In the aftermath of the global financial crisis, small and medium-sized enterprises (SMEs) were among the firms most affected by the turn of the credit cycle (OECD, 2015). As fears increased that credit-constrained SMEs could delay the economic recovery, policy-makers focused their attention on initiatives, such as subsidized funding and lending schemes, to expand SME finance. Beyond such short-term crisis responses, it remains an open question how best to protect SMEs in a more structural way from the cyclicality of bank lending.

This paper studies whether banks' use of relationship lending techniques influences the cyclicality of credit. Our methodological innovation is to differentiate between relationship and transaction banks by using information on banks' lending techniques from 397 face-to-face interviews with the "ultimate bank insiders": their CEOs. We find, for a sample of 14,100 firms across 21 countries, that a greater local presence of banks that view themselves as relationship lenders is associated with fewer firms being credit constrained during a downturn (2008-09) but not during a credit boom (2005).

The role of relationship lending for firm financing has received ample attention in the literature.[1] Relationship lending—repeatedly interacting with clients to obtain and exploit proprietary borrower information (Boot, 2000)—enables banks to learn about borrowers' creditworthiness and to adapt lending terms accordingly (e.g. Rajan, 1992 and von Thadden, 1995). It has long been regarded as the appropriate tool for banks to lend to (opaque) SMEs. Attention has only recently turned to the specific role of relationship lending during economic downturns and crises. Theory suggests that relationship lenders can play a role in the continuation of lending during downturns as they can (implicitly) insure against adverse macroeconomic conditions (Berger and Udell, 1992; Berlin and Mester, 1999). Because relationship lenders acquire valuable information during the lending relationship, they can also more easily adapt their lending conditions to changing circumstances (Agarwal and Hauswald, 2010; Bolton, Freixas, Gambacorta and Mistrulli, 2016). This may allow them to continue to lend on more favorable terms to profitable firms when a crisis hits.

[1] Degryse, Kim and Ongena (2009) and Kysucky and Norden (2015) review the literature on relationship lending and its effect on firms' access to credit during normal times.

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To examine whether the availability of relationship lending techniques co-varies with firms' credit constraints at the peak and the trough of the credit cycle, we combine several datasets. First, we classify banks as either relationship or transaction lenders based on the views of the bank CEO. Banks that view relationship lending techniques as very important when dealing with SMEs are considered relationship lenders. We use detailed credit-registry information from a representative country in our sample (Armenia), to show that banks that are classified this way as relationship lenders engage in significantly longer and broader lending relationships, deal with smaller clients, and are less likely to require collateral. These results are in line with the previous empirical literature on relationship lending (e.g. Petersen and Rajan, 1994; Berger and Udell, 1995; Degryse and Van Cayseele, 2000) and indicate that if the CEO considers relationship lending to be important this is reflected in the lending practices of their bank.

Second, we merge this information on bank-lending techniques with firm-level survey data on financing constraints of 14,100 businesses and with hand-collected information on the geographic location of 38,310 bank branches across 21 countries in emerging Europe. These combined data allow us to capture the type of banks that surround each firm and to measure, at the local level, the link between banks' views on the importance of relationship lending and firms' financing constraints at the peak and trough of the credit cycle.

We find that a greater presence of relationship banks is associated with fewer nearby firms being credit constrained in 2008-09—when the credit cycle had turned—but not in 2005. This holds after controlling for characteristics of the local banking landscape, such as banks' funding structure and local competition, and for various firm characteristics. This result is also robust to a range of specification tests and ways to address endogeneity. For 2008-09, we find that the link between relationship banking and relaxed credit constraints is stronger for young, small, and non-exporting firms, firms with no other sources of external finance, and firms that lack tangible assets, i.e. firms that are more opaque and more likely to be constrained in a downturn.

These findings are consistent with the hypothesis that relationship lending—as measured by our novel indicator of a bank's business model—can be critical for alleviating firms' credit constraints during a credit cycle downturn. We present additional evidence that suggests that the loosening of credit constraints does not reflect the evergreening of loans to underperforming firms.

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In contrast, the beneficial role of relationship lending is concentrated among relatively safe firms and is positively linked to firm investment and growth after the turn of the credit cycle. Our findings are therefore in line with the "helping hand" hypothesis—which highlights the beneficial role of relationship lending (Chemmanur and Fulghieri, 1994)—rather than the "zombie lending" hypothesis whereby banks keep inefficient firms alive (Peek and Rosengren, 2005 and Caballero, Hoshi and Kashyap, 2008).

Our paper contributes to a growing literature on the role of relationship lending during economic downturns and crises. A first set of papers builds on the seminal contribution of Petersen and Rajan (1994) and focuses on individual firm-bank relationships. These papers typically use loan or loan-application data from credit registries to identify the impact of firm-bank relationships on access to credit within a particular country. For Spain, Jiménez, Ongena, Peydró and Saurina (2012) show that when GDP growth is low, banks are more likely to continue to lend to long-term clients. For Germany, Puri, Rocholl and Steffen (2011) find that savings banks affected by the subprime crisis started to reject more loan applications but did so to a lesser extent for existing retail clients (those with a checking account). For Portugal, Iyer, Peydró, da-Rocha-Lopes and Schoar (2014) show that banks with a higher pre-crisis dependency on interbank liquidity decreased their credit supply more during the crisis. Firms with stronger lending relationships were partially isolated from this credit crunch. For Italy, Gobbi and Sette (2014) and Sette and Gobbi (2015) show that firms with longer lending relationships had easier access to credit, at a lower cost, after the collapse of Lehman Brothers. These firms consequently increased investment and employment more in the wake of the crisis (Banerjee, Gambacorta and Sette, 2016). Taking a slightly different approach, Bolton, Freixas, Gambacorta and Mistrulli (2016) find that Italian firms located closer to their bank's headquarter (implying relationship rather than transaction-based lending) were offered better lending terms after the collapse of Lehman Brothers.

A second, and still very small, literature does not focus on *within-bank* differences between clients in terms of firm-bank relationships, but rather analyzes differences *between* banks in their strategic orientation towards relationship or transaction lending. Specifically, DeYoung, Gron, Torna and Winton (2015) define for a sample of U.S. community banks relationship lenders as those banks that before the global financial crisis had a high share of small business lending in

their loan portfolio. Using this metric, the authors find that while most community banks reduced their small business lending during the crisis, the small group of relationship banks did not do so.

Our main contribution to this emerging literature is to introduce a novel way of measuring a bank's strategic orientation towards relationship lending. We extract information on the lending techniques that banks use when lending to SMEs from structured face-to-face interviews with bank CEOs. This provides us with a direct measure of the bank's business model, without having to rely on (simplifying) assumptions about which banks use which technology. As we merge these data with detailed geographical information on these banks' branch networks, we can assess the importance of relationship banks near individual firms.

We apply our new approach to 21 countries with varying levels of economic and financial development. This not only adds to the external validity of earlier results but also allows us to exploit between-country (as well as within-country) variation in both the prevalence of relationship lending and the intensity of the 2008-09 economic downturn. Furthermore, by using firm-level survey data, we can distinguish between financially unconstrained firms, firms that were either rejected or discouraged from applying for a loan, and firms without credit demand. Studies using credit registry data face the potential limitation that non-applicant firms may not need credit, or they need credit but are discouraged from applying. Finally, by studying the role of relationship lending in both the peak and trough of the credit cycle we can show that, as predicted by theory, relationship lending is more important during a downturn. Notwithstanding this very different empirical approach, our results align well—and therefore solidify—earlier findings on the role of relationship lending during downturns.

Before proceeding, it is useful to comment on three methodological issues. First, we do not observe actual lending relationships. However, by using data for both borrowing and non-borrowing firms we can gauge the local general equilibrium effect of banks' lending techniques, which we would miss if only focusing on borrowing firms. Second, we rely on survey data for both firms and banks. While firm-level survey data have been widely used in the recent literature (e.g. Campello, Graham and Harvey, 2010; Popov and Udell, 2012 and Ongena, Popov and Udell, 2013) there may be concerns about measurement error in firms' responses to questions about why they do not apply for a loan, or that rejection might simply reflect the lack of investment

opportunities with positive NPV. To mitigate these concerns, we offer several robustness tests with different definitions of firms' credit constraints, including measures based on balance-sheet data.

Third, our empirical strategy relies on the location of banks and enterprises being independent of each other. Following Berger, Miller, Petersen, Rajan and Stein (2005) we assume that the banking landscape near firms imposes an exogenous geographical limitation on the banks that firms have access to. We offer ample evidence that is consistent with this assumption. We also test for heterogeneous effects of the local presence of banks that view themselves as relationship lenders across different types of firms. This further addresses the possible endogenous matching of firms and banks.

We proceed as follows. Section 2 describes the data sources we combine after which Section 3 presents our empirical approach. We discuss our baseline results and robustness tests in Sections 4 and 5, respectively. Section 6 then considers real effects and Section 7 concludes.

2. Data

Our empirical analysis rests on joining three important pieces of information: data on firms' credit constraints at different points in time, the geo-coordinates of the bank branches surrounding these firms, and data on the lending techniques of these banks. We discuss the data on firms' real performance in Section 6.

2.1. Firm data: credit constraints and covariates

We use the EBRD-World Bank's Business Environment and Enterprise Performance Survey (BEEPS) to measure the incidence of credit constraints among 14,100 firms across 21 countries in emerging Europe (see Table 2 for a country list). This region experienced a pronounced credit cycle over the past decade. While year-on-year credit growth amounted to between 35 and 40 percent during 2005-07, credit growth decelerated markedly in 2008 and even turned negative in 2009 (Figure OA1 in the on-line Appendix).[2] This provides the necessary contrast to compare firms' financing constraints at different points of the credit cycle and to relate them to banks' business models.

[2] In Estonia, Latvia and Lithuania the credit cycle started to turn as early as 2007 whereas in the other sample countries credit tapered off in the third quarter of 2008 (Berglöf, Korniyenko, Plekhanov and Zettelmeyer, 2010).

We use two BEEPs waves: one conducted in 2005 (7,053 firms) and one in 2008-09 (7,047 firms). The sampling for both waves was independent and based on separate draws. This allows us to directly compare the parameter estimates generated by regression models that use the two samples. Face-to-face interviews were held with the owner or main manager of each of these enterprises. The survey also contains information on the geographical location of each firm and on a large number of firm characteristics such as the number of employees, age, ownership, legal structure, export activity and industry.

Crucially, we observe both firms with and without demand for bank loans as well as borrowers and non-borrowers. By combining answers to various questions, we first distinguish between firms with and without demand for credit. Among the former group, we then identify firms that were credit constrained: those that were either discouraged from applying for a loan or were rejected when they applied (Cox and Japelli, 1993 and Duca and Rosenthal, 1993).[3]

To assess financing constraints at the firm level, we follow Popov and Udell (2012) and use BEEPS question K16: "*Did the establishment apply for any loans or lines of credit in the last fiscal year?*" For firms that answered "*No*", we move to question K17, which asks: "*What was the main reason the establishment did not apply for any line of credit or loan in the last fiscal year?*" For firms that answered "*Yes*", question K18a subsequently asks: "*In the last fiscal year, did this establishment apply for any new loans or new credit lines that were rejected?*" We classify firms that answered "*Yes*" to K16 and "*No*" to K18a as unconstrained as they were approved for a loan, while we classify firms as credit constrained if they either answered "*Yes*" to K18a (i.e. were rejected) or answered "*Interest rates are not favorable*"; "*Collateral requirements are too high*"; "*Size of loan and maturity are insufficient*"; or "*Did not think it would be approved*" to K17. Firms that did not apply for a loan (K16: "*No*") and responded to K17 with: "*Do not need a loan*" are classified as unconstrained with no loan demand. This strategy allows us to differentiate between firms that did not apply for a loan because they did not need one and firms that did not apply because they were discouraged (but needed a loan).

[3] See also Guiso, Sapienza and Zingales (2004) who use survey information on whether households applied and were accepted for loans to construct a local indicator of financial development across Italian provinces.

The summary statistics in Table 1 indicate that 70 percent of all sample firms in 2005 needed a loan, while 62 percent did in 2008-09. Thirty-four percent of firms were financially constrained in 2005, while 40 percent were constrained in 2008-09, pointing to a substantial tightening of financing constraints in 2008-09. Given that demand declined and constraints increased between 2005 and 2008-09, it is important to differentiate between both. Behind these averages lies substantial variation across and within countries (Table 2). While 12 percent of firms in Slovenia were financially constrained in 2005 and 17 percent in 2008-09, 64 percent of firms in Azerbaijan were constrained in 2005 and 78 percent in 2008-09. The variation over time also differs considerably across countries. While the share of constrained firms dropped in Belarus from 45 to 34 percent between 2005 and 2008-09, it increased from 28 to 50 percent in Latvia.

[Insert Tables 1 and 2 here]

We next use the BEEPS survey to create firm-level control variables. These include firm size (*Small firm* and *Large firm* – making medium firms the base case); whether a firm is *Publicly listed*; is a *Sole proprietorship*; is a *Former state-owned enterprise*; is an *Exporter*; and whether a firm's financial statements are *Audited* by an external auditor. We expect that larger, publicly listed, and audited firms—all transparency proxies that should be inversely related to information asymmetries—face fewer credit constraints. Table 1 provides summary statistics of all variables and Appendix Table A1 gives their definitions and sources.

2.2. Bank branch networks

We next collect information on the bank branches in the vicinity of each firm. We need *time-varying* information to create an accurate picture of the branch networks in both 2005 and 2008-09. We hired a team of consultants with extensive banking experience to hand-collect contemporaneous and historical information on branch locations. This allows us to paint a (gradually changing) picture of the branching landscape in each year over the period 1995-2011. Changes over time reflect branch closures and openings, either incrementally by existing banks or in step-wise fashion when banks entered or exited a country. Information was gathered by contacting the banks or by downloading data from bank websites. All information was double-

checked with the bank as well as with the SNL Financial database. We focus on branches that provide funding to SMEs, excluding those that only lend to households or large corporates.

In total our dataset contains the geo-coordinates of 38,310 branches operated by 422 banks. These banks represent 96.8 percent of all bank assets in these 21 countries.[4] We merge this information with two other datasets: Bureau Van Dijk's BankScope, to get balance sheet and income statement data for each bank, and the Claessens and Van Horen (2014) database on bank ownership to determine whether a bank is foreign or domestic owned. A bank is classified as foreign owned if at least half of its equity is in foreign hands. For foreign banks we also identify the name and city of incorporation of the parent bank.

We connect the firm and branch data in two ways. First, we match by locality. For instance, we link all BEEPS firms in Brno, the second largest city of the Czech Republic, to all bank branches in Brno.[5] The assumption is that a firm has access to all branches in its locality. Second, we draw circles with a radius of 5 or 10 kilometers around the geo-coordinates of each firm and then link the firm to all branches inside that circle.[6] On average, a locality in our dataset contains 21 bank branches in 2008 whereas a circle with a 5 (10) kilometer radius contains 18 (30) branches. This reflects that most of the localities in our dataset are relatively large towns and cities. For instance, Brno covers an area of 230 km^2. This exceeds the surface of a 5 km circle (79 km^2) but is smaller than the surface of a 10 km circle (314 km^2). Our main analysis uses the locality variables but we will show that our results are very similar when using the alternative (circle) measures of spatial firm-bank closeness.

2.3. Measuring banks' lending techniques

The third and final step in our data construction is to create variables at the locality (or circle) level that measure key characteristics of the banks surrounding the firms. All of these variables are averages weighted by the number of branches that a bank operates in the locality. Our key variable,

[4] Unweighted country average. Total bank assets as taken from BankScope for the year 2007.
[5] Only very few firms are based in a locality without any bank branches. We link these firms to the branches in the nearest locality. Excluding them from the analysis does not impact any of our results.
[6] By way of comparison, the median Belgian SME borrower in Degryse and Ongena (2005) is located 2.5 kilometers (1.6 miles) from the lending bank's branch. In the U.S. data of Petersen and Rajan (2002) and Agarwal and Hauswald (2010) this median distance is 3.7 kilometers (2.3 miles) and 4.2 kilometers (2.6 miles), respectively.

Share relationship banks, measures the share of bank branches in a locality owned by relationship banks as opposed to transaction banks. To create this variable, we turn to the second Banking Environment and Performance Survey (BEPS II).[7] As part of BEPS II, a questionnaire was administered during a face-to-face interview with 397 bank CEOs by a specialized team of senior financial consultants, each with considerable first-hand banking experience. The interviewed banks represent 80.1 percent of all bank assets in the 21 sample countries.

We use BEPS question Q6, which asked CEOs to rate on a five-point scale the importance (frequency of use) of the following techniques when dealing with SMEs: relationship lending; fundamental and cash-flow analysis; business collateral; and personal collateral (personal assets pledged by the entrepreneur). Although, as expected, almost all banks find building a relationship (knowledge of the client) of some importance to their lending, about 60 percent of the banks in the sample find building a relationship "very important", while the rest considers it only "important" or "neither important nor unimportant". We categorize the banks that think that relationships are very important as relationship banks. Our variable *Share relationship banks* then equals the share of relationship banks in the locality of each firm, weighted by the number of branches each bank has in the locality.

Question Q6 does not refer to a specific date. However, Fahlenbrach, Prilmeier and Stulz (2012) show that bank business models hardly change over time. Indeed, when we enquired with a set of CEOs they confirmed that "these things do not change".[8] Also, due to technological developments such as small business credit-scoring, any gradual change in lending techniques has likely been in the direction of transaction lending. This would bias our results against finding a mitigating effect of relationship lending, as it makes it more likely that even though we now code a bank as a transaction lender it might have used more relationship lending techniques in the past. To more formally address this issue, we perform a robustness test (discussed in Section 5.1) where we limit our analysis to banks that were not involved in a merger or acquisition—events that may impact lending techniques—and show that our results continue to hold.

[7] See http://www.ebrd.com/what-we-do/economics/data/banking-environment-and-performance-survey.html.

[8] Additional data from the BEPS survey back up this assertion. We asked CEOs to rate, for 2007 and 2011, the importance of (i) training bank staff and (ii) introducing new IT technologies. Both activities may be related to changes in lending techniques. The survey answers reveal no strong shift in the prevalence of these activities over time and this holds for both relationship and transaction banks.

The self-reported nature of the survey data may introduce some biases. For example, bank CEOs may be overly optimistic about the use of certain lending techniques. Reporting could also be linked to personal characteristics or cultural background. We deal with these potential biases in several ways—including through country fixed effects, comparing the importance of lending techniques across different borrower types, and, most importantly, by using credit-registry data to study lending relationships in one of our sample countries in considerable detail. Specifically, in Section 5.3 we use Armenian loan-level data and show that loans by banks identified as relationship lenders in our survey, are longer-term, less likely to be collateralized, and granted to smaller borrowers. These lenders also have longer and broader relationships with their clients.

Interestingly, among *both* domestic and foreign banks there are large proportions of banks that identify themselves as relationship lenders. Indeed, while 45 percent of the domestic banks see themselves as relationship banks, this percentage is higher among foreign banks (64 percent). At first sight, this goes somewhat against the common wisdom that portrays foreign banks as transaction lenders (e.g. Mian, 2006; Beck, Ioannidou and Schäfer, 2016) in particular when foreign banks focus on a niche of large blue-chip companies. However, the role of foreign banks in our broad country sample is much more extensive and balanced than in some of the developing countries—such as Pakistan and Bolivia—that were the focus of earlier (single-country) studies. Foreign banks are not niche players in our country sample—they own between 20 and 90 percent of all banking assets—and regard emerging Europe as a second home market where they compete with domestic banks on a level-playing field (De Haas et al., 2015).

When we compare balance sheet and branching characteristics of relationship and transaction banks we do not find systematically significant differences (Table 3). The only variable that differs at the 10% level is the level of capitalization (p-value: 0.06). This difference, however, is driven by the fact that foreign banks, which are more likely to be relationship lenders, have lower Tier 1 ratios (measured at the parent level). Within the group of domestic banks, there are no significant differences between relationship and transaction lenders. Within the group of foreign banks, the only significant difference (p-value: 0.05) is that banks from Western Europe are more likely to

be relationship lenders.[9] We find no clear differences in terms of size, age, funding indicators, proportion of branches outside a country's main cities, average distance between branches and their headquarters, number of hierarchical levels involved in SME credit approval decisions, or entry mode (greenfield versus M&A). This suggests that our indicator of relationship lending does not significantly co-vary and therefore does not proxy for other observable bank characteristics.

[Insert Table 3 here]

The summary statistics in Table 1 show that, on average, the share of relationship banks in a locality was 53 percent in 2005 and 50 percent in 2008-09. This share varies significantly across countries, from 90 percent in the Czech Republic to 19 percent in Georgia (Table 2, 2008-09). Even more important for our empirical strategy is that there is substantial variation in relationship banking *within* countries.[10] This is visualized in Figure 1, a heat map of relationship banking in all localities with at least one BEEPS firm. Darker colors indicate a higher share of branches owned by banks viewing themselves as relationship banks. The map shows substantial variation in relationship banking *within* the 21 countries and this is exactly the cross-locality variation that we exploit in this paper.

[Insert Figure 1 here]

In a similar fashion, we also construct a rich set of control variables that measure other aspects of the local banking landscape. We measure for each firm the average Tier 1 ratio of the surrounding banks (*Tier 1*, as in Popov and Udell, 2012), the average use of wholesale funding by these banks (gross loans to customer funding ratio) (*Wholesale funding*), and banking competition in the vicinity of the firm as measured by the Herfindahl-Hirschman index (*HHI).*[11]

[9] We also run (unreported) multivariate regressions to gauge which characteristics explain whether a foreign bank subsidiary is a relationship lender. Also in this case the only variable that consistently enters positively and significantly is a dummy that indicates whether the parent bank is headquartered in Western Europe. This is consistent with Mian (2006) who shows that foreign bank subsidiaries in Pakistan whose parent banks are geographically and culturally closer (i.e. are headquartered in Asia) behave more like domestic banks.

[10] This variation is largely unrelated to the local presence of foreign banks. For instance, while foreign banks own about 25 percent of the branches in the Moldovan cities of Orhei and Ceadir-Lunga, the share of relationship banks in Orhei is relatively low at 40 percent whereas it amounts to 100 percent in Ceadir-Lunga.

[11] For foreign banks, the Tier 1 ratio and the use of wholesale funding are measured at the parent level.

3. Methodology

To estimate the link between the share of relationship banks near a firm and the probability that the firm is credit constrained, we use the following model for both the 2005 and 2008-09 cross-section. We hypothesize that relationship banks were particularly helpful once the cycle had turned in 2008. Consider the model:

$$Y_{ijkl} = \beta_1 X_{ijkl} + \beta_2 L_{jk} + \beta_3 Share\ relationship\ banks_{jk} + \beta_4 C_k + \beta_5 I_l + \varepsilon_{ijkl} \qquad (1)$$

where Y_{ijkl} is a dummy variable equal to 1 if firm *i* in locality *j* of country *k* in industry *l* is credit constrained (rejected or discouraged), and zero otherwise. X_{ijkl} is a matrix of firm covariates to control for observable firm-level heterogeneity: *Small firm*, *Large firm*, *Publicly listed*, *Sole proprietorship*, *Privatized*, *Exporter* and *Audited*. L_{jk} is a matrix of bank characteristics in locality *j* of country *k*: bank solvency (*Tier 1*), *Wholesale funding* and local banking competition (*HHI*). This matrix of locality characteristics also includes dummies to identify capitals and cities (localities with at least 50,000 inhabitants). We saturate the model with country and industry fixed effects C_k and I_l to wipe out (un)observable variation at these aggregation levels. The inclusion of all these variables should reduce omitted variable bias. We cluster error terms at the country-level to allow them to be correlated due to country-specific unobserved factors.

Our main independent variable of interest is *Share relationship banks*$_{jk}$, the share of bank branches in locality *j* of country *k* that belong to banks that think relationship banking is "very important" when dealing with SMEs. We are interested in β_3 which can be interpreted as showing the link between the presence of relationship banks and firms' credit constraints.

We present probit regressions both with and without a first-stage Heckman selection equation where the need for a loan is the dependent variable. Since in our sample a firm's credit constraint is only observable if the firm expresses the need for a loan, we use selection variables that are excluded from Equation (1) for the identification of the model. The first variable is *Informal payments*, a dummy that is one if the firm states that it sometimes, frequently, usually, or always

has to pay some irregular "additional payments or gifts" to get things done with regard to customs, taxes, licenses, regulations, and services; zero otherwise. The second variable is *Corruption*, a dummy that is one if the firm experiences corruption as a moderate, major or severe obstacle to its current operations; zero otherwise. Both variables are positively but only weakly correlated. While the first measure captures the incidence of bribery, the second one gauges its severity.

From an economic point of view, informal payments can be linked to credit demand in two main ways. First, costly bribes may directly increase a firm's financing needs (Ahlin and Pang, 2008). Second, firms that want to expand (and will at some point ask for bank credit for this expansion) become more interesting targets for bureaucrats that seek bribes and have discretion in enforcing regulations and licensing requirements. This is because the negotiating position of expanding firms weakens as the opportunity cost of not paying bribes goes up (Bliss and Di Tella, 1997 and Svensson, 2003). This will further strengthen the firm-level correlation between making informal payments and needing bank credit. Finally, note that informal payments are typically not observed by lenders as borrowers tend to actively hide bribes. They should therefore not factor into the subsequent loan supply decision.[12]

While an extensive literature has explored cross-country variation in corruption (e.g. Djankov, La Porta, Lopez-de-Silanes and Shleifer, 2002) other papers have documented substantial variation within countries, including Clarke and Xu (2004) for 21 Central and Eastern European countries and Johnson, Kaufmann, McMillan and Woodruff (2000) for five countries in this region. Variance decomposition (available on request) shows that within-country variation in *Informal payments* and *Corruption* is 3.5 times as high as between-country variation and within-industry variation is ten times as high as between-industry variation.

4. Empirical results

[12] In unreported regressions, we experiment with other selection variables including the intensity of competition a firm faces from other companies in the same industry and applying for government subsidies (following Popov and Udell (2012), Hainz and Nabokin (2013) and Ongena, Popov and Udell (2013)). Moreover, we run Heckman models without selection variables in the first stage so that the coefficient is only identified through the nonlinearity of the inverse Mills ratio. In all cases the results remain statistically and economically very similar.

4.1. Baseline results

We start our empirical analysis by summarizing in Table 4 the results of the Heckman selection equation. The dependent variable is a dummy that is one if the firm has a demand for bank credit, and zero otherwise. The probit specification includes the two selection variables—*Corruption* and *Informal Payments*—alongside our standard set of firm and locality covariates (unreported). We also include *Share relationship banks*, our key locality variable that we use as a credit-supply shifter in the next stage of our analysis. We saturate the model with country and industry fixed effects.

As expected, *Corruption* and *Informal Payments* are positively and significantly correlated with a firm's demand for credit. Importantly, we find no relationship, neither in 2005 nor in 2008-09, between our variable measuring the local presence of relationship banks and the demand for credit (either at the level of the firm locality or at the 5 (10) km circle around the firm). This gives us confidence that *Share relationship banks* is not endogenous to local demand conditions and hence a good candidate to subsequently identify shifts in the supply of credit.

At the bottom of Table 4, we provide three goodness-of-fit measures alongside the pseudo-R^2 as the latter may not be the most appropriate measure when dealing with a binary dependent variable. The first two provide information on the correctly predicted outcomes. We predict 61 to 62 percent of all outcomes correctly. According to McIntosh and Dorfman (1992) the sum of the fraction of zeroes correctly predicted plus the fraction of ones correctly predicted should exceed unity if the prediction method is of value. In our case the sum of these fractions is 1.22 or 1.23, which is reassuring. The third measure is the Hosmer-Lemeshow (2013) test statistic. This test investigates whether the fitted model is correct across the model population, i.e. whether the observed events match expected events in different subgroups of the population. Following standard practice, we employ 10 groups of equal size. The test consistently reveals that we cannot reject the null hypothesis that the fitted model is correct.

[Insert Table 4 here]

Next, in Table 5 we present regression specifications in line with Equation 1 to estimate the association between the local presence of relationship banks and firms' access to credit. We first show results for 2005—the time of the credit boom—and then for 2008-09—when the credit cycle had turned. For each period we present three probit regressions (at the locality level and with different sets of control variables) and then three second-stage Heckman regressions (at the level of the firm locality or the 5 (10) km circle around the firm). All models again include country and industry fixed effects.

[Insert Table 5 here]

The results in Table 5 show no significant relationship between the local importance of relationship lending and firms' financing constraints in 2005 but a strong and significantly negative relationship in 2008-09. When the credit cycle turned, firms in localities with relatively more banks that view relationships as very important were less constrained than observationally similar firms in localities with relatively few relationship lenders. The economic magnitude of this effect is substantial: using the coefficient of column (10), moving from a locality with 20 percent relationship banks to one with 80 percent relationship banks reduces the probability of being credit constrained in 2008-09 by 26 percentage points. These findings are large given that 40 percent of firms report to be constrained in 2008-09. Our results are consistent across different matching procedures between banks and firms (locality or circle) and robust to controlling for selection bias with the Heckman procedure or not. They also hold controlling for a large number of firm characteristics and other characteristics of the banks active in the respective location.[13]

Several of the control variables enter significantly and with coefficient signs consistent with the literature. Compared with medium-sized firms, small (large) firms are more (less) likely to be financially constrained. Exporters and audited firms are less likely to experience credit constraints. These results hold for both survey waves, reflecting that firm opaqueness tends to cause agency problems in both good and bad times. Publicly listed firms became more constrained during the

[13] Our results also remain quantitatively and qualitatively unchanged when we control for local economic activity as proxied by the 2005 gross cell product (US$, market exchange rates). Cells are terrestrial grids of 1 degree longitude by 1 degree latitude (approximately 100x100 km). Source: Yale University G-Econ Project. As these data are not available for all sample countries, we control for local economic development using capital and city dummies.

crisis than non-listed firms, reflecting the drying up of alternative funding sources. Similarly, sole proprietorships were significantly more constrained during 2008-09 but not during 2005.

Few of the locality-level control variables enter significantly. In line with Popov and Udell (2012), we find that firms in localities with branches of less solvent banks (lower Tier 1 ratio) experience tighter credit constraints in 2008-09, though the coefficient enters significantly in only one specification. The average reliance of local banks on wholesale funding does not explain financing constraints over and above banks' reliance on relationship lending. We further control for the degree of banking concentration (*HHI*) in the locality. In 2008-09, firms that are located in more concentrated banking markets face tighter credit constraints. This effect materializes over and above the beneficial effect of a high local share of relationship banks.[14]

Finally, in the second-stage Heckman regressions (columns 4-6 and 10-12), the inverse Mills ratio does not enter significantly in the 2008-09 regressions, indicating that selection bias does not distort our results during the crisis. The inverse Mills ratio enters significantly at the 10% in the 2005 regression, suggesting that some selection bias is present and that estimates obtained through regressions without a correction for this bias may be inconsistent. As discussed in Heckman (1979), in this case the standard errors obtained in the second step are understated and significance levels are therefore overstated. This re-enforces our finding of the absence of a significant relationship between the local presence of relationship banking and firms' credit constraints in 2005. The insignificance of the inverse Mills ratio in 2008-09 and the positive—though only borderline significant—inverse Mills ratio in 2005 also suggest that in 2005, a firm with average sample characteristics that selects into a need for credit has a somewhat higher probability of being credit constrained than a firm that is drawn at random from the entire population with the average set of characteristics, while in 2008-09 firms in need of credit were less special and closer to the typical firm in the population at large.

4.2. Firm heterogeneity

Theory predicts that relationship lending is especially important for small and opaque firms. However, it is a priori not clear whether relationship banks will continue lending to such firms

[14] The correlation coefficient between *HHI* and *Share relationship banks* is small (-0.11 in 2005; -0.23 in 2008-09).

during a credit downturn or focus on larger and less opaque firms. In Table 6 we therefore present regressions to estimate how the relationship between the local presence of banks that think relationships are very important and firms' access to credit varies across firm types. We interact *Share relationship banks* with inverse indicators of opacity: the number of employees; firm age; exporter status; a dummy indicating whether a firm is audited; a dummy that indicates whether a firm is likely to have external funding (access to state funding, a foreign parent, or the stock market); a dummy that indicates whether the firm is publicly listed; and a dummy that indicates whether the firm is in an industry with above-median levels of tangible assets (properties, plants and equipment). All specifications include our standard set of firm and locality controls as well as country and industry fixed effects (not reported). We estimate these models using linear probability OLS due to the well-known pitfalls associated with interaction effects in nonlinear models (Ai and Norton, 2003).[15] As in Table 5, the inverse Mills ratio enters insignificantly in the 2008-09 regressions, while it enters positively and significantly at the 10% level in several though not all 2005 regressions.

It is striking that none of these interaction effects is precisely estimated in 2005 while in 2008-09 the link between relationship lending and financing constraints consistently varies across firm types. We find the relationship between *Share relationship banks* and credit constraints during a crisis to be stronger for smaller and younger firms, non-exporting and non-audited firms, firms without access to non-bank external funding, non-listed firms, and firms with few tangible assets. That is, while a greater presence of relationship banks near a firm is associated with fewer firms being credit constrained in 2008-09, this association is much stronger for firms that according to an extensive literature typically face tighter credit constraints.

In terms of economic magnitudes, an increase in *Share relationship banks* from 20 to 80 per cent reduces credit constraints by 16 percentage points more for small firms (i.e. firms that are one standard deviation smaller) than for the median firm[16]; 13 percentage points more for young firms (one standard deviation younger) than for the median-aged firm; 10 percentage points more for

[15] We also estimate all models using probit and our results are virtually the same in terms of statistical significance and the magnitude of the marginal effects implied by the interaction terms.
[16] The 16 percentage points reduction in credit constraints is computed as -0.414*(0.6)+0.075*0.6*(3.3-1.39).

non-exporting firms; 8 percentage points more for non-audited firms; 11 percentage points more for firms without external funding; 16 percentage points more for firms that are not publicly listed; and 5 percentage points more for firms with below-median asset tangibility.

These findings are consistent with the literature that has shown that these firms suffer more from market frictions in their access to external finance and that relationship lending is consequently more important. Our results expand on these findings, however, by confirming that relationship lenders do not shy away from such firms during a credit downturn. Instead, the mitigating effect of the presence of relationship lenders on these firms' financing constraints is stronger during the downturn. We note that the significant interaction effects in 2008-09 also further reduce endogeneity concerns and suggest that our base specification indeed picks up the effect of the local prevalence of relationship lending on access to credit.

[Insert Table 6 here]

5. Robustness, extensions and external validation of the relationship-bank measure

5.1. Main robustness tests

Table 7 presents tests to gauge the robustness of our core results in columns 4 and 10 of Table 5. As before, we report the inverse Mills ratio in all second-stage Heckman regressions. It never enters significantly in the 2008-09 regressions and positively and significantly at the 10% level in the 2005 regressions. In the first six columns, we relax the discrete categorization (i.e. a bank is a relationship bank when it considers relationship lending to be very important). We first create a continuous variable so that we can use and weigh information on banks that consider relationship banking to be important though to a lesser degree (columns 1 and 2). We use each bank's score (on a five-point scale) to the question how important relationship banking is for SME lending and take the branch-weighted average by locality. The average value for this variable *Relationship banks (continuous)* is relatively stable between 2005 and 2008-09 at 3.39 and 3.38, respectively. Our findings are confirmed: the share of relationship banks enters negatively and significantly in 2008-09 but (positively and) insignificantly in 2005.

The next exercise, in columns 3 and 4, assesses the importance of relationship banking for SMEs relative to retail borrowers (within the same bank). *Relationship banks (relative to retail borrowers)* is the share of branches in a locality that are owned by banks whose CEO views relationship lending as a very important technique when lending to SMEs but not for retail borrowers. This relative measure mitigates potential biases that might occur in the reporting by CEOs. It enables us to focus on banks that find relationship lending especially important for the types of borrowers analyzed in this paper. Our results hold when using this alternative definition.

Lastly, *Share transaction banks* is the percentage of branches in a locality that are owned by banks for whom fundamental analysis and cash-flow based lending is a "very important" lending technique and for whom relationship lending is *not* very important. We find that a larger presence of these banks is associated with *more* credit constraints during the downturn but not in 2005 (columns 5-6). This mirrors, and hence corroborates, our findings on the beneficial effect of banks that consider themselves relationship lenders.

[Insert Table 7 here]

In the last four columns of Table 7, we examine whether our results are sensitive to how we identify credit constrained versus unconstrained firms. In columns 7 and 8, we use a narrower constraint definition where we do not consider firms to be credit constrained that are discouraged due to high interest rates. Firms that complain about high interest rates might simply not have projects with a sufficiently high return. We again find the same results. Lastly, in columns 9 and 10, we use an alternative (and inverse) credit-constrained variable that measures the percentage of a firm's fixed assets financed through bank credit. Consistent with our earlier findings, firms in localities with many banks that view themselves as relationship lenders have a higher proportion of assets funded through bank loans in 2008-09. This supports our baseline finding that these firms were less credit constrained. In 2005 this effect is negative at the 10 percent significance level, suggesting that firms in localities with many transaction banks had easier access to credit during the boom period. This is in line with the positive (but imprecisely estimated) effect of relationship lending on our baseline credit-constraints measure in 2005.

In Table OA1 in the Online Appendix we subject our results to additional robustness tests. We show the robustness of our findings to clustering the standard errors at the locality level (columns 1-2)[17] and to using a linear probability (OLS) model which allows us to calculate standard errors using the conservative wild cluster bootstrap-t procedure (Cameron, Gelbach and Miller, 2008) (columns 3-4). Our results also hold when we use a (branch-weighted) Lerner index as an alternative proxy for competition (columns 5-6) and when we control for the local share of foreign and of small banks (columns 7-8).

Pooling the 2005 and 2008-09 observations and including an interaction term between the share of relationship banks and a 2008-09 dummy yields an insignificant coefficient on the share of relationship banks and a statistically significant negative coefficient for the interaction term, thus confirming that the role of the local presence of relationship banks is limited to the downturn (column 9).[18] Dropping the largest country in our sample, Ukraine, shows that our findings are not driven by this single country (columns 10-11).[19] We also confirm our findings when excluding banks that experienced an ownership change during our sample period when computing *Share relationship banks*: arguably for this group of banks lending techniques have been most stable over time (columns 12-13). Finally, excluding multi-establishment firms (123 firms in 2005; 164 firms in 2008-09), which may be subject to the banking environment in several localities, confirms our findings (columns 14-15).[20]

5.2. Addressing endogeneity

We next assess whether our findings may be driven by endogeneity. The insignificant coefficient of *Share relationship banks* in the loan-demand regressions of Table 4 is reassuring. It suggests that relationship banks did not select into localities with a higher demand for external finance.

[17] While clustering by locality is appealing in principle, there are many localities with just one firm. In those cases locality clustering amounts to not clustering the standard errors at all. Overall, country-level clustering is therefore the more conservative approach.

[18] While the 2005 and 2008-09 waves of the BEEPS survey contain some firms that were interviewed in both waves, this sub-sample is too small to obtain sensible coefficient estimates.

[19] Similarly, our results hold when we exclude Poland—another large country—or the three relatively peripheral countries Armenia, Azerbaijan and Georgia.

[20] As in Table 5, the inverse Mills ratio enters insignificantly in the 2008-09 regressions and positively and significantly at the 10% level in the 2005 regressions. In column (9) where we use the combined sample, it does not enter significantly.

However, we cannot exclude the possibility that new firms selected into localities with a higher share of relationship banks to secure funding throughout the credit cycle. We therefore re-run our regressions dropping firms that were established either less than five years ago or less than 12 years ago (the median firm age in our sample). Columns 1 to 4 of Table OA2 in the Online Appendix confirm our findings. Next, the regressions in columns 5 to 8 show the robustness of our results by replacing the *current* branch-weighted share of relationship banks with the *historical* branch-weighted share of these banks in either 1995 or 2000. Using the lagged value of relationship banks in a locality reduces the risk that our findings are driven by banks' viewing themselves as relationship lenders entering localities to serve firms with a higher need for external finance. This confirms our findings.[21]

To further mitigate concerns, we ran an (unreported) locality-level regression of the *Share relationship banks* in 2008 on characteristics of the local firm population as well as country and industry fixed effects. If the presence of relationship banks were driven by the composition of the business sector in a locality, then we should find significant correlations between firm characteristics averaged at the locality level and the share of relationship banks. Yet, we do not find any significant relationship between, on the one hand, the share of small firms, large firms, sole proprietorships, privatized firms, exporters, or audited firms and, on the other hand, the share of relationship banks. We find only one marginally significant positive association, at the 10 percent level, between the share of publicly listed firms and the share of relationship banks. An F-test for the joint significance of these local firm characteristics cannot reject the null of no systematic relationship between firm characteristics and the presence of relationship banks (p-value: 0.25). We conclude that the presence of banks' viewing themselves as relationship banks in a locality is unrelated to a large set of observable firm characteristics.[22]

[21] As before, we find an insignificant inverse Mills ratio in the 2008-09 regression and a positive and significant at the 10% level inverse Mills ratio in the 2005 regressions.

[22] We also follow Altonji, Elder and Taber (2005) and Bellows and Miguel (2009) to assess omitted variable bias by gauging the coefficient stability across specifications. We calculate the ratio between the coefficient in the regression including controls (numerator) and the difference between this coefficient and one derived from a regression without covariates (denominator). This ratio shows how strong the covariance between the unobserved factors explaining credit constraints and the share of relationship banks needs to be, relative to the covariance between observable factors and the share of relationship banks, to explain away our effect. This ratio is 142.7 and 41.9 for the specifications in columns 9 (probit) and 10 (Heckman) of Table 5. These high ratios indicate that the coefficient for *Share relationship*

5.3. Are bank CEOs' views in line with actual indicators of relationship lending?

Our measure of relationship lenders is unique compared to the existing literature as it is based on a survey of bank CEOs. In light of possible biases due to perceptions of individual CEOs or cross-country cultural differences, we look for external validation of this measure by employing information from the Armenian Credit Reporting Agency. This credit registry contains information on all credit products—i.e. there are no minimum loan size reporting restrictions—sold to firms between January 2009 and June 2013 (a total of over 40,000 contracts). Slightly over half of these are standard loans whereas the remainder are credit lines, factoring, leasing, guarantees, letters of credit, overdrafts and repurchase agreements.

Armenia is one of the countries in our sample and is well covered by the BEPS II survey: 17 out of 19 Armenian banks participated in the survey and can therefore be classified as a relationship or transaction bank. The structure of the Armenian banking system is also representative of our country sample. According to our definition, 59 (41) percent of Armenian banks are relationship (transaction) banks. In our full country sample, these numbers are 58 (42) percent. Similarly, while 70 percent of all Armenian banks are foreign owned this number is 65 percent in the full country sample. Finally, of all foreign-owned Armenian banks 64 percent are classified as a relationship bank. In the full country sample this share is also 64 percent.

We use the detailed registry information on Armenian relationship and transaction banks to test whether any observable differences between both bank types are in line with the previous literature on relationship lending. If so, this would provide strong support for our survey-based bank classification and the empirical results based on that classification. A logical starting point is to check whether relationship banks engage in *longer* and *broader* lending relationships (Petersen and Rajan, 1994; Degryse and Van Cayseele, 2000; Ongena and Smith, 2001 and Uchida, Udell and Yamori, 2012). *Relationship length* measures the number of months since the bank first sold a credit product—a standard loan, credit line, factoring or leasing agreement, guarantee, letter of credit, overdraft or repurchase agreement—to the firm. This variable proxies for the ability of the bank to learn about the firm through repeat interactions over time. *Relationship breadth* measures

banks is remarkably stable when we add covariates. It is therefore unlikely that unobserved heterogeneity can explain away the protective role of local relationship lending that we document.

the number of different credit-product types that the bank has provided to a firm over the course of the relationship. A bank that provides a broader product range may generate a deeper understanding of the firm (Petersen, 1999).[23]

[Insert Table 8 here]

The first two rows of Table 8 compare the average and median *Relationship length* of relationship and transaction banks. We focus on firms that had outstanding credit contracts with banks in the first half of 2013.[24] The average (median) lending relationship of relationship banks is 3.21 (4.70) months longer than that of transaction banks. This implies that the median lending relationship of relationship banks is 20 percent longer than that of transaction banks. Relationship banks also provide firms with a slightly more diverse credit offering than transaction banks: on average 1.29 (1.25) different types of credit product for relationship (transaction) banks.

Consistent with theory, the data also show a substantially higher incidence of credit lines among clients of relationship banks.[25] At the borrower level, 12 (9) percent of all relationship (transaction) bank clients have ever received a credit line from their bank (line 5). At the individual product level, 10 percent of all credit products sold by relationship banks are credit lines as compared to only 7 percent for transaction banks (line 6). We also find that the mean (median) size of a borrower (as proxied by a firm's total amount of outstanding credit products from all sources) of a relationship bank is 37 (14) percent smaller than that of a transaction bank. This is consistent with the literature that suggests that relationship lenders specialize in lending to smaller firms, typically less transparent (Mian, 2006).

[23] By its very nature, the credit registry does not contain information on deposit accounts and other financial products. Our definition of relationship length and breadth is therefore limited to (a broad range of) credit products. This allows is to analyze whether the provision of more and different types of credit services brings informational economies of scale and scope to the lending relationship. It does, however, not allow us to assess the impact that the cross-selling of *non*-credit services may have on lending relationships (as in Santikian, 2014).

[24] We focus on this most recent half year to minimize the impact of left-censoring as our sample starts in 2009.

[25] According to Berger and Udell (1995) "*The line of credit is an attractive vehicle for studying the bank-borrower relationship because the line of credit itself represents a formalization of this relationship*".

Next, we compare two other key loan characteristics—collateralization and maturity—for all standard loans extended during the whole 2009-13 period.[26] The data show that the incidence of collateral among relationship banks is 11 percent lower than among transaction banks, in line with earlier theoretical and empirical work that shows that collateral requirements go down in case of longer firm-bank relationships (Boot and Thakor, 1994; Berger and Udell, 1995; Degryse and Van Cayseele, 2000; and Bharath, Sandeep, Saunders and Srinivasan, 2011). Moreover, the credit-registry data also suggest that relationship banks are willing to lend at longer maturities. The average (median) difference between the maturity of loans granted by relationship and transaction banks amounts to 2.8 (6.2) months.

The last three lines of Table 8 compare the loan quality of relationship versus transaction banks. We focus on the oldest loan vintage so we can track loans until maturity. If relationship lending involves improved screening and monitoring, then we expect better loan performance among relationship banks. On the other hand, relationship lenders may be more lenient and allow temporary non-repayment. Our data, which allow us to track loan performance over the entire duration of the loan, provide suggestive evidence in line with both of these mechanisms. First, we find that ex ante loan quality—as measured by banks' internal risk ratings on a 0 (worse) to 5 (best) scale—does not differ between relationship and transaction banks. However, during the life of the loan we do see that non-performance is temporarily higher among relationship banks (yet, this difference of 1.3 percentage points is not statistically significant). Interestingly, relationship banks are also more than twice as likely to recover a loan in the event of temporary repayment problems. This is in line with more intense and more effective monitoring by these banks (Mian, 2006).

In Table OA3 in the Online Appendix we compare Armenian relationship and transaction banks in a multivariate setting. We focus on the incidence of collateral and the maturity of standard loan contracts that were granted during the full 2009-13 period. All specifications include firm and

[26] Collateral helps banks to sort observationally equivalent borrowers, mitigate ex post moral hazard and reduce losses when a borrower defaults (Thakor and Udell, 1991 and Gale and Hellwig, 1985). Banks can use shorter maturities to allow for more frequent information disclosure and renegotiation of contract terms (Barnea, Haugen and Senbet, 1980 and Rajan, 1992).

time (semi-annual) fixed effects, so that we now compare the behavior of different bank types for the same firm.

We present specifications without covariates in columns 1 and 4 and add controls in columns 2-3 and 5-6. We include the loan amount and ex ante internal risk rating, as previous literature has shown that both loan size and the riskiness of borrowers—as perceived by the lender—affect loan maturity and the presence of collateral. We also control for the (level and squared) *Relationship length*, *Relationship breadth* (both as previously defined) and for whether the lender is a *Primary bank* (i.e. the bank has more than 50 percent of the firm's outstanding bank debt). Loan conditionality might vary even for the same firm across different lenders (Petersen and Rajan, 1994, Degryse and Van Cayseele, 2000). By controlling for within-firm differences across lenders, the dummy *Relationship bank* picks up differences in lending techniques independent of the relationship between this specific borrower and the bank.[27] These multivariate regressions confirm that relationship banks are significantly less likely to require collateral, even when controlling for various covariates. We further find positive though statistically insignificant maturity differences between both bank types in this multivariate setting.[28]

In sum, when we use detailed credit-registry data from Armenia to compare banks viewing themselves as relationship banks with those viewing themselves as transaction banks, we find that relationships banks engage in significantly longer and broader lending relationships, deal more often with smaller clients, and are less likely to require collateral. Notwithstanding this focus on more opaque clients and the limited use of collateral as a disciplining tool, we find only limited differences in temporary repayment problems. Moreover, relationship banks display a superior ability to get borrowers with repayment problems back on track. In all, this indicates that our novel way to identify relationship banks yields results that correspond very well with the existing evidence on the lending practices of these banks. This gives us additional confidence in the appropriateness of our classification method.

[27] The correlations among covariates are below 0.25 except for *Relationship breadth* and *Relationship length* (0.41). Columns 2 and 5 show that excluding *Relationship breadth* (and *Loan amount*) does not affect our results.

[28] In columns 7-9, we also assess the incidence of credit lines within a sample of all credit products provided to firms that interacted at least once with both a relationship and a transaction bank. As before, we find that a credit contract is significantly more likely to be a credit line if the lender is a relationship bank.

5.4. Relationship banking and regional business cycle variation

The effect of relationship lending may not only vary across firms with different characteristics but also with the macroeconomic environment in which they operate. In Table OA4 in the Online Appendix we analyze whether relationship lending is particularly beneficial to firms in regions that experience a more severe economic downturn. We interact our local measure of relationship lending with output growth in 2008-09 or 2007-09, exploiting new data on regional growth patterns.[29] In columns 1 and 2 we measure output growth at the level of the region where the firm is based. In columns 3 and 4 we present a mixed approach where we measure output growth at the regional level where available and at the country level elsewhere.

The results in Table OA4 confirm that the protective effect of the local presence of banks that view themselves as relationship lenders was particularly strong in those regions that were hit relatively hard by the 2007-09 financial crisis. The interaction terms of the share of relationship banks with output growth enter positively and significantly, suggesting that firms in areas with more negative growth benefited more in terms of fewer financing constraints if the share of relationship banks was higher. Relationship lending is thus especially important in more adverse macroeconomic environments. The inverse Mills ratio does not enter significantly in any of the regressions, suggesting that selection bias does not affect our estimations.

5.5. Relationship banking and local banking structure

Finally, in Table OA5 in the Online Appendix, we explore the interaction between the local presence of banks' viewing themselves as relationship lenders and the banking market structure.[30] First, we interact the share of relationship lenders with the degree of bank concentration (*HHI*) (columns 2 and 6). While this interaction is insignificant, the share of relationship lenders remains significantly negative in 2008-09. Second, in columns 3 and 7 we include *Share decentralized banks*, a locality variable that measures the share of branches owned by banks where loan officers make the final decision on SME loan applications. We also interact this decentralization variable

[29] See Gennaioli, La Porta, Lopez de Silanes and Shleifer (2014) for more details on the regional data. These local GDP data are consistently measured at the most disaggregated administrative level (typically states or provinces).

[30] Columns 1 and 5 of Table OA5 replicate columns 4 and 10 of Table 5 using linear probability regressions. We use a linear model throughout Table OA5 as we include interaction effects in most specifications (Ai and Norton, 2003).

with our local concentration measure. While none of the variables enter significantly in 2005, the interaction term enters positively and significantly in the 2008-09 sample. This is consistent with Canales and Nanda (2012), who show for the case of Mexico that decentralized banks, whose branch managers have greater lending autonomy and invest more in collecting soft information, grant smaller loans at higher interest rates in concentrated credit markets. Our results indicate that such hold-up behavior manifests itself mainly during cyclical downturns. Importantly, this does not affect our findings on the importance of relationship lenders in alleviating firms' credit constraints during the downturn (column 8).[31]

6. Relationship banking: Helping hand or evergreening?

Our analysis shows that a greater local presence of relationship banks is associated with fewer credit constraints during an economic downturn. This begs the question whether relationship banks help sound firms to bridge difficult times (as in Chemmanur and Fulghieri, 1994) and to recover more quickly or, in contrast, whether it reflects 'evergreening' as banks roll over loans to underperforming firms (as in Peek and Rosengren, 2005 and Caballero, Hoshi and Kashyap, 2008). In other words, do our findings point to a helping hand, and therefore a beneficial role of relationship lending for the real economy, or to zombie lending whereby banks keep inefficient firms alive with possible negative consequences for economic growth?

We approach this question from two angles. First, we set out to understand which firms take advantage of relationship lending during a downturn. In particular, we assess whether mainly sound firms benefit—in line with a helping-hand hypothesis—or whether it is the riskier part of the firm population that benefits—in line with an evergreening story. Second, we examine whether firms that have easier access to credit due to the local presence of relationship lenders perform relatively well (helping hand) or lag (evergreening) during a cyclical downturn.

To answer these two questions, we need detailed balance sheet and income statement information at the firm level, not available in BEEPS. We therefore collect comprehensive data from Bureau Van Dijk's Orbis database for all firms with bank debt in the pre-crisis year 2007 that

[31] We again find a positive and significant at the 10% level inverse Mills ratio in the 2005 regressions and an insignificant inverse Mills ratio in the 2008-09 regressions.

are located in the localities present in the BEEPS dataset that we have used so far. Data coverage in Orbis varies across variables and years: we can use information on about 63,000 firms for the period 2005-07 and 79,000 firms for the years 2007-09.

Based on these Orbis data, we create the variable *Change net debt* as a proxy for firms' ability to access additional credit during the cyclical downturn (see also Acharya, Eisert, Eufinger and Hirsch, 2014). We define net debt as current plus non-current liabilities minus cash and divide this by total assets. We then measure the change in net debt between end-2007 and end-2009 and between end-2005 and end-2007. This is the (inverse) equivalent of the BEEPS-based *Credit constrained* variable that we have used so far.

Using *Change net debt*, we find that firms in localities with a higher share of banks viewing themselves as relationship banks reduced their external debt financing between 2007 and 2009 less compared to similar firms in localities with a lower share of such banks (Table 9, column 2). This suggests that the former group of firms were less credit constrained. The economic magnitude of this effect is substantial: moving from a locality with 20 percent relationship banks to one with 80 percent relationship banks increases net debt by 3 percentage points, which is somewhat smaller than the average change in net debt over the period 2007-09. We do not find a significant effect of the local presence of relationship lenders over the period 2005-07 (column 1). The fact that we replicate this key result based on a completely different dataset adds further confidence to the robustness of our main finding that relationship banks alleviate credit constraints during a cyclical downturn but not during a credit boom.

Next, we use the Orbis data to distinguish between safe and risky firms. We follow Ohlson (1980)—who builds on Altman (1968)—and calculate a linear combination of nine firm-level financial variables, using the weights originally proposed by Ohlson.[32] The resulting O-score can then be transformed into the probability that a firm fails within a year: exp(O-score)/1+exp(O-score). We create two dummy variables to distinguish between safe and risky firms. The first dummy is "1" if the firm has a below-median O-score (and zero otherwise) while the second

[32] These variables are: log total assets adjusted for inflation; total liabilities/total assets; working capital/total assets; current liabilities/current assets; a dummy that is one if total liabilities exceed total assets and zero otherwise; net income/total assets; (pre-tax income + depreciation)/total liabilities; a dummy that is one if income was negative for the last two years and zero otherwise; and the relative change in net income defined as: $(NI_t - NI_{t-1})/(|NI_t| + |NI_{t-1}|)$.

dummy is "1" if the firm has a default probability below 0.5 (and zero otherwise). We compute these dummies using 2007 and 2009 data.

In columns 3 to 6 of Table 9, we now compare the association of relationship lending with external debt financing for safe versus risky firms during the downturn of 2007-09. We find that safe firms on average increased their external-debt financing less during those two years compared with risky firms. More importantly, the average positive effect of the local presence of relationship banks during a credit cycle downturn (column 2) appears to be driven by easier access to bank lending for safe firms. In contrast, the presence of relationship lenders had a negative effect on the change in external debt financing of risky firms. This holds when we measure firm risk on the basis of 2007 data (columns 3 and 5) or 2009 data (columns 4 and 6) and also holds for both of our firm-risk proxies. In summary, this suggests that relationship banks are more likely to expand lending to safe than to risky borrowers during the crisis. This result is in line with a helping-hand hypothesis and at odds with an evergreening explanation.

[Insert Table 9 here]

In Table 10, we focus on several basic firm indicators that might react to firms' (in)ability to access credit: total investment, the (log) change in total assets and the (log) change in the number of employees. Previous contributions show that credit constraints can negatively affect firm growth (Beck, Demirgüc-Kunt and Maksimovic, 2005) and investments (Campello, Graham and Harvey, 2010 and Duchin, Ozbas and Sensoy, 2010). Credit constraints can also constrain local employment as firms decrease their payroll to levels commensurate with internal funding sources (Chodorow-Reich, 2014).

We use these data in a two-stage least squares model to estimate the real effects of the local presence of relationship banks during a downturn. We instrument the endogenous variable *Change in net debt* by *Share relationship banks* while including a standard set of covariates. In this way we extract the exogenous element of the change in borrowing as determined by the local share of

relationship banks.[33] This first-stage regression equals our baseline specification in Table 9, column 2. Our identifying assumption is that the local banking structure in terms of lending techniques only affects firm growth through its impact on firms' ability to access credit.

In the second stage, presented in Table 10, we use the predicted change in net borrowing to explain investment (column 1), growth in total assets (column 2) and growth in the number of employees (column 3) between end-2007 and end-2009. The results suggest that where a high presence of relationship banks increases net borrowing in a locality, this is associated with higher subsequent firm growth in terms of new investment and total assets. In economic terms the effects are substantial. A firm that managed to increase its net debt by an additional one standard deviation, expanded its assets by 11.3 percent more over the subsequent two years compared with a more credit-constrained firm, all else equal.[34] We find no effect on employment growth. This likely reflects that hiring and firing decisions are taken irregularly as firms try to smooth employment fluctuations. This may apply in particular to the small firms in our sample.

In line with our discussion in previous sections, *Share relationship banks* reduces credit constraints and hence increases net debt significantly in the first stage, suggesting that this variable is a strong instrument. The F-statistic based on the first-stage regression is 11.7, above the often-used rule-of-thumb of 10, suggesting that our instrument is valid. Our results therefore suggest that there are positive real effects stemming from local relationship lending. This is again clearly at odds with a more negative 'evergreening' interpretation of our core results.

Finally, we present 2SLS regressions in columns 4 to 6 where we measure firm growth over the pre-crisis period 2005-07 instead of 2007-09. This amounts to a placebo test to assess whether firm-level changes in net debt in 2008-09 also induced higher firm growth in the *preceding* years 2005-2007. The absence of any effect here (and a very weak first stage) gives us further confidence that our results for 2007-09 indeed reflect the effect of incremental borrowing during the downturn on firm performance and not merely a selection effect.

[33] The Wooldridge (1995) robust score test indicates that Δ *Net Debt* cannot be treated as exogenous and that 2SLS is therefore the preferred estimation method. However, for *Growth employees* the p-value of this statistic is 0.49, suggesting that the change in net debt may be exogenous to the growth in the firm's number of employees.
[34] The standard deviation of the predicted value of *Change net debt* (based on the first-stage regression) is 0.07.

[Insert Table 10 here]

7. Conclusions

We collect data from 21 countries on the bank branches in the direct vicinity of a large sample of surveyed firms. Using information provided by the CEOs of these banks—a novelty in the relationship-lending literature—we can determine whether the banks around each firm view themselves as relationship lenders. To externally validate this novel way to classify relationship lending, we employ detailed credit registry data for Armenia and find that our classification method yields results that correspond well with existing evidence on the lending practices of relationship banks. We then use our classification of relationship banks to examine the association between the local predominance of relationship lending and firms' credit constraints at different points of the credit cycle.

We find that a greater presence of banks viewing themselves as relationship lenders is associated with fewer firms facing credit constraints during cyclical downturns. This presence is not important during good times, suggesting that different lending techniques then act as substitutes. During a downturn, the greater presence of relationship banks is beneficial in particular for smaller, younger and more opaque firms with less collateral to pledge. This easing effect of relationship banks on credit constraints mainly benefits relatively safe firms and is positively associated with firm investment and growth after the turn of the credit cycle. Our results are therefore in line with relationship banks smoothing the negative impact of cyclical downturns after having acquired sufficient information about borrowers during good times. This enables them to give sound firms a helping hand to bridge difficult times when transaction banks seem to withdraw.

Our analysis has broader implications beyond the region we look at. Several commentators have recently urged banks to go "back to basics" and to put more emphasis on relationship lending as this may insure firms against unexpected economic shocks.[35] A recent policy report on banks in Europe and the U.S. also points to the lack of information about SMEs as well as banks' disinvestments in front-end staff that interface directly with borrowers as reasons why banks remain reluctant to lend to SMEs in the wake of the global financial crisis (IIF, 2013). As loan

[35] For example, "*Local Banks for Local People"* (The Telegraph, 28-05-2013) and, for a contrarian view, "*Let's Abolish Wall Street and Return to Local Banking!*" (Forbes, 13-09-2012).

officers can rely less on collateral and hard information, they instead need to take a deeper look at firms' prospects. This requires a subtler judgment of the ability and commitment of firm owners and management. Our results concur with this anecdotal evidence as we find that not all banks are equally equipped to produce such judgments during a cyclical downturn.

Our results have a clear policy implication. While the recent literature has pointed to the benefits of diverse lending techniques within a banking system, relationship lending appears to have a more prominent role to play during economic downturns. The effect of a financial crisis on the real economy would therefore likely be smaller if banking systems encompass enough banks that put an emphasis on relationship lending, with firms actively seeking long-term banking relationships.

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Table 1
Summary Statistics

This table shows summary statistics for all variables used in the empirical analysis. Sd: standard deviation. Orbis firm-level variables are measured in 2005 (left side) and 2007 (right side), except for *Change net debt*, *Investment*, *Growth total assets*, and *Growth employees* which are measured over the period 2005-2007 (left side of the table) and 2007-2009 (right side of the table) and the *Safe firm* variables which are measured for 2007 (left side) and 2009 (right side). All variable definitions and data sources are provided in Appendix Table A1.

	2005						2008-09					
	N	Mean	Median	Sd	Min	Max	N	Mean	Median	Sd	Min	Max
Firm-level variables (BEEPS)												
Loan needed	7,053	0.70	1	0.46	0	1	7,047	0.62	1	0.48	0	1
Constrained	4,909	0.34	0	0.48	0	1	4,382	0.40	0	0.49	0	1
Narrow constrained	4,909	0.18	0	0.39	0	1	4,382	0.26	0	0.44	0	1
Small firm (< 20 employees)	7,053	0.55	1	0.50	0	1	7,045	0.42	0	0.49	0	1
Large firm (> 100 employees)	7,053	0.18	0	0.38	0	1	7,045	0.25	0	0.43	0	1
Publicly listed	7,053	0.02	0	0.14	0	1	7,111	0.12	0	0.32	0	1
Sole proprietorship	7,053	0.36	0	0.48	0	1	7,111	0.18	0	0.38	0	1
Privatized	7,053	0.12	0	0.33	0	1	7,111	0.18	0	0.38	0	1
Exporter	7,053	0.27	0	0.45	0	1	7,111	0.28	0	0.45	0	1
Corruption	7,053	0.36	0	0.48	0	1	7,111	0.49	0	0.50	0	1
Informal payments	7,053	0.34	0	0.47	0	1	7,111	0.27	0	0.44	0	1
Employees (log)	7,053	3.09	2.77	1.57	1.10	9.16	7,045	3.51	3.30	1.39	0	9.81
Age (log)	7,045	2.45	2.40	0.74	1.39	5.19	6,972	2.54	2.56	0.70	0	5.21
External funding	7,053	0.21	0	0.40	0	1	7,111	0.22	0	0.41	0	1
Audited	6,881	0.47	0	0.50	0	1	6,922	0.46	0	0.50	0	1
Asset tangibility (sector level)	2,834	0.46	0	0.50	0	1	2,686	0.51	1	0.50	0	1
Firm-level variables (Orbis)												
Change net debt	79,423	0.05	0.01	0.45	-3.30	5.55	96,723	0.05	0.00	0.66	-2.54	9.58
Investment	67,347	2.39	0.58	4.81	0	22.29	85,937	1.43	0.20	4.84	0.00	43.15
Growth total assets (log diff.)	89,368	0.51	0.33	0.89	-2.64	4.63	111,575	-0.03	-0.04	0.68	-3.13	4.04
Growth employees (log diff.)	82,420	0.14	0	0.59	-1.95	2.23	106,503	-0.07	0	0.57	-2.20	1.90
Small firm (< 20 employees)	121,484	0.74	1	0.44	0	1	121,484	0.74	1	0.44	0	1
Large firm (> 100 employees)	121,484	0.06	0	0.23	0	1	121,484	0.06	0	0.23	0	1
Publicly listed	121,484	0.00	0	0.02	0	1	121,484	0.00	0	0.02	0	1
Exporter	121,484	0.11	0	0.31	0	1	121,484	0.11	0	0.31	0	1
Leverage	88,316	0.84	0.95	0.27	-1	1	120,344	0.87	0.97	0.22	-1	1
Asset tangibility (firm level)	89,157	0.28	0.20	0.27	0	1	121,159	0.29	0.20	0.27	0	1
EBITDA	70,795	0.11	0.10	0.23	-2.28	1.34	96,403	0.11	0.10	0.23	-2.26	1.34
Cash flow	70,897	0.10	0.08	0.19	-2.36	1.08	96,478	0.08	0.07	0.21	-2.36	1.08
Safe firm (Ohlson O-score)	69,107	0.48	0	0.50	0	1	82,145	0.48	0	0.50	0	1
Safe firm (default probability)	69,107	0.65	1	0.48	0	1	82,144	0.58	1	0.49	0	1

Table 1 (cont'd)

	2005						2008-09					
	N	Mean	Median	Sd	Min	Max	N	Mean	Median	Sd	Min	Max
Locality-level variables												
Share relationship banks	6,706	0.53	0.57	0.27	0	1	7,025	0.50	0.50	0.23	0	1
Tier 1	6,898	11.96	9.58	5.59	6.5	41.3	6,962	10.68	9.13	3.86	5.51	41.4
Wholesale funding	7,016	111.94	113.81	30.77	23.94	243.79	7,098	130.93	120.65	40.75	51.10	495.88
HHI	7,053	0.22	0.16	0.18	0.06	1	7,111	0.18	0.13	0.18	0.05	1
Capital	7,053	0.34	0	0.47	0	1	7,111	0.32	0	0.46	0	1
City	7,053	0.43	0	0.50	0	1	7,111	0.37	0	0.48	0	1
Relationship banks (continuous)	6,706	3.39	3.50	0.45	2.00	4.00	7,025	3.38	3.44	0.36	2.00	4.00
Relationship banks (relative to retail)	6,706	0.33	0.34	0.23	0	1	7,022	0.28	0.25	0.21	0	1
Share transaction banks	6,706	0.36	0.34	0.26	0	1	7,025	0.39	0.39	0.25	0	1
Share relationship banks (1995)	6,000	0.58	0.62	0.31	0	1	5,987	0.53	0.50	0.32	0	1
Share relationship banks (2000)	6,133	0.55	0.55	0.29	0	1	6,318	0.48	0.49	0.30	0	1
Lerner index	6,989	0.40	0.41	0.06	0.14	0.73	7,094	0.40	0.40	0.05	0.17	0.65
Share foreign banks	7,053	0.52	0.59	0.31	0	1	7,111	0.58	0.64	0.28	0	1
Share small banks	6,718	0.52	0.43	0.42	0	1	7,074	0.46	0.40	0.36	0	1

Table 2
Relationship Banking and Credit Constraints

This table shows country means for some of our main variables. *Loan needed* indicates the proportion of firms that needed a loan during the last fiscal year. *Constrained* indicates the proportion of firms that needed a loan but were either discouraged from applying for one or were rejected when they applied. *Share relationship banks* is the number of branches of relationship banks in a locality divided by the total number of bank branches in that locality, averaged across all BEEPS localities in a country.

	Loan needed		**Constrained**		**Share relationship banks**	
	2005	2008-09	2005	2008-09	2005	2008-09
Albania	0.67	0.43	0.29	0.36	0.92	0.83
Armenia	0.74	0.59	0.32	0.35	0.35	0.46
Azerbaijan	0.52	0.55	0.64	0.78	0.36	0.45
Belarus	0.79	0.75	0.45	0.34	0.26	0.27
Bosnia	0.75	0.78	0.20	0.36	0.59	0.56
Bulgaria	0.67	0.58	0.35	0.48	0.84	0.77
Croatia	0.78	0.64	0.13	0.36	0.74	0.71
Czech Republic	0.55	0.52	0.41	0.30	1.00	0.90
Estonia	0.60	0.54	0.23	0.25	0.57	0.53
Georgia	0.62	0.64	0.36	0.36	0.18	0.19
Hungary	0.78	0.41	0.28	0.32	0.60	0.58
Latvia	0.70	0.59	0.28	0.50	0.49	0.45
Lithuania	0.71	0.60	0.29	0.22	0.61	0.59
Macedonia	0.67	0.60	0.55	0.49	0.40	0.39
Moldova	0.79	0.71	0.31	0.41	0.27	0.28
Poland	0.68	0.54	0.45	0.38	0.60	0.59
Romania	0.72	0.63	0.31	0.29	0.58	0.55
Serbia	0.76	0.77	0.37	0.38	0.81	0.79
Slovak Republic	0.61	0.54	0.21	0.38	0.27	0.31
Slovenia	0.72	0.64	0.12	0.17	0.67	0.64
Ukraine	0.69	0.68	0.37	0.51	0.11	0.27

Table 3
Comparing Relationship with Transaction Banks

This table compares relationship with transaction banks along a number of characteristics. Columns [1]-[3] refer to the full sample while columns [4]-[6] and [7]-[9] analyze domestic and foreign banks, respectively. In each of these three sets of columns, the first two columns indicate the percentage of all banks with a below-median value (odd column) or an above-median value (even column) *and* that are relationship banks. For dummy variables, the first two columns indicate the percentage of all banks where this dummy is '0' (odd column) or '1' (even column) *and* that are relationship banks. For instance, of all banks with a below (above) median share of branches outside the main cities 55 (59) per cent is a relationship bank. A formal t-test indicates whether these shares differ significantly. A *Small bank* has less than EUR 1 billion in assets. A *Young bank* was established less than four years ago. *Wholesale funding* is the gross loans/customer funding ratio (measured at the parent level for foreign banks). *Tier 1 ratio* is the tier 1 capital ratio (measured at the parent level for foreign banks). *Share branches outside main cities* is the share of bank branches not located in the country's capital or its two largest cities. *Hierarchical distance* is the number of hierarchical layers within the bank that are involved in the approval of SME loans. *Local distance* is the average km distance (log) between the branches of a bank and their domestic HQ. *Parent from border country* is '1' if the parent bank is headquartered in a country that shares a border with the country where the subsidiary is located; '0' otherwise. *Parent from Western Europe* is '1' if the parent bank is headquartered in a Western European country; '0' otherwise. *Distance to parent HQ* is the distance (log) between the domestic HQ and the parent HQ. *Greenfield* is '1' if a foreign bank was established as a de novo bank; '0' otherwise.

	All banks			**Domestic banks**			**Foreign banks**		
	Share relationship banks if continuous variable < median or if dummy = 0	Share relationship banks if continuous variable > median or if dummy = 1	t-test of equal shares (p-value)	Share relationship banks if continuous variable < median or if dummy = 0	Share relationship banks if continuous variable > median or if dummy = 1	t-test of equal shares (p-value)	Share relationship banks if continuous variable < median or if dummy = 0	Share relationship banks if continuous variable > median or if dummy = 1	t-test of equal shares (p-value)
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Small bank (dummy)	0.51	0.59	0.18	0.35	0.49	0.28	0.55	0.67	0.10
Young bank (dummy)	0.56	0.61	0.48	0.46	0.25	0.42	0.64	0.63	0.86
Wholesale funding	0.54	0.59	0.45	0.38	0.54	0.11	0.65	0.60	0.54
Tier 1 ratio	0.64	0.51	0.06	0.42	0.50	0.54	0.64	0.63	0.94
Share branches outside main cities	0.55	0.59	0.49	0.45	0.44	0.92	0.61	0.66	0.55
Hierarchical distance	0.57	0.58	0.88	0.46	0.43	0.79	0.62	0.66	0.54
Local distance	0.56	0.58	0.68	0.47	0.43	0.63	0.63	0.64	0.81
Parent from border country (dummy)	-	-	-	-	-	-	0.66	0.55	0.17
Parent from Western Europe (dummy)	-	-	-	-	-	-	0.53	0.68	0.05
Distance to parent HQ	-	-	-	-	-	-	0.64	0.64	0.96
Greenfield (dummy)	-	-	-	-	-	-	0.61	0.67	0.43

Table 4
Relationship Banking and Credit Demand Through the Credit Cycle

This table shows first-stage Heckman selection regressions to estimate the impact of the local presence of relationship banks on firms' demand for bank credit during the credit boom (2005) and crunch (2008-09). The first (last) three columns show 2005 (2008-09) estimates. Local banking variables used in columns [1] and [4] are defined at the level of the locality where a firm is based whereas those used in columns [2],[5] and [3],[6] consider the bank branches in a spatial ring around the firm with a 5 or 10 km radius, respectively. In all regressions the dependent variable is a dummy variable that is '1' if the firm needed credit. Unreported covariates are the same as those included in Table 5. Robust standard errors are clustered by country and shown in parentheses. ***, **, * correspond to the 1%, 5%, and 10% level of significance, respectively. Table A1 in the Appendix contains all variable definitions.

	2005			**2008-09**		
	Locality	5 km	10 km	Locality	5 km	10 km
	[1]	[2]	[3]	[4]	[5]	[6]
Share relationship banks	-0.066	0.055	0.001	0.043	0.034	0.065
	(0.139)	(0.134)	(0.152)	(0.147)	(0.132)	(0.143)
Corruption	0.253***	0.251***	0.249***	0.176***	0.173***	0.164***
	(0.054)	(0.053)	(0.055)	(0.037)	(0.035)	(0.034)
Informal payments	0.173***	0.175***	0.172***	0.175***	0.185***	0.181***
	(0.036)	(0.039)	(0.038)	(0.063)	(0.059)	(0.059)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	6,451	6,739	6,631	6,616	6,670	6,821
Pseudo R2	0.06	0.06	0.06	0.05	0.05	0.05
Correctly predicted outcomes (%)	0.62	0.61	0.62	0.61	0.61	0.61
Sum of % correctly predicted '0' and '1'	1.22	1.23	1.22	1.22	1.23	1.22
Hosmer-Lemeshow test (p-value)	0.93	0.17	0.87	0.42	0.17	0.33

Table 5
Relationship Banking and Credit Constraints Through the Credit Cycle

This table shows baseline regressions to estimate the relationship between the local presence of relationship banks and firms' access to bank credit during the credit boom (2005) and the credit crunch (2008-09). The first (last) six columns show 2005 (2008-09) estimates. Columns [1]-[3] and [7]-[9] show probit regressions while the other columns show second-stage results of a Heckman selection procedure (the excluded variables in the first stage are *Corruption* and *Informal payments*). Local banking variables used in columns [1]-[4] and [7]-[10] are defined at the level of the locality where the firm is based whereas those used in columns [5],[6] and [11],[12] are constructed by taking into account the bank branches in a spatial ring around the firm with a 5 or 10 km radius, respectively. In all regressions the dependent variable is a dummy variable that is '1' if the firm was credit constrained. Robust standard errors are clustered by country and shown in parentheses. ***, **, * correspond to the 1%, 5%, and 10% level of significance, respectively. Table A1 in the Appendix contains all variable definitions.

	2005						**2008-09**					
	Probit			Heckman			Probit			Heckman		
		Locality		Locality	5 km	10 km		Locality		Locality	5 km	10 km
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
Share relationship banks	0.081	0.017	0.226	0.206	0.277	0.214	-0.407***	-0.431***	-0.451***	-0.439***	-0.433***	-0.417**
	(0.241)	(0.246)	(0.290)	(0.289)	(0.211)	(0.212)	(0.127)	(0.134)	(0.141)	(0.144)	(0.142)	(0.175)
Small firm (<20 empl)		0.482***	0.504***	0.461***	0.440***	0.458***		0.370***	0.374***	0.384***	0.383***	0.396***
		(0.045)	(0.050)	(0.055)	(0.061)	(0.056)		(0.051)	(0.051)	(0.051)	(0.051)	(0.053)
Large firm (>100 empl)		-0.326***	-0.297***	-0.297***	-0.325***	-0.312***		-0.272***	-0.271***	-0.288***	-0.299***	-0.294***
		(0.095)	(0.097)	(0.097)	(0.091)	(0.092)		(0.043)	(0.044)	(0.052)	(0.056)	(0.057)
Publicly listed		-0.169	-0.178	-0.143	-0.152	-0.142		0.237***	0.245***	0.250***	0.247***	0.239***
		(0.167)	(0.166)	(0.168)	(0.163)	(0.170)		(0.072)	(0.072)	(0.070)	(0.072)	(0.069)
Sole proprietorship		0.063	0.076	0.113*	0.087	0.099		0.114**	0.122**	0.107*	0.113**	0.095*
		(0.069)	(0.065)	(0.069)	(0.071)	(0.071)		(0.053)	(0.052)	(0.055)	(0.056)	(0.053)
Privatized		-0.032	0.013	0.036	0.020	0.023		0.086	0.101	0.091	0.102	0.109
		(0.057)	(0.059)	(0.061)	(0.056)	(0.057)		(0.080)	(0.081)	(0.085)	(0.082)	(0.081)
Exporter		-0.249***	-0.259***	-0.221***	-0.232***	-0.231***		-0.201***	-0.203***	-0.213***	-0.211***	-0.210***
		(0.054)	(0.056)	(0.054)	(0.053)	(0.051)		(0.056)	(0.055)	(0.059)	(0.058)	(0.058)
Audited		-0.252***	-0.275***	-0.271***	-0.290***	-0.272***		-0.215***	-0.217***	-0.228***	-0.219***	-0.208***
		(0.054)	(0.054)	(0.053)	(0.052)	(0.056)		(0.051)	(0.052)	(0.053)	(0.053)	(0.053)
Tier 1			-0.005	-0.004	-0.007	0.000			-0.016**	-0.014	-0.006	-0.016
			(0.009)	(0.010)	(0.008)	(0.011)			(0.008)	(0.009)	(0.010)	(0.011)
Wholesale funding			0.000	0.001	0.000	0.001			0.000	-0.001	0.001	0.002
			(0.002)	(0.002)	(0.002)	(0.002)			(0.002)	(0.002)	(0.002)	(0.003)
HHI			-0.174	-0.139	-0.315	-0.133			0.360**	0.324**	0.445***	0.335**
			(0.179)	(0.175)	(0.226)	(0.143)			(0.167)	(0.163)	(0.171)	(0.164)
Capital			0.157	0.128	0.071	0.142			0.080	0.100	0.136*	0.106
			(0.103)	(0.105)	(0.098)	(0.087)			(0.083)	(0.085)	(0.079)	(0.068)
City			-0.136*	-0.135*	-0.173***	-0.106			0.007	-0.002	0.057	0.027
			(0.070)	(0.069)	(0.065)	(0.068)			(0.067)	(0.066)	(0.062)	(0.060)
Inverse Mills' ratio				0.484*	0.490*	0.545*				-0.207	-0.200	-0.149
				(0.274)	(0.285)	(0.291)				(0.205)	(0.203)	(0.214)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	4,690	4,610	4,527	4,527	4,693	4,651	4,235	4,105	4,085	4,085	4,121	4,208
Pseudo R2	0.05	0.13	0.13	0.13	0.13	0.13	0.05	0.10	0.10	0.10	0.10	0.10
Correctly predicted outcomes (%)	0.62	0.66	0.67	0.67	0.66	0.67	0.61	0.65	0.65	0.65	0.65	0.65
Sum of % correctly predicted '0' and '1'	1.21	1.34	1.36	1.36	1.35	1.35	1.18	1.29	1.29	1.29	1.29	1.29
Hosmer-Lemeshow test (p-value)	0.63	0.60	0.12	0.12	0.13	0.16	0.13	0.43	0.54	0.49	0.27	0.51

Table 6
Relationship Banking and Credit Constraints Through the Credit Cycle: Firm Heterogeneity

This table shows linear probability OLS regressions to estimate how the relationship between the local presence of relationship lenders and firms' access to bank credit during the credit boom (2005) and the credit crunch (2008-09) differs across firm types. The first (last) seven columns show 2005 (2008-09) estimates. All columns show second-stage results of a Heckman selection procedure (the excluded variables in the first stage are *Corruption* and *Informal payments*) where *Share relationship banks* is measured at the locality level. In all regressions the dependent variable is a dummy variable that is '1' if the firm was credit constrained. All local banking variables are defined at the level of the locality where a firm is based. Unreported covariates are the same as in Table 5. Robust standard errors are clustered by country and shown in parentheses. ***, **, * correspond to the 1%, 5%, and 10% level of significance, respectively. Table A1 in the Appendix contains all variable definitions.

	2005							2008-09						
Firm type →	Employees	Age	Exporter	Audited	External funding	Publicly listed	Asset tangibility	Employees	Age	Exporter	Audited	External funding	Publicly listed	Asset tangibility
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]
Share relationship banks	0.029	0.013	0.062	0.117	0.051	0.075	0.028	-0.414***	-0.401***	-0.203***	-0.213***	-0.187***	-0.186***	-0.114
	(0.139)	(0.182)	(0.099)	(0.095)	(0.093)	(0.088)	(0.132)	(0.094)	(0.120)	(0.064)	(0.061)	(0.054)	(0.052)	(0.083)
Share relationship banks * Firm type	0.011	0.024	0.037	-0.085	0.097	-0.048	0.007	0.075***	0.098**	0.155**	0.132*	0.173***	0.252***	0.111*
	(0.021)	(0.054)	(0.092)	(0.059)	(0.089)	(0.156)	(0.092)	(0.025)	(0.043)	(0.076)	(0.072)	(0.060)	(0.085)	(0.062)
Firm type	-0.077***	0.020	-0.088*	-0.045*	0.002	0.027	-0.120**	-0.116***	-0.059**	-0.156***	-0.143***	-0.037	-0.035	-0.129***
	(0.015)	(0.027)	(0.046)	(0.025)	(0.054)	(0.112)	(0.048)	(0.013)	(0.025)	(0.038)	(0.042)	(0.036)	(0.047)	(0.034)
Inverse Mills' ratio	0.600*	0.598*	0.576	0.600*	0.577	0.602*	0.240	-0.258	-0.326	-0.300	-0.314	-0.285	-0.298	-0.767
	(0.317)	(0.326)	(0.351)	(0.329)	(0.354)	(0.329)	(0.595)	(0.217)	(0.237)	(0.224)	(0.220)	(0.229)	(0.226)	(0.667)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Number of obs.	4,527	4,527	4,527	4,527	4,527	4,527	1,929	4,085	4,085	4,085	4,085	4,085	4,085	1,652
R2	0.16	0.15	0.15	0.15	0.15	0.15	0.17	0.13	0.12	0.12	0.12	0.12	0.12	0.13

Table 7
Relationship Banking and Credit Constraints: Robustness Tests

This table shows various robustness tests of our baseline results in Table 5. In columns [1]-[2] the main independent variable is a branch-weighted average of how banks in a locality rate the importance of relationship lending on a 5-point scale (ranging from 0 to 4). In columns [3]-[4] the main independent variable is the number of branches of banks for whom relationship lending is a "Very important" lending technique for SMEs but not for retail clients/total no. of branches in the locality. In columns [5]-[6] the main independent variable is the number of branches of transaction banks/total no. bank branches in the locality. Transaction banks are those for whom fundamental/cash-flow-based lending is a "Very important" lending technique while relationship lending is not a very important lending technique. Columns [7]-[8] show regressions for a more narrowly defined credit-constrained variable. Columns [9]-[10] use the percentage of fixed assets funded through bank credit as an alternative dependent variable in an OLS regression. All columns show second-stage results of a Heckman selection procedure (the excluded variables in the first stage are *Corruption* and *Informal payments*) where *Share relationship banks* is measured at the locality level. In all regressions except those in columns [9] and [10] the dependent variable is a dummy variable that is '1' if the firm was credit constrained. All local banking variables are defined at the level of the locality where a firm is based. Unreported covariates are the same as in Table 5. Robust standard errors are clustered by country and shown in parentheses. ***, **, * correspond to the 1%, 5%, and 10% level of significance, respectively. Table A1 in the Appendix contains all variable definitions.

	Relationship banks (continuous)		**Relationship banks (relative to retail borrowers)**		**Share transaction banks**		**Narrow constrained**		**Bank-funded fixed assets**	
	2005	2008-09	2005	2008-09	2005	2008-09	2005	2008-09	2005	2008-09
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Share relationship banks	0.098	-0.196*	0.270	-0.493**	-0.259	0.421**	0.107	-0.299**	-8.609*	11.583**
	(0.186)	(0.119)	(0.270)	(0.209)	(0.299)	(0.176)	(0.188)	(0.156)	(4.418)	(4.969)
Inverse Mills' ratio	0.580*	-0.203	0.582*	-0.241	0.575*	-0.208	0.453	-0.318	-	-
	(0.335)	(0.203)	(0.334)	(0.207)	(0.340)	(0.202)	(0.282)	(0.262)	-	-
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	4,527	4,085	4,527	4,083	4,527	4,085	4,527	4,075	4,798	4,018
(Pseudo) R2	0.13	0.10	0.13	0.10	0.13	0.10	0.13	0.10	0.06	0.03
Correctly predicted outcomes (%)	0.67	0.65	0.67	0.65	0.67	0.65	0.66	0.62	-	-
Sum of % correctly predicted '0' and '1'	1.36	1.29	1.36	1.29	1.36	1.29	1.28	1.20	-	-
Hosmer-Lemeshow test (p-value)	0.29	0.32	0.17	0.63	0.21	0.52	0.41	0.28	-	-

Table 8
Relationship Banks versus Transaction Banks: The Case of Armenia

This table compares relationship banks with transaction banks in Armenia along a number of key characteristics. *Relationship length* measures the number of months since the bank provided the borrower with the first credit product (i.e. a standard loan, credit line, factoring or leasing contract, guarantee, letter of credit, overdraft agreement or a repurchase agreement). *Relationship breadth* measures the number of different credit products (standard loan, credit line, factoring or leasing contract, guarantee, letter of credit, overdraft agreement or a repurchase agreement) that a client received from the bank over the course of the relationship; and *Borrower size* equals the firm's total amount of outstanding credit products from all sources and is expressed in US$. All other variable definitions can be found in the main text. ***, **, * indicate a difference that is statistically significant at the 1, 5 or 10 percent level, respectively, according to a t-test of equal means or a non-parametric equality of medians test (Pearson ch^2 test). Source: BEPS II and the Armenian credit registry (ACRA).

	Relationship banks	Transaction banks	Difference	Period	Number of observations
	[1]	[2]	[3]	[4]	[5]
Relationship length (mean)	30.03	26.82	3.21***	H1 2013	15,729
Relationship length (median)	28.20	23.50	4.70***	H1 2013	15,729
Relationship breadth (mean)	1.29	1.25	0.04***	H1 2013	11,912
Relationship breadth (median)	1.00	1.00	0.00	H1 2013	11,912
Credit line incidence (borrower level)	12%	9%	3%***	2009-13	11,912
Credit line incidence (product level)	10%	7%	3%***	2009-13	40,358
Borrower size (mean)	439,054	691,958	-252,904***	2009-13	11,344
Borrower size (median)	30,000	35,000	-5,000***	2009-13	11,344
Collateral dummy (mean)	80%	90%	-10%***	2009-13	22,422
Collateral dummy (median)	100%	100%	0.00	2009-13	22,422
Maturity (mean)	35.72	32.93	2.79***	2009-13	22,422
Maturity (median)	36.50	30.33	6.17***	2009-13	22,422
Ex ante internal risk rating (0-5)	4.97	4.98	-0.01	2009	3,953
Non-performance during loan	8.60%	7.30%	1.30%	2009	3,953
Loan recovered after non-performance	1.70%	0.80%	0.90%**	2009	3,953

Table 9
Relationship Banking: Helping Hand or Evergreening?

This table shows OLS regressions, based on Orbis firm-level data, to estimate the relationship between *Share relationship banks* and the change in net debt during the credit boom (2005-07, column [1]) and the credit crunch (2007-09, columns [2]-[6]). In columns [3] and [4], *Safe firm* is a dummy variable that is "1" for firms with a below-median Ohlson O-score and "0" otherwise. In columns [5] and [6], *Safe firm* is a dummy variable that is "1" for firms with a probability of default below 0.5 and "0" otherwise. Columns [3] and [5] measure firm risk in 2007 and columns [4] and [6] in 2009. The following firm covariates are included: *Small firm*, *Large firm*, *Publicly listed, Exporter, Leverage*, *Asset tangibility, EBITDA* and *Cash flow*. The locality controls are the same as in Table 5. All local banking variables are defined at the level of the locality where a firm is based. Robust standard errors are clustered by country and shown in parentheses. ***, **, * correspond to the 1%, 5%, and 10% level of significance, respectively. Table A1 in the Appendix contains all variable definitions.

Dependent variable →	**Δ Net Debt 2005-07**	**Δ Net Debt 2007-09**	**Δ Net Debt 2007-09**			
			Safe firm proxy: Low Ohlson O-score		Safe firm proxy: Low default probability	
			2007	2009	2007	2009
	[1]	[2]	[3]	[4]	[5]	[6]
Share relationship banks	-0.001	0.057***	-0.086	-0.098*	-0.134*	-0.140**
	(0.013)	(0.017)	(0.051)	(0.046)	(0.072)	(0.053)
Share relationship banks * Safe firm			0.198**	0.197**	0.222**	0.230**
			(0.087)	(0.085)	(0.100)	(0.083)
Safe firm			-0.133**	-0.347***	-0.160**	-0.374***
			(0.047)	(0.063)	(0.055)	(0.059)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	62,793	79,261	57,162	69,356	57,162	69,355
R2	0.036	0.016	0.016	0.111	0.017	0.113

Table 10
The Real Effects of Relationship Banking

This table shows two-stage least squares (2SLS) regressions, based on Orbis firm-level data, to estimate the impact of the change in net debt between end-2007 and end-2009 on firms' investment ([1]), asset growth ([2]) and growth in the number of employees ([3]) during the credit crunch (2007-09). In the first-stage, the locality-level instrument is *Share relationship bank*. Columns [4]-[6] provide a placebo test with second-stage outcomes measured as growth rates between end-2005 and end-2007. The following firm covariates are included: *Small firm*, *Large firm*, *Publicly listed*, *Exporter*, *Leverage*, *Asset tangibility*, *EBITDA* and *Cash flow*. The locality controls are the same as in Table 5. Local banking variables are defined at the level of the locality where a firm is based. Robust standard errors are clustered by country and shown in parentheses. ***, **, * correspond to the 1%, 5%, and 10% level of significance, respectively. Table A1 in the Appendix contains all variable definitions.

	2007-2009			**2005-2007**		
	Investment	Growth total assets	Growth employees	Investment	Growth total assets	Growth employees
	[1]	[2]	[3]	[4]	[5]	[6]
Δ Net Debt 2007-09	9.205**	1.365**	-0.640	46.757	5.868	3.614
	(3.966)	(0.572)	(0.813)	(93.466)	(9.744)	(7.804)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
F-stat	11.676	11.676	11.676	0.041	0.041	0.041
R2 (first stage)	0.018	0.018	0.018	0.012	0.012	0.012
Share relationship banks	0.039***	0.039***	0.039***	0.003***	0.003***	0.003***
(first-stage)	(0.011)	(0.011)	(0.011)	(0.015)	(0.015)	(0.015)
Number of obs.	71,000	71,000	71,000	48,548	48,548	48,548

Figure 1
Local Variation in Relationship Banking

This heat map plots the geographical localities in our dataset. Each dot indicates a locality that contains at least one surveyed firm. Darker colors indicate a higher proportion of bank branches owned by relationship banks. Relationship banks are defined as banks whose CEO mentioned that relationship lending was a "Very important" technique when lending to SMEs.

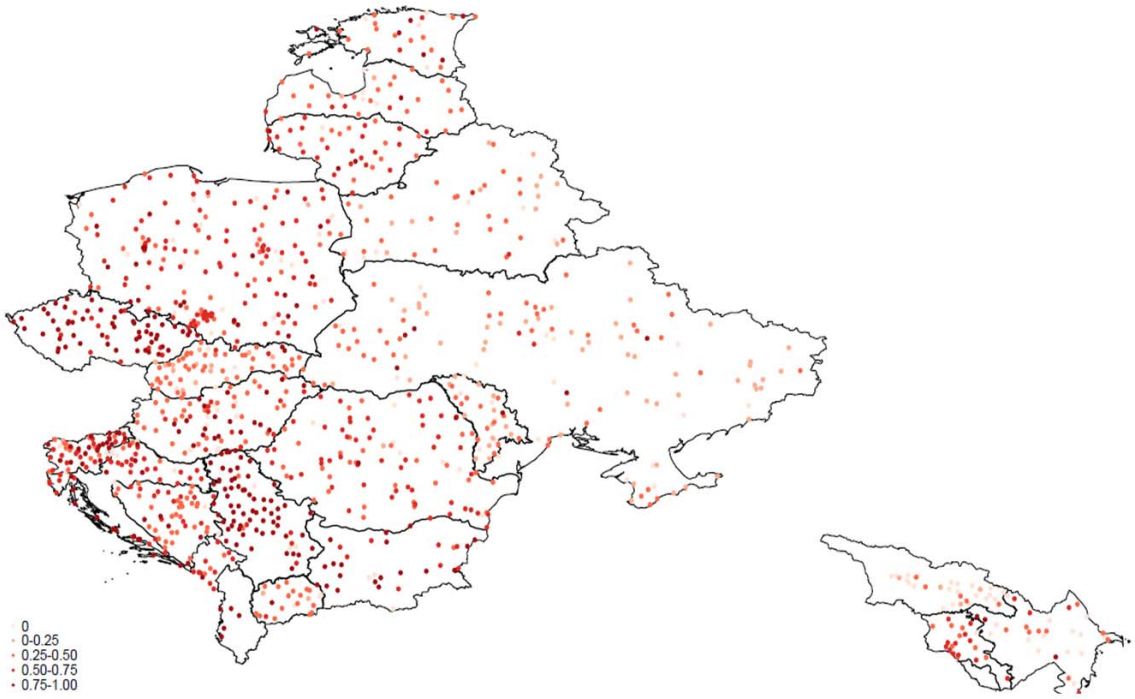

Table A1
Variable Definitions and Sources

This table shows variables definitions and data sources for all variables used in the empirical analysis.

	Definition	Source	Unit
Firm-level variables			
Loan needed	Dummy=1 if firm needs a loan; 0 otherwise	BEEPS	0/1
Constrained	Dummy=1 if firm needs a loan but was discouraged from applying or rejected when it applied; 0 otherwise	BEEPS	0/1
Narrow constrained	Dummy=1 if firm needs a loan but was discouraged from applying or rejected when it applied (except for firms that were discouraged due to high interest rates); 0 otherwise	BEEPS	0/1
Bank-funded fixed assets	Percentage of firm's fixed assets funded through bank credit	BEEPS	%
Small firm (< 20 empl)	Dummy=1 if firm employs less than 20 people; 0 otherwise	BEEPS	0/1
Large firm (> 100 empl)	Dummy=1 if firm employs more than 100 people; 0 otherwise	BEEPS	0/1
Publicly listed	Dummy=1 if firm is a shareholder company with publicly traded shares; 0 otherwise	BEEPS	0/1
Sole proprietorship	Dummy=1 if firm is a sole proprietorship; 0 otherwise	BEEPS	0/1
Privatized	Dummy=1 if firm is a former state enterprise that was subsequently privatized; 0 otherwise	BEEPS	0/1
Exporter	Dummy=1 if part or all of the firm's production is exported; 0 otherwise	BEEPS	0/1
Corruption	Dummy=1 if corruption is a moderate, major or severe obstacle to the firm's operations; 0 otherwise	BEEPS	0/1
Informal payments	Dummy=1 if the firm manager indicates that firms in his/her line of business at least sometimes have to pay irregular "additional payments or gifts" to get things done with regard to customs, taxes, licenses, and regulations; 0 otherwise	BEEPS	0/1
Age	Firm age in years (in logs)	BEEPS	-
External funding	Dummy=1 if firm is state-owned, foreign-owned, and/or has publicly traded shares; 0 otherwise	BEEPS	0/1
Audited	Dummy=1 if the financial statements of the firm are audited by an external auditor; 0 otherwise	BEEPS	0/1
Asset tangibility (sector level)	Dummy=1 if the firm is in an industry with an above-median fraction of assets represented by net property, plant and equipment for US firms in the same industry during 1980–89; 0 otherwise	Aghion and Kharroubi (2013)	0/1
Change net debt	Change in (Current + Non-current liabilities - Cash)/Total assets	Orbis	Δ share
Investment	(Fixed assets(t) - Fixed assets(t-n) + Depreciation)/Fixed assets(t-n); 0 when negative	Orbis	%
Growth total assets	Growth of a firm's total assets (log difference)	Orbis	%
Growth employees	Growth of a firm's total number of employees (log difference)	Orbis	%
Leverage	(Total assets-Equity)/Total assets	Orbis	%
Asset tangibility (firm level)	Fixed assets/Total assets	Orbis	%
EBITDA	(Earnings before interest, Taxes, Depreciation and Amortization)/Total assets	Orbis	%
Cash flow	Cash flow/Total assets	Orbis	%
Safe firm (Ohlson O-score)	Dummy =1 if firm has a below median Ohlson O-score; 0 otherwise	Orbis	0/1
Safe firm (default probability)	Dummy =1 if firm has a default probability <0.5; 0 otherwise. Default probability is exp(Ohlson O-score)/1+exp(Ohlson O-score)	Orbis	0/1

Table A1 (cont'd)

	Definition	Source	Unit
Locality-level variables			
Share relationship banks	No. branches of relationship banks/total no. bank branches in the locality. Relationship banks are those banks for whom relationship lending is a "Very important" lending technique	BEPS	Share
Tier 1	Average Tier 1 capital ratio of banks in a locality (branch weighted)	BankScope/BEPS	Share
Wholesale funding	Average wholesale funding (gross loans/customer funding ratio) of banks in a locality (branch weighted)	BankScope/BEPS	Share
HHI	Locality-level Herfindahl-Hirschmann Index. Market shares measured by branches.	BEPS	Share
Capital	Dummy=1 if locality is the capital of the country; 0 otherwise	BEPS	0/1
City	Dummy=1 if locality has at least 50,000 inhabitants; 0 otherwise	BEPS	0/1
Relationship banks (continuous)	Branch-weighted average of how banks in a locality rate the importance of relationship lending on a 5-point scale (ranging from 0 to 4)	BEPS	Share
Relationship banks (relative to retail)	No. branches of banks for whom relationship lending is "Very important" for SME but not for retail lending/total no. bank branches in the locality	BEPS	Share
Share transaction banks	No. branches of transaction banks/total no. bank branches in the locality. Transaction banks are those for whom fundamental/cash-flow-based lending is a "Very important" lending technique while relationship lending is not a "Very	BEPS	Share
Share relationship banks (1995)	No. branches of relationship banks/total no. bank branches in the locality in 1995. Relationship banks are those banks for whom relationship lending is a "Very important" lending technique	BEPS	Share
Share relationship banks (2000)	No. branches of relationship banks/total no. bank branches in the locality in 2000. Relationship banks are those banks for	BEPS	Share
Lerner index	Locality-level Lerner index. Branch-weighted average of Lerner index as estimated for each bank	BankScope/BEPS	Share
Share foreign banks	No. branches of foreign-owned banks/total no. bank branches in the locality	BEPS	Share
Share small banks	No. branches of banks with less than EUR 1 billion in assets/total no. bank branches in the locality	BankScope/BEPS	Share
Regional GDP growth	Real GDP growth in a region	National sources	%

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Table OA1
Relationship Banking and Credit Constraints: Additional Robustness Tests

This table shows additional robustness tests of our baseline results in Table 5. Robust standard errors are clustered by locality instead of by country in columns [1]-[2]. In columns [3]-[4] the models are estimated using a linear probability (OLS) model and standard errors are Wild cluster bootstrapped. Columns [5]-[6] include a locality-level and branch-weighted Lerner index instead of the Hirshmann-Herfindahl index to measure local credit-market competition. Columns [7]-[8] include locality-level and branch-weighted control variables that measure the *Share small banks* and *Share foreign banks*. Column [9] is estimated for a pooled 2005-08/09 sample. Columns [10]-[11] exclude all Ukrainian observations. Columns [12]-[13] exclude banks where ownership changes took place during our sample period when computing *Share relationship banks*. Column [14]-[15] exclude multi-establishment firms whose headquarters are based in another locality. All columns show second-stage results of a Heckman selection procedure (the excluded variables in the first stage are *Corruption* and *Informal payments*) where *Share relationship banks* is measured at the locality level. In all regressions the dependent variable is a dummy variable that is '1' if the firm was credit constrained. All local banking variables are defined at the level of the locality where a firm is based. Unreported covariates are the same as in Table 6. Robust standard errors are clustered by country (except in columns [1]-[2]) and shown in parentheses. ***, **, * correspond to the 1%, 5%, and 10% level of significance, respectively. Table A1 in the Appendix contains all variable definitions.

	Clustering at locality level		**Linear probability model, wild cluster bootstrapped s.e.**		**Alternative control for local competition**		**Controlling for foreign and small banks**		**Pooled sample**	**Excluding Ukraine**		**Excl. banks with ownership change**		**Excl. multi-establishment firms**	
	2005	2008-09	2005	2008-09	2005	2008-09	2005	2008-09	2005; 2008-09	2005	2008-09	2005	2008-09	2005	2008-09
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]
Share relationship banks	0.206	-0.439***	0.073	-0.149***	0.196	-0.450***	0.110	-0.413***	0.218	0.327	-0.468***	0.359	-0.286*	0.127	-0.428***
	(0.219)	(0.152)	(0.088)	(0.051)	(0.290)	(0.155)	(0.297)	(0.146)	(0.289)	(0.280)	(0.157)	(0.239)	(0.170)	(0.294)	(0.147)
Lerner index					-0.407	0.343									
					(0.901)	(1.055)									
Share foreign banks							0.099	-0.079							
							(0.426)	(0.257)							
Share small banks							-0.131	0.007							
							(0.474)	(0.126)							
Share relationship banks*2008-09									-0.648**						
									(0.326)						
Inverse Mills' ratio	0.584*	-0.207	0.604*	-0.303	0.502*	-0.235	0.506*	-0.195	0.232	0.593*	-0.169	0.512*	-0.192	0.507*	-0.182
	(0.316)	(0.301)	(0.329)	(0.223)	(0.274)	(0.206)	(0.280)	(0.212)	(0.196)	(0.324)	(0.217)	(0.276)	(0.200)	(0.279)	(0.211)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	4,527	4,085	4,527	4,085	4,519	4,084	4,402	3,919	8,612	4,138	3,545	4,527	4,085	4,404	3,921
Pseudo R2	0.132	0.100	0.147	0.127	0.133	0.099	0.135	0.102	0.119	0.137	0.099	0.133	0.099	0.134	0.102
Corr. pred. (%)	0.67	0.65	-	-	0.67	0.65	0.67	0.65	0.66	0.67	0.65	0.67	0.65	0.67	0.65
Sum corr. '0' and '1'	1.36	1.29	-	-	1.36	1.29	1.36	1.30	1.33	1.36	1.29	1.36	1.30	1.36	1.30
HL test (p-value)	0.104	0.489	-	-	0.101	0.340	0.158	0.761	0.156	0.245	0.133	0.286	0.250	0.091	0.795

Table OA2
Relationship Banking and Credit Constraints: Endogeneity

This table shows alternative specifications of our baseline regressions in Table 5 to address possible endogeneity concerns. Columns [1]-[2] and [3-4] are based on samples that exclude firms younger than 5 and 12 years, respectively (12 years is the median firm age in the total sample). In columns [5]-[6] and [7]-[8] the contemporaneous share of relationship banks in each locality is replaced by the historical share of these banks in 1995 and 2000, respectively. All columns show second-stage results of a Heckman selection procedure (the excluded variables in the first stage are *Corruption* and *Informal payments*) where *Share relationship banks* is measured at the locality level. In all regressions the dependent variable is a dummy variable that is '1' if the firm was credit constrained. All local banking variables are defined at the level of the locality where a firm is based. Unreported covariates are the same as in Table 5. Robust standard errors are clustered by country and shown in parentheses. ***, **, * correspond to the 1%, 5%, and 10% level of significance, respectively. Table A1 in the Appendix contains all variable definitions.

	Firms 5 years and older		**Firms 12 years and older**		**Share relationship banks (1995)**		**Share relationship banks (2000)**	
	2005	2008-09	2005	2008-09	2005	2008-09	2005	2008-09
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Share relationship banks	0.173	-0.487***	0.177	-0.513***	0.038	-0.331***	0.196	-0.318***
	(0.288)	(0.139)	(0.394)	(0.176)	(0.216)	(0.081)	(0.156)	(0.101)
Inverse Mills' ratio	0.512*	-0.317	0.668*	-0.576	0.538*	0.004	0.541*	-0.153
	(0.294)	(0.215)	(0.382)	(0.226)	(0.283)	(0.213)	(0.280)	(0.198)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	4,174	3,738	2,153	2,525	4,205	3,731	4,283	3,888
Pseudo R2	0.134	0.104	0.159	0.112	0.133	0.098	0.133	0.100
Correctly predicted outcomes (%)	0.67	0.66	0.70	0.67	0.67	0.65	0.67	0.65
Sum of % correctly predicted '0' and '1'	1.36	1.30	1.39	1.31	1.36	1.29	1.36	1.30
Hosmer-Lemeshow test (p-value)	0.263	0.238	0.161	0.179	0.060	0.842	0.131	0.170

Table OA3
Relationship Banks and Lending Characteristics in Armenia

This table shows OLS regressions to explain the probability that a loan is collateralized (columns 1-3), the loan maturity in months (columns 4-6) and the probability that a new credit contract between a firm and a bank is a credit line (columns 7-9). The first six columns are based on a sample of standard loan contracts provided to all borrowers. The last three columns are based on a sample of all credit products provided to firms that borrowed at least once from a relationship bank *and* at least once from a transaction bank during the sample period. Covariates control for the ex ante internal risk rating (0-5 range, with higher a better rating); the (squared) length of the firm-bank relationship (the number of months since the bank provided the firm with the first standard loan, credit line, factoring or leasing contract, guarantee, letter of credit, overdraft agreement or repurchase agreement); the breadth of the relationship as measured by the number of different credit-product types (standard loan, credit line, factoring or leasing contract, guarantee, letter of credit, overdraft agreement or a repurchase agreement) that a client received from the bank during the relationship; and a dummy variable that indicates whether the bank is the firm's primary bank (i.e. a bank that provides more than 50 percent of all outstanding loans). Source: BEPS II and Armenian credit registry (ACRA). ***, ** and * indicate statistical significance at the 1, 5 and 10 per cent level, respectively. All specifications include firm and semi-annual fixed effects. Robust standard errors are clustered by firm. Constants not shown.

	Collateral			**Maturity**			**Credit line**		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Relationship bank	-0.054**	-0.057***	-0.056***	0.066	0.048	0.055	0.083***	0.073***	0.056***
	(0.021)	(0.022)	(0.020)	(0.049)	(0.047)	(0.042)	(0.009)	(0.020)	(0.018)
Ex ante internal risk rating		-0.038	-0.028		0.065	0.125		0.025	0.019
		(0.043)	(0.042)		(0.129)	(0.111)		(0.052)	(0.053)
Relationship length		-0.009	0.007		-0.063	0.018		-0.008	0.014
		(0.017)	(0.020)		(0.039)	(0.038)		(0.025)	(0.024)
Relationship length^2		0.001	-0.002		-0.001	-0.010		0.010	0.005
		(0.005)	(0.006)		(0.012)	(0.012)		(0.009)	(0.008)
Primary bank		0.066**	0.034		0.458***	0.302***		0.046**	0.078***
		(0.032)	(0.036)		(0.068)	(0.062)		(0.021)	(0.018)
Relationship breadth			0.014			-0.080			-0.804***
			(0.024)			(0.054)			(0.026)
Loan amount			0.043***			0.224***			0.007
			(0.012)			(0.024)			(0.006)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm clusters	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(Pseudo) R2	0.526	0.529	0.539	0.547	0.574	0.622	0.473	0.480	0.632
No. observations	5,901	5,901	5,901	5,901	5,901	5,901	9,966	9,966	9,966
Product sample	Standard loans only						All types of credit products		
Borrower sample	All borrowers						Borrowed at least once from a relationship and a transaction bank		

Table OA4
Relationship Banking and Regional Business Cycle Variation

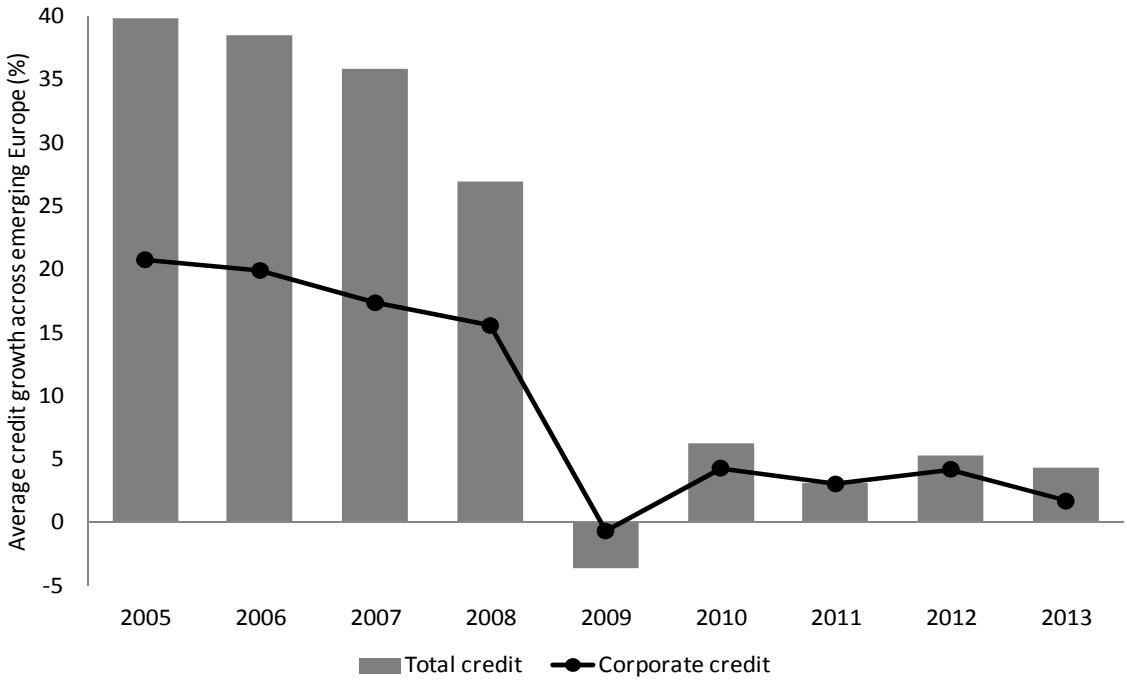
This table shows linear probability OLS regressions to estimate how the relationship between the impact of the local presence of relationship lenders and firms' access to bank credit in 2008-09 depended on the severity of the crisis in the region where the firm is incorporated. Output growth is measured at the regional level in [1]-[2] and at the regional level where available and country level otherwise in [3]-[4]. All columns show second-stage results of a Heckman selection procedure (the excluded variables in the first stage are *Corruption* and *Informal payments*) where *Share relationship banks* is measured at the locality level. In all regressions the dependent variable is a dummy variable that is '1' if the firm was credit constrained. All local banking variables are defined at the level of the locality where a firm is based. Unreported covariates are the same as in Table 5. Robust standard errors are clustered by country and shown in parentheses. ***, **, * correspond to the 1%, 5%, and 10% level of significance, respectively. Table A1 in the Appendix contains all variable definitions.

	Regional GDP growth		**Regional GDP growth if available; country GDP growth otherwise**	
	[1]	[2]	[3]	[4]
Share relationship banks	-0.180***	-0.213***	-0.121**	-0.152***
	(0.065)	(0.062)	(0.050)	(0.049)
Share relationship banks	0.874**		0.880**	
*Output growth 2008-09	(0.421)		(0.387)	
Share relationship banks		0.409**		0.449***
*Output growth 2007-09		(0.198)		(0.169)
Inverse Mills' ratio	-0.401	-0.334	-0.323	-0.274
	(0.281)	(0.274)	(0.224)	(0.215)
Firm controls	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Number of obs.	3,099	3,099	4,085	4,085
R2	0.111	0.108	0.121	0.119

Table OA5
Relationship Banking, Decentralization and Concentration

This table shows linear probability OLS regressions to estimate the relationship between the local presence of relationship banks and firms' access to bank credit during the credit boom (2005) and the credit crunch (2008-09), while controlling for local bank concentration and the local presence of decentralized banks. *HHI* is a locality-level Herfindahl-Hirschmann Index where market shares are measured by branches. *Share decentralized banks* is a locality-level variable that measures the share of bank branches that are owned by banks where loan officers make the final decision on SME loan applications (i.e. banks with only one hierarchical approval level). Robust standard errors are clustered by country and shown in parentheses. ***, **, * correspond to the 1%, 5%, and 10% level of significance, respectively. Table A1 in the Appendix contains all variable definitions.

	2005				**2008-09**			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Share relationship banks	0.073	0.083		0.091	-0.149***	-0.110*		-0.155**
	(0.088)	(0.125)		(0.117)	(0.051)	(0.065)		(0.077)
Share relationship banks * HHI		-0.021		-0.001		-0.086		0.075
		(0.108)		(0.103)		(0.155)		(0.144)
Share decentralized banks			-0.177	-0.218			-0.132	-0.108
			(0.147)	(0.162)			(0.150)	(0.154)
Share decentralized banks * HHI			0.202	0.255			0.514***	0.476**
			(0.157)	(0.182)			(0.190)	(0.220)
HHI	-0.031	-0.017	-0.046	-0.058	0.114**	0.160	0.044	0.004
	(0.058)	(0.051)	(0.051)	(0.057)	(0.057)	(0.126)	(0.047)	(0.112)
Inverse Mills' ratio	0.604*	0.611*	0.624*	0.635*	-0.303	-0.306	-0.291	-0.288
	(0.329)	(0.332)	(0.335)	(0.338)	(0.223)	(0.223)	(0.210)	(0.211)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Locality controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	4,527	4,527	4,527	4,527	4,085	4,085	4,085	4,085
R2	0.147	0.147	0.147	0.147	0.119	0.119	0.119	0.120

Figure OA1
The Credit Cycle Across Emerging Europe

This figure shows annual nominal credit growth (%) across emerging Europe over the period 2005-13. The bars and line indicate total and corporate credit growth, respectively. Growth rates are based on the difference in end-year credit stocks. Source: CEIC.