Courts, firms and allocation of credit

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Abstract

The paper investigates whether and how performance of regional commercial courts has affected external credit of Russian enterprises between 1995 and 2002. The results show that more reliable courts lead to higher bank lending to firms. This occurs predominantly through expansion of the number of businesses which have access to bank financing. There is limited evidence that trade credit also responds to changes in quality of courts. However, credit from suppliers is considerably less sensitive to court performance than bank credit.

Court reliability is precisely defined and measured objectively using appeal rates of lower court decisions. The paper analytically derives the relationship between reliability of courts, appeal rates and lending to firms, identifying a specific channel through which law enforcement affects external financing. Empirical analysis is based on a new panel dataset which measures credit at the level of a firm and permits a number of robustness tests.

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1 Introduction

Bank lending to private firms in Russia averaged 13% of GDP between 1995 and 2002. This is in stark contrast to the rest of the industrialized world: among G7 countries this ratio was 86% in the same period. Among Russian medium and large size firms, less than half hold bank loans. For those who do, these loans amount to 10% of total assets. This is about a third of the proportion reported by firms in G7 economies[1]. Given the role of financial intermediation in promoting investment and economic growth, it is important to explain such differences[2].

This paper studies the role of law enforcement in explaining the pattern of credit received by firms in Russia. The poor state of Russia's judiciary is often named one of the top reasons for the country's economic problems[3]. According to a World Bank survey, only 18% of Russian respondent firms believe that commercial court system in Russia is consistent and reliable[4].

This paper links credit received by Russian firms to quality of commercial courts in regions where these firms locate. I match data on firm-level credit received by approximately 20,000 large and medium size enterprises with statistics on performance of 81 regional commercial courts for eight consecutive years, from 1995 to 2002.

Less than half of firms in the sample receive bank loans, but almost all the firms have trade credit. During the sample period, which includes the 1998 financial crisis, the share of firms with access to either type of credit declined. At the same time, the amount of credit received by enterprises who continue to have access to it increased. Behind these aggregate trends lie substantial differences in external financing of firms located in different regions of Russia, which, this study argues, can in part be explained by different performance of commercial courts in these regions.

I develop an analytical framework to analyze how courts may affect lending decisions. It is based on the premise that, if there is a dispute between a lender and a firm, litigation is more costly than an out-of-court settlement. The model then shows that lender's costs of contract enforcement increase when lower courts are less *reliable* predictors of higher courts decisions[5]. I also show that the rate of appeal of lower court decisions rises when the lower court is less reliable. This allows me to use the rate of appeal of lower court decisions as a

[1] See IMF International Financial Statistics, Rajan and Zingales (1995) on external financing in G7 countries, and Huang et al (2002) on Russia's bank credit.

[2] For links between financial markets and economic growth, see Levine (1997) and Rajan and Zingales (1998).

[3] For instance, Black et al (2000) who argue that lack of 'decent legal and enforcement infrastructure' was largely responsible for the many failures of Russian privatisation. See also Gray and Hendley (1997) for case study analysis, Biletsky et al (2002), Frye and Zhuravskaya (2000) and Frye (2004) for surveys of firms.

[4] See World Bank (2000). The number includes firms that reported that courts are 'frequently', 'mostly' and 'always' consistent and reliable. The rest of the firms chose 'sometimes', 'seldom' or 'never'. These results put Russia in the 22nd place among 80 countries surveyed.

[5] Subsequently, I call the court system less *predictable*, when its lower courts are less reliable predictors of higher court decisions.

proxy for court reliability in my empirical estimations.

My empirical results show that when commercial courts are more reliable, banks lend more to firms located in these courts' jurisdictions. First, I find that improvements in reliability of commercial courts increase the number of firms to which banks are willing to lend. Second, the amount of bank credit received by firms also rises with court reliability. The results also show that the latter effect is significantly smaller and potentially less robust than the former. Court performance also influences trade credit, but this effect is notably smaller in magnitude and the inference is less robust. Improvements in court performance are not found to increase credit received by firms from other enterprises with whom they have ownership links.

This evidence in this study lends new support to the view that legal environment is important for economic and financial development. Among the first studies to show a positive relationship between rule of law and countries' growth rates were Keefer and Knack (1995) and Mauro (1995). Yet, causality between quality of law enforcement and development proved notoriously difficult to establish: a positive relationship may be observed, for instance, because more advanced economies are able to build more reliable court systems. La Porta et al (1997) refine this approach by looking separately at various aspects of law on books on the one hand, and quality of law enforcement on the other, and linking them to external financing. In their 1998 paper, they show that a relationship exists between legal origin, law on books and concentration of ownership. Demirguc-Kunt and Maksimovic (1998) also show a positive relationship between the rule of law and the use of external financing in different countries.

Pistor et al (2000) focus on external finance in transition economies. Their results again point at the existence of a strong link between law and finance: for example, they show that improving legal environment from Russia's level to that of Poland increases market capitalization by 20% and private credit by 25%. They find that law enforcement has a larger impact on external finance than law on the books. Turning to trade credit in transition countries, survey evidence by Johnson et al (1999) shows that firms who have more confidence in courts are more willing to extend credit to customers. This effect is weaker for those suppliers that have had a relationship with a customer for some time.

In cross-country studies, identification of the effect of law enforcement is usually hindered by difficulty of controlling for country characteristics. Subnational studies help improve identification: Chemin (2004) compares the speed of courts across Indian states and shows that in states with faster courts firms have more external financing and undertake more specific investment. Within five Eastern European countries, Johnson et al (2002) show that firms who report that courts perform better are also more likely to invest, although they are no more likely to receive bank financing than other firms.

In this study, both time and cross-regional variation in court quality is utilized. Much of the policy and macroeconomic environment is common across Russia's regions, making it easier to separate the effect of law enforcement from other factors. Credibility of the results is improved by using an objective mea-

sure of reliability of courts. The study also establishes a specific mechanism through which reliability and predictability of the court system affects the willingness of banks to extend credit.

The paper is organized as follows. In section 2, I develop an analytical framework to show how reliability and predictability of the court system affects lending decisions. Section 3 describes the data. Section 4 develops an empirical model and reports results of the estimations. Section 5 concludes.

2 Analytical framework

This section develops a simple model to understand how law enforcement by courts may affect lending to firms. The is based on a premise that, if a dispute arises, litigation is a more costly option than a settlement. I define the *reliability* of a (lower level) court as the extent to which its decision reduces uncertainty about what is lawful, and in particular, what a higher court would consider lawful in the case at hand. I refer to a court system as more *predictable* when the reliability of the lower courts is higher. The model shows that the expected contract enforcement costs of lenders fall when courts are more reliable.

First, I show that when lower courts are less reliable, lenders are more likely to litigate rather than settle their disputes with borrowers. This raises the expected costs of contract enforcement for lenders and therefore discourages credit. Lenders who face a higher probability of a default on a loan are more affected by reliability of courts.

Second, the model demonstrates that lower court reliability leads to a higher probability that a court's decision is appealed. This allows me to use the rate of appeals as a proxy for otherwise unobserved reliability of the lower court in subsequent empirical estimation.

Finally, the developed framework shows which other factors may impact both the rate of appeal and bank lending, and how. These findings help interpret the results in section 4.

2.1 Set up

To help follow the model, appendix A lays out its timing.

Consider a bank that decides whether to extend a loan of amount L to a firm. For simplicity set the bank's costs of loanable funds to zero.

With some probability d the bank expects the firm to default on the loan. If default occurs, the bank threatens to sue the firm in the lower court, and then in the court of appeals, if necessary. Suppose that the bank knows with certainty that it will win in the court of appeals.

The firm faces uncertainty and attaches probability ϕ to the bank winning the appeal. Although ϕ is not observable to the bank, it is known to be uniformly distributed on a $[0, 1]$ interval[6]. The firm makes an offer of an out-

[6] If there is no uncertainty about the decision of the appellate court, then all disputes are settled out of court when litigation is costly. Here, I assume that the bank does not face any

of-court settlement to the bank. Assume a Nash bargaining solution with the bank keeping α share of surplus generated by the settlement. Let s denote the total amount that the bank keeps in case of a settlement. Let λ denote the probability that out-of-court bargaining between the firm and the bank breaks down, and the case goes to the lower court[7]. Let c be the costs of litigating in lower court, borne by each party.

Assume that the lower court makes a decision in favour of the bank with probability ρ. In other words, ρ captures the frequency with which the lower court correctly anticipates the decision of the court of appeal.

After the lower court decision, the party that lost in the lower court threatens the other with appeal. The firm updates its expectations and arrives at Φ, a posterior probability that the bank will win the appeal. The firm and the bank then bargain over a settlement to avoid appeal. Let S denote the amount received by the bank if they settle. Again I use the Nash bargaining solution here. If bargaining breaks down, the dispute goes to the court of appeals. Let Λ denote the probability that the case goes to appeal given that it has been litigated in the lower court. Let C be the costs of litigating in appellate court for each side.

2.2 Analysis

At time $t = 0$ the bank decides whether to extend a loan. It has the following expected profit function

$$\Pi = (1 - d)L + d[(1 - \lambda)s + \lambda[(1 - \Lambda)S + \Lambda(L - C) - c]]. \tag{1}$$

At $t = 1$, the firm defaults on the loan with probability d. If default occurs, the bank threatens with litigation. Since litigation is costly, it is efficient to settle out of court. The firm makes an offer of a settlement to the bank.

The firm and the bank will settle as long as the minimum settlement that the bank asks for does not exceed the maximum expected loss from litigation for the firm

$$L - c - C < \phi L + c + C^{8}. \tag{2}$$

This inequality holds with probability

$$\mathrm{p}(\phi > 1 - \frac{2(c + C)}{L}) = \frac{2(c + C)}{L}. \tag{3}$$

uncertainty for simplicity. Relaxing this assumption does not affect the results.

[7] The idea of out of court bargaining in presence of uncertainty over potential court decision is due to Priest and Klein (1984).

[8] At $t = 1$, prior to the lower court decision, the firm expects to go all the way to appeal if litigation occurs. Thus, the maximum amount it is prepared to offer to settle at $t = 1$ is its expected loss from litigating in both courts, i.e. $\phi L + c + C$.

At $t = 1$ the bank, knowing the distribution of ϕ, the value of ρ and the fact that he will win at appeal, can calculate the probability of settlement at $t = 3$. Thus, the bank's minimum accepted settlement at $t = 1$ is somewhat greater than $L - c - C$, but for simplicity I ignore this secondary effect.

If the settlement occurs, the bank receives

$$s = L + \alpha[(\mathrm{E}(\phi \mid \phi < \frac{2(c+C)}{L} - 1)L + 2(C+c)], \tag{4}$$

where $\mathrm{E}(\phi \mid \phi > 1 - 2(c+C)/L) = 1 - (c+C)/L$ and E(.) is the expectations operator.

If agreement on a settlement is not reached, at $t = 2$ the bank and the firm litigate in the lower court. The latter decides in favour of the bank with probability ρ.

At $t = 3$, the firm updates its estimated probability of the bank winning the appeal using new information contained in the lower court's decision. Using Bayes' rule, the firm's posterior estimate of this probability is

$$\Phi = \begin{cases} \frac{\phi\rho}{\phi\rho+(1-\phi)(1-\rho)} \text{ if the bank wins in the court of first instance} \\ \\ \frac{1-(1-\phi)\rho}{(1-\phi)\rho+\phi(1-\rho)} \text{ if the bank looses} \end{cases} . \tag{5}$$

The firm updates more, i.e. its posterior Φ is further away from ϕ, when the lower court decision contains more information about what will happen at appeal. More precisely, Φ is further away from ϕ when ρ is further away from 1/2.[9]. Thus, the lower court decisions reduce uncertainty more when $|\rho - 1/2|$ is higher. To use the definition introduced in the beginning of section 2, the lower court is a more *reliable* predictor of appellate court's judgements when $|\rho - 1/2|$ is higher[10].

The firm and the bank then bargain over a settlement S to be received by the bank if appeal is to be avoided. Settlement occurs as long as

$$\Phi > 1 - 2C/L. \tag{6}$$

The probability of a settlement given that dispute had been litigated in the lower court is given by

$$1 - \Lambda = \rho - \rho \min(\frac{\mathrm{p}(\phi < \phi^*)}{2(c+C)/L}, 1), \tag{7}$$

where $\phi^* = (1 - \frac{2C}{L})(1-\rho)/\{(1 - \frac{2C}{L})(1-2\rho) + \rho\}$.

Proposition 1

The probability of appeal to a higher court, Λ, *falls with reliability of lower court decisions,* $|\rho - 1/2|$.

[9] The firm makes no updating at all when $\rho = 1/2$.

[10] If I assume that lower court's decisions are more consistent with appellate court's view than random guesses, $(\rho > 1/2)$, then ρ captures reliability of lower court decisions.

The proof of proposition 1 is in appendix B. The intuition is the following: when the lower court is more reliable, the firm's estimated probability of the bank winning the appeal increases more (i.e. moves closer to the true value of 1). Consequently, the firm offers more to the bank to settle the dispute out of court. This reduces the ex ante probability of appeal for any initial value of ϕ.

If dispute is settled, the bank receives a settlement

$$S = L - C + \alpha[(E(\Phi|\phi < 1 - 2(c + C)/L, \Phi > 1 - 2C/L) - 1)L + 2C]. \quad (8)$$

If, on the other hand, the bargaining at $t = 3$ breaks down, the two parties go on to litigate in the court of appeals, which returns a verdict in favour of the bank. Substituting results in (7) and (8), we can express the bank's profit in terms of exogenous variables. This gives rise to the following:

Proposition 2

Lender's expected costs fall with court reliability, $|\rho - 1/2|$.

The proof of Proposition 2 is in appendix C. This proposition contains the basic insight into how reliability of court decisions affects lending. When the lower court is more reliable, the firm receives more information from its decision about the would-be outcome of the case at appeal. When the firm better anticipates the decision of the appellate court, it is willing to offer more to the bank in a settlement, and the litigation at appeal is less likely. Since litigation is costly, this lowers the expected costs of enforcing the loan contract for the lender, and, therefore, makes the lender more likely to extend the loan.[11].

The impact of court reliability on the bank's costs, and, therefore, lending, is larger when the probability of a default is larger. This implies that lenders that have access to better selection or monitoring technology will be less influenced by the quality of courts in their lending decisions.

Propositions 1 and 2 provide motivation for the empirical analysis of section 4. In practice $|\rho - 1/2|$ is not directly observable. It affects lending by reducing the probability of litigation in the appellate court. Therefore, the impact of court reliability on lending decisions can be empirically identified by estimating the relationship between loans extended and the probability of appeal.

The framework above also identifies three other factors that affect both the probability of appeal and the lender's expected profits[12]. First, the size of loan L influences the probability of appeal. The sign of the effect of L on Λ depends on the values of other variables (ρ, c and C).

Second, both the probability of appeal and expected profits of the lender are affected by how good the firm is at estimating its chances of winning in court. In the framework above, this corresponds to the range of the firm's prior

[11] Note that this framework is agnostic as to whether the court of appeals or the lower court makes a fairer decision. Here, less reliable courts are costly because they lead to more inefficient litigation.

[12] Derivations for these three effects are not shown here, but are available from the author.

ϕ around the bank's true chances of winning at appeal. Reducing this range increases both the probability of appeal and expected profits of lenders.

Finally, the probability of appeal and expected profits are both affected by costs of litigation (c and C). The sign of this effect is uncertain, and depends on ρ.

These influences are further discussed in section 4.3, after empirical results are presented.

3 Background and data

3.1 Institutional background

Economic disputes between firms, individual entrepreneurs and the state fall under the jurisdiction of Russian *arbitrazh* courts. These are professional courts organized in a three-tier structure: courts of first instance (regional courts), appellate courts (okrug courts), and the Supreme Arbitration Court.

Regional courts were created in 1991 in 81 of Russia's 89 administrative regions. They replaced the Soviet system of arbitration tribunals which had dealt with conflicts between state-owned enterprises under central planning. Although the old name was kept, the new system was set up quite differently from the Soviet one[13].

The jurisdiction of each regional arbitrazh court coincides with the administrative borders of the region[14]. The plaintiff is required to file his suit in the arbitrazh court of the region where the *defendant* is officially registered, preventing 'venue shopping'. Therefore, if a firm defaults on a loan, the lender will be suing it in the commercial court of the region where the firm is registered. This implies that lending to firms should be affected by the quality of the court where these firms are registered, rather than the court in the region where the lender is registered.

Litigants unhappy with a decision of the regional court can appeal it to a corresponding okrug court of appeals, of which there are ten it total[15,16]. These courts were established in 1995. The jurisdiction of each appellate court includes from 7 to 11 regional arbitrazh courts[17]. In contrast with regional courts, all cases filed with courts of appeal are tried by at least three judges. There are no restrictions on the types of cases that can be appealed.

Litigants can appeal decisions of okrug courts further to the Supreme Arbitration Court of Russia. Yet, it selects and reviews only a small fraction of suits filed with it.

In an effort to isolate arbitrazh courts from the influence of regional and local authorities, arbitrazh court system is officially financed solely from the federal

[13] See, for instance, Hendley (1998).

[14] The exceptions are eight regions which do not have an 'own' court.

[15] An 'okrug' is a large geographical division in Russia which includes several regions.

[16] Before a decision of a regional court comes into force, a litigant who is unsatisfied with it can also request a re-consideration by a three judge panel of the same regional court.

[17] The exception is Moscow okrug court which only covers two regional courts.

budget. Once a judge has been appointed to an arbitrazh court, he has tenure until he retires. The salary of a judge cannot be reduced throughout his career. Although initial appointment procedures for arbitrazh judges differ across regional courts and between regional and okrug courts, most of the time the final selection is done by a federal office from a shortlist of candidates compiled by a committee of judges. Deciding which judges get promoted is the prerogative of the presidential office, again after a committee of judges had short-listed the candidates.

Litigation fees are set by a federal law, the same for all courts of each tier.

In Russia, between 1995 and 2001, 63% of all cases resolved by regional commercial courts were disputes between enterprises, including banks. The vast majority of these were breach of contract suits. In the same period, litigants took roughly 5% of all regional court decisions to appellate courts[18].

3.2 Data

Table 1 provides the descriptive statistics for the main variables used in this study. The data on annual activity of each regional commercial court is has been obtained from the Supreme Arbitration Court of Russia. The firm level data on credits and loans received were taken from the Alba/Gnozis collection of accounting reports of medium and large size Russian enterprises[19]. Regional characteristics, used as control variables, were taken from annual publications of Goskomstat (the state statistical committee) and the Ministry of Finance.

External credit is observed for each of approximately 20,000, medium and large size enterprises every year between 1995 and 2002[20]. The sample accounts for approximately 1% all registered firms in Russia, and about 16% of total employment. Just under half of all firms are industrial firms, and about a third are providers of services. Construction firms make up 11% of the sample, transport firms – 8%, and agricultural firms – 3%. Outlier firms with credit to assets ratio in the top 1/2% of the distribution in any of the years were removed from the sample.

Trade credit is the single most important source of lending received by Russian firms: across the eight sampled years, it accounts, on average, for 51% of the stock of debt held by them (or 23% of firms' total assets). As in other countries, it is also the most common one: 97% of firms receive at least some trade credit from their suppliers.

In contrast, just 41% of firms report having bank credit. Among firms that do receive bank loans, they accounts for 19% of all external debts (or 10% of assets), and represent the second most important source of credit after that from suppliers.

Between 1995 and 1998, the sample average of bank credit to assets fell, hitting the low of 5% in the year of Russia's banking crisis. It then saw a

[18] See The Supreme Arbitration Court (2002).

[19] A more detailed description of these data can be found, for example, in Bessonova et al (2003).

[20] This is an unbalanced panel.

gradual recovery in post-crisis years to 10% in 2002. This pattern is consistent with the aggregate figures published by the Central Bank of Russia.

This trend masks two opposing effects: continuous expansion of bank credit by firms that have access to it counteracted by a fall in the number of such firms. Evolution of the share of firms with bank credit varies significantly from region to region, and some examples are shown in figure 4. In some regions, this first fell, and then rose again over time. Steady declines were observed, for example, in Chukotsky region and Dagestan.

The court data covers 81 regional arbitrazh courts over the same period of eight years, 1995-2002. The rate of appeals was calculated by dividing the number of regional court decisions appealed by the number of all cases completed in the same court in the same year[21]. As shown in table 1, the mean rate of appeal in the sample is 5%[22]. Average rates for individual courts vary from 3% (Bashkortostan) to 11% (Moscow city)[23].

4 Empirical method and results

The econometric analysis is based on a panel data model of the form

$$y_{irt} = f(\beta(1 - \Lambda_{rt}) + \delta x_{irt} + u_{irt}), \tag{9}$$

where y is the credit of firm i located in region r at time t, and Λ_{rt} is the rate of appeals in regional commercial court r and time t. Thus, $1 - \Lambda_{rt}$ captures reliability of the regional court. Other exogenous variables are denoted by x_{itr}. If more reliable courts have a positive effect on lending, β should be positive and significant.

Three issues arise when estimating and interpreting the parameters of this model. First, many firms in the sample have no bank credit. Since bank credit cannot be negative, the appropriate model for describing its behaviour is $y_{irt} = \max(0, \beta(1 - \Lambda_{rt}) + \delta x_{irt} + u_{irt})$. Thus, a linear estimation of the relationship between y_{irt} and $1 - \Lambda_{rt}$ would produce inconsistent coefficients. Therefore, I estimate a non-linear tobit model in subsection 4.1.

The second concern is the nature of unobserved elements (u_{irt}) in equation (9). When the error term includes firm or region specific characteristics, these are common to several observations, and residuals for these observations will be correlated. This requires standard errors of estimators to be adjusted accordingly.

Third, if we believe these unobserved characteristics (u_{irt}) to be correlated with the law enforcement variable $1 - \Lambda_{rt}$, estimators that ignore this correlation will be inconsistent. Unfortunately, non-linear estimation procedures have

[21] An alternative definition, where the number of cases appealed was divided by all cases completed in the previous year, was also tested: this does not significantly affect the conclusions.

[22] For comparison, in the US, the rate of appeal of district court decisions was 13.5% in 2000. This includes all civil cases, not only commercial disputes.

[23] Variation in (perceived) effectiveness of courts is also found by Frye and Zhuravskaya (2000) who survey of small shops in three Russian cities.

significant limitations in dealing with such omitted variables. In section 4.2, I argue that my results using tobit model indicate that a discrete choice model may capture well the main effect of law enforcement on credit here. I, therefore, use discrete choice models for robustness checks in section 4.2.

Throughout this empirical section, I try to be explicit about the assumptions I make on u_{irt}. I start with most innocuous ones in subsection 4.1, and then relax them in the robustness discussion in 4.2.

Finally, subsection 4.3 focuses on further interpretation of obtained results. It comes back to the issue that the rate of appeals might proxy for variables other than reliability of courts, raised earlier in the paper.

4.1 Basic results

Table 2 summarizes the results of estimating the effect of reliability of courts on credit received by firms using (9).

Column 1 looks at bank credit, measured as a fraction of the firm's total assets. I find a highly significant and positive effect of court reliability on bank credit. The model is estimated using tobit, with the marginal effects given in columns 1a and 1b. The effect of court reliability on the size of loans to firms that are receiving them is positive and significant (column 1a). So is the effect of court reliability on the probability that a firms receives a loan (column 1b). The latter is significantly greater than the former. This suggests that improvements in law enforcement mostly work through broadening access to credit for firms who have not been borrowing before, rather than increasing the size of loans to firms that are already borrowing.

In terms of magnitude, a one percentage point reduction in the rate of appeals increases the probability that a firm receives bank credit by 1.2%. This suggests, for example, that replacing Chukotsky commercial court (one of the courts with the highest appeal rates), with that from Vladimirskaya oblast, should increase the number of firms who receive bank credit by about 8%[24].

Turning to trade credit, column 2 shows that the coefficient on reliability of law enforcement is also positive and significant. However, it is notably smaller than the coefficient on bank credit. Since only 4% of observations in the sample report zero trade credit, the non-linear effects are likely to be small. Accordingly, a linear model is estimated in column 3. Its results are consistent with the tobit model.

Column 4 looks at credit received by enterprises from dependent firms. It is not affected by law enforcement. In columns 5 and 6, I test for impact of court reliability on trade credit extended by the sampled firms to their customers, and find no effect. Since the lender must sue the borrower in the borrower's region, this is consistent with firms extending credit to customers located in other regions.

[24] This is a slight abuse of interpretation, since in a tobit regression the marginal effect is not constant with respect to independent variables. In the next section, I show that a linear estimate of the effect of court reliability is almost exactly the same in magnitude, and, therefore, the example above is valid.

Altogether, these results make sense: The number of firms receiving bank credit increases when regional courts are more reliable. The loan amounts also rise but the effect is smaller. This is consistent with contract enforcement costs being largely fixed. Credit from suppliers is notably less sensitive to court performance. This is consistent with major theories of trade credit, that suggest that suppliers have better access to information and monitoring of their clients than banks[25]. This result also agrees with Johnson et al (1999) who show that Eastern European suppliers respond more to perceived court quality when the customer is new. Finally, lending from firms who are connected to the borrower through ownership links, and, therefore, largely protected from the borrower's default, is not affected by court performance.

4.2 Robustness

The next task is to assess the robustness of these findings. The tobit model assumes that the error terms, u_{irt} are independently normally distributed, and uncorrelated with the law enforcement variable. However, because the empirical model does not account for all firm and regional factors affecting credit, a more realistic form of the error term allows for interdependence across observations i.e.

$$u_{irt} = \nu_r + \mu_i + \varepsilon_{itr}. \tag{10}$$

Here ν_r captures a region specific effect common to all firms located in one region (for example, physical infrastructure), and μ_i captures a firm effect (for instance, managerial ability), under the assumption that both of these stay the same for the sample period.

This has two implications. First of all, the true variance-covariance matrix of u_{irt} will now have non-zero off-diagonal elements for observations from the same region and for the same firm. Ignoring these will underestimate the standard errors of regression coefficients. In my data, this effect is aggravated because the law enforcement variable is measured at the level of region, and does not vary across observations for firms located in the same region for any given year (see Moulton (1990)).

Secondly, if either ν_r or μ_i are correlated with law enforcement, a model that does not account for this will produce inconsistent estimates. As discussed in more detail below, some of regional factors may be correlated with reliability of court decisions. It is less likely that individual firm characteristics have an impact on regional rate of appeals at courts. Still, this cannot be ruled out since the sample includes large firms.

If data generating process were linear, the issue of correlation between ν_r, μ_i and explanatory variables could have been addressed by taking advantage of panel structure of the data and estimating a 'fixed effects' regression. In a non-linear framework, introducing regional or firm dummies does not solve the problem. In tobit type models, this problem is especially difficult to deal with

[25] See, for instance, Petersen and Rajan (1997).

when the common factors are unobservable[26].

My findings so far suggest that the dominant effect of better court performance is on the probability of a firm receiving a loan. Focusing on this, I redefine the dependent variable as a binary (discrete choice) indicator which equals to 1 if the firm has a loan, and 0 otherwise. Table 3 estimates a logit (column 1) and a linear probability (column 2) models using this binary outcome. The results confirm the highly significant positive effect of court reliability on bank lending found in the tobit model. The marginal effect of reducing the rate of appeal on the probability of receiving a bank loan is 1.1%, which is almost the same as that obtained from the tobit model.

Shifting the focus to the probability of getting a loan allows me to tackle the problem of fixed unobserved effects. Column 2 demonstrates that the estimates remain robust when all fixed regional level effects are controlled for by dummies in a linear model. To address a further issue of unobserved firm level effects, a firm fixed effects model is estimated using conditional logit (column 3) and linear probability (column 4). The coefficient on court reliability remains positive and significant at 1% level. However, the magnitude of the marginal effect reported in the linear regression is now 0.4%, significantly below the 1.1% obtained earlier.

It so happens that no firms in the sample moved from one region to another: this implies that allowing for firm fixed effects also controls for regional level effects. When unobserved effects are given by (10), the error term reduces to ε_{itr} after inclusion of firm level dummies. This means that the firm fixed effects model in column 4 provides correct estimates of standard errors.

This is no longer the case if instead we posit that unobserved regional factors vary over time. Then the error term becomes

$$u_{irt} = \nu_{rt} + \mu_i + \varepsilon_{itr}. \tag{11}$$

Now, even when firm fixed effects are controlled for, the residuals of observations for firms located in the same region in the same year are correlated. The standard errors of fixed effects coefficients will be understated, aggravated since law enforcement does not vary across firms. Furthermore, if elements of ν_{rt} are correlated with the law enforcement variable, fixed effects estimates may be inconsistent[27].

Estimations reported in table 4 address these issues. I control for some omitted factors whose over time changes may be affecting both court reliability and bank credit.

So far, dynamic regional factors, such as the level of regional development and regional government policies, have not been included. Yet, there are no obvious channels through which such factors could influence court reliability: re-

[26] If the factors affecting credit and law enforcement were all observable, a two stage procedure proposed by Smith and Blundell (1986) could be followed to obtain consistent estimates for law enforcement coefficients. For more on estimation of tobit models with unobservable effects see Honore and Kyriazidou (2000).

[27] Similarly, fixed effects may not lead to consistency if ε_{itr} and law enforcement are correlated.

gional commercial courts are financed and organized by the federal government, who appoints judges taken from the national pool of candidates.

Using the same logic, court quality is likely to be correlated with assistance from the federal centre to a particular region. Such assistance may also affect lending to firms in its own right. I control for federal support using three measures of government subsidies: first, direct subsidies from the federal government to the regional government; second, subsidies to individual firms, and third, the amount individual firms owe in tax arrears[28]. In addition, I control for changes in regional infrastructure over time by including the fraction of the population with access to telephones. Finally, I include court case load per judge to control for the possibility that increases in regional economic activity raise both bank credit and the number of law suits, affecting court performance. Results in column 1 show that inclusion of these controls does not affect the estimated impact of court reliability on access to credit.

I now introduce controls for changes in firm level factors. Current assets proxy for the firm's demand for short term financing. The fraction of finished goods in inventory measures the ease with which creditors can liquidate short term assets in case of a default. Column 2 shows that the coefficient on court reliability remains positive and significant when these controls are included. Both controls are significant and have expected positive signs.

The regression shown in column 3 addresses contemporaneous correlation of residuals potentially caused by omitting time varying regional factors. Standard errors of coefficients in column 3 are adjusted for this using a procedure outlined in Rogers (1993), and usually referred to as 'clustering.' Although the standard error of the estimated impact of court reliability has now risen, the effect is still positive and significant at the 5% level.

I now perform the most stringent robustness test by adding region specific time trends to control for changes in omitted variables over time. The effect of court reliability can no longer be identified. This is not entirely surprising: inclusion of regional time trends reduces the variation from which the effect of law enforcement is identified to deviations from the regional trend.

Coming back to the size of bank loans that firms receive, the effect of courts on it does not seem to disappear when region specific trends are used. The estimation in column 5 uses bank credit to assets ratio as a dependent variable in a linear model. In column 6, the same equation is estimated only for observations where bank credit is positive. Despite inclusion of region specific trends, the effect of court reliability is positive and significant. However, these estimation must be viewed with caution, since bank credit data is, by nature, non-linear.

Finally, table 5 revisits the relationship between predictability of the court system and credit from sources other than banks, now using a firm fixed effects specification. The effect of courts on trade credit received can no longer be identified. The impact of court reliability on credit from firms connected through ownership has a negative sign. This suggests that as courts' perfor-

[28] Subsidies to firms and tax debts may also include those from/due to regional governments.

mance improves, firms switch from internal to external sources of funding.

To summarize, the positive effect of court reliability on the proportion of firms receiving bank credit is robust to controlling for regional and firm fixed effects. This effect remains highly significant also when a number of important regional level and firm level controls are included. It is robust to adjustment of the standard errors for intra-firm and contemporaneous intra-regional correlation. However, the effect of law enforcement on access to bank credit can no longer be identified when region specific time trends are included.

4.3 The rate of appeals as a proxy for other things[29]

A remaining concern is that one minus the rate of appeals might proxy for something other than reliability of the lower court's decisions. Section 2 showed that court reliability $|\rho - 1/2|$ directly affects the rate of appeals Λ and through it, bank's profits[30]. However, it is also influenced by three other factors: first, average amount at stake; second, the parties' ability to assess legality of their claim; and third, costs of litigation. Since my regressions do not control for these explicitly, I shall now consider how the interpretation of my results may be affected by omission of these three variables.

First, the average amount at stake is likely to be positively correlated with the size of credit received by firms. This may affect interpretation of estimations with size of loan as a dependent variable. From the model in section 2, the stake's impact on the rate of appeals is ambiguous. If it is negative, omission of the average amount at stake will underestimate the effect of court reliability on size of bank loans, and vice versa. Yet, omission of the stake variable should not influence estimations where the probability of getting a loan is used as a dependent variable, since there is no obvious correlation between such probability and dispute stake. Thus, the interpretation of my finding that higher court reliability increases the number of firms that get bank credit should not be affected.

Second, when the firm's ability to anticipate the decisions of appellate court improves (range of ϕ shrinks), this reduces the expected bank's costs of enforcing loan contracts. At the same time, it also increases the rate of appeals[31]. Therefore, omitting the degree of sophistication of litigating parties from regressions biases the coefficient on court performance downwards. This implies that my results underestimate the true effect of court performance on external finance.

Third, the costs of litigation can be broken down into court fees, and other firm specific costs (such as lawyer fees, reputation effects etc.). The former

[29] In this section, I rely on several effects derived from the model in section 2 which are not shown here explicitly, but are available on request.

[30] At extremes, when $\rho = 1/2$, $\Lambda = 1$; when $\rho = 1$, $\Lambda = 0$; and when $\rho = 0$, $\Lambda = 1$.

[31] This follows from the framework in section 2. As the range of firm's expectations shrinks around the bank's true chances of winning, the probability that the suit is litigated in the lower court falls. However, the probability that the suit appealed *given that it had been litigated in the lower court* rises.

do not vary across Russian courts, and their effects are controlled for by year dummies. All fixed components of firm specific costs and reputation effects are controlled for by firm dummies. Yet, if such costs have a dynamic firm specific component, it is possible that the coefficient on $1 - \Lambda$ picks up some of their effect. From section 2, costs of litigation have an ambiguous effect on the rate of appeals and the expected total costs of enforcing repayment by lenders (it depends on ρ). When the costs move these two variables in opposite directions, my empirical findings may understate the impact of court consistency on lending. When these two variables change in the same direction in response to changes in litigation costs, my results may indeed overstate the effect of court performance on external financing.

5 Concluding remarks

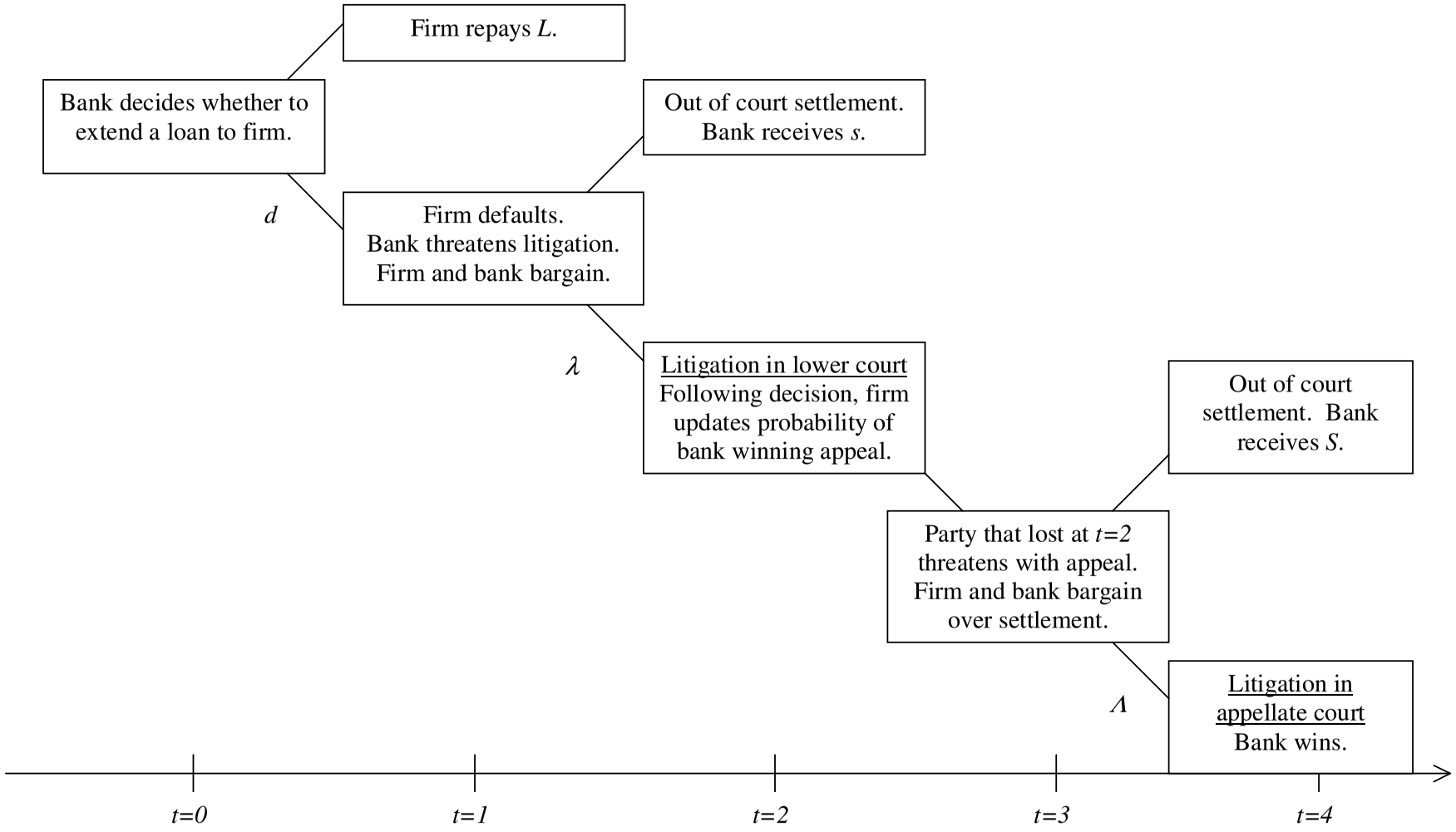
This paper examines the link between law enforcement and credit extended to firms. Empirical evidence indicates that reliability of commercial court decisions is an important determinant of lending to firms. I have shown that improvements in court performance lead to a rise in the number of firms to which banks issue credit. They also tend to increase the size of loans that banks extend. In contrast, the impact of court performance on trade credit is much weaker and less robust.

The study focuses on a particular aspect of court performance: the reliability of the judicial decisions as predictors of what is lawful. It also identifies a channel through which law enforcement effect operates: when law enforcement is more predictable, this encourages early settlement between disputing parties, helps avoid costly litigation and therefore reduces expected costs of contract enforcement for banks and other lenders[32].

The analysis provides new evidence that the legal environment is important for financial and economic development. Furthermore, it shows that the specific ways in which courts enforce laws have a substantial impact, even when law on the books remains the same. This suggests, that looking at differences in the process of law enforcement and not just laws themselves is important for understanding why different legal systems are associated with different patterns of economic development.

[32] In particular, such a mechanism may help explain existing evidence that countries which spent less time adapting laws borrowed from other legal systems to local circumstances have experienced slower economic development (see Berkowitz et al (2003)).

Appendix A Timing of the model



Appendix B

Proof of Proposition 1

Here I show that the probability that the lower court decision is appealed, Λ, falls in court reliability, $|\rho - 1/2|$.

Recall that Λ is the probability that the firm's estimate of the bank's chances to win the appeal is above ϕ^*, given that it is below $1-2(c+C)/L$ (the condition for litigation in the lower court). Thus, $\Lambda = \rho \min\left[\phi^*/(1-2(C+c)/L), 1\right] + (1-\rho)$.

Let us first consider the case when $\rho > 1/2$. For Λ to fall in $|\rho - 1/2|$ in this case, it must fall in ρ. Differentiating with respect to ρ gives

$$\frac{\partial \Lambda}{\partial \rho} = \rho \frac{\phi^*}{1 - \frac{2(C+c)}{L}} + \frac{\partial \phi^*}{\partial \rho} \frac{1}{1 - \frac{2(C+c)}{L}} - 1, \tag{12}$$

where

$$\frac{\partial \phi^*}{\partial \rho} = \frac{-(1 - \frac{2C}{L})\frac{2C}{L}\rho}{[(1 - \frac{2C}{L})(1-2\rho) + \rho]^2} < 0. \tag{13}$$

Thus, $\frac{\partial \Lambda}{\partial \rho} < 0$. When $\rho < 1/2$, converse is true. QED

Appendix C

Proof of Proposition 2

I need to show that the bank's expected profits increase in court consistency $|\rho - 1/2|$. First consider the case when $\rho > 1/2$. The first derivative of Π with respect to ρ is

$$\frac{\partial \Pi}{\partial \rho} = \begin{cases} = d\ \lambda\{L - C + (-\frac{\partial \Lambda}{\partial \rho})\alpha[(\bar{\Phi} - 1)L + 2C] + (1 - \Lambda)\alpha\frac{\partial \bar{\Phi}}{\partial \rho}L\} > 0 \\ \quad \text{if } \phi^* < 1 - 2(c + C)/L \\ \\ = 0 \ \text{ if } \phi^* \geq 1 - 2(c + C)/L \end{cases} \tag{14}$$

where $\bar{\Phi} = E(\Phi \mid \phi^* < \phi < 1 - 2(C + c)/L)$.

To sign (14), note that $d > 0$, $\lambda > 0$, and $L - C > 0$. In appendix B, I have shown that $-\partial\Lambda/\partial\rho > 0$. Since $\alpha[(\bar{\Phi} - 1)L + 2C]$ is the surplus from settlement, it is positive. Finally, the firm's posterior estimate of the bank's chances to win the appeal, given that the settlement is achieved also increases with reliability of the lower court: $\frac{\partial \bar{\Phi}}{\partial \rho} = [-(1 - \rho)^2 \frac{\partial \phi^*}{\partial \rho}]/(2\rho\phi - 1 - \rho - \phi)^2 > 0$. Thus, $\partial\Pi/\partial\rho$ is positive. Converse is true when $\rho < 1/2$. QED.

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Table 1 Descriptive statistics, 1995 - 2002

		N	*Mean*	*Standard deviation*	*Median*	*Min*	*Max*	*% zero*
Firm	Bank credit, ratio to assets	125,000	0.04	0.12	0.00	0	2.4	64
	Trade credit received, ratio to assets		0.25	0.35	0.12	0	9.8	4
	Credit from subsidiaries and dependent firms, ratio to assets		0.01	0.03	0.00	0	0.7	91
	Trade credit extended, share of assets		0.18	0.20	0.09	0	1.0	8
	Current assets, share of assets		0.57	0.31	0.55	0	1.0	0
	Finished goods, share of inventory		0.33	0.34	0.21	0	1.0	14
	Government subsidy, ratio to assets		0.01	0.05	0.00	0	0.9	75
	Owed to government, ratio to assets		0.10	0.18	0.04	0	3.2	2
Regional	Court decisions appealed, % of litigated	590	5	3	5	0.1	31	
	Case load, applications per judge		323	421	238	31	5,286	
	Federal transfers to region, thousands of 1998 roubles		841	2,061	426	0	39,449	
	Persons with access to phone lines in region, per 1000		125	104	74	9	462	

Notes: Column N gives the average number of observations for the list of variables. The actual number varies slightly for each particular indicator due to missing observations. Number of judges used in calculating caseload is the author's estimate based on judicial appointment data used in chapter 3.

Table 2 Law enforcement and firm credit: 1995-2002

	(1)	(1a)	(1b)	(2)	(2a)	(2b)	(3)	(4)	(5)	(6)
Dependent variable	**Bank credit, % of assets**			**Trade credit received from suppliers**				**Credit from dependent firms**	**Trade credit extended to customers**	
Method	Tobit			Tobit			OLS	Tobit	Tobit	OLS
	Coeff	Marginal effect given BC>0	Marginal effect on prob(BC>0)	Coeff	Marginal effect given TC>0	Marginal effect on prob(TC>0)	Coeff	Coeff	Coeff	Coeff
Court reliability	0.007**	0.002**	0.012**	0.002**	0.001**	0.002**	0.002**	0.000	-0.000	0.001
(1 - rate of appeals)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.011)	(0.002)
Year dummies	———	*Y*	———	———	*Y*	———	*Y*	*Y*	*Y*	*Y*
Regional dummies	———	*Y*	———	———	*Y*	———	*Y*	*Y*	*Y*	*Y*
Industry dummies	———	*Y*	———	———	*Y*	———	*Y*	*Y*	*Y*	*Y*
N	———	116,534	———	———	126,687	———	126,687	117,950	117,542	118,190
R^2	———	0.12	———	———	0.16	———	0.13	0.14	0.00	0.00

*Notes: Standard errors in parentheses; + significant at 10%, * significant at 5%; ** significant at 1%.*

Pseudo R^2 for tobit, adjusted R^2 for linear regression.

Standard errors in linear regressions are heteroskedasticity adjusted.

Table 3 Law enforcement and firms' access to bank credit

	(1)	(2)	(3)	(4)
Dependent variable	**Access to bank credit (binary)**			
Method	Logit	Linear probability model	Conditional logit	Linear probability model with firm fixed effects
Court reliability	0.044**	0.011**	0.027**	0.004**
	(0.005)	(0.001)	(0.007)	(0.001)
Year dummies	*Y*	*Y*	*Y*	*Y*
Regional dummies	*Y*	*Y*	*Y*	*N*
Industry dummies	*Y*	*Y*	*Y*	*N*
N	118,121	118,121	42,175	123,940
				(41,971)
R^2	0.08	0.10	0.08	0.54

*Notes: Standard errors in parentheses; + significant at 10%, * significant at 5%; ** significant at 1%.*

Pseudo R^2 for conditional logit, adjusted R^2 for linear regression.

Number of firms, not observations, is reported for conditional logit.

Table 4 Law enforcement and access to credit: controlling for time-varying factors

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	**Access to bank credit (binary)**				**Bank credit, % of assets**	**Bank credit, % of assets given BC>0**
Method	Linear probability model				OLS	OLS
Court reliability	0.005**	0.004**	0.004*	0.001	0.0014**	0.002*
	(0.001)	(0.001)	(0.002)	(0.001)	(0.0005)	(0.001)
Central government's transfers to region	0.000	0.000	0.000			
	(0.000)	(0.000)	(0.000)			
Government subsidies to firm	-0.006	-0.010	-0.009			
	(0.006)	(0.010)	(0.010)			
Owed to government by firm	-0.000**	0.000**	0.000**			
	(0.000)	(0.000)	(0.000)			
Regional telephone coverage	-0.000	-0.000	0.000			
	(0.000)	(0.000)	(0.000)			
Judicial caseload	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Current assets		0.060**	0.053**	0.052**	0.074**	0.16**
		(0.013)	(0.014)	(0.014)	(0.008)	(0.014)
Finished goods in inventory		0.080**	0.085**	0.085**	0.016**	0.007
		(0.011)	(0.011)	(0.011)	(0.003)	(0.008)
Year dummies	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
Regional dummies	*N*	*N*	*N*	*N*	*N*	*N*
Industry dummies	*N*	*N*	*N*	*N*	*N*	*N*
Firm fixed effects	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
Region-specific time trends	*N*	*N*	*N*	*Y*	*Y*	*Y*
Standard errors adjusted for contemporaneous intra-region correlation	*N*	*N*	*Y*	*Y*	*Y*	*Y*
N	108,449	96,934	96,934	99,609	100,031	40,534
R^2	0.55	0.55	0.55	0.55	0.51	0.60

*Notes: Standard errors in parentheses; + significant at 10%, * significant at 5%; ** significant at 1%.*

Pseudo R^2 for conditional logit, adjusted R2 for linear regression.

Standard errors in linear regressions have been adjusted for heteroskedasticity.

Table 5 Law enforcement and non-bank credit

	(1)	(2)	(3)
Dependent variable	**Trade credit, % of assets**	**Credit from dependent firms, binary**	**Trade credit extended, % of assets**
Method		OLS	
Court reliability	0.003	-0.002*	0.004
	(0.002)	(0.001)	(0.003)
Central government's transfers to region	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Government subsidies to firm	0.060^{+}	0.001	0.155**
	(0.004)	(0.003)	(0.000)
Owed to government by firm	-0.000**	0.000	-0.000**
	(0.000)	(0.000)	(0.000)
Regional telephone coverage	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)
Current assets	0.428**	0.021**	
	(0.021)	(0.008)	
Finished goods in inventory	0.038**	0.007	
	(0.011)	(0.007)	
Year dummies	*Y*	*Y*	*Y*
Regional dummies	*N*	*N*	*N*
Industry dummies	*N*	*N*	*N*
Firm fixed effects	*Y*	*Y*	*Y*
Standard errors adjusted for contemporaneous intra-region correlation	*Y*	*Y*	*Y*
N	101,357	90,564	109,639
Adjusted R^2	0.61	0.52	0.25

*Notes: Standard errors in parentheses; $^{+}$ significant at 10%, * significant at 5%; ** significant at 1%.*
Standard errors in linear regressions have been adjusted for heteroskedasticity.

Figure 1 Proportion of firms with bank credit, 1995 – 2002, selected regions of Russia