

Relationship Lending and Loan Performance*

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Abstract

This paper studies whether relationship lending helps firms in financial distress by examining the effect of relationship lending on ex-post loan performance. I combine a new and direct measure of relationship lending with unique credit registry data, exploiting an exogenous rule that determines the lending technique for each loan of a firm. My findings demonstrate that the same firm is more likely to become delinquent on a relationship-based relative to a transaction-based loan. Consistent with theory, relationship banks tolerate temporary delinquencies of a firm as long as they can extract rents in the long run. Relationship banks are also more likely to continue to lend to firms after past non-performance. These findings reveal that relationship lending serves as a liquidity insurance for firms in distress. I conclude that relationship banks must be better at enforcing contracts, not having ex-ante riskier customers or rescheduling loans more often despite higher delinquency rates.

JEL Classification: G21, G30

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1 Introduction

Relationship lending constitutes one of the most important comparative advantages of bank lending to firms. When engaging in relationship lending, banks gather propriety information about their customers through repeated interactions (Boot (2000)). Some theories suggest that banks use their superior knowledge to extend loans at favorable contract terms and provide firms with better access to finance (Boot and Thakor (1994), Petersen and Rajan (1995)). In contrast, alternative theories point out that relationship lending is associated with possible “hold-up” problems and extraction of rents from firms (Sharpe (1990), Rajan (1992)). While the empirical literature has mostly focused on contract terms and credit availability, far less is known whether relationship lending helps firms in financial distress. This paper fills the gap by examining the effect of relationship lending on ex-post loan performance.

Understanding bank behavior when firms are hit by idiosyncratic liquidity shocks is important for practitioners and academics alike. Firms and their sources of funding when faced with liquidity shocks are vital for the economy as a whole. Moreover, insights into banks’ reactions to idiosyncratic shocks of firms will help designing policies to foster financial stability. While the theoretical literature has shown that informed banks provide continuation financing when firms are in need, the empirical literature is still lagging behind. The findings of the paper present evidence that relationship lending serves as a liquidity insurance for firms in distress, while extracting rents in the long run.

Studies on relationship lending face several empirical challenges. First, relationship lending is not readily observable, being part of a bank’s internal policy. Empirical studies often use the length, strength, and depth of a bank-firm relationship or the geographical distance between firms and banks as measures of relationship lending.¹ Second, the use of the relationship lending is likely correlated with firm and bank characteristics. Relationship lending centers around the acquisition of “soft” information (knowledge of

¹See among others Petersen and Rajan (1994), Berger and Udell (1995), Cole (1998) Harhoff and Körting (1998), Machauer and Weber (1998), Degryse and Ongena (2005), Agarwal and Hauswald (2010). Elsas and Krahen (1998) are one of the few to rely on self-evaluations of credit managers on the housebank status of a bank for a particular client.

the client), which plays a more important role for lending to small and opaque firms by small and decentralized banks (Stein (2002)). Ideally, one would like to observe variation in the use of relationship lending *within* banks and firms in order to eliminate biases coming from confounding effects of bank and firm characteristics. Third, one needs randomization in the use of relationship lending across banks and firms to avoid selection and composition biases.

A novel approach that combines survey data on banks' lending policies with unique credit registry data from Armenia allows me to address the identification challenges. First, the survey data provide a new and direct measure of the importance (frequency of use) of relationship lending based on answers of banks. Second, the use of the relationship lending technique varies within some banks across loan types and not others. Third, a bank specific rule determines whether a loan of a firm is based on relationship or transactional lending. Since the bank specific rule is set by the bank and a firm is unlikely to know and thus influence the rule, it creates exogenous variation (from a firm's perspective) in the use of lending techniques within a firm across banks.²

To evaluate the effect of relationship lending on loan outcomes, the relationship lending measure is linked to loan-level data from the private credit registry of Armenia for the period between January 2009 and June 2013. The credit registry data covers virtually all loans to firms during the sample period, containing detailed data on every loan such as date of origination, maturity date, contract terms and loan performance as well as data on firm characteristics such as legal status, industry, location, and banking relationships. Armenia provides an ideal setting to examine the effects of relationship lending on loan performance. By 2004, Armenia was completely privatized, leaving no government banks and only few government firms that should not distort the analysis.³ The credit market is still at a developing stage with banks dominating the financial system.⁴ Since

²In Appendix B, I find that some manipulation is present, probably by loan officers. However, in Section 4.5 I show that, different from a regression discontinuity design, identification is coming from loans further away from the threshold for which the main results continue to hold.

³In particular, firms with private domestic ownership make up 89.9% of all firms, followed by firms with private foreign ownership (7.7%) and with state ownership (0.7%) (World Bank (2011)).

⁴The loans to GDP ratio was around 40% in 2013 compared to 96% and 198% in developed markets such as Germany and United States. According to a report by CBA (2014), banks were holding almost 90% of financial assets in 2013 and earned most of their income from lending.

few outside financing options exist and bank lending is of high importance, my analysis is not contaminated by other financing options for firms. While 97.7% of all registered legal entities in 2009 were small and medium-sized enterprises (SMEs), even large firms in Armenia are rather comparable to SMEs (World Bank (2014)).⁵ Most importantly, stylized facts from other banking markets also hold for Armenia such as the reliance of relationship banks on “soft” information and a contract menu of high interest rates, less collateral requirements and longer maturities compared to more transaction-based banks.

For the analysis, I distinguish between *Relationship Banks* that always rely on relationship lending and *Mixed Banks* that value relationship lending only for corporate loans and employ transactional lending based on firm fundamentals and collateral for SME loans.⁶ Figure 1 illustrates the idea, presenting bank types, loan types and the corresponding lending techniques. Now, imagine a firm that receives an SME loan from a *Relationship Bank* and another SME loan from a *Mixed Bank*. Controlling for loan characteristics, I examine differences in loan performance of such a firm when lending techniques differ (relationship versus transactional lending, left arrow in the figure). In contrast, if a firm receives two corporate loans from a *Relationship* and *Mixed Bank* when both banks rely on relationship lending, I expect no differences in loan performance (right arrow in the figure).

The effect of relationship lending on ex-post loan performance is ambiguous. Theories on financial intermediation advocate that banks mitigate asymmetric information problems by acquiring propriety information through screening and monitoring of clients in repeated interactions (see, e.g., Diamond (1984), Ramakrishnan and Thakor (1984), Allen (1990)). If relationship lending results in more efficient screening and monitoring, better ex-post loan performance should be the outcome. If banks use their knowledge to be more lenient towards a client, they might allow the client to temporarily become delinquent. Von Thadden (1995) suggests that banks might tolerate short-term bad re-

⁵Relative to the European Union and the US, Armenian SMEs are much smaller with employee numbers below 100 compared to 250 and 500 employees (SME DNC (2010)).

⁶Although it might seem surprising that *Mixed Banks* do not apply relationship lending for SME loans, survey evidence by De la Torre, Martínez Pería, and Schmukler (2010) confirms that banks often offer standardized products to SMEs. Moreover, *Mixed Banks* report that they rely more on fundamentals/cash flow analysis and collateral for SME loans.

sults as long as they can extract long-term rents. The reasoning for this is that banks learn the firm's quality through monitoring, and hence will not interpret short-term bad results as signs of bad quality and prematurely terminate good projects. Similarly, Rajan (1992) suggests that informed banks offer financial flexibility to firms at the costs of a share in their profits.

My findings demonstrate that the *same firm* is 50% more likely to become delinquent for less or more than 90 days on a relationship-based loan relative to a transaction-based loan. When both banks rely on relationship lending, differences in loan performance disappear. The result continues to hold when I control for loan characteristics, bank characteristics, loan origination fixed effects and firm \times time fixed effects. The finding also survives a battery of robustness tests, including different performance measures, an alternative definition of relationship lending, timing of information dispersion, different samples, and matching techniques.

Next, I examine the effect of relationship lending on long-term loan performance. Results reveal that, albeit higher delinquency rates, *Relationship Banks* do not experience higher defaults or lower recovery rates when loans mature relative to *Mixed Banks*. Moreover, *Relationship Banks* often earn higher returns, even conditional on higher delinquency rates. In line with theory, *Relationship Banks* tolerate *temporarily* higher delinquencies as long as they can secure long-term rents, not incurring higher defaults and often higher returns in the *long run* relative to *Mixed Banks*. Finally, I show that *Relationship Banks* are more likely to continue to lend to firms after past non-performance. The findings indicate that relationship lending provides a liquidity insurance for firms that face temporary problems, offering financial flexibility and improved access to finance.

Does the result on long-term loan performance imply that *Relationship Banks* are better at enforcing contracts? To this extent, I show that albeit higher delinquency rates, *Relationship Banks* do not have ex-ante riskier customers or reschedule loans more often than *Mixed Banks*. The results suggest that *Relationship Banks* must have some additional unobservable information about their clients that allows them to be more lenient and make no losses but often higher returns long term. At the same time, further

tests reveal that *Relationship Bank* are indeed monitoring their clients more often than *Mixed Banks*.

Since the measure of relationship lending is new in the literature and relies on survey responses, I conduct several robustness tests.⁷ In particular, I confirm that relationship lending leads to more use of soft information in loan pricing. Further, I examine the determinants of relationship lending across all banks in the survey. Literature suggests that small and decentralized banks are more likely to engage in relationship lending, having a comparative advantage in collecting and processing soft information that is vital for lending to small and opaque firms (Stein (2002), Berger, Miller, Petersen, Rajan, and Stein (2005), Mian (2006)). I find that relationship banking is less prevalent among hierarchical and large banks. Still, in line with Berger and Udell (2006) and Beck, Ioannidou, and Schäfer (2014b), the main result on relationship lending shows that banks vary their use of lending techniques but can target the same clientele.

The paper is related to an extensive literature on relationship lending.⁸ Some authors advocate that relationship lending provides better access to finance and favorable contract terms in the form of lower interest rates and less collateral requirements (see, e.g., Petersen and Rajan (1994), Berger and Udell (1995)), the more so in crisis times (see, e.g., Bolton, Freixas, Gambacorta, and Mistrulli (2013), Beck et al. (2014a)). Others, however, indicate that banks might lock-in borrowers and raise interest rates when borrowers face transportation costs and low bank competition (Degryse and Ongena (2005)) or informational hold-up and switching costs (Ioannidou and Ongena (2010)). While previous literature mostly uses approximations of relationship lending and primarily focuses on contract terms and credit availability, this paper combines a new and direct measure of relationship lending with credit registry data to test bank behavior over the loan spell. A related paper by Elsas and Krahen (1998) shows that relationship banks increase their credit volume when firms experience small rating deteriorations. Although the current paper also provides evidence on the liquidity insurance offered by relationship banks, it

⁷Beck, Degryse, De Haas, and van Horen (2014a) provide cross-country evidence on the validity of the measure.

⁸For a more detailed review, see Degryse, Kim, and Ongena (2009) and Kysucky and Norden (2014).

draws a more complete picture by revealing that relationship banks require long-term rents in return.

The paper also contributes to the literature on the effects of relationship lending and use of soft information on loan performance. Literature on consumer credit markets shows that relationship lending leads to lower default risk because of better screening and monitoring by banks (Puri, Rocholl, and Steffen (2013)). In mortgage markets, securitization may adversely affect screening standards of banks and result in higher default rates (Keys, Mukherjee, Seru, and Vig (2010)), while the involvement of risk managers alongside loan officers reduces default rates (Berg (2014)). Other papers show that hierarchical and physical distances decrease the use of soft information and make loan defaults more likely (Liberti and Mian (2009), Agarwal and Hauswald (2010), Skrastins and Vig (2014)). This paper shows that relationship banks behave differently with firms than consumers, allowing for temporary delinquencies with future rents in sight. Some papers also explore defaults of firms but rather focus on strategic choices of firms to default on lenders with which they have personal interactions and long relationships or that are geographically and culturally close to them (Morales (2014), Schoar (2014), Baele et al. (2014)). A recent paper by Li, Lu, and Srinivasan (2013) investigates contract terms during firm distress, showing that relationship banks offer similar interest rates to outside banks but keep collateral requirements low after firm distress. This paper, in contrast, exploits the time series of each loan and examines bank behavior when firms experience temporary repayment problems.

The paper is structured as follows. Section 2 describes the data and provides summary statistics. Section 3 introduces the empirical methodology. Section 4 presents results and robustness tests. Section 5 validates the relationship lending measure. Section 6 concludes.

2 Data

2.1 Bank Survey Data

The first data source is the Banking Environment and Performance Survey (BEPS) II that provides information on banks' internal lending policies and organizational structures in the region of Central and Eastern Europe, Central Asia and North Africa. Since I only have credit registry data from Armenia, I focus on Armenian banks.⁹ The survey data allows me to construct a direct measure of relationship lending, relying on the answers to Questions Q6 and Q10 of 17 Armenian banks. In these answers, banks indicate the importance (frequency of use) of four lending technologies on a five-point Likert scale for SME and corporate loans separately (ranging from 1 "very unimportant" to 5 "very important"): relationship lending (knowledge of the customer), fundamental/cash flow analysis (financial information), collateral (personal assets pledged by entrepreneur), and collateral (business assets). Additionally, in Questions Q4 and Q8 banks report the number of layers that needs to be passed for loan approval if the bank grants an SME or corporate loan. In a follow-up questionnaire banks report the loan amount threshold at which they differentiate between an SME type and a corporate type loan.

For the main empirical analysis, I use the survey answers on the importance of the relationship lending technology. In contrast to previous literature, I thus do not approximate relationship lending with the strength, length, depth or distance of bank-firm relationships but directly observe the self-reported importance of relationship lending of each bank for two loan types.¹⁰ The survey specifies relationship lending as knowledge of the client, which is similar to Boot (2000)'s definition of relationship lending as the acquisition of propriety information over multiple interactions with a customer. The fact that the measure does not refer to a specific time period should not pose a problem,

⁹The BEPS II survey was jointly undertaken by the European Bank for Reconstruction and Development (EBRD) and European Banking Center (EBC) at Tilburg University in 2011. CEOs of more than 400 banks in the region of Central and Eastern Europe, Central Asia and North Africa were interviewed by a specialized team of senior financial consultants with considerable banking experience on topics such as activities, funding and risk management, lending technologies, competitive environment, the influence of foreign parent banks and perceptions of legal and regulatory systems.

¹⁰Based on the same survey, Beck et al. (2014a) construct the share of relationship banks in the vicinity of firms and test how it affects access to finance for these firms over the business cycle.

since Fahlenbrach et al. (2012) confirm that bank business models stay relatively constant over time. Still, I conduct several robustness tests in Section 4.5 and show that the relationship lending measure captures the use of “soft” information when pricing loans in Section 5. Moreover, Beck, Degryse, De Haas, and van Horen (2014a) provide cross-country evidence for the validity of the relationship lending measure.

Based on banks’ survey answers I define 9 *Relationship Banks* that report relationship lending to be “very important” for both SME and corporate loans, and 6 *Mixed Banks* that find relationship lending “very important” for corporate loans only but less for SMEs. Two banks drop from the sample because one bank grants SME loans only and the other one never considers relationship lending as “very important” for both loan types. It might seem surprising that *Mixed Banks* do not rely on relationship lending but rather on transactional lending for SMEs. In fact, these banks mostly report firm fundamentals, cash flow analysis and collateral to be more important for giving out SME loans. Moreover, 97.7% of all registered legal entities in 2009 were SMEs, implying that even large firms in Armenia are rather comparable to SMEs in more developed countries (World Bank (2014)). SME loans are thus relatively small loans for which standardization of the lending process is more likely. Survey evidence by De la Torre et al. (2010) shows that banks offer standardized products, sometimes combined with tailor-made features, to a group of SMEs with similar needs such as adjusting the credit line to the business cycle of a specific industry.

The second important information from the survey are the loan amount thresholds that help assigning different loan types to each loan of a firm. The loan amount thresholds differ across banks in size and currency such that a firm can receive an SME loan from one bank and a corporate loan from another.¹¹ Since the loan amount threshold is part of a bank’s internal policy, it creates exogenous variation (from a firm’s perspective) in the assignment of a firm’s loan to a different loan type and hence to the importance of

¹¹Although there exists a law on “State Support to SMEs” that specifies annual assets and turnover as well as the number of employees for different firm categories, banks use their own rules of thumb to classify a firm as SME or corporate firm. Discussions with bank employees, ACRA and CBA employees, confirmed that banks classify firms mostly by loan amount. An IFC survey also shows that the loan amount is a good proxy for firm size (IFC (2013)).

use of relationship lending.¹² Such bank policies can still be subject to manipulation by loan officers. In Appendix B, I find that some manipulation is present. In Section 4.5, however, I show that identification is coming from loans further away from the loan amount threshold for which main results continue to hold.

2.2 Credit Registry Data

The second unique dataset is the Armenian private credit registry from the Armenian Credit Reporting Agency (ACRA) that allows me to assess the effect of relationship lending on loan outcomes.¹³ Founded in 2004, the credit registry covers all loans to firms (without a loan amount restriction) from 21 Armenian banks between January 2009 and June 2013 on a semiannual basis.¹⁴ For each loan, I have information on the origination and maturity dates, contract terms, ex-post loan performance, location of loan issue, and economic sector of a loan. For each firm, I have information on the legal status, industry, physical location, and banking relationships. The private credit registry is used by the Central Bank of Armenia (CBA) for the analysis of the banking sector as well as for supervision purposes. Since all banks are members of the private credit registry and have paid a flat rate membership fee, they mostly rely on data from the private credit registry, which is more complete, for screening and monitoring purposes of firms. In almost 99% of the cases banks inquire information in a standardized format that covers information on all current and past loans of a firm dating back 5 years without revealing the other bank's identity.¹⁵

¹²Liberti and Mian (2009) also use 19 bank rule variables that determine the hierarchical level to which a firm is sent in order to investigate the effect hierarchical distance on information production.

¹³Armenia has also a public credit registry managed by the Central Bank of Armenia (CBA), which, however, covers only large loans above around 3.165 million US dollars (1.5 million Armenian Drams) that do not receive the highest credit rating, while the private credit registry covers virtually all loans to firms. Based on the “Procedure for Creation of Information System of Creditworthiness of Customers of Banks, Credit Organizations, Branches of Foreign Banks operating in the Republic of Armenia, that is of Credit Registry, and Procedure for Participation in Credit Registry”, banks are obliged to report to all credit registries about all their loans within 3 business days. Discussions with ACRA and CBA staff confirm that banks report on their loan portfolio almost on a daily basis.

¹⁴I received access to the credit registry through a collaboration of the CBA, the EFSE Development Facility and Tilburg University.

¹⁵Typical information includes contract terms, ex-post loan performance, firm characteristics and some information on borrower-affiliated parties. Information in a non-standardized format additionally covers detailed information on firm owners, participants, and guarantors but requires additional consent from involved parties and is only available against a much higher fee than the usual membership fee and is

The BEPS II survey data has been merged with the credit registry data by the CBA, keeping the bank and firm names anonymous. Using the loan amount threshold, I assign SME and corporate loan types to each loan of a firm. The final sample consists of 15 banks that report the importance of use of the relationship lending, and account, on average, for 84% (87%) of all banks' credit contracts in terms of value (number). The credit registry covers different contract types such as loans, credit lines, factoring, leasing, guarantees, letters of credit, overdrafts, repurchase agreements, and swaps. I focus on loans and refer to them as "standard credit contracts" to have a more homogenous and most representative set of loans.¹⁶ These contracts account for 73% (70%) of all credit contracts in terms of value (number). Most loans are issued either in Armenian Drams (AMD) or US dollars (49% and 48%, respectively) with only few loans in euros, British Pounds and Russian Rubles. I convert all loan amounts in US dollars based on the monthly exchange rate of the Armenian Central Bank.¹⁷ To ensure the use of timely information, I only study "new loans" that have been issued between January 2009 and June 2013.¹⁸ Few loans that are not rated or have a written-off status at the date of loan issue and loans that have a zero interest rate (but possibly have non-zero fees) are dropped. The resulting dataset consists of 53,780 loan-time observations of 19,332 loans to 6,649 firms with an average loan spell of almost 3 years.

Differences in firm composition might influence the effect of relationship lending on loan performance. For example, high-risk firms might self-select themselves to *Relationship Banks*, expecting that these banks will grant them more freedom to become delinquent on their loans. Therefore, I focus on firms that received loans from both bank types, *Mixed* and *Relationship Banks* for the main analysis. Since sample selection is not random, inferences based on such a selected sample do not necessarily apply to the total sample but offer a cleaner identification not contaminated by firm selection and

therefore only rarely requested.

¹⁶I use other credit contracts to calculate the exposure of firms to banks as well as relationship characteristics.

¹⁷Note that base interest rates might differ across loans of different currencies. Since I focus on loan performance in Section 4.1 and the variation in interest rates in Section 5, it should not affect the results. Still, I control for differences in currencies and conduct robustness tests for loans of different currencies.

¹⁸I exclude loans that have been originated before January 2009 and stay in the system because of past non-performance.

composition effects. The sub-sample consists of 10,656 loan-time observations of 4,441 loans to 621 firms and constitutes nearly 40% of the total lending amount of the entire sample. To account for time-varying firm characteristics, I also experiment with a sample of 3,790 loan-time observations of 1,952 loans to 318 firms that received loans from both bank types in the same period.¹⁹

2.3 Descriptive Statistics

In order to gain some insights into banks' survey responses as well as other characteristics of Armenian banks, Table 1 reports bank types (*Relationship* vs. *Mixed* Banks), survey responses on the importance of relationship lending and the average number of hierarchical layers for loan approval by loan type as well as bank level summary statistics on the average loan amount threshold in US dollars, the market share in terms of loan number and loan value, the average borrower size based on the total borrowing amount across all banks in US dollars, bank size based on total assets as of 2009 and foreign ownership that equals one if more than 50% of equity is foreign-owned. Since bank names remain anonymous, I rely on bank characteristics from the BEPS II survey and reported by the Central Bank of Armenia. A first look reveals that bank characteristics vary across the two bank types, *Mixed* and *Relationship Banks*. Unreported results suggest that no specific bank characteristic is correlated with the importance of relationship lending in Armenia, confirming that the two bank types are not driven by other bank characteristics. The only difference between the two groups is generally lower loan amount thresholds for *Relationship Banks*.²⁰ The differences in loan amount thresholds rather facilitate the analysis as it allows for more variation in loan types within one firm across the two bank types.

To strengthen results on the determinants of relationship lending in general, I use responses of 400 banks in the region of Central and Eastern Europe, Central Asia and North Africa to examine the effect of bank characteristics on the importance of relation-

¹⁹Still, in Section 4.5, I confirm that main results continue to hold for the total sample as well as the sample of firms that exclusively lend from *Relationship* or *Mixed Banks*.

²⁰In unreported regressions results of the determinants of loan amount thresholds, I find that larger banks are more likely to have higher loan amount thresholds.

ship lending. Consistent with the literature, I find that relationship banking is more prevalent among small and decentralized banks (see e.g., Aghion and Tirole (1997), Stein (2002), Berger et al. (2005), Mian (2006), Berger and Black (2011), Beck et al. (2014b)). Foreign banks that are joint ventures or subsidiaries rely more on relationship lending than domestic banks, while there is no difference between domestic banks and foreign banks through mergers and acquisitions.

Table 2 shows ex-post loan performance measures, loan characteristics, relationship characteristics, and firm characteristics by bank type for the total sample of 19,332 loans to 6,649 firms and for the sub-sample of 4,441 loans to 621 firms that borrow from both bank types. Definitions of the variables can be found in Table A.1 of Appendix A. In order to capture temporary loan delinquencies, I mainly rely on performance measures “Non-Performance 0 90 days” that is equal to one if a loan goes overdue for less than 90 days and zero otherwise as well as “Non-Performance 90 days” that is equal to one if a loan goes overdue for more than 90 days and zero otherwise. Other measures of loan performance indicate if a loan has any overdue principal or interest payments (Non-Performance), goes overdue for more than 180 days (Non-Performance 180 days), or is completely written off/lost (Default).

Descriptive statistics and graphical analysis on loan performance offer first evidence that *Relationship Banks* temporarily experience higher delinquency rates without more loan defaults. For the total sample, loan delinquencies are significantly higher by 0.8% to 2.6% for *Relationship Banks* compared to *Mixed Banks*. For the sub-sample, the differences in loan delinquencies for less and over 90 or 180 days increase, while the differences in loan defaults vanish. Figure 2 shows average delinquency rates over 90 days over time for the sub-sample by bank type (*Relationship* versus *Mixed Banks*) and loan type (Figure 2a for SME loans and Figure 2b for corporate loans). Delinquency rates over 90 days are always higher for *Relationship Banks* compared to *Mixed Banks* for SME loans (Figure 2a), the case when *Relationship Banks* rely on relationship lending and *Mixed Banks* on transaction-based lending. In case of corporate loans (Figure 2b), when both employ relationship lending, no consistent differences in delinquency rates

are present. The figures confirm that relationship lending leads to temporarily higher delinquencies independent of time.

Apart from firm compositional and selection biases, differences in contract terms between *Relationship* and *Mixed Banks* might influence loan performance. For the total sample, *Relationship Banks* give out smaller loans (\$181,000 versus \$225,000) at slightly higher interest rates (15.4% versus 15.1%) that are less likely to be collateralized (82% versus 88%) or guaranteed (5% versus 10%) but are granted at almost 3 months longer maturities (36 months versus 33 months) without differences in credit ratings compared to *Mixed Banks*. The findings are consistent with Beck, Ioannidou, and Schäfer (2014b) who show that domestic banks are more likely to give out unsecured loans at higher interest rates and longer maturities than foreign banks. Except for collateral and guarantees, most of the differences in contract terms disappear for the sub-sample, suggesting that differences in loan characteristics should not be driving differences in loan performance.

If contract terms do not significantly differ across bank types within the same firm, then I can isolate the effect of relationship lending on loan performance. Keys, Mukherjee, Seru, and Vig (2010) claim that when a firm applies for a loan, banks collect “hard” information (e.g., credit rating) and “soft” information (e.g., knowledge of the client or future repayment ability). When studying loan performance around a FICO score threshold, they assume that after controlling for hard information any differences in default rates on either side of the threshold should be coming from the effect of securitization on the use of soft information. Similarly, the results above show that there are no significant differences in loan characteristics for the sub-sample. Still, in the main analysis, I control for observable hard information variables (loan characteristics) and unobservable soft information (firm and firm \times time fixed effects). The relationship lending measure thus should capture some of the unobservable soft information “extracted” from the firm fixed effects and the residual. In Section 5, I show more formally that relationship lending is indeed associated with higher use of soft information.

Differences in other loan characteristics (location, industry and currency), relationship characteristics (bank-firm relationship in months, scope, primary bank, number of relationships) and other firm characteristics (firm location, industry, legal type) do not

completely disappear for the total sample compared to the sub-sample. Since the main analysis focuses on variation within a firm, most of these differences will not play a role. Moreover, I control for these characteristics in different specifications of the model and in robustness tests.

3 Empirical Methodology

In order to identify the effect of relationship lending on ex-post loan performance, I distinguish between *Relationship Banks* that always rely on relationship lending and *Mixed Banks* that value relationship lending only for corporate loans and employ transactional lending based on firm fundamentals and collateral for SME loans. Figure 1 illustrates the idea, presenting bank types, loan types and corresponding lending techniques. *Mixed Banks* are the treatment group since they rely on transactional and relationship lending for SME and corporate loans respectively. *Relationship Banks* are the control group, always employing relationship lending. Using the loan amount threshold, I assign SME and corporate loan types to each loan of a firm. The loan type then determines the lending technique for each loan of a firm.

Now, imagine a firm that receives an SME loan from a *Relationship Bank* and another SME loan from a *Mixed Bank*. Controlling for loan characteristics, I examine differences in loan performance of such a firm when lending techniques differ (relationship versus transactional lending, the left arrow in the figure). In contrast, if the firm receives two corporate loans from a *Relationship* and *Mixed Bank* when both banks rely on relationship lending, I expect no differences in loan performance (right arrow in the figure). Empirically, I estimate estimate the following model:

$$\begin{aligned}
\text{Loan Performance}_{ijkt} = & \beta_1 \text{Corporate Loan}_{ijk} \times \text{Relationship Bank}_{ij} \\
& + \beta_2 \text{SME Loan}_{ijk} \times \text{Mixed Bank}_{ij} \\
& + \beta_3 \text{Corporate Loan}_{ijk} \times \text{Mixed Bank}_{ij} \\
& + \theta' \text{Controls}_{ijk} + \alpha_j + \gamma_t + \varepsilon_{ijkt},
\end{aligned} \tag{1}$$

where i, j, k, t index loans, firms, banks, and time (semiannually). Notice that time stands for the period each loan is observed in and not only the loan origination period. Loan Performance $_{ijkt}$ equals 1 if a loan becomes delinquent for (less) more than 90 days in a given half year. Corporate Loan $_{ijk} \times$ Relationship Bank $_{ij}$ equals one if a firm receives a corporate loan from a *Relationship Bank*. SME Loan $_{ijk} \times$ Mixed Bank $_{ij}$ equals one if a firm receives an SME loan from a *Mixed Bank*. Corporate Loan $_{ijk} \times$ Mixed Bank $_{ij}$ equals one if a firm receives a corporate loan from a *Mixed Bank*. The reference group are SME loans of *Relationship Banks*.

The coefficient β_2 is the main coefficient of interest that gauges the differences in performance for transaction-based versus relationship-based loans for the *same firm* (SME loans of *Mixed* vs. *Relationship Banks*). A negative (positive) coefficient implies that transactional lending leads to better (worse) loan performance, implying, in turn, that relationship lending leads to worse (better) performance of SME loans. The difference between the coefficients β_1 and β_3 measures the difference in performance when both banks employ relationship lending (corporate loans of *Mixed* vs. *Relationship Banks*).

Controls $_{ijk}$ consists of loan, firm and bank characteristics. Loan characteristics include contract terms such as the credit rating at loan initiation (Credit Rating $_{ijk}$), loan interest rate (Interest Rate $_{ijk}$), the natural logarithm of one plus the loan amount (Loan Amount $_{ijk}$), two dummy variables that indicate whether the loan is collateralized (Collateral $_{ijk}$) or has a guarantee (Guarantee $_{ijk}$), and the natural logarithm of one plus the loan maturity in months (Loan Maturity $_{ijk}$). Although results in Section 2.3 show that most contract terms do not differ across *Relationship* and *Mixed Banks*, I still control for them in the regressions. I assume that contract terms are hard information variables that explain the performance of a loan. Controlling for hard information variables within the same firm ensures that the effect on loan performance is coming from differences in the importance of relationship lending and thus the use of unobservable soft information (see, e.g., Keys et al. (2010)).²¹ If omitted variable bias is driving the results it will affect *Relationship* and *Mixed Banks* in the same way since contract terms do not differ across the two bank

²¹In Section 5, I confirm that relationship lending is indeed associated with higher use of soft information in loan pricing.

types.

To account for observable firm characteristics, I include dummy variables that indicate whether a firm is located in the capital Yerevan, whether it is associated with the trade or other fields of service industries and whether the firm is a private firm. Since bank characteristics might influence bank behavior, I use indicators of bank size, ownership and average hierarchy for loan approval. Finally, I also include dummy variables that indicate loan location, industry and currency.

The firm fixed effects, α_j , eliminate firm heterogeneity and compositional biases, comparing differences in loan performance within the same firm across different banks. Time of loan origination fixed effects, γ_t , are included to control for the timing of loan origination. In some specifications, I also use firm \times time fixed effects, where time stands for the current period, to account for changes in firm characteristics over time. Standard errors are always clustered at firm level to control for possible correlations in the residuals across observations of the same firm.²² In the main regressions, I rely on a linear probability model since logit models with a large number of fixed effects suffer from the “incidental parameter problem”.²³ In section 4.5, I confirm the main results using a logit model.

4 Relationship Lending and Loan Performance

In this section, I first show that relationship lending results in temporarily higher delinquency rates. Second, I reveal that, given previous delinquencies, *Relationship Banks* are not worse off in the long run, are able to extract rents and continue to lend to firms afterwards. Third, I examine whether *Relationship Banks* are better at enforcing contract terms and are more likely to monitor firms than *Mixed Banks*. Finally, I conduct several robustness tests.

²²In Section 4.5, I show that results survive clusters at bank level and double clustering at bank \times time and firm levels.

²³Because of the large number of fixed effects in the model relative to the smaller number of periods for which a borrower is observed, a non-linear model could give inconsistent estimates; this is known as the “incidental parameter problem” (see, for example, discussion in Cameron and Trivedi (2005, pp. 726-727)).

4.1 Relationship Lending and Loan Delinquencies

In Figure 2, we have already observed that firms are more likely to become delinquent on relationship-based relative to transaction-based loans. Tables 3 and 4 document more formally that temporary delinquencies are less likely for SME loans of *Mixed Banks* relative to SME loans of *Relationship Banks* (β_2). Table 3 uses delinquencies for less than 90 days and Table 4 for delinquencies over 90 days as dependent variables. In particular, the main result in Column (2) of both tables suggests that the *same* firm is by 2.5 (1.6) percentage points more likely to become delinquent for less (more) than 90 days on a relationship-based relative to a transaction-based loan. Given an average delinquency rate for less (more) than 90 days of 4.9% (3%) for the sub-sample, the results imply that a firm is by around 50% more likely to become temporary delinquent on a relationship-based loan, an economically meaningful effect.²⁴

In all specifications, I control for loan contract characteristics to isolate the effect of relationship lending on loan performance from observable hard information variables that explain loan performance. To show the consistency of results, I run a pooled regression with firm characteristics in Column (1) to control for hard information variables on borrower level; in Columns (2)-(5) regressions with firm fixed effects to account for any unobservable firm characteristics and in Column (6), I add firm \times time fixed effect to additionally control for changes in firm characteristics over time. In Columns (3)-(5), apart from firm fixed effects, I add loan origination fixed effects, bank characteristics and other loan characteristics.

Comparing Columns (1) and (2) in Tables 3 and 4, it becomes evident that adding firm fixed effects does not change the main coefficient β_2 , suggesting that the effect is not driven by differences in firm characteristics but rather differences in lending technologies (relationship lending for SME loans of *Relationship Banks* and transactional lending for SME loans of *Mixed Banks*). Even when firm \times time are added, the main effect remains significant for delinquencies below 90 days but loses its significance for delinquencies above

²⁴Results continue to hold if I use a logit model with similar magnitudes of the odds ratios of the main effect (see Section 4.5 and Table 9).

90 days.²⁵ For While loan origination fixed effects in Column (3) and other loan characteristics in Column (5) do not change the magnitude of the main coefficient, adding bank characteristics in Column (4) increases the effect to 3.2 (1.9) percentage points in Table 3 (4). Overall, the main coefficient remains highly significant and similar in size throughout all specifications.

To further strengthen my results, I test for differences between coefficients of corporate loans of *Relationship* and *Mixed Banks*, the case when both rely on relationship lending. The p-values at the bottom of Tables 3 and 4 are never highly statistically significant, confirming that only differences in lending techniques affect loan performance. Additionally, the coefficient of the Corporate Loan $_{ijkt}$ \times Mixed Bank $_{ij}$ is often positive and significant in Table 4, revealing that also within *Mixed Banks* relationship lending leads to higher delinquencies.

Turning to loan characteristics, I find that initial credit ratings have the highest economic effect, being a natural predictor of future loan performance. A one unit increase in the credit rating is associated with a 18 to 39 percentage points lower delinquency rate. Loans that have high interest rates, are collateralized and have longer maturities are more likely to become delinquent. Higher loan amounts are generally associated with higher delinquencies rates over 90 days but seem to lead to less delinquencies for loans within the same firm. As for other control variables, higher hierarchies for loan approval have a slightly significant positive effect on delinquencies for less than 90 days, while loan in other services industries experience lower delinquency rates. The other variables do not exhibit a significant effect on loan performance.

All in all, results indicate that relationship lending leads to *temporarily* higher delinquencies, although one would expect *Relationship Banks* to have better performing loans due to their screening and monitoring abilities. Von Thadden (1995) and Rajan (1992), however, suggest that banks might tolerate short-term bad results and thus offer financial flexibility as long as they can extract long-term rents. Banks learn a firm's quality through monitoring during the loan spell and therefore do not consider bad short-term

²⁵For the logit model, however, the effect is significant for both delinquency measures.

results as a sign of bad quality and prematurely terminate good projects. In the next section, I explore what happens in the long run.

4.2 Relationship Lending and Long-Term Effects

In this section, I examine long-term effects by looking at defaults, recovery rates, and losses as well as return on loans at the end of the loan spell. If theory holds, I should not find differences in loan performance at the end of the loan spell, despite temporary higher delinquencies for relationship-based loans. Knowing the quality of the firms, *Relationship Banks* will allow temporary delays in loan repayment for firms that are not likely to default at the end of the loan spell. Still, *Relationship Banks* might extract higher rents through, for example, higher return on loans in order to be compensated for such temporary delinquencies.

Descriptive statistics in Table 2 have already shown that, for the sub-sample, *Relationship Banks* have significantly higher delinquency rates but not higher default rates (in loss/written-off status) compared to *Mixed Banks*. In Table 5, I examine only SME loans of *Relationship* and *Mixed Banks*, the case when one relies on relationship lending and the other on transactional lending. To account for right-censoring, I select SME loans that are observed until maturity and condition them to have been delinquent during the loan spell. Since many observations are lost, I present results for both the total and the sub-sample, also because the effect of higher delinquencies of *Relationship Banks* continues to hold for the total sample (see Section 4.5). To measure long-term performance, I calculate loan defaults that equal one if a loan is in loss or written-off status at the end of the loan spell, recovery rates that equal one if a loan has had overdue payments during the loan spell but did not default at maturity and losses defined as written-off amounts relative to the contract amount. As I do not have a direct measure of written-off amounts, I use the overdue principal (plus interest rate amount) given delinquencies. Since I am interested in looking at long-term effects for the two lending technologies, I focus on cross-sectional tests for differences in long-term performance.

Panel A of Table 5 reports univariate tests of default rates, recovery rates, and losses

at the end of the loan spell for SME loans that have been delinquent for less than 90 days. Although SME loans of *Relationship Banks* seem to default more often after delinquencies for the total sample, the difference is not highly statistically significant and disappears for the sub-sample. Recovery rates always remain insignificant for the total sample and sub-sample. Interestingly, the losses in percentage of the contract amount are smaller for *Relationship Banks* than *Mixed Banks*, indicating that despite higher delinquency rates *Relationship Banks* are not losing more on average.

Panel B repeats the analysis for SME loans that have been delinquent for more than 90 days. While loan defaults are higher and recovery rates lower for the total sample at 10% significance level only, differences again disappear for the sub-sample. Losses given delinquencies over 90 days do not differ for both samples. However, the amounts lost are much higher for delinquencies over 90 days than for short-term delinquencies below 90 days, since the former ones are more likely to turn into actual defaults. Overall, the results indicate that relationship lending does not lead to worse long-term performance at the end of the loan spell, despite higher temporary delinquencies. In unreported regression results, I confirm that results continue to hold when I use regression analysis.

Long-term performance at the end of the loan spell might be correlated if firms default across all banks. For this reason, I also calculate return on loans a bank gains at the end of the loan spell or until the loan is observed. Table 2.3 has already revealed that *Relationship Banks* charge higher interest rates for the total sample, suggesting that *Relationship Banks* require higher rates for the financial flexibility they offer. Following Haselmann, Schoenherr, and Vig (2013), I calculate the return on a loan (ROL) by bank j to firm i for the entire loan spell:

$$\text{ROL}_{ij} = \sum_{t=1}^T \frac{\text{Loan Balance}_{ijt}}{\sum_{t=1}^T \text{Loan Balance}_{ijt}} [(1 - \mathbf{1}_{\{NPL=1\}})r_{ijt} + \mathbf{1}_{\{NPL=1\}}\text{Loss}_{ijt}], \quad (2)$$

where the first term stands for the ratio of the outstanding loan amount from bank j to firm i at the beginning of period t ($\text{Loan Balance}_{ijt}$) to the sum of the outstanding loan amounts over the loan spell ($\sum_{t=1}^T \text{Loan Balance}_{ijt}$). The indicator function ($\mathbf{1}_{\{NPL=1\}}$)

equals one when a loan has overdue amounts between t and $t+1$, r_{ijt} is the interest rate charged by bank j to firm i and Loss_{ijt} is the loss of the bank, which is defined as the (negative) of the written off amount over the contract amount. The weights ensure that returns or defaults receive more weight at the beginning of the loan spell and less weight at the end of the loan spell, when most of the loan has been repaid.²⁶ Since I do not observe the actual written off amounts, losses are defined as the overdue principal (plus overdue interest) amount in case a loan is in a loss/written-off status or delinquent over the contract amount.²⁷

Table 6 shows univariate tests and regression estimates of ROLs of SME loans for the total sample and the sub-sample. Unconditional ROLs of SME loans are significantly higher for *Relationship Banks* relative to *Mixed Banks* for the total sample but not for the sub-sample. While ROLs given delinquencies below 90 days are by 2.5 percentage points higher for *Relationship Banks* and statistically significant for both samples, ROLs given delinquencies over 90 days are not significantly different for both samples. The last panel presents pooled regression results of the ROL measure on a *Mixed Bank* dummy for the total sample and sub-sample of SME loans, unconditionally and conditional on delinquencies below and over 90 days. Results are similar to univariate tests with significantly higher ROLs for the total sample for all SME loans and given delinquencies below 90 days as well as for the sub-sample for delinquencies below 90 days. Although differences in ROLs between *Relationship* and *Mixed Banks* are not always statistically significant, they are always larger in size for *Relationship Banks*.

In sum, results in this section are in line with theoretical predictions that *Relationship Banks* allow their customers to become temporarily delinquent yet are able to extract long-term rents, not facing higher defaults or losses but offer higher return on loans at loan maturity relative to *Mixed Banks*. These findings imply that relationship lending provides a liquidity insurance for firms in distress, offering greater financial flexibility

²⁶Haselmann, Schoenherr, and Vig (2013) additionally discount the weights to account for the time value of money. Unreported results using discounted ROLs confirm that the findings are not affected.

²⁷In unreported results, I also use the overdue principal (plus overdue interest) amount over the contract amount only in case a loan is in a loss/written-off status and zero otherwise. This measure yields virtually the same results.

without incurring higher losses.

4.3 Relationship Lending and Enforcement of Contracts

Since delinquencies are higher but losses and ROLs are not significantly different for *Relationship Banks* compared to *Mixed Banks*, the question arises whether *Relationship Banks* are better at enforcing contract terms. If *Relationship Banks* are indeed superior, I should not find any differences in “observable” ex-ante non-performance between all customers of both banks types despite differences in ex-post loan performance.

Panel A of Table 7 compares ex-ante non-performance with the bank a firm borrows from (Past NPL Bank), with any bank (Past NPL Any Bank), and with other banks (Past NPL Other Banks) between *Relationship* and *Mixed Banks* on bank-borrower-time and bank-borrower level for the total sample of firms. A *t*-test for differences in ex-ante loan performance reveals that while customers of *Relationship Banks* have a worse performance history with their *Relationship Bank* relative to customers of *Mixed Banks*, there are no statistically significant differences in ex-ante loan performance with any bank or other banks for the customer base of both bank types. The first result shows that *Relationship Banks* are more likely to continue to lend to firms despite past non-performance than *Mixed Banks*, which is another proof for the insurance function of relationship lending. At the same time, clients of *Relationship Banks* are not ex-ante riskier based on general past non-performance, albeit worse ex-post performance. This implies that *Relationship Banks* must have some additional unobservable information about their clients that allows them to be more lenient and not make losses long term.

Another way to test whether *Relationship Banks* are better at enforcing contracts is to look at loan rescheduling and renegotiations. If *Relationship Banks* do not roll over loans and renegotiate contract terms more often than *Mixed Banks* (for SME loans) despite higher delinquency rates, then they must be better at enforcing contracts. Panel B of Table 7 shows the average percentage of rollover loans within one-month, two-month, and three-month windows as well as the average percentage of increases in the interest rate, loan amount and loan maturity for the total sample and sub-sample given delinquencies

below 90 days.²⁸ Results reveal that there are no highly significant differences in rollover loans between *Relationship* and *Mixed Banks* despite higher delinquencies among SME loans of *Relationship Banks*. As for renegotiations of contract terms, *Mixed Banks* are more likely to raise interest rates, while *Relationship Banks* often extend maturity upon delinquencies over 90 days. This indicates that *Relationship Banks* are not necessarily the ones adjusting contract terms more often.

In sum, results in this section reveal that *Relationship Banks* are better at enforcing contracts, not having ex-ante riskier customers or rescheduling loans more often than *Mixed Banks* despite higher delinquency rates. The results suggest that better enforcement of contracts might be an explanation for the insurance function of relationship lending. *Relationship* are also more likely to continue to lend to firms, providing a shelter for firms in distress.

4.4 Relationship Lending and Monitoring

If *Relationship Banks* indeed offer liquidity insurance based on the superior knowledge of their clients, they must be monitoring firms during the loan spell to gain these additional information about them. Although I do not directly observe the behavior of banks, I have data on the use of the credit registry by banks to inquire information about firms for loan granting and loan monitoring purposes between June 2012 and June 2013. Since the data just offers the numbers of inquiries on firm level, I focus on firms that received loans either only from *Relationship* or *Mixed Banks* to be able to disentangle the effect for these two bank types.

Table 8 reports regression results for the number of inquiries for loan monitoring in Columns (1)-(3) and loan granting purposes in Columns (4)-(6) for a sample of 2,737 firms that exclusively borrow either from *Relationship* or *Mixed Banks* and for which data on banks' use of the credit registry exists. The main independent variable is the *Mixed Bank Firm* dummy that tests for differences in the use of credit registry between the firms

²⁸As I do not know for sure whether a loan has been rolled over, I declare a loan of a firm to be a rollover loan if a firm has a previous performing or non-performing loan with a bank and a new loan that has been issued within one, two, or three months before or after the previous loan with the same bank. Additionally, I assume that a bank renegotiates contract terms if they change during the spell of a loan.

that received loans just from *Mixed Banks* relative to *Relationship Banks*. To control for firm heterogeneity, I add firm size measured as the average total outstanding debt across banks, past non-performance measure with the same bank, any bank and other banks as in Section 4.3 as well as firm location, industry and ownership fixed effects. Despite the restrictions of the data and estimation techniques, regression results can give at least an indication of whether *Relationship Banks* engage in more monitoring. In fact, the coefficient of *Mixed Bank Firm* is negative and significant in Columns (1)-(3), suggesting that *Relationship Banks* are by around 26 to 33 percentage points more likely to inquire the credit registry to monitor firms. For loan granting inquiries of the credit registry, the *Mixed Bank Firm* dummy is never significant and small in size.

In sum, these results suggest that *Relationship Banks* are more likely to monitor firms but do not inquire additional information when granting loans. Thus, *Relationship Banks* seem to acquire information about the client during the loan process to learn about the quality of the firm better and allow for temporary delinquencies that do not result in defaults.

4.5 Robustness Tests

In this section, I explore whether the effect of relationship lending on delinquencies below 90 days survives a battery of robustness tests.²⁹ Table 9 documents results of several robustness tests, using specifications of Table 3 in Columns (1) and (2) with firm characteristics and with firm fixed effects. To conserve space, Table 9 reports only the main coefficient of $SME\ Loan_{ijk} \times Mixed\ Bank_{ij}$ that measures the effect of low importance of relationship lending on loan performance as well as its standard error and the number of observations.

Panel A of Table 9 reports results for alternative non-performance measures, namely “Non-Performance” that equals one if a loan has any overdue payments or overdue days and zero otherwise as well as “Non-Performance 180” that equals one if loans becomes delinquent for more than 180 days and zero otherwise. While there is no systematically

²⁹In unreported results, I confirm that robustness tests also hold when I use logit models instead of delinquencies over 90 days as the dependent variable.

significant effect of relationship lending on loan performance with firm characteristics, I find statistically significant effects with firm fixed effects that are similar in magnitude relative to their average values. The same firm is by around 40% and 56% more likely to become delinquent on any payments and for more than 180 days, respectively.

In Panel B of Table 9, I test for different loan characteristics. Row “W/o Right-censored Loans” uses only loans that are observed until maturity to account for possible issues of right-censoring. Results might be biased if I underestimate possible loan non-performance that occurs after the observations period for loans that are not observed until maturity. Despite slightly reduced significance, the main effects continues to hold and even increases in magnitude to 3.3 and 2.8 percentage points. When splitting loans into local currency and US dollars loans in Rows “Local currency loans” and “US dollar loans” the effect becomes stronger for US dollars and loses significance and magnitude for local currency loans. This suggests that either *Relationship Banks* offer more flexibility in US dollars based on their dollar-denominated funding structure or that firms have more problems repaying US dollar denominated loans, having less income in US dollars. When splitting loans issued before and after 2011 in Rows “Loans between January 2009-2011” and “Loans after January 2011”, the negative effect of SME loans of *Mixed Banks* mostly survives for loans after 2011, but is somewhat reduced for loans between January 2009-2011. This might be due to the reduced number of observations or generally higher non-performance for all banks during the crisis period.

In Row “W/o loans 50%” of Panel B, I exclude loans outside a range of 50% around the loan amount threshold that determines SME and corporate loans. I assume that the change from relationship to transaction-based lending does not switch from one to the other exactly at the threshold for *Mixed Banks* but is more likely to happen more gradually with larger loan amounts. This implies that differences in lending techniques between *Relationship* and *Mixed Banks* should be stronger further away from the threshold. As expected, the main effect continues to hold and is somewhat stronger in magnitude.

For the last two Rows “Timing w/o SME & corp. Loans” and “Timing w/o SME Loans” of Panel B, imagine a firm that receives a transaction-based loan, and then a

relationship-based loan within the same bank (i.e, SME vs. corporate loan of the same *Mixed Bank*). If the information sharing across departments does not work perfectly and the customer will be assigned, for example, to different loan officers in different departments, the timing of loans will not influence the main results. If information on customers is shared among departments, then once a firm receives a transaction-based loan, the customer will be known to the bank and there will be no difference in loan performance once the firm receives a relationship-based loan. Therefore, in Rows “Timing w/o SME & corp. Loans” and “Timing w/o SME Loans” of Table 9, I exclude (i) all SME and corporate loans once a firm switches from SME to corporate loans and (ii) only SME loans once a firms switches from SME to corporate loans in the case of *Mixed Banks*. Only few loans are dropped and results remain virtually the same, suggesting imperfect information sharing across departments of *Mixed Banks*.

In Panel C of 9, I examine effects of relationship characteristics. Relationship lending might not be the most important lending technology for a bank such that a 5 for “very important” might mean something else for one bank compared to another bank. Therefore, I construct a measure of the importance of relationship lending relative to the importance of other lending technologies (fundamental, private and business collateral) by loan type. For all *Mixed Banks* the relative importance of relationship lending is always higher for corporate compared to SME loans. The importance of relationship lending stays constant across loan types for only 4 out of 9 *Relationship Banks* and is always higher compared to *Mixed Banks*. Row “Alternative relationship lending” of Table 9 reveals for that for the reduced sample of banks the main result continues to hold, although somewhat reduced in magnitude and significance. In Row “Relationship variables”, I add relationship variables used in the previous literature to the main regressions such as the natural logarithm of one plus the bank-firm relationship in months, a dummy variable that equals one if a firm has more than 50% of its outstanding debt with a bank, and a dummy variable that equals one if a firm has other products with the bank (e.g., credit lines, factoring, guarantees). Although, in unreported results, the dummy variable for the main bank of a firm significantly lowers delinquencies below 90 days, the negative effect of transactional

lending on loan performance is not affected. Lastly, in Rows “New customers” and “Old customers”, I distinguish between loans of new customers to a bank and customers with which a bank has had a previous relationship since *Relationship Banks* are more likely to know these old customers better and thus be more lenient towards them. In line with this prediction, the main effect increases to 2.7 percentage points for old customers but becomes almost completely insignificant for new customers.

Panel D of Table 9 investigates whether effects differ for firm of different industries. In particular, I examine whether *Relationship Banks* are particularly helpful for firms in more opaque industries. Therefore, I distinguish between the main industries in Armenia such as trade, manufacturing and construction as well as other fields of services and other industries. While the negative effect of transaction-based lending on delinquencies disappears for more transparent industries in Rows “Trade, manufacturing, construction” and “Other industries”, the effect increases to 3.3 and 3.6 percentage points in Row “Other fields of services”, a more opaque industry.

The last Panel E of Table 9 compares different estimation techniques. In Row “Logit model”, I estimate a logit model instead of a linear probability model for the benchmark specifications and report odds ratios to ease the interpretation. The odds of becoming delinquent on a relationship-based loans rise by 43% when controlling for firm characteristics and by 56% within the same firm relative to transaction-based lending. In Row “Matching on firm and loan amount”, I rely on a matching technique similar to Ioannidou and Ongena (2010) and Beck et al. (2014b). Since matching is a nonparametric estimation technique, it does not impose a functional form on the relationship between matching variables and the dependent variable. In particular, I match SME loans of *Relationship* and *Mixed Banks* of the same firm from the sub-sample of 4,441 loans and 10,656 loan-time observations. Then, I match on differences in loan amounts between SME loans of *Relationship* and *Mixed* Banks, conditioning them to be in 0.5 or 0.25 standard deviations of the average loan amount of SME loans of the two bank types. In Row “Matching on firm and loan char.”, I additionally match on differences in interest rates, maturity and credit ratings in the same way and exact matching of collateralized

and non-collateralized loans. Specifications (1) and (2) in Table 9 correspond to a 0.5 and 0.25 standard deviation radius for each of the matching variables. While matching on firm and loan amounts yields similar results as for the main regression with an 2.6 percentage points effect, matching on more variables increases the negative effect to 4.3 and 6.2 percentage points, yet only significant in the former case which might be due to the small number of observations in the latter case. The results imply that conditioning on loan characteristics to be similar, main results continue to hold.

In Row “Full/Opposite Sample” I estimate specification (2) of Table 3 with firm characteristics for the full sample of 6,649 firms and 19, 332 loans in Column Specification (1) and for the opposite sample of 6,028 firms that receive 14,891 loans from either *Relationship* or *Mixed Banks* only in Column Specification (2). The effect is smaller in magnitude (2.0 and 1.6 percentage points for the full and opposite sample) but remains highly statistically significant, suggesting that the main result is not restricted to the sub-sample and its cleaner identification technique within the same firm. In the last two rows of Table 9 , I implement clusters at bank level and double clustering at bank \times time and firm level to account for the fact that observations within a bank and time period might be correlated. Although standard errors increase, the main effect remains significant.

Finally, I investigate whether firms are more likely to delay repayments with *Relationship Banks* because the delayed loan repayments are actually small in size. To this extent, I create three ratios that capture the relative size of delayed repayments: all measures use the overdue principal and interest rate amount in the numerator and set it relative to the total loan amount, the total outstanding debt with the particular bank in a period or the total outstanding debt of a firm in a period. For each dependent variable, I use firm characteristics or firm fixed effects to control for unobserved firm heterogeneity and restrict the sample to loans that have been delinquent for less than 90 days. Results in Table 10 show that there is never a statistically significant difference of relative overdue amounts for SME loans of *Relationship* and *Mixed Banks*, even within the same firm. This result confirms that the size of the overdue amounts is not driving the fact that the same firm is more likely to delay loan repayments with *Relationship Banks*.

5 Relationship Lending and Information Use

Since the measure of relationship lending is new to the literature and relies on survey responses, this section shows that it captures the use of soft information when pricing loans. Similar to Rajan, Seru, and Vig (2014) and Skrastins and Vig (2014), I assume that in a state with just hard information and no soft information available, hard information variables will perfectly predict the loan interest rate. In a state with additional soft information, hard information variables will not be able to completely explain interest rates and the unexplained part becomes a measure of soft information.

For the analysis, I use a regression model with multiplicative heteroskedasticity introduced by Harvey (1976) and firstly applied to banking by Cerqueiro, Degryse, and Ongena (2011). The model estimates mean effects on the interest rate and the determinants of the residual variance in interest rates. The model consists of an equation for the mean of interest rates, and a second one for the residual variance of interest rates:³⁰

$$\text{Loan Spread}_{ijk} = \theta' \text{Controls}_{ijk} + \alpha_j + \varepsilon_{ijk}, \quad (3)$$

$$\begin{aligned} \text{Log}(\sigma_{ijk}^2) &= \alpha_0 + \delta_1 \text{Corporate Loan}_{ijk} \times \text{Relationship Bank}_{ij} \\ &+ \delta_2 \text{SME Loan}_{ijk} \times \text{Mixed Bank}_{ij} \\ &+ \delta_3 \text{Corporate Loan}_{ijk} \times \text{Mixed Bank}_{ij}, \end{aligned} \quad (4)$$

where i, j, k index loans, firms, and banks. Note that different from equation (1) I only use information at loan initiation such that each loan appears only once in the data set. The Loan Spread_{ijk} equals the loan interest rate minus the refinancing rate of the Armenian banks with the Armenian Central Bank. $\text{Log}(\sigma_{ijk}^2)$ stands for the natural logarithm of the residual variance of the loan spread. The other variables are defined as in equation (1). By including loan contract terms as well as firm fixed effects, I control for all hard information variables that explain the variation in interest rates for the *same firm*. The remaining unexplained variation should capture the use of soft information. A positive (negative) effect on the variance of the unexplained part means that the variance

³⁰A more detailed description of the methodology can be found in the Appendix A.

increases (decreases), hard information variables are less (more) predictive of future loan performance and more (less) soft information is used.

The coefficient δ_2 estimates the effect of transactional lending on the variation in interest rates (soft information use) relative to relationship lending (SME loans of *Mixed* vs. *Relationship Loans*). The difference in coefficients δ_1 and δ_3 measures the effect on the variation in interest rates (soft information use) when both banks rely on relationship lending (corporate loans of *Mixed* vs. *Relationship Loans*).

Table 11 shows estimation results of the regression model with multiplicative heteroscedasticity in equations 3 (Panel A) and 4 (Panel B), where the columns correspond to the specifications of the columns in Table 3. Panel A shows the coefficients of the mean of interest rates that are in line with the previous literature. Panel B documents the coefficients of the variance of the error term. All specifications reveal a negative effect of transactional lending on the variation in interest rates (SME loans of *Mixed Banks*). Transactional lending reduces the unexplained part of interest rates and leads to less use of soft information relative to relationship lending. A test for differences in coefficients shows that the use of soft information does not significantly differ when both banks rely on relationship lending. In sum, these results suggest that the relationship lending measure indeed captures the use of soft information in loan pricing.

6 Conclusions

Although the empirical literature on relationship lending is quiet extensive, few is known about the behavior of banks when firms are in distress. In a novel approach that combines survey data on banks' lending policies with unique credit registry data, this paper fills this gap by examining the effect of relationship lending on ex-post loan performance. In line with Von Thadden (1995) and Rajan (1992), I find that relationship banks tolerate *temporary* delinquencies without facing higher defaults and often higher rents in the *long run*. Moreover, *Relationship Banks* are more likely to continue to lend to firms after past non-performance. The paper presents evidence that relationship lending serves as

a liquidity insurance for firms in distress, offering greater financial flexibility and better access to finance.

The findings of the paper have several broader implications. Relying on soft information, relationship lending constitutes a critical tool to target SMEs which are the backbone of most economies.³¹ This paper shows that relationship lending is especially beneficial when firms experience liquidity shortages. In the long run, firms will thus have longer investment horizons which should lead to more investments, employment and economic growth. Moreover, proprietary information seems to be key for banks to ease lending standards which calls for an improved contractual and informational framework. From a financial stability perspective, relationship lending appears to be an efficient lending technique to help firms in need without incurring higher losses for banks. Finally, the results might also be useful for other markets such as the labor market or insurance market in which close relationships help reducing existing information asymmetries.

³¹According to the website of the Global Alliance of SMEs, SMEs have provided nearly 50% of jobs in most countries (53% in US and 78% in Germany) and account for 75% and 39% of GDP in Germany and US (Global Alliance of SMEs (2014)).

References

- Agarwal, Sumit, and Robert Hauswald, 2010, Distance and private information in lending, *Review of Financial Studies* 23, 2757–2788.
- Aghion, Philippe, and Jean Tirole, 1997, Formal and real authority in organizations, *Journal of Political Economy* 105, 1–29.
- Allen, Franklin, 1990, The market for information and the origin of financial intermediation, *Journal of Financial Intermediation* 1, 3–30.
- Baele, Lieven, Moazzam Farooq, and Steven Ongena, 2014, Of religion and redemption: Evidence from default on Islamic loans, *Journal of Banking & Finance* 44, 141–159.
- Beck, Thorsten, Hans Degryse, Ralph De Haas, and Neeltje van Horen, 2014a, When arm’s length is too far. Relationship banking over the business cycle, EBRD Working Paper No. 169.
- Beck, Thorsten, Vasso Ioannidou, and Larissa Schäfer, 2014b, Foreigners vs. Natives: Bank lending technologies and loan pricing, Working Paper Series Cass Business School No. 28.
- Berg, Tobias, 2014, Playing the devil’s advocate: The causal effect of risk management on loan quality, available at SSRN: <http://ssrn.com/abstract=2435158>.
- Berger, Allen N., and Lamont K. Black, 2011, Bank size, lending technologies, and small business finance, *Journal of Banking & Finance* 35, 724–735.
- Berger, Allen N., Nathan H. Miller, Mitchell A. Petersen, Raghuram G. Rajan, and Jeremy C. Stein, 2005, Does function follow organizational form? Evidence from the lending practices of large and small banks, *Journal of Financial Economics* 76, 237–269.
- Berger, Allen N., and Gregory F. Udell, 1995, Relationship lending and lines of credit in small firm finance, *Journal of Business* 68, 351–381.
- Berger, Allen N., and Gregory F. Udell, 2006, A more complete conceptual framework for SME finance, *Journal of Banking & Finance* 30, 2945–2966.
- Bolton, Patrick, Xavier Freixas, Leonardo Gambacorta, and Paolo Emilio Mistrulli, 2013, Relationship and transaction lending in a crisis, NBER Working Paper 19467.
- Boot, Arnoud W.A., 2000, Relationship banking: What do we know?, *Journal of Financial Intermediation* 9, 7–25.
- Boot, Arnoud W.A., and Anjan V. Thakor, 1994, Moral hazard and secured lending in an infinitely repeated credit market game, *International Economic Review* 35, 899–920.
- Cameron, A. Colin, and Pravin K. Trivedi, 2005, *Microeconometrics: methods and applications* (Cambridge University Press).
- CBA, 2014, Financial Stability Report 2013, Technical report, Central Bank of The Republic of Armenia.
- Cerqueiro, Geraldo, Hans Degryse, and Steven Ongena, 2011, Rules versus discretion in loan rate setting, *Journal of Financial Intermediation* 20, 503–529.
- Cole, Rebel A., 1998, The importance of relationships to the availability of credit, *Journal of Banking & Finance* 22, 959–977.
- De la Torre, Augusto, María Soledad Martínez Pería, and Sergio L Schmukler, 2010, Bank involvement with SMEs: Beyond relationship lending, *Journal of Banking & Finance* 34, 2280–2293.
- Degryse, Hans, Moshe Kim, and Steven Ongena, 2009, *Microeconometrics of banking: Methods, applications, and results* (Oxford University Press).

- Degryse, Hans, and Steven Ongena, 2005, Distance, lending relationships, and competition, *Journal of Finance* 60, 231–266.
- Diamond, Douglas W., 1984, Financial intermediation and delegated monitoring, *Review of Economic Studies* 51, 393–414.
- Elsas, Ralf, and Jan Pieter Krahnert, 1998, Is relationship lending special? Evidence from credit-file data in Germany, *Journal of Banking & Finance* 22, 1283–1316.
- Fahlenbrach, Rüdiger, Robert Prilmeier, and Rene M. Stulz, 2012, This time is the same: Using bank performance in 1998 to explain bank performance during the recent financial crisis, *Journal of Finance* 67, 2139–2185.
- Garmaise, Mark J., and Gabriel Natividad, 2014, Negative financial spillovers in local banking negative financial spillovers in local banking markets, Working Paper New York University.
- Global Alliance of SMEs, GASME, 2014, Four global experience to support SME development, available at <http://www.globalsmes.org>.
- Harhoff, Dietmar, and Timm Körting, 1998, Lending relationships in Germany – Empirical evidence from survey data, *Journal of Banking & Finance* 22, 1317–1353.
- Harvey, Andrew C, 1976, Estimating regression models with multiplicative heteroscedasticity, *Econometrica: Journal of the Econometric Society* 44, 461–465.
- Haselmann, Rainer, David Schoenherr, and Vikrant Vig, 2013, Lending in social networks, Working Paper London Business School.
- IFC, 2013, Verifying accuracy of IFC’s SME measurement, World Bank and International Finance Corporation.
- Ioannidou, Vasso, and Steven Ongena, 2010, Time for a change: Loan conditions and bank behavior when firms switch banks, *Journal of Finance* 65, 1847–1877.
- Keys, Benjamin J, Tanmoy K Mukherjee, Amit Seru, and Vikrant Vig, 2010, Did securitization lead to lax screening? Evidence from subprime loans, *Quarterly Journal of Economics* 125, 307–362.
- Kysucky, Vlado, and Lars Norden, 2014, The benefits of relationship lending in a cross-country context: A meta-analysis, *Management Science*, forthcoming .
- Li, Yan, Ruichang Lu, and Anand Srinivasan, 2013, Relationship bank behavior during borrower distress, available at SSRN: <http://ssrn.com/abstract=1773069>.
- Liberti, Jose M, and Atif R Mian, 2009, Estimating the effect of hierarchies on information use, *Review of Financial Studies* 22, 4057–4090.
- Machauer, Achim, and Martin Weber, 1998, Bank behavior based on internal credit ratings of borrowers, *Journal of Banking & Finance* 22, 1355–1383.
- McCrary, Justin, 2008, Manipulation of the running variable in the regression discontinuity design: A density test, *Journal of Econometrics* 142, 698–714.
- Mian, Atif, 2006, Distance constraints: The limits of foreign lending in poor economies, *Journal of Finance* 61, 1465–1505.
- Morales, Paola, 2014, Strategic choice of delinquencies under firm liquidity constraints, tilburg University.
- Petersen, Mitchell A., and Raghuram G. Rajan, 1994, The benefits of lending relationships: Evidence from small business data, *Journal of Finance* 49, 3–37.
- Petersen, Mitchell A., and Raghuram G. Rajan, 1995, The effect of credit market competition on lending relationships, *Quarterly Journal of Economics* 407–443.
- Puri, Manju, Jörg Rocholl, and Sascha Steffen, 2013, What kinds of bank-client relationships matter in reducing loan defaults and why?, available at SSRN:

<http://ssrn.com/abstract=1572673>.

- Rajan, Raghuram G., 1992, Insiders and outsiders: The choice between informed and arm's-length debt, *Journal of Finance* 47, 1367–1400.
- Rajan, Uday, Amit Seru, and Vikrant Vig, 2014, The failure of models that predict failure: Distance, incentives and defaults, *Journal of Financial Economics*, forthcoming .
- Ramakrishnan, Ram T.S., and Anjan V. Thakor, 1984, Information reliability and a theory of financial intermediation, *Review of Economic Studies* 51, 415–432.
- Schoar, Antoinette, 2014, The personal side of relationship banking, Working Paper MIT.
- Sharpe, Steven A., 1990, Asymmetric information, bank lending, and implicit contracts: A stylized model of customer relationships, *Journal of Finance* 45, 1069–1087.
- Skrastins, Janis, and Vikrant Vig, 2014, How organizational hierarchy affects information production, Working Paper London Business School.
- SME DNC, 2010, Reference Book: Small and Medium Entrepreneurship Sector in Armenia 2007-2009, Small and Medium Entrepreneurship Development National Center of Armenia.
- Stein, Jeremy C, 2002, Information production and capital allocation: Decentralized versus hierarchical firms, *The Journal of Finance* 57, 1891–1921.
- Von Thadden, Ernst-Ludwig, 1995, Long-term contracts, short-term investment and monitoring, *Review of Economic Studies* 62, 557–575.
- World Bank, 2011, Armenia: Country Profile, Enterprise Survey: Running a business in Armenia, World Bank and International Finance Corporation, Rev. 7.
- World Bank, 2014, Country Program Snapshot, World Bank and International Finance Corporation.

Table 1: Bank Level Descriptive Statistics

The Table reports bank level summary statistics for 15 Armenian banks on the importance of relationship lending and the average number of hierarchical layers for loan approval by loan type, the average loan amount threshold in US\$, the market share in terms of loan number and loan value, the average borrower size based on the total borrowing amount across all banks in US\$ between January 2009 and June 2013 as well as bank size based on total assets as of 2009 and foreign ownership that equals one if more than 50% of equity is foreign-owned.

Bank ID	Bank Type	SME Loans		Corporate Loans					Share in Value of Loans (%)	Borrower Size	Bank Size	Foreign
		Relationship Lending	Average Hierarchy	Relationship Lending	Average Hierarchy	Average Threshold in \$US	Share in Number of Loans (%)					
38	Mixed	3	2	5	2	2,751,486	0.027	0.029	1,727,395	Small	0	
59	Mixed	4	2	5	2	1,500,000	0.065	0.216	3,033,712	Big	0	
70	Relationship	5	1	5	1	518,444	0.061	0.041	1,0679,69	Medium	0	
219	Mixed	4	3	5	1	166,639	0.076	0.032	529,078	Medium	0	
274	Relationship	5	2	5	3	837,301	0.054	0.036	466,309	Medium	1	
457	Mixed	4	2	5	3	2,751,486	0.089	0.136	2,133,701	Big	0	
470	Mixed	4	3	5	3	500,000	0.169	0.067	721,984	Medium	0	
520	Relationship	5	2	5	1	1,000,000	0.037	0.108	3,756,655	Big	0	
523	Relationship	5	2	5	2	1,355,53	0.025	0.017	1,211,437	Medium	0	
662	Relationship	5	1	5	2	500,000	0.137	0.068	313,301	Big	0	
702	Relationship	5	1	5	1	271,106	0.122	0.055	790,899	Medium	0	
772	Mixed	4	1	5	3	661,568	0.026	0.024	1,833,290	Small	0	
776	Relationship	5	3	5	3	300,000	0.040	0.028	1,748,996	Small	1	
798	Relationship	5	2	5	2	200,000	0.037	0.029	1,319,247	Small	0	
995	Relationship	5	5	5	5	500,000	0.035	0.112	2,471,792	Big	1	

Table 2: Loan Level Descriptive Statistics

The Table reports loan level summary statistics on ex-post loan performance measures, loan characteristics, relationship characteristics, and firm characteristics by bank type between January 2009 and June 2013. The two bank types are *Relationship Banks* that always rely on relationship lending and *Mixed Banks* that rely on relationship lending only for corporate loans. Definitions of the variables can be found in Table A.1 of Appendix A. The left panel "Total Sample" reports summary statistics for the total sample of 19,332 loans to 6,649 firms. The right panel "Sub-Sample" reports summary statistics for a sub-sample of 4,441 loans to 621 firms that received loans from both *Relationship* and *Mixed Banks*. The Columns "Difference *t*-test" in both panels report *t*-statistics for differences in means between the two bank types and indicate significance at the 1%, 5%, and 10% levels with ***, **, *, .

Variable Names	Total Sample						Sub-Sample					
	Relationship Bank			Mixed Bank			Relationship Bank			Mixed Bank		
	Mean	Std	Difference	Mean	Std	<i>t</i> -test	Mean	Std	Difference	Mean	Std	Difference
Ex Post Loan Performance												
Non-Performance	0.058	0.233	0.061	0.238	-0.002	0.051	0.220	0.046	0.209	0.005	0.030***	
Non-Performance 0-90 days	0.100	0.300	0.075	0.263	0.026***	0.088	0.284	0.058	0.234	0.030***		
Non-Performance 90 days	0.046	0.210	0.037	0.188	0.010***	0.041	0.199	0.023	0.150	0.018***		
Non-Performance 180 days	0.029	0.168	0.021	0.144	0.008***	0.025	0.156	0.015	0.123	0.010**		
Default (loss/written-off)	0.020	0.139	0.012	0.110	0.008***	0.012	0.109	0.009	0.095	0.003		
Loan Characteristics												
Credit Classification	4.99	0.17	4.99	0.14	-0.002	4.98	0.18	4.99	0.13	-0.007		
Interest Rate	15.37	3.88	15.10	3.72	0.264***	13.81	3.73	13.76	3.56	0.045		
Loan Spread	8.00	4.37	7.62	4.08	0.380***	6.41	4.21	6.25	3.98	0.152		
Loan Amount in US\$	181,386	606,152	224,708	714,815	-43,322***	352,903	963,534	341,802	752,242	11,100		
Collateral	0.82	0.38	0.88	0.32	-0.062***	0.76	0.43	0.87	0.33	-0.108***		
Guarantee	0.05	0.22	0.11	0.31	-0.053***	0.11	0.31	0.16	0.37	-0.051***		
Loan Maturity in Months	36.32	21.37	33.38	22.46	2.940***	32.39	22.65	32.00	24.42	0.389		
Other Loan Characteristics												
Loan Location in Yerevan	0.59	0.49	0.75	0.43	-0.163***	0.72	0.45	0.77	0.42	-0.051***		
Wholesale and Retail Trade	0.46	0.50	0.42	0.49	0.041***	0.51	0.50	0.44	0.50	0.070***		
Industry Loan												
Other Fields of Service	0.13	0.34	0.22	0.41	-0.083***	0.11	0.31	0.14	0.35	-0.037***		
Industry Loan												
Loan in USD	0.46	0.50	0.51	0.50	-0.051***	0.58	0.49	0.61	0.49	-0.026*		

Table 2 (continued): Loan Level Descriptive Statistics

Variable Names	Total Sample						Sub-Sample									
	Relationship Bank			Mixed Bank			Relationship Bank			Mixed Bank			Difference			
	Mean	Std		Mean	Std		Mean	Std		Mean	Std		Mean	Std	<i>t</i> -test	
Relationship Characteristics																
Relationship in Months	15.63	18.16	15.92	17.65	-0.291		17.43	19.27	16.22	17.27	1.211**		17.43	19.27	16.22	17.27
Scope	0.18	0.38	0.24	0.43	-0.062***		0.30	0.46	0.31	0.46	-0.012		0.30	0.46	0.31	0.46
Primary Bank	0.93	0.26	0.90	0.30	0.032***		0.79	0.41	0.74	0.44	0.049***		0.79	0.41	0.74	0.44
Number of Relationships	1.93	1.39	1.94	1.47	-0.012		3.41	2.08	3.24	2.01	0.176***		3.41	2.08	3.24	2.01
Multiple Relationships	0.53	0.50	0.51	0.50	0.025***		1	0	1	0	0		1	0	1	0
Firm Characteristics																
Firm Location in Yerevan	0.59	0.49	0.75	0.43	-0.163***		0.72	0.45	0.77	0.42	-0.051***		0.72	0.45	0.77	0.42
Wholesale Retail Trade	0.23	0.42	0.16	0.36	0.075***		0.24	0.43	0.18	0.39	0.057***		0.24	0.43	0.18	0.39
Industry Firm																
Other Fields of Service	0.54	0.50	0.63	0.48	-0.087***		0.54	0.50	0.60	0.49	-0.057***		0.54	0.50	0.60	0.49
Industry Firm																
Private Firm	0.54	0.50	0.65	0.48	-0.104***		0.53	0.50	0.61	0.49	-0.076***		0.53	0.50	0.61	0.49
Observations	10,598		8,734		19,332		2,151		2,290		4,441		2,151		2,290	

Table 3: Relationship Lending and Loan Performance (NPL 0-90 days)

The Table reports regression results from a linear probability model for a sub-sample of 10,656 loan-time observations of 4,441 loans to 621 firms that received loans from both *Relationship* and *Mixed Banks* between January 2009 and June 2013. The dependent variable is Loan Performance $_{ijkt}$ that equals one when a loan is delinquent for less than 90 days. The main independent variable is “SME Loan \times Mixed Bank” which measures the performance of transaction-based relative to relationship-based loans, i.e., SME loans of *Mixed* versus *Relationship Banks* (the reference group). Columns (1) reports results for with loan characteristics and firm characteristics. In Columns (2)-(5) firm fixed effects are added. Column (3) adds loan origination fixed effects, Column (4) bank characteristics, and Column (5) other loan characteristics. Column (6) introduces firm \times time fixed effect and thus the sample is reduced to 3,790 loan-time observations of 1,952 loans to 318 firms. The last row presents p-values for a Wald test of differences in coefficients when both banks rely on relationship lending, i.e., corporate loans of *Relationship* versus *Mixed Banks*. Definitions of the variables can be found in Table A.1 of Appendix A. Standard errors are clustered at firm level and presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%.

	(1)	(2)	(3)	(4)	(5)	(6)
Corporate Loan \times Relationship Bank	0.035* (0.020)	0.025 (0.017)	0.025 (0.016)	0.020 (0.016)	0.025 (0.016)	0.021 (0.020)
SME Loan \times Mixed Bank	-0.025*** (0.009)	-0.025*** (0.008)	-0.025*** (0.008)	-0.032*** (0.012)	-0.024*** (0.009)	-0.027** (0.013)
Corporate Loan \times Mixed Bank	-0.021 (0.021)	0.004 (0.017)	0.001 (0.017)	0.009 (0.017)	0.004 (0.017)	-0.001 (0.020)
Credit Rating	-0.191*** (0.061)	-0.178*** (0.062)	-0.178*** (0.062)	-0.175*** (0.062)	-0.182*** (0.062)	-0.091 (0.154)
Credit Interest Rate	0.005*** (0.002)	0.002 (0.002)	0.003* (0.002)	0.001 (0.002)	0.003 (0.002)	0.008* (0.004)
Loan Amount	0.004 (0.004)	-0.002 (0.004)	-0.001 (0.004)	-0.003 (0.004)	-0.003 (0.004)	0.008 (0.006)
Collateral	0.029*** (0.009)	0.015 (0.010)	0.012 (0.012)	0.015 (0.011)	0.018* (0.010)	-0.001 (0.023)
Guarantee	0.006 (0.017)	0.001 (0.025)	-0.001 (0.025)	-0.001 (0.026)	0.003 (0.025)	-0.036 (0.023)
Maturity	0.016*** (0.006)	0.013** (0.006)	0.015** (0.006)	0.013** (0.006)	0.012** (0.006)	0.002 (0.007)

Table 3 (continued): Relationship Lending and Loan Performance (NPL 0-90 days)

	(1)	(2)	(3)	(4)	(5)	(6)
Firm Location Yerevan	0.004 (0.010)					
Wholesale Retail Trade Industry Firm	-0.011 (0.014)					
Other Fields of Service Industry Firm	0.011 (0.013)					
Private Firm	-0.001 (0.010)					
Large Bank				0.012 (0.012)		
Foreign Bank				-0.007 (0.021)		
High Average Hierarchy				0.021* (0.012)		
Loan Location in Yerevan					0.007 (0.019)	
Wholesale Retail Trade Industry Loan					-0.002 (0.013)	
Other Fields of Service Industry Loan					-0.023* (0.013)	
Loan in USD					0.015 (0.009)	
Constant	0.811** (0.315)	0.891*** (0.318)	0.838*** (0.311)	0.876*** (0.318)	0.889*** (0.321)	0.319 (0.796)
Firm Fixed Effects	No	Yes	Yes	Yes	Yes	No
Loan Origination Fixed Effects	No	No	Yes	No	No	No
Firm×Time Fixed Effects	No	No	No	No	No	Yes
R-squared	0.044	0.293	0.294	0.293	0.294	0.633
Observations (Loan-Time Level)	10,656	10,656	10,656	10,656	10,656	3,790
Corporate Loan × Relationship Bank = Corporate Loan × Mixed Bank	0.144	0.498	0.444	0.711	0.484	0.525

Table 4: Relationship Lending and Loan Performance (NPL 90 days)

The Table reports regression results from a linear probability model for a sub-sample of 4,441 loans to 271 firms that received loans from both *Relationship* and *Mixed Banks* between January 2009 and June 2013. The dependent variable is Loan Performance $_{ijkt}$ that equals one when a loan is delinquent for more than 90 days. The main independent variable is “SME Loan \times Mixed Bank” which measures the performance of transaction-based relative to relationship-based loans, i.e., SME loans of *Mixed* versus *Relationship Banks* (the reference group). Columns (1) reports results for with loan characteristics and firm characteristics. In Columns (2)-(5) firm fixed effects are added. Column (3) adds loan origination fixed effects, Column (4) bank characteristics, and Column (5) other loan characteristics. Column (6) introduces firm \times time fixed effect and thus the sample is reduced to 3,790 loan-time observations of 1,952 loans to 318 firms. The last row presents p-values for a Wald test of differences in coefficients when both banks rely on relationship lending, i.e., corporate loans of *Relationship* versus *Mixed Banks*. Definitions of the variables can be found in Table A.1 of Appendix A.. Standard errors are clustered at firm level and presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%.

	(1)	(2)	(3)	(4)	(5)	(6)
Corporate Loan \times Relationship Bank	0.004 (0.017)	0.001 (0.008)	-0.000 (0.008)	-0.002 (0.009)	0.002 (0.008)	-0.001 (0.010)
SME Loan \times Mixed Bank	-0.016*** (0.006)	-0.016*** (0.005)	-0.016*** (0.005)	-0.019*** (0.007)	-0.015*** (0.005)	-0.012 (0.007)
Corporate Loan \times Mixed Bank	0.012 (0.023)	0.021* (0.011)	0.021* (0.011)	0.022* (0.012)	0.020* (0.011)	-0.000 (0.013)
Credit Rating	-0.388*** (0.037)	-0.206*** (0.044)	-0.208*** (0.044)	-0.206*** (0.044)	-0.209*** (0.045)	-0.146*** (0.039)
Credit Interest Rate	0.004*** (0.001)	-0.000 (0.001)	0.001 (0.001)	0.000 (0.001)	0.001 (0.001)	0.002 (0.002)
Loan Amount	0.007** (0.003)	-0.003* (0.002)	-0.003* (0.002)	-0.003 (0.002)	-0.003** (0.002)	0.000 (0.001)
Collateral	0.021** (0.009)	0.019** (0.007)	0.018*** (0.006)	0.020*** (0.007)	0.020*** (0.008)	0.016 (0.013)
Guarantee	-0.002 (0.008)	0.003 (0.008)	0.003 (0.008)	0.004 (0.008)	0.004 (0.008)	-0.007 (0.011)
Maturity	0.002 (0.005)	0.005* (0.003)	0.005* (0.003)	0.006** (0.003)	0.005 (0.003)	0.003 (0.005)

Table 4 (continued): Relationship Lending and Loan Performance (NPL 90 days)

	(1)	(2)	(3)	(4)	(5)	(6)
Firm Location Yerevan	0.009 (0.008)					
Wholesale Retail Trade	0.004 (0.014)					
Industry Firm	-0.002 (0.012)					
Other Fields of Service	0.010 (0.009)					
Private Firm						
Large Bank				-0.005 (0.008)		
Foreign Bank				-0.003 (0.009)		
High Average Hierarchy				0.007 (0.007)		
Loan Location in Yerevan					0.002 (0.011)	
Wholesale Retail Trade					-0.002 (0.009)	
Industry Loan					-0.017*	
Other Fields of Service					0.010 (0.010)	
Industry Loan					0.007 (0.006)	
Loan in USD						
Constant	1.800*** (0.184)	1.069*** (0.215)	1.061*** (0.220)	1.057*** (0.212)	1.072*** (0.215)	0.720*** (0.193)
Firm Fixed Effects	No	Yes	Yes	Yes	Yes	No
Loan Origination Fixed Effects	No	No	Yes	No	No	No
Firm×Time Fixed Effects	No	No	No	No	No	Yes
R-squared	0.186	0.480	0.482	0.480	0.481	0.847
Observations (Loan-Time Level)	10,656	10,656	10,656	10,656	10,656	3,790
Corporate Loan × Relationship Bank = Corporate Loan × Mixed Bank	0.819	0.253	0.208	0.179	0.273	0.953

Table 5: Relationship Lending and Long-Term Performance

The Table reports performance statistics of SME loans selected from the total sample of 19,332 loans to 6,649 firms and the sub-sample of 4,441 loans to 621 firms that received loans from both *Relationship* and *Mixed Banks* between January 2009 and June 2013. For SME loans *Relationship Banks* rely on relationship lending and *Mixed Banks* on transactional lending. Both panels show loan defaults (loss/written-off), recovery rates, the percentage of the loan and interest amount not repaid in time or lost/written-off for SME loans that are observed until maturity. Loan default equals one if a loan is in loss or written-off status at the end of the loan spell and zero otherwise. Recovery rate equals one if a loan has been delinquent during the loan spell but did not default at the end of the loan spell. The percentage of loan and interest amount not repaid in time (lost/written-off) stands for the ratio of the principal and interest rate amount over the total contract amount in case of delinquencies below/over 90 days or default, conditional on non-performance at the end of the loan spell. While Panel A conditions loans to have been delinquent for less than 90 days during the loan spell, Panel B conditions loans to have been delinquent over 90 days during the loan spell. For all panels, the column "Difference *t*-test" reports *t*-statistics for differences in means between the two bank types and indicates significance at the 1%, 5%, and 10% levels with ***, **, *.

Panel A: Defaults, Recovery Rates, and Losses for SME Loans if NPL 0-90 days

Variable Names	Total Sample: SME Loans				Sub-Sample: SME Loans				Difference	<i>t</i> -test
	Relationship Banks		Mixed Banks		Relationship Banks		Mixed Banks			
	Mean	Std	Mean	Std	Mean	Std	Mean	Std		
Loan Default (loss/written-off)	0.249	0.433	0.198	0.399	0.169	0.377	0.212	0.412	0.051*	-0.043
Recovery Rate	0.127	0.333	0.158	0.366	0.156	0.365	0.173	0.382	-0.031	-0.017
% of loan and interest amount not repaid in time	0.047	0.127	0.104	0.229	0.064	0.185	0.111	0.240	-0.057***	-0.047
% of lost/written-off loan and interest amount	0.256	0.858	0.181	0.551	0.145	0.675	0.147	0.374	0.075	-0.002
Observations (Loan Level)	543		303		77		52		846	129

Panel B: Defaults, Recovery Rates, and Losses for SME Loans if NPL 90 days

Variable Names	Total Sample: SME Loans				Sub-Sample: SME Loans				Difference	<i>t</i> -test
	Relationship Banks		Mixed Banks		Relationship Banks		Mixed Banks			
	Mean	Std	Mean	Std	Mean	Std	Mean	Std		
Loan Default (loss/in written-off status)	0.608	0.489	0.522	0.501	0.512	0.506	0.600	0.498	0.087*	-0.088
Recovery Rate	0.226	0.419	0.296	0.458	0.220	0.419	0.333	0.479	-0.070*	-0.114
% of loan and interest amount not repaid in time	0.849	1.407	0.931	1.137	0.907	1.834	0.608	0.619	-0.082	0.299
% of lost/written-off loan and interest amount	0.672	1.328	0.559	0.938	0.661	1.688	0.340	0.453	0.113	0.321
Observations (Loan Level)	301		186		41		30		487	71

Table 6: Relationship Lending and Long-Term Rents

The Table reports summary statistics and regression results of returns on loans for SME loans selected from the total sample of 19,332 loans to 6,649 firms and the sub-sample of 4,441 loans to 621 firms that received loans from both *Relationship* and *Mixed Banks* between January 2009 and June 2013. For SME loans *Relationship Banks* rely on relationship lending and *Mixed Banks* on transactional lending. Returns on loans are defined in equation 2 as the value-weighted interest rate and loss of a bank in case of non-performance. The loss of a bank is defined as the overdue principal plus interest rate amount over the contract amount. The first panel shows the return on SME loans on loan level for the total sample and the sub-sample by bank type. The second and third panels show the return on SME loans that have been delinquent for less than 90 days and over 90 days. For all panels, the column “Difference *t*-test” reports *t*-statistics for differences in means between the two bank types and indicates significance at the 1%, 5%, and 10% levels with ***, **, *, and *. The last panel shows results from a regressions of return on loans on a *Mixed Bank* dummy without firm fixed effects for all SME loans (“All Loans”), for SME loans not delinquent for less than 90 days (“NPL 0-90=0”), for SME loans delinquent for less than 90 days (“NPL 0-90=1”), for SME loans not delinquent over 90 days (“NPL 90=0”), and for SME loans delinquent over 90 days (“NPL 90=1”).

Variable Names	Total Sample: SME Loans						Sub-sample: SME Loans					
	Relationship Banks			Mixed Banks			Relationship Banks			Mixed Banks		
	Mean	Std	Difference	Mean	Std	t-test	Mean	Std	Difference	Mean	Std	t-test
Return on loans												
Return on Loans	15.08	4.514	0.385***	14.7	4.46	17,919	13.75	4.421	0.385***	13.53	4.201	0.221
Observations (Loan-Level)	9,630			8,289			1,770			2,091		3,869
Return on loans given NPL 0-90 days												
Return on Loans	13.22	5.955	2.544***	10.68	6.127	1,570	11.95	5.495	2.544***	9.521	6.048	2.443***
Observations (Loan-Level)	950			620			138			117		255
Return on loans given NPL 90 days												
Return on Loans	7.819	5.137	0.554	7.265	4.877	715	7.63	5.086	0.554	6.368	4.419	1.262
Observations (Loan-Level)	421			294			67			43		110
Regressions on return on loans												
	Total Sample: SME Loans						Sub-sample: SME Loans					
	All Loans	NPL 0-90=1	NPL 90=1	All Loans	NPL 0-90=1	NPL 90=1	All Loans	NPL 0-90=1	NPL 90=1	All Loans	NPL 0-90=1	NPL 90=1
Mixed Bank	-0.385** (0.159)	-2.544*** (0.505)	-0.554 (0.501)	-0.221 (0.356)	-2.443** (1.209)	-1.262 (1.179)	13.746*** (0.249)	11.955*** (0.564)	7.630*** (0.718)	0.001 3,861	0.043 255	0.016 110
Constant	15.080*** (0.104)	13.220*** (0.236)	7.819*** (0.281)									
R-squared	0.002	0.041	0.003									
Observations (Loan-Level)	17,919	1,570	715									

Table 7: Relationship Lending and Enforcement of Contract Terms

The Table reports summary statistics loans selected from the total sample of 19,332 loans to 6,649 firms and the sub-sample of 4,441 loans to 621 firms that received loans from both *Relationship* and *Mixed Banks* between January 2009 and June 2013. Panel A reports summary statistics on past non-performance of any kind with the present bank of the firm, with any bank and with other banks of the firm on bank-firm-time and bank-firm level. For the sample, I collapse all 19,332 loan observations to bank-firm-time level or bank-firm level. Panel B reports summary statistics on rollover loans as well as increases in the interest rate, loan amount and maturity during the loan spell for the total sample and sub-sample of SME loans given delinquencies below 90 days. For SME loans *Relationship Banks* rely on relationship lending and *Mixed Banks* on transactional lending. I declare a loan of a firm to be a rollover loan if a firm has a previous performing or non-performing loan with a bank and a new loan that has been issued within one, two, or three months before or after the previous loan with the same bank. For all panels, the column "Difference *t*-test" reports *t*-statistics for differences in means between the two bank types and indicates significance at the 1%, 5%, and 10% levels with ***, **, *

Panel A: Distribution of Ex-ante Borrower Risks

Variable Names	Total Sample: Bank-Firm-Time Level				Total Sample: Bank-Firm Level						
	Relationship Bank		Mixed Bank		Relationship Bank		Mixed Bank		Difference	<i>t</i> -test	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std			
Past NPL with Bank	0.016	0.126	0.011	0.103	0.013	0.104	0.008	0.080	0.005**	0.005**	
Past NPL with Any Bank	0.017	0.128	0.018	0.132	0.014	0.116	0.017	0.124	-0.001	-0.002	
Past NPL with Other Banks	0.015	0.119	0.016	0.124	0.013	0.110	0.015	0.121	-0.001	-0.002	
Observations	7,874		6,322		4,531		3,352		14,196		7,883

Panel B: Rollover Loans and Renegotiations of Contract Terms given NPL 0-90 days

Variable Names	Total Sample: SME Loans				Sub-Sample: SME Loans						
	Relationship Bank		Mixed Bank		Relationship Bank		Mixed Bank		Difference	<i>t</i> -test	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std			
Rollover loans (-\+ 3 months)	0.012	0.107	0.015	0.120	0.022	0.146	0.017	0.130	-0.003	0.005	
Rollover loans (-\+ 2 months)	0.008	0.091	0.008	0.090	0.022	0.146	0.009	0.093	0.000	0.013	
Rollover loans (-\+ 1 months)	0.005	0.072	0.005	0.069	0.007	0.085	0.009	0.093	0.000	-0.001	
Change in Interest Rate during loan spell	0.021	0.144	0.036	0.185	0.022	0.146	0.068	0.253	-0.014*	-0.047*	
Change in Amount during loan spell	0.002	0.046	0.005	0.069	0.007	0.085	0.000	0.000	-0.003	0.007	
Change in Maturity during loan spell	0.044	0.206	0.018	0.132	0.058	0.235	0.009	0.093	0.027***	0.050**	
Observations (Loan Level)	950		620		138		117		1,570		255

Table 8: Use of Credit Registry for Loan Monitoring and Granting Purposes

The Table reports regression results for a sample of 2,737 firms that exclusively received loans either from *Relationship* or *Mixed Banks* and for which data on banks' use of the credit registry for loan monitoring and granting purposes exists from June 2012 until June 2013. The dependent variables are either "Monitoring" or "Granting", indicating the number of bank inquiries of a firm's credit registry information for loan monitoring or granting purposes. The main independent variable is "Mixed Bank Firm" which measures whether a firm that received loans only from *Mixed Banks* was inquired through the credit registry for loan monitoring or granting purposes. The reference group are firm that received loans only from *Relationship Banks* and were inquired by these. To control for differences in firm characteristics, I add firm size based on the average total outstanding debt across banks and past non-performance measures with their bank, any bank and all banks in columns (2) and (4) as well as firm location, industry and ownership fixed effects in columns (3) and (4). Standard errors are robust and presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%.

	# of Loan Monitoring Inquiries			# of Loan Granting Inquiries		
	(1)	(2)	(3)	(4)	(5)	(6)
Mixed Bank Firm	-0.334*** (0.109)	-0.257** (0.109)	-0.263** (0.119)	-0.037 (0.062)	0.006 (0.061)	0.004 (0.065)
Firm Size		0.303*** (0.034)	0.319*** (0.037)		0.146*** (0.018)	0.154*** (0.019)
Past NPL with Bank		-0.182 (0.259)	-0.229 (0.286)		-0.143 (0.186)	-0.153 (0.196)
Past NPL with Any Bank		0.207 (0.773)	0.280 (0.816)		0.274 (0.602)	0.260 (0.619)
Past NPL with Other Banks		1.176 (1.112)	1.033 (1.198)		0.210 (0.654)	0.272 (0.658)
Constant	2.205*** (0.061)	-1.340*** (0.386)	-2.097*** (0.797)	2.042*** (0.038)	0.439** (0.194)	0.341 (0.540)
Firm Location Fixed Effects	No	No	Yes	No	No	Yes
Firm Industry Fixed Effects	No	No	Yes	No	No	Yes
Firm Ownership Fixed Effects	No	No	Yes	No	No	Yes
R-squared	0.008	0.122	0.160	0.000	0.041	0.078
Observations	1,295	1,295	1,295	2,245	2,245	2,245

Table 9: Robustness Tests of Relationship Lending and Loan Performance

The Table reports robustness regression results for a sub-sample (or selection thereof) of 10,656 loan-time observations of 4,441 loans to 621 firms that received loans from both *Relationship* and *Mixed Banks* between January 2009 and June 2013. The dependent variable is $\text{LoanPerformance}_{ijkt}$ that equals one when a loan is in arrears for more than 90 days unless otherwise noted. For each robustness test, I rerun specifications of Table 3 in Columns (1) and (2) with firm characteristics or with firm fixed effects. To conserve space, I only report the coefficient of “SME Loan \times Mixed Bank” which measures the performance of transaction-based relative to relationship-based loans, i.e., SME loans of *Mixed* versus *Relationship Banks* (the reference group), as well as its standard error and the number of observations. Panel A reports regression results for alternative non-performance measures: “Non-Performance” that equals one if a loan has any overdue payments on the principal amount and interest rate and zero otherwise and “Non-Performance 180 days” that equals one if a loan is delinquent for more than 180 days and zero otherwise. Panel B reports results for different loan characteristics. “W/o Right-censored Loans” reduces the original sub-sample to loans that are observed until maturity; “Timing w/o SME & corp. Loans” excludes SME and corporate loans once a firm switches from SME to corporate loans for a *Mixed Bank*, meaning a switch from transactional to relationship lending; “Timing w/o SME Loans” excludes only SME loans once a firm switches from SME to corporate loans for a *Mixed Bank*; “W/o loans 50% around threshold” excludes loans 50% around the threshold; “Local Currency Loans” and “US dollar loans” uses only loans denominated in local currency or US dollars; “Loans after January 2011” uses only loans after January 2011. Panel C investigates different relationship characteristics. “Alternative Relationship Lending” defines the importance of relationship lending relative to the importance of other lending technologies and reduces the sample to *Relationship Banks* for which the relative importance of relationship lending stays constant for SME and corporate loans (4 out of 9 *Relationship Banks*) and *Mixed Banks* for which the relative importance of relationship lending is higher for corporate loans compared to SME loans (all 5 *Mixed Banks*), and “Relationship Variables” adds relationship variables such as relationship duration, the scope of a firm-bank relationship and a dummy variable that equals one if a firm’s debt exposure to a bank is above 50% and zero otherwise; “New Customers” and “Old Customers” splits the benchmark regression into first time customers and repeated customers of a bank. Panel D examines different firm characteristics. “Trade, manufacturing, construction” uses only observations of firms from the trade, manufacturing or construction industries, while “Other fields of services” and “Other industries” uses only observations of firms either from other fields of service industries or remaining other industries. Panel E relies on different estimation methods of the benchmark regressions. Row “Logit model” uses a logit model instead of a linear probability model for the benchmark specifications and reports odds ratios; “Matching on firm and loan amount” estimates the average differences in delinquencies for less than 90 days between SME loans of *Relationship* and *Mixed Banks* using a sub-sample of loans of the same firm with similar loan amounts: “Matching on firm and loan char.” additionally matches on collateral, interest rate and rating. Specifications (2) and (3) correspond to a 0.5 and 0.25 standard deviation radius for each of the matching variables. “Full/Opposite sample” estimates specification (2) with just loan and firm characteristics for the full sample of 6,649 firms and 19,332 loans in the column Specification (2) and for opposite sample of 6,028 firms that receive 14,891 loans from either *Relationship* or *Mixed Banks* only in the column Specification (3). The last two rows “Bank clusters” and “Bank \times time and firm clusters” cluster standard errors at bank level only and use double clusters at bank-time and firm level, respectively. Definitions of the variables can be found in Table A.1 of Appendix A. If not otherwise noted, standard errors are clustered at firm level and presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%.

Table 9 (continued): Robustness Tests of Relationship Lending and Loan Performance

Variable Names	Specification (1) with firm characteristics			Specification (2) with firm fixed effects		
	Coeff.	Std. Error	Obs.	Coeff.	Std. Error	Obs.
Panel A: Alternative Measure of Loan Performance						
Non-Performance	-0.005	(0.007)	10,656	-0.013**	(0.005)	10,656
Non-Performance 180 days	-0.007	(0.005)	10,656	-0.009**	(0.004)	10,656
Panel B: Loan Characteristics						
W/o right-censored loans	-0.033***	(0.011)	5,214	-0.028**	(0.013)	5,214
Local currency loans	-0.021*	(0.012)	5,946	-0.010	(0.011)	5,946
US dollar loans	-0.033***	(0.010)	4,710	-0.040***	(0.014)	4,710
Loans between January 2009-2011	-0.027**	(0.011)	2,881	-0.020	(0.015)	2,881
Loans after January 2011	-0.025**	(0.011)	7,775	-0.022**	(0.011)	7,775
W/o loans 50% around threshold	-0.026***	(0.010)	9,161	-0.025***	(0.009)	9,161
Timing w/o SME & corp. loans	-0.025***	(0.009)	9,885	-0.025***	(0.008)	9,885
Timing w/o SME loans	-0.025***	(0.009)	10,044	-0.025***	(0.008)	10,044
Panel C: Relationship Characteristics						
Alternative relationship lending	-0.023**	(0.010)	5,898	-0.017*	(0.010)	5,898
Relationship variables	-0.026***	(0.009)	10,656	-0.026***	(0.008)	10,656
New customers	-0.020	(0.014)	3,389	-0.025*	(0.014)	3,389
Old customers	-0.027**	(0.011)	7,267	-0.027***	(0.010)	7,267
Panel D: Firm Characteristics						
Trade, manufacturing, construction	-0.007	(0.017)	3,367	-0.014	(0.013)	3,367
Other fields of services	-0.036***	(0.012)	5,715	-0.033***	(0.012)	5,715
Other industries	-0.022	(0.017)	1,574	-0.020	(0.016)	1,574
Panel E: Alternative Estimation						
Logit model	0.568**	(0.128)	10,656	0.444***	(0.105)	2,459
Matching on firm and loan amount	-0.026**	(0.010)	19,207	-0.026**	(0.013)	13,615
Matching on firm and loan char.	-0.043**	(0.020)	2,064	-0.062	(0.041)	404
Full/Opposite sample	-0.020***	(0.004)	53,780	-0.016***	(0.005)	43,124
Bank clusters	-0.025	(0.018)	10,656	-0.025***	(0.008)	10,656
Bank×time and firm clusters	-0.025**	(0.012)	10,656	-0.025***	(0.009)	10,656

Table 10: Overdue Loan Repayments

The Table reports regression results for a sub-sample of 1,193 loan-time observations of 323 loans to 126 firms that received loans from both *Relationship* and *Mixed Banks* between January 2009 and June 2013 and had overdue principal and interest rate repayments for less than 90 days. In the first two columns the dependent variable is the overdue principal and interest rate amount over the contract amount, the following two columns use the same numerator but set it relative to the total outstanding debt of the firm with the respective bank in a period and the last two columns use the total outstanding debt of a firm in a period. The main independent variable is “SME Loan×Mixed Bank” which measures the overdue exposure of transaction-based relative to relationship-based loans, i.e., SME loans of *Mixed* versus *Relationship Banks* (the reference group). For each dependent variable, I use firm characteristics or firm fixed effects to control for firm heterogeneity. Standard errors are robust and presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%.

	NPL Amount over Contract Amount		NPL Amount over Bank Exposure		NPL Amount over Total Exposure	
	(1)	(2)	(3)	(4)	(5)	(6)
Corporate Loan × Relationship Bank	0.001 (0.003)	-0.001 (0.003)	-0.024 (0.022)	-0.062 (0.064)	-0.001 (0.001)	0.000 (0.002)
SME Loan × Mixed Bank	-0.003 (0.003)	-0.003 (0.002)	-0.025 (0.021)	-0.051 (0.048)	-0.001 (0.002)	-0.001 (0.001)
Corporate Loan × Mixed Bank	0.001 (0.005)	0.006 (0.004)	0.032 (0.028)	0.073 (0.069)	-0.000 (0.002)	0.001 (0.002)
Firm Location Yerevan	0.001 (0.004)		-0.031 (0.033)		-0.001 (0.002)	
Wholesale Retail Trade Industry Firm	0.006 (0.008)		0.051 (0.046)		0.003 (0.003)	
Other Fields of Service Industry Firm	-0.003 (0.004)		-0.000 (0.004)		-0.001 (0.002)	
Private Firm	-0.001 (0.005)		0.019 (0.020)		-0.001 (0.002)	
Constant	0.008* (0.005)	0.009*** (0.001)	0.030 (0.023)	0.046 (0.030)	0.005*** (0.002)	0.004*** (0.001)
Firm Fixed Effects	No	Yes	No	Yes	No	Yes
R-squared	0.018	0.446	0.036	0.164	0.018	0.291
Observations	1,193	1,193	1,193	1,193	1,193	1,193

Table 11: Relationship Lending and Information Use

The Table reports regression results from a multiplicative heteroskedasticity model based on Harvey (1976) and Cerqueiro et al. (2011) for a sub-sample of 4,441 loans to 621 firms that received loans from both *Relationship* and *Mixed Banks* between January 2009 and June 2013. The model estimates the determinants of the mean and the residual variance of the Loan Spread_{ijkt}, defined as the loan interest rate minus the refinancing rate of the Armenian banks with the Armenian Central Bank in the upper and lower panels. The main independent variable is “SME Loan × Mixed Bank” which measures the effect of transactional lending on the residual variance in interest rates relative to relationship lending, i.e., SME loans of *Mixed* versus *Relationship Banks* (the reference group). Columns (1)-(2) report results with loan characteristics without and with firm characteristics. In Columns (3)-(6) firm fixed effects are introduced. Column (4) includes a crisis dummy for the years 2009 and 2010, Column (5) adds loan origination fixed effects, and Column (6) adds other loan characteristics. The last row uses a Walt test to test whether the difference in coefficients when both banks rely on relationship lending, i.e., corporate loans of *Relationship* versus *Mixed Banks*, equals zero. Definitions of the variables can be found in the Appendix, Table A.1. Standard errors are clustered at firm level and presented in parenthesis. ***, **, and * indicate significance at the 1%, 5%, and 10%.

Panel A: Mean Equation	(1)	(2)	(3)	(4)	(5)
Credit Classification	-2.062*** (0.469)	-0.206 (0.539)	-0.245 (0.291)	-0.238 (0.545)	0.067 (0.504)
Loan Amount	-1.135*** (0.071)	-0.522*** (0.080)	-0.529*** (0.065)	-0.558*** (0.079)	-0.433*** (0.068)
Collateral	-2.985*** (0.462)	-3.077*** (0.210)	-0.472** (0.194)	-3.149*** (0.201)	-3.125*** (0.205)
Guarantee	-0.742 (0.526)	-1.024* (0.620)	-0.250 (0.345)	-1.137* (0.609)	-1.068* (0.611)
Maturity	1.208*** (0.209)	0.222* (0.116)	0.004 (0.086)	0.213* (0.114)	0.287*** (0.111)
Firm Location Yerevan	-0.970*** (0.214)				
Wholesale Retail Trade Industry Firm	-0.162 (0.295)				
Other Fields of Service Industry Firm	-0.608** (0.266)				
Private Firm	-0.021 (0.309)				
Large Bank				1.122*** (0.200)	
Foreign Bank				-0.455 (0.305)	
High Average Hierarchy				0.316 (0.212)	
Loan Location in Yerevan					-0.153 (0.362)
Wholesale Retail Trade Industry Loan					0.850** (0.398)
Other Fields of Service Industry Loan					1.379*** (0.272)
Loan in USD					-1.807*** (0.229)
Constant	29.405*** (2.571)	18.991*** (2.826)	21.617*** (1.620)	18.781*** (2.844)	16.734*** (2.643)

Table 11 (continued): Relationship Lending and Information Use

Panel B: Variance Equation	(1)	(2)	(3)	(4)	(5)
Corporate Loan Relationship Bank	-0.342** (0.167)	-0.109 (0.174)	-0.016 (0.176)	-0.016 (0.175)	-0.175 (0.170)
SME Loan Mixed Bank	-0.248* (0.131)	-0.696*** (0.157)	-0.416** (0.178)	-0.665*** (0.153)	-0.741*** (0.152)
Corporate Loan Mixed Bank	0.137 (0.197)	-0.088 (0.258)	-0.222 (0.283)	-0.200 (0.261)	-0.061 (0.269)
Constant	2.490*** (0.095)	2.040*** (0.103)	1.221*** (0.118)	1.995*** (0.101)	1.978*** (0.093)
Firm Fixed Effects	No	Yes	Yes	Yes	Yes
Loan Origination Fixed Effects	No	No	Yes	No	No
Pseudo R-squared	0.087	0.204	0.323	0.208	0.221
VWLS R-squared	0.396	0.699	0.841	0.705	0.727
Observations (Loan Level)	4,441	4,441	4,441	4441	4,441
Corporate Loan × Relationship Bank = Corporate Loan × Mixed Bank	0.126	0.950	0.618	0.606	0.744

Figure 1: Identification strategy

The Figure illustrates the identification strategy for the main analysis, presenting bank types, loan types and corresponding lending techniques. The two bank types are *Relationship Banks* (control group) and *Mixed Banks* (treatment group). Each bank reports the importance of relationship lending by SME and corporate loan separately. *Relationship Banks* rely on relationship lending for both loan types, while *Mixed Banks* use relationship lending only for corporate loans and transactional lending (based on fundamental/cash flow analysis and collateral) for SME loans. The arrows indicate that loan performance of the *same firm* is compared for SME loans of the two bank types, when lending techniques differ (relationship vs. transactional lending), and for corporate loans, when both rely on relationship lending.

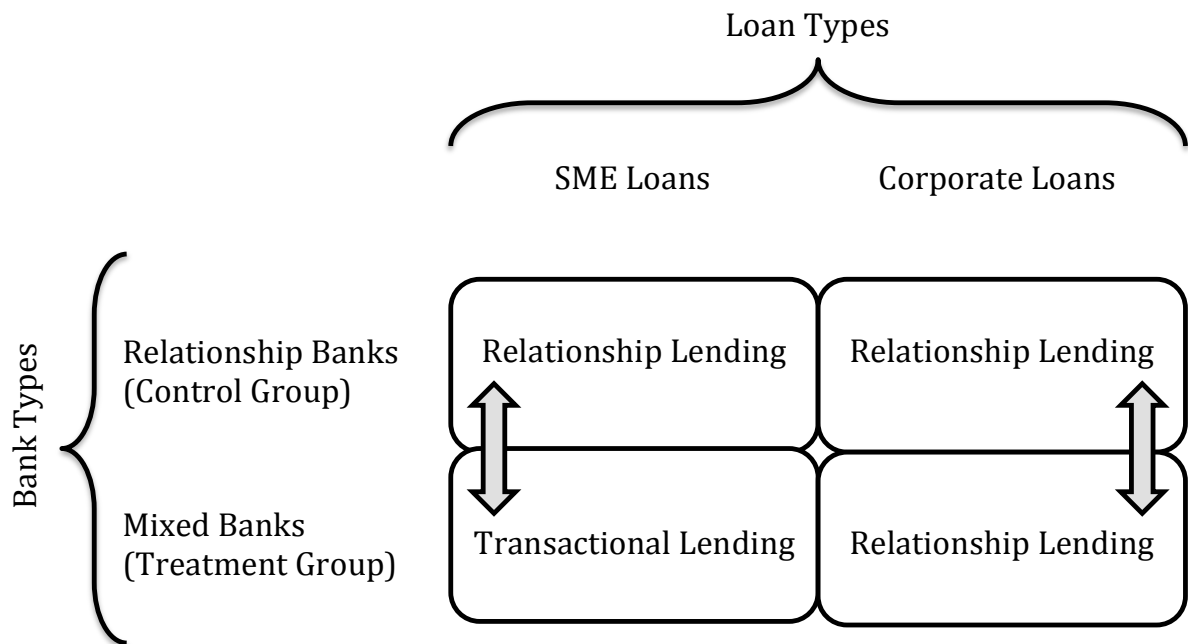
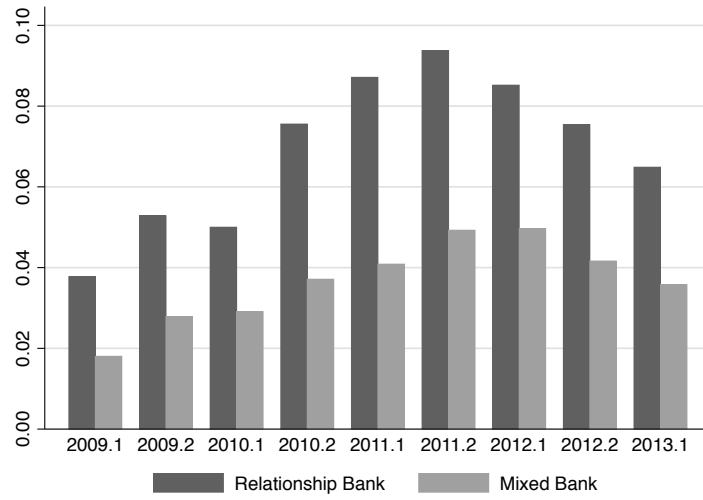


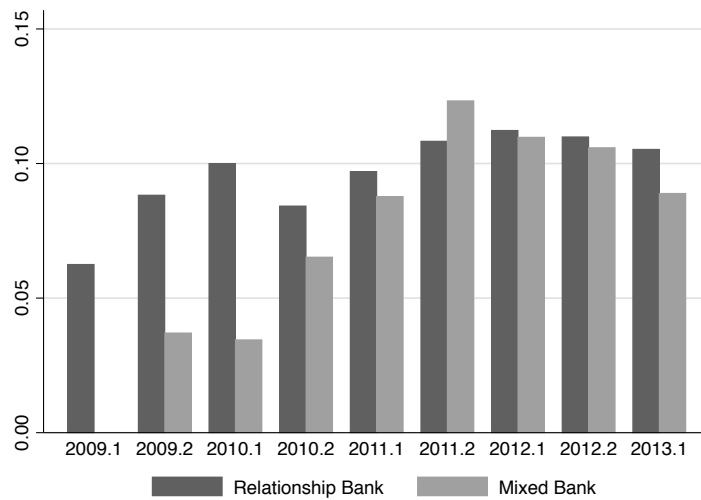
Figure 2: Loan Performance over Time for Sub-sample

ADJUST PLOT The Figure shows the average percentage of loans in delinquency over 90 days for a sub-sample of 4,441 loans to 621 firms that received loans from both *Relationship* and *Mixed Banks* between January 2009 and June 2013. The upper figure shows average non-performance over time for SME loans for both *Relationship* and *Mixed Banks* (relationship vs. transactional lending), while the lower figure shows average non-performance for corporate loans for both bank types (both relationship lending).

(a) SME Loans (Relationship vs. Transactional Lending)



(b) Corporate Loans (Relationship vs. Relationship Lending)



A Variable Definitions

Table A.1: Variable Definitions

The Table reports variable definitions.

Variable Names	Definitions
Loan Performance	
Non-Performance	= 1 if a loan has any overdue payments on the principal and interest rate amount or overdue days, and = 0 otherwise.
Non-Performance 0-90 days	= 1 if a loan is non-performing for less than 90 days, and = 0 otherwise.
Non-Performance 90 days	= 1 if a loan is non-performing for more than 90 days, and = 0 otherwise.
Non-Performance 180 days	= 1 if a loan is non-performing for more than 180 days, and = 0 otherwise.
Default (loss/written-off)	= 1 if a loan has a loss/written-off status, and = 0 otherwise.
Loan Characteristics	
SME Loan	= 1 if a loan is classified as an SME loan based on the loan amount definition of a bank, and = 0 otherwise.
Corporate Loan	= 1 if a loan is classified as a corporate loan based on the loan amount definition of a bank, and = 0 otherwise.
Credit Classification	Credit classification of a loan (1 (worst rating) and 5 (best rating)).
Interest Rate	Annual contractual interest rate at loan origination.
Loan Spread	Loan interest rate minus the refinancing rate of the Central Bank of Armenia.
Loan Amount in US\$	Loan amount at loan origination in US dollars.
Collateral	= 1 if collateral was pledged at loan origination, and = 0 otherwise.
Guarantee	= 1 if a guarantee was given at loan origination, and = 0 otherwise.
Loan Maturity in Months	Number of months between loan origination and maturity.
Other Loan Characteristics	
Loan Location in Yerevan	= 1 if the location of the loan is in Yerevan, and = 0 otherwise.
Wholesale and Retail Trade Industry Loan	= 1 if the industry of the loan is in the whole and retail trade industry, and = 0 otherwise.
Other Fields of Service Industry Loan	= 1 if the industry of the loan is in other fields of the service industry, and = 0 otherwise.
Loan in USD	= 1 if the currency denomination of the loan is in USD, = 0 otherwise.
Relationship Characteristics	
Relationship in Months	Duration of a bank-firm relationship in months.
Scope	= 1 if the firm has additional products (e.g., credit lines, leasing, factoring, overdrafts) with a bank, and = 0 otherwise.
Primary Bank	= 1 if more than 50% of a firm's outstanding debt is originated by one bank, and = 0 otherwise.
Number of Relationships	Number of banks with which a firm has outstanding loans.
Multiple Relationships	= 1 if the firm has outstanding loans from multiple banks, and = 0 otherwise.
Firm Characteristics	
Firm Location Yerevan	= 1 if the location of the firm is in Yerevan, and = 0 otherwise.
Wholesale and Retail Trade Industry Firm	= 1 if the industry of the firm is in the whole and retail trade industry, and = 0 otherwise.
Other Fields of Service Industry Firm	= 1 if the industry of the firm is in other fields of the service industry, and = 0 otherwise.
Private Firm	= 1 if the firm is a private firm, and = 0 otherwise.
Bank Characteristics	
Relationship Bank	= 1 if a bank reports a high importance (frequency of use) of relationship lending for SME and corporate loans, and = 0 otherwise.
Mixed Bank	= 1 if a bank reports a high importance (frequency of use) of relationship lending for corporate loans but less importance for SME loans, and = 0 otherwise.
Large Bank	= 1 if the Central Bank of Armenia considered the bank to be large in terms of total assets at the of 2009. Alternatively, banks are classified as medium-sized and small.
Foreign Bank	= 1 if more that 50% of its equity is foreign-owned (excluding investors with Armenian origin).
High Average Hierarchy	= 1 if the number of layers a loan has to pass to for approval is above 2.

B Test for Discontinuity at the Threshold

In this section, I examine the distribution of loans around the threshold that determines a loan to be an SME or corporate loan. A natural question that arises is whether banks or firms are manipulating loan amounts in order to give out or receive either SME or corporate loans. *Mixed Banks*, for example, could intentionally give out loans with loan amounts just below the threshold in order to avoid giving out a corporate loan that might be associated with higher costs since relationship lending becomes more important. Likewise, firms could apply for loans just below the threshold in order to circumvent possibly higher screening and monitoring activities of banks.

In general, only complete manipulation but not partial manipulation results in identification problems. While complete manipulation assumes that the assignment rule is under complete control of agents, partial manipulation occurs when agents can only partially influence the assignment rule and the rest remains idiosyncratic (McCrary (2008), p 700).³² In the present case, threshold definitions are not publicly known and differ across banks in amount and currency. Half of the banks set thresholds in USD, while the rest sets it in AMD. At the same time, loans are issued in different currencies. For firms, it is more difficult to manipulate their loan amounts, as they are less likely to know the exact thresholds for each bank. At banks, loan officers might be able to manipulate loan amounts. Exchange rate fluctuations might, however, still add an idiosyncratic component (see Garmaise and Natividad (2014) for similar ideas), suggesting partial manipulation.

Even if complete manipulation occurs, it should not influence the main results, since the identification comes from loans further away from the threshold and not around the threshold. Most likely, for *Mixed Banks* lending techniques do not just switch from transactional to relationship lending once a loan passes the loan amount threshold but rather get less transaction-based and more relationship-based with the loan size. Therefore, the further away a loan is from the threshold the more prominent the difference in lending techniques will be for *Mixed Banks* across loan types and for SME loans between *Relationship* and *Mixed Banks*. In unreported results, I confirm that leaving out loans exactly at or around the threshold does not alter the main results.

In order to formally check for manipulation around the threshold, I rely on a methodology developed by McCrary (2008) that tests for the discontinuity at the threshold in the density function of the running variable (loan amount threshold). The upper panel of Figure A.1 plots the density functions of loan amounts with the threshold normalized to zero and a range of 50% around the threshold for the total sample and the sub-sample. Both figures reveal a discontinuous jump at the threshold which is confirmed by coefficients of -1.06 (-1.46) and standard errors of 0.14 (0.28). Errors in the assignment of loans to SME and corporate loans might occur since banks do not explicitly specify whether the threshold is an upper or lower bound or might give approximate amounts. The lower panel of Figure A.1 plots the same density functions as above, leaving out loans exactly at the threshold. The discontinuous jump disappears with coefficients of 0.02 (-0.11) and standard errors of 0.14 (0.30).

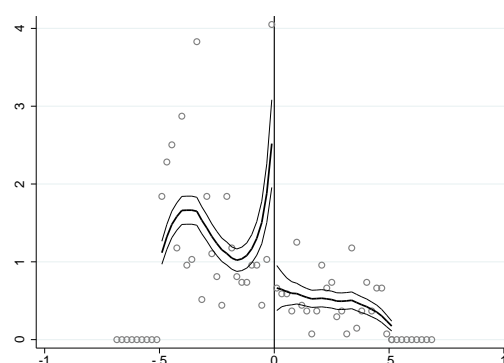
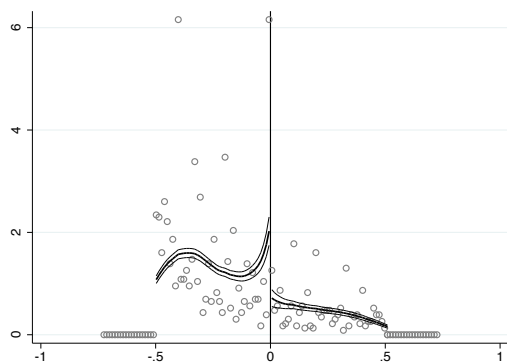
³²Van der Klaauw (2002), DiNardo and Lee (2004), and Lee (2008) present some examples of plausible partial manipulations that do not influence results.

Figure A.1: Density of Loan Amounts around Threshold

The Figure shows the density of loan amounts at the threshold that is normalized to zero and in a range of 50% based on McCrary (2008). The upper figures show the density for the total sample of 19,332 loans to 6,649 firms and the sub-sample of 4,441 loans to 271 firms that received loans from both *Relationship* and *Mixed Banks* between January 2009 and June 2013. The lower figures repeat the analysis for the total and sub-sample, excluding loan amounts directly at the threshold.

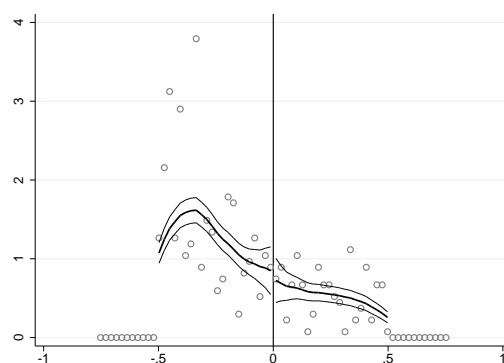
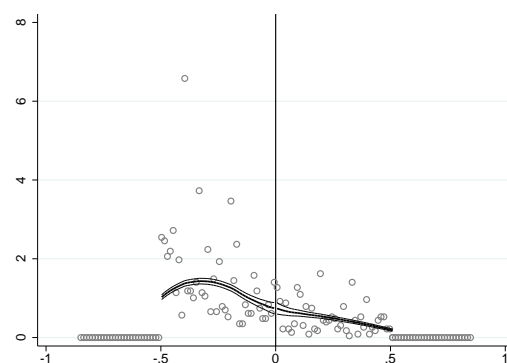
(a) Total Sample

(b) Sub-sample



(c) Total Sample

(d) Sub-sample



C Regression Model with Multiplicative Heteroskedasticity

The regression model with multiplicative heteroscedasticity based on Harvey (1976) is defined as:

$$y_i = \beta' X_i + u_i, \quad (\text{A.1})$$

$$\text{Log}(\sigma_i^2) = \gamma' Z_i, \quad (\text{A.2})$$

where (1) is the mean equation and (2) the variance equation. The identifying assumptions for the model are:

$$E(u_i | X_i) = 0, \quad (\text{A.3})$$

$$E^2(u_i | Z_i) \equiv \sigma_i^2 = \exp(\gamma' Z_i), \quad (\text{A.4})$$

where y_i is the depending variable, X_i a vector of explanatory variables in the mean equation, u_i is a disturbance term, σ_i^2 the residual variance, and Z_i a vector of explanatory variables in the variance equation.

Under the normality assumption, the conditional distribution of y_i is given by:

$$y_i | X_i, Z_i \stackrel{d}{\rightarrow} N(\beta' X_i, \exp(\gamma' Z_i)), \quad (\text{A.5})$$

The heteroscedastic regression model is estimated with Maximum-Likelihood (MLE) by maximizing the following log-likelihood with respect to β and γ :

$$\text{Log}L = \frac{n}{2} \log(2\pi) - \frac{1}{2} \sum_{i=1}^n \gamma' Z_i - \frac{1}{2} \sum_{i=1}^n \exp(-\gamma' Z_i) (y_i - \beta' X_i)^2 \quad (\text{A.6})$$

Harvey (1976) shows that this approach is analogous to estimating the mean Eq. (1), and taking the squared-residuals as the raw estimates of the individual variances, which are subsequently used to estimate Eq. (2). This two-step approach leads to a substantial loss of efficiency vis-à-vis the MLE.