Information Sharing and Information Acquisition in Credit Markets

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Abstract

Since information asymmetries have been identified as an important source of bank profits, it may seem that the establishment of information sharing will lead to lower investment in acquiring information. However, banks base their decisions on both hard and soft information, and it is only the former type of data that can be communicated credibly. We identify strategic complementarity between hard and soft information, and show that when hard information is shared, banks will invest more in soft information. These can potentially lead to more accurate lending decisions and favor small, informationally opaque borrowers. The model offers key implications for borrower switching. We test our theory using firm-level data from 24 countries.
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1 Introduction

The importance of banks in the production of relationship information, and its contribution to improving the functioning of credit markets has long been recognized: with tighter lending relationships banks better assess their borrower's quality, avoid risks and earn rents.[1] Not quite understood is the role that relationship lending plays as part of banks' strategies to compete in a changing industry, which in recent years has seen the entry of information sharing institutions, such as credit bureaus and credit registers. We argue, that information sharing increases the importance of relationship lending, allowing banks to invest more in it, make more accurate credit decisions and earn higher rents. Understanding the influence of information sharing on banks' strategic use of relationship banking, as well as their function in promoting the efficient allocation of credit, has therefore become important from a practical, as well as a policy perspective. In this article, we characterize the nature of this interaction and derive implication for welfare properties of credit markets.

To study these issues we present an extended model based on von Thadden (2004). Two banks enter a two-period loan market and compete in interest rates each period for borrowers of high and low credit quality. Borrowers choose the best quote, and, if offers are identical, allocate themselves randomly. Initially, each bank captures a certain market share, lends to borrowers and observes payment history. When first-period repayments are made, the "inside" bank distinguishes two risk groups in its own market: *defaulting* borrowers, and *successful* borrowers. Moreover, to incorporate the idea of relationship banking, we assume that each inside bank accrues "relationship" specific information by investing in the monitoring of its borrowers during first-period lending.[2] For second period lending, therefore, the inside bank differentiates borrowers in two different sources of information – default/success of its borrower, *and* the outcome of monitoring –*good* or *bad* signal about the borrower's type. The "outside" bank can never observe signals from monitoring, so that monitoring provides the insider with stronger safeguard from competition. Moreover, monitoring will provide further rents for the bank: it will extend credit to good signals, but may avoid losses by rejecting credit to those bad signals, who are likely to be uncreditworthy, if the signal is precise enough. This costly monitoring will be more justified for the defaulting borrowers, as it will provide higher benefits by revealing more uncreditworthy borrowers among them.

Nevertheless, the outside bank will get access to default information under an information sharing regime. When it does, it becomes less aggressive with respect to defaulting borrowers in the lending competition: under no information sharing, it is more aggressive with respect to the defaulting group, since they are pooled with

[1] See, for example, Sharpe (1990), von Thadden 1994).

[2] We analyze the game under ex-ante screening as well, and the results are qualitatively similar. We will discuss only monitoring.

successful borrowers, that have higher average quality. For the same reason, more aggressive bids are made for successful borrowers under information sharing. As a result, under information sharing regime, defaulting borrowers are more likely to stay with the inside bank, while successful borrower –more likely to switch. Because investment in monitoring is more justified for defaulting borrowers, the inside bank will invest more in it.

The main conclusion of our model is that information sharing will increase returns to acquiring relationship information, and thus the amount of investment in relationship lending is higher. Information sharing allows the outside bank to learn about default and successful repayments. Successful, "transactional" customers thus enjoy a more competitive environment, while defaulting, "relationship" customers are less likely to switch. In effect, this will increase size and importance of the relationship bank, and many more bad types will be identified by the insider's unique ability of gathering relationship-specific information.

Our paper provides further implications about interest rates and switching. *Within* each of the regimes, with increasing investment in soft information, interest rates that borrowers pay actually rise. Rather than leveling the playing field, superior knowledge about borrowers provides the incumbent with stronger safeguard from competition. As a result, due to a higher winner's curse that the outsider faces, it bids less aggressively in equilibrium. The response by the informed bank is to bid less aggressively as well, trying to squeeze best types and leading to higher expected interest rates. Nevertheless, when the incumbent tries to squeeze borrowers hard enough, borrowers may eventually switch. Ioannidou and Ongena (2009) present compelling empirical evidence that is consistent with the idea of incumbents accumulating informational rents and borrowers occasionally switching banks as a result of excessive interest rates. Ongena and Smith (2001) and Farinha and Santos (2002) provide evidence that the likelihood a firm switches the lender increases in relationship intensity. In line with this evidence, we test that higher investment in soft information is related to more switching, confirming our proposition.

We go on to compare interest rates and switching *between* the two regimes. We show that the intuition that information sharing will facilitate switching by leveling informational sets, is premature. If default information is important enough for the competitor (say due to otherwise a very low-risk economy), it may in fact decrease switching under information sharing. On the other hand, if lenders try to squeeze the borrowers too much due to higher monitoring, borrowers may eventually want to switch more, and this effect may dominate. Overall results are mixed.

Moreover, we find that that information sharing need not unilaterally decrease interest rates. Previous research in this are has shown that information sharing decreases interest rates (Brown et al 2007, Jappeli and Pagano 2002). Due to lack of data, empirical evidence has scarcely taken into account borrower heterogeneity. Curiously, Doblas-Madrid and Minetti (2009) show that entering a credit bureau reduces access

to finance for borrowers who have high debt exposure (and are therefore, more likely to default. See also Bennardo, Pagano and Piccolo (2008) for a theoretical argument). We find that information sharing increases rates for borrowers with default, and decreases rates for successful ones. From a social perspective, banks and borrowers win *overall.* Larger relationship lending under information sharing provides higher rents for banks, but also increases the efficiency of credit markets and helps allocate funds to the more creditworthy borrowers. Intuitively, because the outside is less interested in bidding for defaulting group, it will make fewer loans to the uncreditworthy borrowers among them. This saving is a transfer to the creditworthy borrowers. Our findings therefore thus offer policy implications. They show that the concern that sharing information will erode rents, lead to insufficient relationship information and decrease welfare, is not necessarily true. Thus, the establishment of *a public register or a credit bureau* will improve the allocation of capital and benefit the more creditworthy borrowers.

Our paper sheds light on the opaque, small business lending in particular. The magnitude of the investment in relationship lending depends on the level of asymmetric information that it is supposed to overcome; if there is no asymmetric information, there is no payoff to the investment. This may generate a differing impact on different firm sizes: information about small firms from public sources is scarce, as most of them do not have audited financial statements, are not rated by rating agencies, and therefore information asymmetries are most acute for small firms (Petersen and Rajan 2004). We derive the theoretical prediction and support it by empirical evidence.

Finally, our results also point to an interesting implication in terms of the structure of the banking system. In particular, information sharing may widen the gap between small banks relying on collecting relationship information and large banks relying on standardized, hard information (Stein 2002, Berger et al. (2005)): indeed, information sharing increases small banks' incentives to collect soft information and make it easier for large banks to get their standardized data.

For our empirical analysis, we use data on firms and information sharing arrangements from 24 transition countries. We analyze the impact of introducing private credit bureaus and public credit registries sharing hard information on the lenders' incentives to invest more in soft, proprietary information. Specifically, we test whether soft information acquisition is higher in countries where hard information is shared. We find statistically strong results supporting the hypothesis, using several measures of soft information acquisition. The effects are economically large.

Using firm-level data allows us to test whether the impact is indeed stronger for small firms. We confirm empirically that soft information acquisition increases more for small firms than for large firms when information is shared.

The finding that information sharing may increase welfare is not new (and the novelty of our paper remains the argument in favor of information sharing since it increases returns to acquiring relationship information.). Padilla and Pagano (1997) show how information sharing may provide borrowers with higher incentives to per-

form: because information becomes available to competitor banks, banks will not be able to appropriate informational rents. Similarly, borrowers may perform better since otherwise default will become know to all banks, and may hinder future access to finance (Padilla and Pagano). In an adverse selection setup, information sharing allows banks learn about those good and bad borrowers of their competitors banks who decide exogenously to switch from the previous banks (Jappeli and Pagano 1993). Our approach offers welfare implications by identifying a link between information sharing and relationship lending. This interaction, to the best of our knowledge, has not been studied before.

In summary, we first derive the equilibrium of the banking competition with and without information sharing. As a second step show that investment in soft information increases when hard information is shared and look at interest rates and switching under both regimes, and compare welfare (Section 3). Section 4 describes data and tests empirical predictions. Section 5 concludes.

2 The Model

We model the interaction between banks and borrowers over two periods. At the starting point, banks have symmetric information about the average ex-ante risk of borrower population. During the lending relationship, each bank acquires both default and relationship information about those borrowers who contracted with it previously. Following Petersen and Rajan 2004, Stein 2002, we call the former *hard* and the latter *soft* information.[3] We call this the *informed* bank: it acquires soft information by investing in monitoring technology and observes the hard data-whether or not borrowers managed to repay their loans.

We study two environments: without information sharing, both types of information are unavailable to competitors -the *uninformed* bank. These provide informational rents for the informed bank.

When information is shared, the success or default of each borrower becomes known to the uninformed bank. The soft information, however, cannot be shared and continues to generate a competitive advantage for informed bank.

2.1 The Setup

There are two banks and a continuum of borrowers in $[0, 1]$ who are active for two periods. In each period, each borrower has access to an investment project that requires $\$I$. Because they have no initial wealth, they borrow the money from one of the two banks.

[3]We use default information here, since it is the most basic type of hard information and also the most commonly shared. Hard information can also obviously be any type of information that can be shared by means of a credit bureau.

There are two types of borrowers:

- High-type borrowers represent a proportion λ in the overall population. They have a probability p $(0 < p < 1)$ of producing a terminal cash flow $R > 0$, and large enough to repay principal and interest rates. With probability $1 - p$ they produce 0.[4]
- Low-type borrowers represent a proportion $1 - \lambda$ in the overall population and they always fail, yielding 0.

The final cash flows are observable and contractible by the current lender. Under information sharing, the return is observable also to the outside lender. The proportions of borrowers and the success probabilities are common knowledge. Borrowers have identical (and independent) projects, no initial funds in both periods and are protected by limited liability. As in vcon Thadden (2004), borrowers do not know their own types.[5] Banks can raise capital at a gross interest rate 1 and compete in interest rates given their respective information sets. They offer one period contracts. [6] At the beginning of the first period, without any previous contact with the potential customers, banks only know the average risk of the population. As a result, they offer the same interest rate to all applicants.

During the first period banks can acquire information about their borrowers by monitoring them. The **monitoring** process begins after the first period loans have been extended. It results in a signal η of borrowers' types. The quality of the signal is given by φ:

$$Pr(\eta = G|type = H) = Pr(\eta = B|type = L) = \varphi > \frac{1}{2};$$
$$Pr(\eta = B|type = L) = Pr(\eta = B|type = H) = 1 - \varphi.$$

Thus, at the end of the first period banks have two types of information about their borrowers:

- the signal generated by monitoring, $\eta = G$ or $\eta = B$;
- the repayment history - i.e., whether borrowers have defaulted or not, $h = D$ or $h = N$.

The signal is costly: getting a signal of quality φ requires an outlay of

[4]We assume a project's output cannot be stored, so that it does not generate resources for operations in the second period

[5]Alternatively, we could assume there are no sorting devices such as collateral, since, for example, the borrower has no wealth.

[6]As shown in Sharpe (1990), this absence is the interesting case to consider, since otherwise the analysis would reduce to standard competitive pricing and miss the important point in bank relationships (see also von Thadden 2004).

$$c(\varphi) = c(\varphi - \frac{1}{2})^2$$

We call φ *informativeness* of monitoring. As a result, banks have to decide how much to invest in the monitoring technology. The default information and information resulting from monitoring can be used by banks to update their estimate of the borrowers' types and adjust their interest rates for the second period.

While default information is verifiable, the outcome of the monitoring process is "soft" information by assumption: it is prohibitively costly to communicate this information between banks. As a result, a credit bureau is only able to collect and share default information, and each bank will know which of the other bank's initial customers has defaulted. Without a credit bureau, both default and monitoring information are only available to incumbent banks.

Thus, incumbent banks can distinguish between three types among their first-period customers:

- borrowers that have defaulted and have also generated a bad signal when monitored;
- borrowers that have defaulted, but have generated a good signal when monitored;
- borrowers that have not defaulted (but generated either a good signal or a bad signal when monitored).

We assume that $p_D R > I$, where $p_D = P(h = D)$ is the success probability given the borrower has defaulted.

$$p_D = \frac{\lambda p(1-p)}{\lambda(1-p) + (1-\lambda)}.$$

This means it is efficient to grant a loan to defaulters.[7] As a result, banks can resort to discriminatory pricing through their interest rate offers as a function of the default history and the informativeness. The first type is obviously the least likely to produce a positive return in the second period, while the last one is the most likely to be successful.

Thus, our setup allows for the relationship scope of the banking firm: relationship lending allows informationally opaque firms with weak financial ratios, collateral, or credit scores to obtain loans by augmenting the weak hard information with good soft information gained through closer contacts over time (Berger and Udell 2002). Indeed, if some of the borrowers are actually good who are just unlucky (our second group above), relying too much on the hard information provided by past defaults could lead

[7] Obviously, it implies it is ex-ante efficient to grant a loan to an average risk.

to welfare losses (Jappelli and Pagano 2000, Berger and Udell 2002).[8] Those who have not defaulted, are certainly good borrowers by assumption. Therefore the signal is not crucial, and banks can lend them safely based only on hard data. We therefore group them all together.

In the next two subsections we describe the equilibrium strategies of the incumbent and outside bank under information sharing, and no information sharing, respectively.

2.2 Default information is shared

We start with the case where information is shared in the economy. The actions taken by the banks and borrowers are outlined below.

The timing of the game

$T = 1$

- Banks announce one term lending rates and compete à la Bertrand.
- Borrowers choose one of the banks with equal probability and invest I.
- Banks invest in monitoring.
- Borrowers repay whenever they can do so.

$T = 2$

- Banks share payment/default history (hard information).
- Simultaneously the inside (first-period, incumbent) and the outside banks offer second period interest rates. Each bank has two types of information about its first period borrowers, and has received default information concerning its competitor's borrowers.
- The firm chooses an offer and invests I. If indifferent, the firm chooses the bank randomly.[9]
- Borrowers repay/ do not repay their loans, banks' payoffs are realized.

2.2.1 Preliminary steps

We first derive a borrower's success probability in light of the each bank's credit assessments based on their information sets. The informational advantage of the informed and the uninformed bank are depicted in Figure 1.

If default information is shared, both the uninformed and the informed bank will learn which borrowers have been successful in the first period. Both banks will therefore

[8] Algebraically, this amounts to the assumption we will make: the good signal defaulting borrowers are creditworthy, while the bad signal ones - are not, $p_{GD}R > I$.

[9] If there is only one offer, the firm takes it. If no offer, the firm does not get credit. We will see in the equilibrium that this may be the case when bad signal defaulting borrowers are not creditworthy.

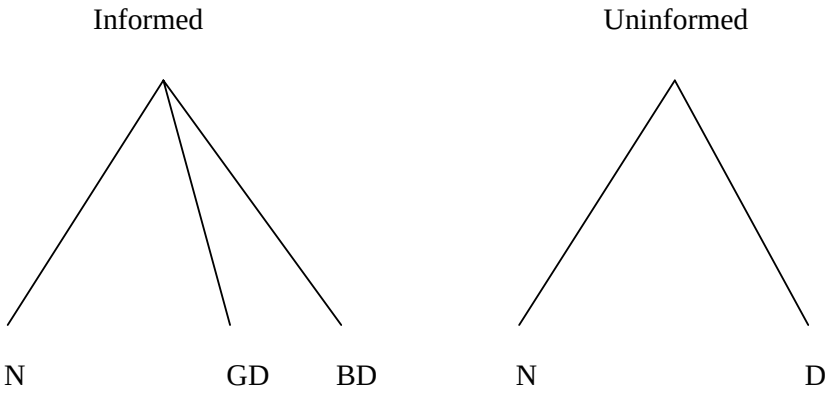

Figure 1: Borrower groups for the informed and the uninformed banks under information sharing

learn the successful borrower's true type: because low ability borrowers never succeed, (bad) signal from monitoring is no longer important.

Based on the acquired information and the initial data on the population, banks are able to update borrowers' success probabilities and use this to determine their interest rates. Both banks can condition their rates on default information, but only the incumbent bank can also use the soft information to differentiate the interest rates that it offers to its first-period borrowers.

Denoting $p_{GD} = P(\eta = G, h = D)$ the success probability when the borrower has produced signal G and history D (and following similar notations), the Bayesian updated probabilities of success are given by:

$$\begin{aligned} p_N &= p; \\ p_{GD} &= \frac{\lambda\varphi p(1-p)}{\lambda\varphi(1-p) + (1-\lambda)(1-\varphi)}; \\ p_{BD} &= \frac{\lambda(1-\varphi)p(1-p)}{\lambda(1-\varphi)(1-p) + (1-\lambda)\varphi} \end{aligned}$$

four the three types, and

$$\begin{aligned} p_D &= \frac{\lambda p(1-p)}{\lambda(1-p) + (1-\lambda)}; \\ \bar{p} &= \lambda p. \end{aligned}$$

for defaulting and the overall universe of borrowers respectively.

From Bayesian rules,*better types have higher updated probabilities*. We define the respective break-even gross interest rate for each of the groups to be equal to the investment I divided by the respective probability, $\overline{r}_K = \frac{I}{p_K}$, for $K = D, N, GD$ or BD, while for the overall population it is equal to $\overline{r} = \frac{I}{\overline{p}} = \frac{I}{\lambda p}$. The break-even interest rates will obviously be lower for better types. The rates are depicted in figure 3.

Figure 2: Interest rates-no information sharing

We define $\bar{\varphi}$ such that $Rp_{BD} = I$. That is, whenever $\varphi > \bar{\varphi}$, bad signal defaulting borrowers are not creditworthy. Thus, when $\varphi > \bar{\varphi}$ the incumbent will not bid for uncreditworthy BD group. Below we analyze the equilibrium in both cases.

2.2.2 Lending Competition

Banks move *simultaneously* to bid second period interest rates, and thus do not observe each other's rates. Uninformed banks do not know the signals borrowers received. As showed in von Thadden (2004), there is no pure strategy equilibrium in simultaneous-bid games where one lender knows more than the other. This is a known result from the literature on auctions (Milgrom and Weber 1982). There is however a mixed-strategy equilibrium in which banks randomize over intervals of interest rates. The second period of the game thus has a mixed-strategy Perfect Bayesian Nash equilibrium, the properties of which we analyze below.

Each bank has five interest rate strategies: Let the cumulative density function $F_u^K(r)$ denote the probability that the uninformed bank chooses an interest rate less or equal to r for defaulting ($K = D$) and non-defaulting ($K = N$) borrowers respectively. $F_i^J(r)$ describes the bidding strategies for the informed bank for the good-signal defaulting ($J = GD$), bad-signal defaulting($J = BD$) and the non-defaulting ($J = N$) borrowers.

For any interest rate for a given group, the informed bank will make a non-negative profit provided it has not been undercut by the competing bank. Thus the profit functions for the three types can be expressed as follows:

$$\pi_i^N(r) = 0$$
$$\pi_i^{GD}(r) = N_{GD}(p_{GD}r - I)(1 - F_u^D(r))$$
$$\pi_i^{BD}(r) = N_{BD}(p_{BD}r - I)(1 - F_u^D(r))$$

where N_{GD}, N_{BD} denote the expected number of the respective borrower group. The outside bank's profits on the two types it can distinguish (defaulters and non-defaulters) will be:

$$\pi_u^D(r) = N_{GD}(p_{GD}r - I)(1 - F_i^{GD}(r)) + N_{BD}(p_{BD}r - I) = 0;$$
$$\pi_u^N(r) = 0.$$

Proposition 2.1 ***Equilibrium Strategy*** *The competition between the informed and the uninformed bank has a mixed-strategy equilibrium for defaulters. In this equilibrium,*

1. $\varphi > \bar{\varphi}$*: the informed bank bids*

$$F_i^{GD} = 1 - \frac{N_{BD}(I - p_{BD}r)}{N_{GD}(p_{GD}r - I)}$$

where F_i^{GD} *is defined on* $[\overline{r}_D, R]$*. It bids pure-strategy* r_N *for the non-defaulting group and refrains from bidding for the bad-signal, defaulting group.*

The uninformed bank bids

$$F_u^D(r) = \varphi F_i^{GD},$$

on $[\overline{r_D}; R)$*. It does not bid with probability* $1 - F_u^D(R) = \frac{p_{GD}\overline{r}_D - I}{p_{GD}R - I}$ *and bids pure-strategy* r_N *for the non-defaulting group.*

2.$\varphi > \bar{\varphi}$*: Both the informed and the uninformed bank always offer credit to all borrowers. The informed bank bids*

$$F_i^{GD} = 1 - \frac{N_{BD}(I - p_{BD}r)}{N_{GD}(p_{GD}r - I)}$$

where F_i^{GD} *is defined on* $[\overline{r}_D, \bar{r}_{BD}]$*, and bids* $\bar{r}_{BD}$ *for the bad-signal, defaulting group. The uninformed bank bids*

$$F_u^D(r) = \varphi F_i^{GD},$$

on $[\overline{r_D}; \bar{r}_{BD})$ *with a point mass at* $\bar{r}_{BD}$*. Both banks bid pure-strategy* r_N *for the non-*

defaulting group.

Proof See Appendix.

The interest rates are depicted in figure 3.

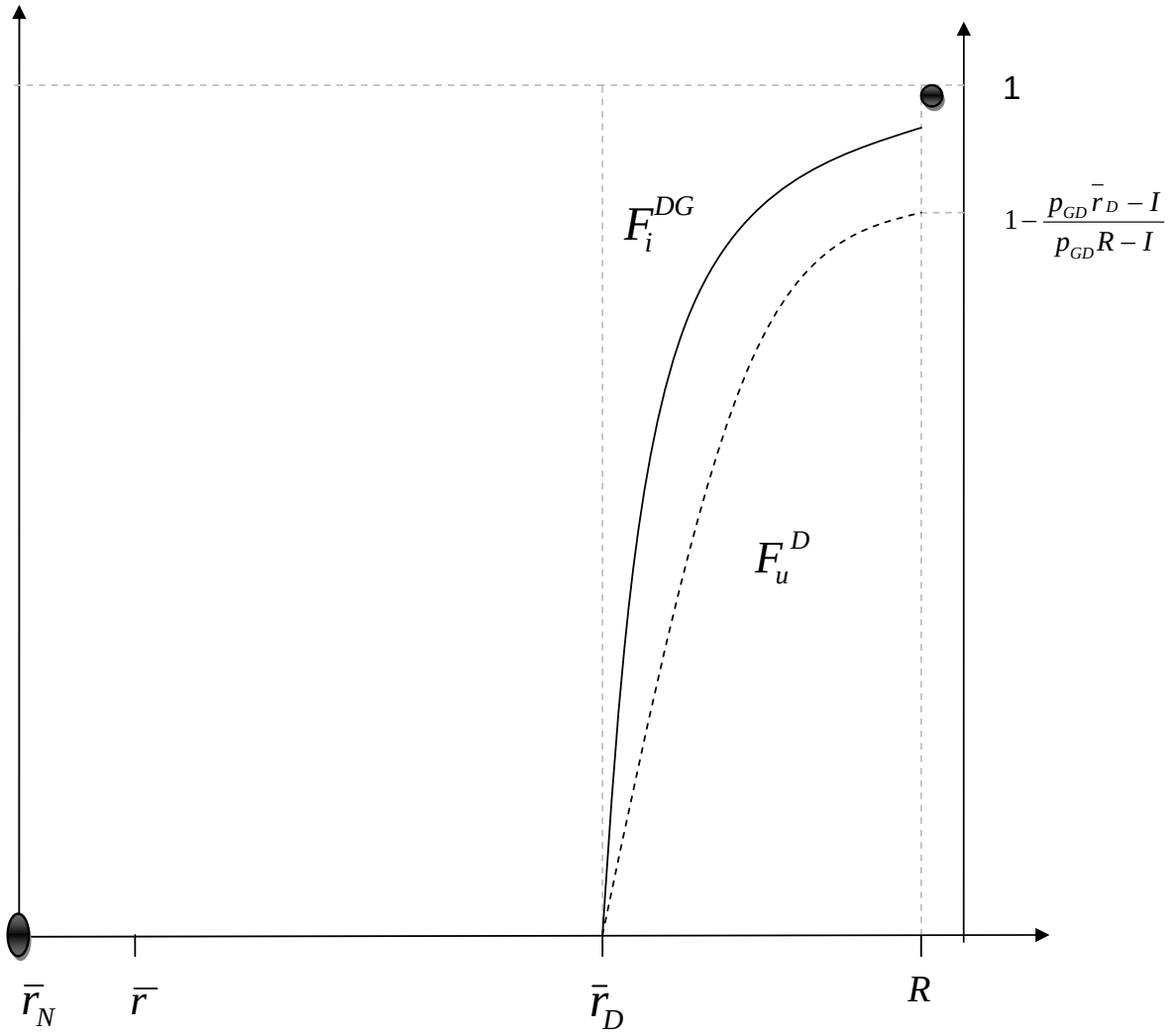

Figure 3: Interest rates under information sharing. Dashed line represent uninformed banks' bidding. both banks bid r_N for non-defaulting borrowers.

The incumbent bank chooses different rates for the good- and bad-signal borrowers, while the outside bank is unable to make that distinction. Both banks can distinguish between defaulting and non-defaulting borrowers, so we can think of the competition between the two banks as taking place on two separate markets (for defaulting and non-defaulting borrowers respectively). The proposition has an intuitive property that

will hold throughout the analysis: *better types receive better loan terms (from the incumbent)*, where better is measured by a favorable hard or soft information. Indeed, the non-defaulters N get as low as $\overline{r_N}$: because the true type of successful borrowers is revealed to be high, banks compete purely a la Bertrand. At the same time, good signal defaulters get higher rates in $[\overline{r_D}; R]$ ($[\overline{r_D}; \overline{r_B D}]$ as in case 2), while bad signal ones are turned down (or receive highest rates $\overline{r_B D}]$ in case 2).

The uninformed bank's bidding is intuitive, too: because it faces adverse selection from the borrower pool of the incumbent bank, its interest rate bids are not on average lower ($\varphi \leq 1$). Finally, the uninformed bank may sometimes deny credit when informativeness of the monitoring is high enough. Thus, some of the BD types, who can only resort to getting credit from the uninformed bank under high informativeness, may in fact be rightly denied access to credit at all. Comparison of the two regimes will reveal, that this is more pronounced under information sharing, and is a source of welfare improvement.

The incumbent bank will make positive profits on good-signal borrowers, and will not bid for bad-signal borrowers. Uninformed banks will make zero profits, but they will *sometimes get the good-signal borrowers.*[10]

Because equilibria are similar and do not affect our main result under the two cases $\varphi > \bar{\varphi}$ and $\varphi < \bar{\varphi}$, we will concentrate on the former one from now on for brevity. The only difference is that the former provides welfare implications.[11]

Proposition 2.2 *The expected gross profits for the incumbent bank when default information is shared is given by*

$$\pi_{share} = I(1-\lambda)(2\varphi - 1)$$

The uninformed bank makes 0 profits.

Proof See Appendix.

The gross profits of the incumbent bank are increasing in the informativeness of the monitoring signal, as one would expect: the more intensive the monitoring, the higher are the appropriated monopolistic rents.

2.3 No information is shared

We describe now the case where there is no credit bureau in the economy. At the beginning of the second period, both default and monitoring information are known

[10] Good borrower switching is a key property of the mixed-strategy equilibrium that stands in contrast with Sharpe (1990), where equilibrium is shown to be erroneous (von Thadden 2004), and is in line with the vast recent evidence on borrower-bank relationships (see for example Ioannidou and Ongena 2008).

[11] for full analysis see Karapetyan and Stacescu 2009.

only to the incumbent bank. The second period timing is:

$T = 2$

- Banks ***do not*** share hard information.
- Simultaneously the inside and the outside banks offer second period interest rates. Each bank has ***three*** types of borrower group from first period lending, and another group from the competitor bank.
- The firm chooses an offer and invests I. If indifferent, the firm chooses randomly.
- Profits are realized based on soft information *and* default information.

Similar to the case with information sharing, there is no pure strategy equilibrium, but there is a mixed-strategy one.

Let $F_u(r)$ denote the bidding strategy of the uninformed bank. Given the first-period monitoring φ, the profit functions for the incumbent bank can be written as follows:

$$\begin{aligned}\pi_i^N(r) &= N_N(p_N r - I)(1 - F_u(r)) \\ \pi_i^{GD}(r) &= N_{BN}(p_{BN} r - I)(1 - F_u(r)) \\ \pi_i^{BD}(r) &= N_{BD}(p_{BD} r - I)(1 - F_u(r))\end{aligned}$$

The uninformed bank only has *one* bidding function since it cannot distinguish between any of the types in this case - not even between defaulting and non-defaulting borrowers.

The profit function for the uninformed bank is given as follows:

$$\pi_u(r) = N_N(p_N r - I)(1 - F_i^N(r)) + N_{GD}(p_{GD} r - I)(1 - F_i^{GD}(r)) + N_{BD}(p_{BD} r - I)(1 - F_i^{BD}(r))$$

The proportions of the types and their success probabilities are expressed in the same way as in the previous case. Before characterizing the equilibrium, we remind the definition of $\overline{r_D}$, the break-even interest rate for the *two least qualified* groups, the defaulting borrowers GD and BD (both good- and bad-signal).

Proposition 2.3 ***Equilibrium Strategy*** *The competition between the informed and the uninformed bank has a mixed-strategy equilibrium for defaulters. In this equilibrium,*

1. when $\varphi > \bar{\varphi}$, the informed bank

- *bids only for non-defaulting borrowers in $[\bar{r}, \bar{r}_D]$;*

$$F_i^N = 1 - \frac{N_{BD}(I - p_{BD}r) + N_{GD}(I - p_{GD}r)}{N_N(p_N r - I)} = \frac{\lambda pr - I}{\lambda p(pr - I)}$$

- *bids only for good signal borrowers that have defaulted in* $[\bar{r}_D, R]$*;*

$$F_i^{GD} = 1 - \frac{N_{BD}(I - p_{BD}r)}{N_{GD}(p_{GD}r - I)}$$

with a point mass at R*.*

- *refrain from bidding for the bad-signal, defaulting group.*

The uninformed bank bids

$$F_u(r) = 1 - \frac{p_N\overline{r} - I}{p_N r - I} = \frac{\lambda pr - I}{\lambda(pr - I)} = pF_i^N,$$

on $[\overline{r}, \overline{r}_D]$*,*

$$F_u(r) = 1 - (1-p)\frac{p_{GD}\overline{r}_D - I}{p_{GD}r - I} = p + (1-p)\varphi F_i^{GD},$$

on $[\overline{r_D}; R)$*. It does not bid with probability* $1 - F_u(R) = (1-p)\frac{p_{GD}\overline{r}_D - I}{p_{GD}R - I}$

2. when $\varphi \leq \bar{\varphi}$*, all banks bid for all borrowers*

Proof See Appendix.

The rates are depicted in figure 4. To save space, details on the case $\varphi \leq \bar{\varphi}$ are provided in the appendix. As under information sharing, the uninformed bank faces adverse selection and the offered rates are not lower: in this case, however it faces adverse selection from hard information as well. While success probability p did not matter under information sharing, it does matter under no information sharing. Once again, better types receive better interest rates.

The term $1 - p = \frac{p_N\bar{r} - I}{p_N\bar{r}_D - I}$ comes from the *pooling* of better population – the non-defaulters. Indeed, at $\bar{r}_D$, the uninformed bank already bids rather aggressively for the defaulting borrowers (with probability $p = 1 - \frac{p_N\bar{r} - I}{p_N\bar{r}_D - I} = F_u(r_D)$ it bids lower than that) compared to the information sharing case. Because, contrary to the case with information sharing, the uninformed bank confuses *best* types with defaulting borrowers, it is willingly more aggressive with them. Finally, as under information sharing regime, the uninformed bank may sometimes deny credit when informativeness of the monitoring is high enough. From equilibria under both regimes (propositions**??** and **??**), we will see that uninformed bank makes less type II mistakes under information sharing. We will come back to this point under welfare discussion.

2.4 Information Rents and Optimal Monitoring

Proposition 2.4 *Informational rents are given by:*

For the informed bank under information sharing

$$\pi_{share} = I(1-\lambda)(2\varphi - 1)$$

For the informed bank, under no sharing

$$\pi_{noshare} = Ip(1-\lambda) + I(1-p)(1-\lambda)(2\varphi - 1)$$

Under both regimes, informational rents are growing in the informativeness of the monitoring. This proposition therefore provides a theoretical counterpart to the observation that bank rents grow with relationship intensity (Degryse and Cayseele 2000, Ioannidou and Ongena 2009) as well as adds to the related theoretical arguments (Diamond 1991, Hauswald and Marquez 2003, 2006).

We can now compare the optimal choices of monitoring with and without information sharing.

Proposition 2.5 *Marginal return to soft information is higher under hard information sharing:*

$$\frac{\partial \pi_{share}(\varphi)}{\partial \varphi} \geq \frac{\partial \pi_{noshare}(\varphi)}{\partial \varphi}$$

Optimal investment in monitoring is higher under information sharing, and is given by:

$$\varphi_{share} = 0.5 + \frac{I}{c}(1-\lambda)$$

$$\varphi_{noshare} = 0.5 + \frac{I}{c}(1-\lambda)(1-p)$$

Proof See Appendix.

Because under no information sharing the incumbent is likely to lose some of its relationship (GD) borrowers to the outside bank, it is less motivated to invest in monitoring. The payoff to the monitoring is lower by fraction $1-p$: the uninformed bank is rather aggressive towards defaulting borrowers when information is not shared (it bids (weakly) lower than $\bar{r}_D$ for D borrowers and wins them almost surely, and higher than –with only $1-p$). It does so because it cannot distinguish between the defaulting and non-defaulting groups. However, the uninformed bank is less aggressive under information sharing (bids higher than $\bar{r}_D$ for D borrowers with certainty), leaving

them to the incumbent more often. Using firm level data, we test and confirm that firms that operate in countries where information sharing is established or is more pervasive, invest more in their borrowers, using several proxies of soft information investment.

Proposition 2.6 *Optimal investment in soft information is increasing in the risk parameters in the economy* $1-\lambda$*, and* $1-p$*.*

Proof Obvious and omitted.

Relying on the arguments that small firms are a much more opaque and risky population (see Berger *et al* 2005, among others), we test whether our findings are more pronounced for small firms.

Proposition 2.7 *If monitoring costs are low enough (*$c < 2I(1-\lambda)(2-p)$*), second-period informational rents will be higher under information sharing.*

Proof Indeed, plugging in optimal values, one can see that$\pi_{share}^{optimal} = \frac{2I^2}{c}(1-\lambda)^2 > Ip(1-\lambda) + \frac{2I^2}{c}(1-\lambda)^2(1-p)^2 = \pi_{noshare}^{optimal}$ will yield the necessary condition.

Thus, second period informational rents can be higher under information sharing, unless the increased cost from higher monitoring outweighs benefits from the higher return. Therefore, once banks start their competition when they already their own borrower's previous history, our model shows how this can lead to endogenizing the information sharing mechanism (see Jappelli and Pagano (1993) and Padilla and Pagano (1997) for similar setups).

2.4.1 First Period

At the beginning of first period banks compete for the whole population, under symmetric information: banks know the proportion of the good and bad borrowers and their success probabilities. The total profits across two periods are given by

$$\lambda(pR_1 - I) + \beta\pi^{sharing}$$

and

$$\lambda(pR_1 - I) + \beta\pi^{nosharing}$$

under information sharing and the no sharing regimes, respectively. Under both regimes banks start with symmetric information at the beginning of period 1. Competing for captive markets in period 2, the price competition in period 1 drives the total profits across the two periods to 0, like in Padilla and Pagano (2000).

2.5 Interest Rates and Switching

Proposition 2.8 *$F_i(r)$ and $F_u(r)$ for all groups of borrowers, as well as* the minimum of the two rates *for each borrower, are non-increasing in φ under both information sharing and no information sharing regimes.*

Proof See Appendix

Proposition 2.9 *Expected interest rates paid by borrowers, are non-decreasing in informativeness φ under both regimes.*

Proof See Appendix

As investment in soft information increases, it also raises interest rates that borrowers pay. Rather than leveling the playing field, superior knowledge about borrowers provides the incumbent with stronger safeguard from competition, due to a higher asymmetric information. Because the uninformed bank faces larger winners' curse, it bids less aggressively in equilibrium. The response by the informed bank is to bid less aggressively as well, leading to higher expected interest rates. This complements to the recent findings that utilize detailed data from U.S. (Schenone (2009))and Bolivia (Ioannidou and Ongena (2009)).

Proposition 2.10 *1. Non-defaulting borrowers are weakly better-off under information sharing.*

2. Defaulting borrowers are on average weakly worse-off.

3. Overall, borrowers are on average weakly better-off.

Proof See Appendix

Thus, the assertion that information sharing will unilaterally decrease interest rates may be premature. Works in this are have shown that information sharing decreases interest rates (Brown et al 2007, Jappeli and Pagano 2002). Due to lack of data, empirical evidence has failed to take into account borrower heterogeneity and thus test point 1 and point 2 above. A testable implication remains for future research: *borrowers with default will receive higher rates, and with borrowers with no-default receive lower rates on average.* However, the findings that borrowers are better off is consistent with existing literature and with our evidence. Indeed, from equilibria under both regimes (propositions**??** and **??**), we could see that uninformed banks make less type II mistakes under information sharing (the probability of not giving credit $1 - F_u(r)$ is lower under no information sharing with factor $1 - p$ for a given informativeness, and is even more so, taking into account the higher informativeness in sharing regime). This is because the outsider faces a higher winner's curse, due to a more precise evaluation of borrowers by the incumbent. Such an outcome is a transfer to the creditworthy borrowers, since banks' total lifetime profits remain unchanged. Information sharing may thus increase welfare.

Proposition 2.11 *1. All borrowers switch (weakly) more as the informativeness increases*
2. Non-defaulting borrowers switch more under information sharing
3. Defaulting borrowers:
a. Switching is more sensitive to informativeness under information sharing b. Bad signal borrowers switch more than good signal ones under both regimes c. Defaulting borrowers may overall switch more or less 4. Change in overall switching is inconclusive

	Sharing	*No Sharing*
Group N	0	$\frac{1}{2}p$
Group GD	$\frac{1}{2}\varphi_{share}$	$p + \frac{1}{2}(1-p)\varphi_{noshare}$
Group BD	$\varphi > \bar{\varphi}$, *1*	$\varphi > \bar{\varphi}$, *1*
	$\varphi \leq \bar{\varphi}$, $\frac{1}{2}(1-\varphi_{share}) + \varphi_{share}$	$\varphi \leq \bar{\varphi}$, $p + \frac{1}{2}(1-p)(1-\varphi_{noshare})$

Proof See Appendix

Our results show that defaulting borrowers may or may not switch more under information sharing depending on whether borrower heterogeneity is more important (p is high) or the (good) soft information is more important. In the former case, because bad borrower get pooled with much better borrowers, they will tend to switch more often when that (high) heterogeneity is not yet revealed to outsiders. However, if the good signal has high enough informativeness under information sharing (φ_{share} is large enough), borrowers may in fact switch more since informed banks try to squeeze too much, compared to the uninformed banks (remember that $F_u^D(r) = \varphi F_i^{GD}$). This is true because, first, the informativeness is higher under information sharing, and,, second, the uninformed's bidding is less sensitive under no information sharing ($F_u(r) = p + (1-p)\varphi F_i^{GD}$). Therefore, the intuition that information sharing will facilitate switching by leveling the playing field, may be premature. Nevertheless, we can see that non-defaulting borrowers are more likely to switch under information sharing, precisely due to that. The mechanics of the model and the resulting interest rate strategies described above are not as simple as in the case of a hypothetical pure-strategy equilibrium in which borrowers never switch to less-informed banks (point 1 in 2.11). However, the model intuition and its implications are arguably realistic. We test that higher investment in soft information is related to more switching. Ioannidou and Ongena (2009) present compelling empirical evidence that is consistent with the idea of incumbents accumulating informational rents and borrowers occasionally switching banks as a result of excessive interest rates. Ongena and Smith (2001) and Farinha and Santos (2002) provide evidence that the likelihood a firm switches the lender increases in relationship intensity. In our proposition too, switching increases (weakly) in informativeness, except in the case for *hard* borrowers, for whom relationship does not matter.

Concluding, if default information is important enough (when risk parameter p is low), they may in fact switch less under information sharing. On the other hand, if lenders try to squeeze too much the borrowers, this effect may dominate.

2.6 Welfare Implications

We now address the important question of how socially desirable information sharing is in our model. Given that under some parameter values we have borrowers that are not creditworthy ($\varphi > \bar{\varphi}$), banks can add to the social value of the information production by cutting down on granting credit to those borrowers (type II mistakes). From equilibria under both regimes (propositions**??** and **??**), we could see see that uninformed banks make less type II mistakes under information sharing This is because the outsider faces a higher winner's curse, due to a more precise evaluation of borrowers by the incumbent. Such an outcome is a transfer to the creditworthy borrowers, since banks' total lifetime profits remain unchanged. Information sharing may thus increase welfare, unless monitoring costs are too high. Thus, although information sharing induces defaulting borrowers to pay higher rates, and non-defaulting borrowers lower rates, overall creditworthy borrowers gain, by means of savings on rejecting loans to uncreditworthy borrowers.

Formally, welfare consists of the sum of all NPV projects, the savings that the uninformed bank makes by not extending credit to the uncreditworthy, less the mistakes it makes by not doing so, less costs of monitoring.

$$W = \lambda(pR - I) - (1-\lambda)I + ((1-\lambda)\varphi - \lambda(1-p)(1-\varphi))(1 - F_u(r)) - c(\varphi - 05)^2$$

$c \leq \frac{0.5(1-\lambda)(1-p)-p\lambda}{R/I+(1-p)(1/\lambda)}$, the benefits from fewer bad loans exceed costs of higher monitoring under information sharing.[12] Thus, unlike Gehrig and Stenbacka (2007) and similar to Jappelli and Pagano (1993), Padilla and Pagano (1997) and Vercammen (1995), welfare may increase as a result of information sharing, even though we are considering a full 2-period setup, with a symmetric information sets in the first period. The distinct point in our framework from that of Gehrig and Stenbacka (2007), is that they assume that all information is shared, and borrowers' true type becomes available to the (initially)uninformed bank. [13] In contrast, we consider pure price-competition, with both hard and soft information. As a result, their concern that information sharing may reduce banks' incentives to invest in information in the first place, is not robust.

[12] Alternatively, one could include the monitor as one of the agents that the social planner cares about, and monitoring costs - as a transfer to/profit for the monitor. In that case welfare increases unambiguously.

[13] Moreover, their results do not hold when switching costs are not present, or when more than one bank is active in the poaching market.

3 Empirical Evidence

To the best of our knowledge, there has been no study on the impact of hard information sharing on the level of soft information acquisition. This paper will be a first attempt to fill this gap, by arguing theoretically (proposition 2.4) and empirically that *soft information acquisition increases when hard information is shared.* We also look at how the soft information produced relates to interest rates and switching empirically, supporting our theory (proposition 2.5 and 2.6) that *successful soft information outcomes reduce interest rates and switching, while bad outcomes increase both.* These are our main hypotheses. Earlier studies have focused on the influence of information sharing on credit market performance, or firms' access to credit. Jappelli and Pagano (2002) use aggregate data to show bank lending to the private sector is larger and default rates are lower in countries where information sharing is more solidly established and extensive, controlling for other economic and institutional determinants of bank lending, such as country size, GDP, growth rate, and variables capturing respect for the law and protection of creditor rights. Djankov et al. (2007) confirm that private sector credit relative to GDP is positively correlated with information sharing in their recent study of credit market performance and institutional arrangements in 129 countries for the period 1978 to 2003. We use firm-level data to check the incentives of banks to invest more in information acquisition when hard information is shared, as well as study borrower switching and interest rates.

Going beyond our main hypotheses, we test our theory by *distinguishing large and small firms.* In our model we derive the prediction that soft information acquisition increases when hard information is shared. There are several reasons why one may expect a difference in this effect for large vs. small firms. First, credit information sharing arrangements target mainly the small business and consumer markets (unlike credit rating agencies, that usually deal with large firms). Thus, one needs to take this into account, since one would expect that their introduction should have a larger effect on the small businesses. Second, since large firms already have available information, produced for instance by credit rating agencies, or by their more developed internal and external reporting, sharing information via credit bureaus should have a lower impact for these firms. Part of what is available in a standard credit bureau report may already be available without a credit bureau for a large firm - e.g., information on company profile, audited financial statements, risk class of the borrower. Earlier research has shown that information can be particularly important for small firms since they are unlikely to be monitored by rating agencies, and information asymmetries are most acute in small firms (see, for example Petersen and Rajan (1994)). Thus, apart from testing that *hard information sharing increases soft information acquisition, and that the switching is changed as a result of soft information outcome, we test whether these are stronger for small firms.* As for *the cost of capital*, in fact existing evidence

suggests that information sharing benefits all firms, but *it does more for small firms than large firms in terms of credit cost and credit access* (Love and Mylenko 2003, Brown et al 2007). Part of what we test is to complement this study, by looking at whether credit cost changes depending on soft information outcome, and whether this is stronger for small firms.

3.1 Data

We draw our data from two main sources. Country level data on information sharing is taken from the World Bank/IFC "Doing Business database. We relate this to firm-level information taken from the EBRD/World Bank Business Environment and Enterprise Performance Survey (BEEPS).

Between 1991 and 2005 information sharing institutions were established in 17 of the 26 transition countries in Eastern Europe and the former Soviet Union.[14] The main sources of this data are the "Doing Business surveys, conducted by the World Bank/IFC (World Bank, 2006).

We use the *information sharing index* constructed by Brown et al (2007) as one of our measures of the depth of information sharing in different countries. The index measures the presence and structure of public credit registries and private credit bureaus on a scale of 1 to 5. It is constructed as the maximum of two scores, one for PCRs and one for PCBs. The PCR score adds one point for fulfilling each of the following five criteria:

(i) both firms and individuals are covered,

(ii) positive and negative data is collected and distributed,

(iii) the registry distributes data which is at least two years old,

(iv) the threshold for included loans is below per capita GDP, and

(v) the registry has existed for more than 3 years.

The PCB score is computed in the same way. The index is then taken as an average over years 1996 to 1999 for the analysis of year 2002, and average over 2000-2003 for year 2005.

Detailed definitions of all variables are available in the *Appendix B*. The BEEPS 2002 provides data on 6153 firms in 26 transition countries and covers a representative sample of firms for each of these countries (survey was done in all countries where EBRD is operational except Tajikistan), while BEEPS 2005 covers over 9655 firms. As in Brown et al, we drop all observations from Uzbekistan and Tajikistan, due to lack of institutional indicators for these countries. Together with missing dependent variables, this leaves us with a sample of 5209 firms at best from 24 countries for year 2002 and with 8599 for year 2005.

[14] For a comprehensive coverage see Table 1 in Brown et al 2007

3.2 Dependent Variables

We relate our information sharing index to firm-level data on our independent variables taken from the Business Environment and Enterprise Performance Survey (BEEPS)(see Table 1).

We use 1) three dependent variables to measure the investment in proprietary information, 2) a dummy showing whether the borrower switched from the main bank, and 3) cost of capital:

1. borrower switching/keeping relationship with the main bank;
2. the banks' reaction to the borrower's non-repayment during the relationship (the reaction as perceived by the borrowers);
3. the days needed to approve the loan starting from the date of application;
4. the use of checking account;
5. the cost of capital.

Our cross-sectional analysis is based on data from BEEPS 2002 for three variables *(switch, days, react)*, BEEPS 2005 is used for *checking account* and *capital cost and capital access* are available in 2002 and 2005.

3.3 Model Specifications

We start our empirical analysis with cross-sectional regressions using the BEEPS 2002. The baseline specification relates each of our three dependent variables for firm i in country j to the information sharing index in the firms country, a vector of other country characteristics, and a vector of firm characteristics that may affect firms' incentives to produce soft information. Our dependent variables were collected during 2002, while information sharing is measured as the average value of the index prior to the survey, i.e. from 1996 to 1999 for 2002, and 2001-2003. Thus, we relate firm-level information to countrywide measures of information sharing that are predetermined with respect to credit variables and this should address the potential endogeneity of information sharing with respect to credit market performance (see also Brown et al 2007).

We will test our theory using 5 dependent variables. Specifically, we test three hypotheses
1) whether soft information acquisition has increased using measures of soft information (dependent variables *days, react, checking account*)
2) how switching has changed *as a result of soft information acquisition, which may have produced either good or bad signals about the borrower*, using a measure of whether the soft information has been good or bad (variable *soft*)
3) how *cost of capital* has changed depending on the soft signal

3.3.1 Country level variables

We include seven country-level variables to control for differences in the legal environment, the structure of the banking sector, and macroeconomic performance (Table 2 provides means of the variables): an index of creditor rights and payment enforcement, banking reform, a measure of market structure/concentration, a proxy for asymmetric information/borrower risk, a measure of foreign bank presence, per capita GDP, and the inflation rate. The *banking concentration* measure is the share of the largest 5 banks in terms of deposits (from Barth et al 2001): higher concentration may indicate higher market power of the banks, higher informational lock in, and therefore less switching. Moreover, since larger banks are less efficient in collecting soft information (Berger et al 2005), higher concentration may have a negative impact on the information acquisition. Also, in more competitive markets, banks anticipate a shorter expected lifespan of their relationships, and they may respond by reducing their relationship-specific investments. Weaker relationships may then induce switching further. We take the share of *non performing loans* as a measure of asymmetric information. In markets with higher degree of risk, switching will be more costly: we expect a negative sign on this variable for switching. The *Creditor rights* variable is taken from Brown et al (2007): it is an aggregate measure of creditor legal protection built with the methodology proposed by La Porta et al. (1998). Higher values of this index imply that secured lenders are better protected in case a borrower defaults. Also, higher levels of creditor protection may act as a disincentive to set up an information sharing arrangement. Indeed, earlier evidence suggests that transition countries with better creditor protection have higher credit market performance (Pistor et al. (2000), Brown et al 2007). However, not only the law on the books matters for credit market development, but also its actual enforcement. As a measure of actual enforcement of creditor protection, we also include the variable *Time to enforce payment*, which measures the (log of the) number of days it takes for a creditor to secure an outstanding payment through the courts if a debtor defaults (variable *ltime*). This variable is taken from the World Bank/IFC "Doing Business database (available from 2003 to 2007 only). We use its multiplication with creditor rights (Ongena and Smith 2000), since enforcement of creditor protection laws may be lax in countries with weak actual enforcement. We expect this to be negatively correlated with switching and cost of capital, consistent with the finding that Judicial efficiency is negatively related with firms patronizing a number of banks (Ongena and Smith 2000), as well as with theoretical arguments (Hart 1995, Bolton and Scharfstein 1996).[15]

The *banking reform index* is an index showing level of changes from a state owned bank with soft-budget constraints to a commercial bank with hard budget constraints in a market economy. *Foreign bank share* variable is the asset share of foreign owned banks in each country. Recent evidence suggests that foreign bank entry has improved

[15]Using creditor right and time to enforce payment separately does not alter our results

credit market performance in transition countries, reducing intermediation spreads and facilitating credit access (Giannetti and Ongena 2005). Also, foreign bank presence may coincide with information sharing, if these banks are familiar with the benefits of credit reports from their home markets, and therefore tend to patronize private credit bureaus also in their host countries. Alternatively, when foreign banks are serving foreign firms in the host country, they might be able to access information on those firms through their home bureaus, and are less interested in information sharing. We include *inflation and log of per capita GDP*, as previous evidence suggests that macroeconomic stabilization is associated with an expansion in financial intermediation in transition countries (Fries and Taci, 2002).

3.3.2 Firm level explanatory variables

We include six firm-level explanatory variables to control for the variation in credit risk and financing requirements across firms, and we use two different measures of good/bad soft information.

Younger firms are generally considered as more risky than older firms. However, *in transition countries firm age also determines the economic regime* under which the firm emerged. Thus, while older firms may be less risky in general, they may be riskier in transition countries, because they emerged during the pre-transition or transition phase. Rather than controlling simply for firm age, we therefore distinguish firms by three categories depending on whether they were established *before 1989 (Pre-transition firm), between 1989 and 1993 (Transition firm), after 1993 (Post-transition firm)* (Brown et al 2007, Gianetti and Ongena 2005). We further include two control variables for firm ownership. *State-owned firm* is a dummy variable that equals one if the government holds a majority stake in the firm. The effect of this variable is a priori ambiguous. On the one hand, state ownership may reduce firm risk in the eye of a bank, due to the possible government bailout in case of default. On the other, state ownership may increase default risk, owing to the political pressures on management to diverge from profit-maximizing policies (see Brown et al 2007). Moreover, these firms may receive public funding, which reduces their reliance on credit for investment and therefore relieves a constraint on their growth. We include the *the debt ratio*; previous research has shown that firm with higher leverage switch more often (e.g., Ongena and Smith 2001). This finding is confirmed in our data. Firm debt is also related to the firm risk, and may therefore change incentives to acquire soft information: one the one hand raising the leverage will raise the borrower's risk, on the other hand, lower risk firms can afford higher leverage.

As discussed above, we are also interested in the differential effect depending on the firm size. Moreover, it is customary to regard larger firms as less risky, other things equal. We distinguish small firms from large ones by their number of employees (Small firm = 1-49, Large firm $\geq$ 50).

From BEEPS survey 2002 and 2005, we construct the summary variable *soft*, that measures how protected the borrower is from different *non-financial* factors. It summarizes answers to 19 questions on "non financial problems of growth". The exact question in the survey asks: *Can you tell me how problematic are these factors for the operation and growth of your business?*. The factors include skills of workers, their education, contract violations by customers and suppliers, among others. Arguably, relationship-specific investment is necessary to evaluate how problematic these factors are for the operations and growth of the firm. The variable ranges from 0.21 to 1, with lower value indicating problems (=the bank receives bad signal(B), when monitors about these problems).
As a further measure of the sign of the soft information, we use *management quality*, which is one of the most important soft characteristics of the firm (see Grunert, Norden, Weber 2005). In our survey it is the sum of three variables: *previous experience* of the manager within that firm, *the age of the manager*, *the manager's education*. Each of the variables takes several values in the survey. The variable ranges from 0 to 3, and higher values of the management quality would mean better signals for the lender. Finally, in all our regressions we include sector dummies, to control for different finance needs of firms.[16]

Firm level explanatory variables are detailed in the Appendix for variables. Our sample is dominated by small firms (67 %). Exactly half of the firms were established after 1993, and are thus categorized as post-transition firms, while a further 28% were established in the transition phase of 1989 1993. The majority of firms are privately owned, with only a minor share state-owned (14%).

The data provides a similar sample of non-agricultural firms across all countries. The sample is dominated by small firms (67%) and private firms (86%). The sample includes firms from service and manufacturing sectors, with the majority of firms (54%) have their main activity in the service sector. All firms in the sample are at least 3 years old. The 2005 survey includes 9655 firms. The sample structure for the 2005 survey resembles by design that of the 2002 survey.

3.4 Regressions

3.4.1 Soft Information Acquisition

Our aim is to provide empirical evidence that in support of the theory: banks invest more in soft information once hard information is shared. In order to examine this hypothesis, which is also the main message of our paper, we look at several aspects:

[16] Although some of these variables can be regarded as pieces of hard information, we believe the general picture may have a proprietary nature for the main bank

- the *days* banks spend to approve a loan application;
- how flexibly *banks* react to late payments from their borrowers;
- the use of checking accounts as a way to accumulate information on borrowers.

Days

The days variable is taken from the BEEPS 2002 survey. The question in the survey asks, *How many days did it take to agree the loan with the bank from the date of application?*. The mean is 25 while standard deviation is 37. The dependent variables is the logarithm of the days reported.[17] The reported output is based on robust OLS estimation. The first column is the estimate for the total sample, the second one is only for small firms, while the third one is for large firms only.

Arguably, investment in soft information by screening a loan application requires time (see also Inderst 2007). A bank that carefully screens its borrowers will have to spend more time before making the loan decision. If the information the bank relies on is hard, then the time interval will arguably be lower, since the borrowers have to prepare in advance the standardized information needed to get a loan. Finally, if the bank does little screening of either type, then the basic standardized procedures in that case will likely take very little.

Of course, a bank may also spend more time before making the loan simply because its procedures are inefficient. This is a reasonable worry in our case, since banking systems have been undergoing radical changes during the last two decades, and their efficiency has been transformed. The days variable can differ largely owing to the strength of institutional reforms. We control for this through the variable *Banking reform index*. Higher values of this index reflect reforms that encourage financial discipline and improve corporate governance.

The first column shows that information sharing is related with more time to conclude the loan application. Column 2 shows that the effect is largely driven by small firms, while column 3 is for large firms, and there the coefficient is again not statistically different from 0. We also use Poisson regressions, where our results are similar, and we have 1% significance on information variable. [18]

Concentration has a negative impact, since higher concentration means larger (relative to the economy) banks may be using more hard information and standardized procedures, giving small role to screening and approving loans faster. As expected,

[17] The existnce of the manye outliers motivates our use of the logarithm

[18] One may think that time spent on application may increase since more risky applications maybe considered: this is the established discipline effect of information sharing (Padilla Pagano 2000) whereby more risky applicants can enter the market but may put more effort ex-post since credit bureaus will now share their default information with other lenders. To provide some evidence that this is at least not the only reason, we use a small panel: we have only 594 firms reporting the variable for years 2002 and 2005. Results show that information sharing still has similar impact(with significance level 5 percent).

stronger creditor protection seems to allow to approve loans faster, since creditor worry less about defaults. On the other hand, since borrowers are more likely to have single relationship (Ongena and Smith 2000) when enforcement and protection are higher, they may spend resources - that is time, on the screening of loan applications. For younger firms after transition banks may be using more impersonal and modern communication, in line with earlier findings that older firms are closer to their banks and are less likely to have have impersonal communication. Indeed, apart from age, this is even more plausible for a pre-transition vs. post-transition borrowers. There may also be a role for the *vintage* effect (Berger et al 2005); older borrowers started their careers with their bankers face-to-face and have not changed their ways of communicating with their banks.

Banks' reaction

The reaction variable is taken from the BEEPS 2002 survey. The question in the survey asks:

- Now I would like to ask you a hypothetical question. If your firm were to fall behind in its bank repayments, which of the following would best describe how you would expect the bank to react?

The possible answers are:

1. Extend the term of the loan without changing the conditions (=3).
2. Extend the term of the loan but increase the interest rate (=2).
3. Begin legal proceedings to take possession of some assets of the firm (=1).

Arguably, if the bank is reacts more flexibly in case of late payments (higher values of the variable), it must be that the bank has a good knowledge and is optimistic of the firm. It relates late payments to bad luck, rather than to gloomy prospects. In contrast, a bank that does not invest in monitoring or screening its borrowers will simply take late payments as a pure negative signal about the firm's potential and will be more likely to cease the banking relationship.[19] 2000 firms reply to this question, which considerably reduces observation number. The output is ordered probit, although robust OLS estimates have the same significance.

When we use the whole sample - both large and small firms - we have high significance for the information sharing index. Columns two and three look at the subsamples of large and small firms. As it may be expected, given the higher importance of soft information for small firms, we get a very strong result for their subsample. Banks are more likely to be flexible with small banks in the presence of information sharing.

[19]Similar questions have been used as proxies of soft information on earlier studies, that utilize companies' grading of their main banks in terms of satisfaction (Ogura and Uchida (2006), Uchida, Udell and Yamori (2007)).

Creditor rights times contract enforcement seem to make banks less cooperative (as perceived by the borrowers), especially for small firms. This may be owing to the fact that banks realize that proceeding to legal procedure for instance (lower values of react) may result in actual winning. As we expected, bank reform index has a negative sign: banks with binding hard-budget constraints will be stricter to their borrowers. The regression shows that younger firms seem to be less optimistic about their bank's favorable response to a sudden non-repayment: in fact when we replace transition/post transition with age, the coefficients are significant. For younger firms after transition banks may have not yet accumulated enough information via monitoring and therefore their reaction is more rigid.

Checking account

The checking account variable is taken from the BEEPS 2002 survey. The question in the survey asks:"Does your establishment have a checking or saving account". It has been observed that the use of checking account gives the bank advantageous information on the borrower and works as a monitoring tool for the lender (Nakamura 1991, Degryse and van Cayseele 2000, Norden and Weber 2004). And while the pieces of information received via the checking account are hard, the overall knowledge that the bank can obtain about the borrower is soft (Norden and Weber 2004). Moreover, evidence suggests that there is a positive impact of the checking account existence on the probability of personal communication between the bank and the borrower. Table 5 shows that checking account is used more in countries with information sharing, supporting our hypothesis on more investment in monitoring in these countries.

Once again, the first column is the total sample. The second column is for small firms, and the third one is for large firms. We do not find evidence in favor of larger importance for small firms for this variable, which we attribute to the findings that small borrowers are less likely to have checking accounts for many other reasons.[20] In all three cases information sharing makes the use of checking accounts more likely.

We do not use debt/aset ratio due to the absence of this variable for year 2005. Concentration has a negative impact, in line with earlier arguments and findings (Berger et al. 2005). Higher concentration suggests that larger banks are dominating in the industry, and less likely to invest in relationship-specific information. The creditor rights times (speed of) payment enforcement is again positive, consistent with earlier findings that banks are willing to monitor borrowers better as relationship is more likely to be single when creditor right and payment enforcement are stronger. The positive effect of per capita GDP is consistent with earlier findings of higher probability of owning a checking account when income is higher (Vermilyea and Wilcox 2002).[21]

[20]Hogarth, Anguelov and Jinkook (2004) find that households are generally less likely to have checking accounts, which is related to income, planning horizon, education, credit history, education.

[21]As this variable is taken from survey year 2005, we also complement this index with measures of credit information sharing from IFC/Doing Business. We repeat our analysis using:

1. Coverage data that show percentage of population that has data in the bureau
2. An index of Credit Information constructed by IFC/Doing business

3.4.2 Switching or Staying with the Main Bank?

The switching variable is taken from the BEEPS 2002 survey. The question in the survey asks, *Has your firm changed its main bank (the single bank with which your firm has the closest relationship)since 1998?'*. Possible answers include "yes", "no", "no main bank". 8 percent of the firms report that they have no main bank, and we exclude those firms. This leaves us with a sample of 5209 firms)$\dot{2}$6 percent of the firms report that they have switched their main bank. We also use the average information sharing index for year 1996-1998, to estimate switching *after* establishing information sharing. We would like to test whether investment in soft (proprietary) information is important for switching.

Column 1 shows that overall the sample does not show more or less switching in information sharing countries. Column 2 two shows that those who did not have an overdue payment, are less likely to switch, because the incumbent becomes extremely aggressive about the good borrowers. Column 3 shows that higher investment in soft information is related to a higher likelihood of switching. calculating marginal effect, we reveal that this may bring up to 8% difference in switching, which is rather large given the 26% sample average.

3.4.3 Cost of capital

We begin analyzing the effects of information on *cost of capital*. It ranges from 1 to 4, with higher values indicating a higher cost of financing. It equals 4, if cost of finance is reported to be a major obstacle, 3 = moderate obstacle, 2 = minor obstacle, 1 = no obstacle. Unlike Brown et al (2007) we also take into account soft information, which generates important difference from what is reported in Brown et al (2007). The latter find that cost of capital is lower in countries with information sharing, and that this effect is larger for small, opaque firms. We would like to test whether soft (proprietary) information influences cost of capital in information sharing countries, and whether it is more important for small firms.

Results. We do so by adding an interaction term. Indeed, the table shows that the interaction of soft signal and information sharing has a negative and large sign,

3. Multiply coverage on PCB/PCR by a coefficient that shows the depth, but not coverage, of the information shared

The score adds for each of the following functions: (i) both firms and individuals are covered, (ii) positive and negative data is collected and distributed, (iii) the registry distributed data which is at least two years old. Thus we do not add score for bureaus that share data above a certain amount of loans, or for bureaus that share both individual and firm data, since these are already included in the coverage number (although adding these two results in little changes). We do the same for PCB, and then take the sum of the two numbers (or take the maximum, which does change our results qualitatively). The estimates remain robust.

indicating that cost of capital goes down when the soft signal gets better (the output is ordered probit, although robust OLS estimates give similar results). From the first two rows of the first column one can see that the firms with worst signals (Soft=4.75) will actually experience an increase in cost of capital. The marginal effects show that while cost of access goes up by 0.44 for the worst signal borrower, it actually reduces by 0.25 for the best signals for one point of the information sharing index (and information sharing index is constructed to range from 0 to 5). This is quite large given that the sample average of cost of capital is 2.53. Consistent with our analysis of small and large firms, columns 2 and 3 show that the signal matters more for the small firms. The model confirms that privatized firms are less risky, and experience less problem of capital cost. We did not have any a priori prediction as to the sign post-transition and transition variables, since these are younger firms but, as argued before, may be less risky on the other hand, than pre-transition firms. Stronger creditor rights and *faster* contract enforcement seem to reduce cost of capital. Foreign bank presence seems to increase cost of capital: Karapetyan and Stacescu (2007) show that foreign bank presence is related to *less coverage* of the credit bureaus. Table repeats this analysis using panel estimates from 2002 and 2005. The results for *access to capital*, defined similarly, are very similar to table 7 and 8 and are not reported for brevity.

CONCLUSIONS

It might seem intuitive to think that when information is shared via credit bureaus or public credit registers banks will have lower incentives to invest in information collection, lower monitoring or screening, and ultimately, quality of lending decisions may decline.

Starting from the important distinction between hard and soft information, and the observation that only the former can be shared through pooling arrangements, we show that banks will actually invest more in acquiring soft information when hard information is shared. The intuition behind the result is as follows: when hard information is shared, the uninformed bank becomes more aggressive about the good quality transactional customers, with no-default in history, and less aggressive about the defaulting borrowers: borrowers in the latter group stay more with the incumbent, who therefore invests more in their type-informativeness. This will improve the accuracy of lending decisions and may be useful for small firms that are differentiated along "soft" characteristics. Thus, one of the apparent victims of information sharing – borrowers that require significant investment in information – may actually benefit from the existence of credit bureaus.

Our results obviously present an important argument in favor of information sharing. They also point to an interesting implication in terms of the structure of the banking system. In particular, information sharing may widen the gap between small banks relying on collecting soft information and large banks relying on standardized, hard information (Stein 2002, Berger et al. (2005)): indeed, information sharing increases small banks' incentives to collect soft information and makes it easier for large banks to get their standardized data.

The findings of our paper emphasize the importance of making the distinction between the various types of information acquired by banks when assessing the welfare effects of information sharing arrangements. This is an area where further research can be helpful in understanding banks and bank competition.

4 Appendix A

Proof of Proposition.2.1 Define the success probabilities

$$\begin{aligned} p_N &= p \\ p_{GD} &= \frac{\lambda\varphi p(1-p)}{\lambda\varphi(1-p)+(1-\lambda)(1-\varphi)}; \\ p_{BD} &= \frac{\lambda(1-\varphi)p(1-p)}{\lambda(1-\varphi)(1-p)+(1-\lambda)\varphi} \end{aligned}$$

and the respective break-even rates $\overline{r}_K = \frac{I}{p_K}$, for $K = D, N, GD$ or BD.

The construction of the mixing strategies is done in a sequence of standard arguments outlined here (see Hauswald and Marquez (2000) for details). Let $F_u^K(r)$ the uninformed bank's bidding distribution over loan-rate offers r, for defaulting ($K = D$) and non-defaulting ($K = N$) groups. $F_i^J(r)$ describes the bidding strategies for the informed bank for the good-signal defaulting ($J = GD$), bad-signal defaulting($J = BD$) and the non-defaulting ($J = N$) borrowers. Finally, let $t_i(J)$ and $r_u(K)$ denote interest-rate offers by the informed and the uninformed banks.

1. *The non-defaulting borrowers*: both banks know their repayment history, and compete a la Bertrand under symmetric information, offering marginal cost pricing $\bar{r}_N$.

2. *Defaulting borrowers* (GD, BD, D): Let $\bar{\varphi}$ denote informativeness level that solves $p_{BD}(\varphi)R = I$.

a) *Suppose first* $\varphi > \bar{\varphi}$.

The informed bank will not bid for $J = BD$, since they are not creditworthy (this is because $\frac{\partial \bar{p}_{BD}}{\partial \varphi} = \frac{(1-2\varphi)\lambda(1-\lambda)p(1-p)}{\left(\lambda(1-\varphi)(1-p)+(1-\lambda)\varphi\right)^2} \leq 0$). Thus, $F_i^{BD}(r) = 0$ for all r. Furthermore, it can be shown that $F_i(r)$ and $F_u(r)$ are continuous, strictly increasing, and atomless on some common support $[\underline{r}, \bar{R})$ (see von Thadden 2004, Engelbrecht-Wiggans *et al* 1983, Milgrom and weber (1982)). For $J = GD$, the informed bank gets expected profit for any r

$$\pi_{i,share}^{GD}(r) = N_{GD}(p_{GD}r - I)(1 - F_u^D(r))$$

$$\pi_{u,share}^{D}(r) = N_{GD}(p_{GD}r - I)(1 - F_i^G D(r)) + N_{BD}(p_{BD}r - I)(1 - F_i^{BD}(r))$$

Finally, it can be shown that the uninformed bank has to break even in the equilibrium, implying that $\pi_{u,share}(r) = 0$ (von Thadden 2004). To calculate the lower bound of the common support, observe that the uninformed bank wins the defaulter almost surely at that rate and gets $\underline{r}p_D - I$, implying $\underline{r} = \bar{r}_D$. For the upper note that none of the banks will clearly bid above cash flow R. Thus, in the current case with $\varphi > \bar{\varphi}$ the support is $[\bar{r}_D, R)$

b)Now suppose $\varphi < \bar{\varphi}$ (the bad signal defaulting borrowers are creditworthy). and Clearly, $r_i^{BD} \geq \bar{r}_{BD}$ because anything lower than that yields losses. Repeated undercutting arguments establish that the informed bank bids pure strategy break-even $\bar{r}_{BD}$ for bad signal defaulting borrowers. The remainder of the proof is similar to case is similar, except that common support is now $[\bar{r}_D, \bar{r}_{BD})$. Concluding, the common support of the c.d.f.'s of the two banks is therefore $[\bar{r}_D, \bar{r}_{BD} \wedge R)$.

Since the mixing distributions are increasing, equilibrium profits for each banks must be constant over any $r \in [\bar{r}_D, \bar{r}_{BD} \wedge R)$: the bank has to be indifferent for any bid. Thus,

But then,

$$N_{GD}(p_{GD}r - I)(1 - F_u^D(r)) = \text{ constant.}$$

so that

$$N_{GD}(p_{GD}\bar{r}_D - I) = N_{GD}(p_{GD}r - I)(1 - F_u^D(r)).$$

because the uninformed bank starts bidding from $\bar{r}_D$, $1 - F_u^D(\bar{r}_D) = 1$. This gives us the expression for $F_u^D(r)$:

$$F_u^D(r) = 1 - \frac{p_{GD}\bar{r}_D - I}{p_{GD}r - I}.$$

Similarly,

$$N_{GD}(p_{GD}r - I)(1 - F_i^{GD}(r)) + N_{BD}(p_{BD}r - I) = 0$$

which yields

$$F_i^{GD}(r) = 1 - \frac{N_{BD}(I - p_{BD}r)}{N_{GN}(p_{GD}r - I)}.$$

over $r \in [\bar{r}_D, \bar{r}_{BD} \wedge R)$, where $N_{GD} = \lambda\varphi(1-p) + (1-\lambda)(1-\varphi)$, $N_{BD} = \lambda(1-\varphi)(1-p) + (1-\lambda)\varphi$. It is now easy to verify that $\varphi F_i^{GD}(r) = \frac{p_{GD}r - p_{GD}\bar{r}_D}{p_{GD}r - I} = F_u^D(r)$.

Since both banks randomize over the full support of their distribution functions, they cannot profitably deviate from their mixed strategies. Therefore, the distributions above represent the unique equilibrium of the bidding game for a given borrower. Observe that $F_i^{GD}(R^-) = 1 - \frac{N_{BD}(I - p_{BD}R)}{N_{GN}(p_{GD}R - I)} < 1$, so that there is a point mass at R.

Moreover, $F_u^D(R) = \varphi F_i^{GD}(R) < 1$, so that the uninformed does not bid with probability $1 - F_u^D(R)$ whenever $\varphi > \bar{\varphi}$.

Proof of proposition 2.2 Indeed, the incumbent lends to group N and GD and earns , so the incumbent bank's *total* profits can therefore be written as the sum of

two terms:

$$\pi_{share} = N_N(p_N\overline{r}_N - I) + N_{GD}(p_{GD}\overline{r}_D - I)$$

However, the first term is 0 since, hard information sharing has leveled the playing field.

$$\begin{aligned} N_{GD}(p_{GD}\overline{r}_D - I) &= \lambda\varphi p(1-p)\frac{\lambda(1-p)+1-\lambda}{\lambda p(1-p} - \big(\lambda\varphi(1-p) + (1-\lambda)(1-\varphi)\big) \\ &= (2\varphi - 1)(1-\lambda) \end{aligned}$$

Thus gross profits are linearly increasing in φ. (Net profits can be obtained by subtracting the cost of monitoring $c(\varphi - \frac{1}{2})^2$.) For $\varphi < \bar{\varphi}$ the analysis follows similar steps, remembering that the worst type yields 0 profits since the bank bids pure strategy break-even rate. For the proof of the uninformed banks' zero profits, see von Thadden (2004).

Proof of Proposition 2.3 The construction of the common support is similar to the one in 2.1, with a change in lower bound, $[\bar{r}, \bar{r}_{BD} \wedge R)$, since the uninformed breaks even by solving $\underline{r}\lambda p - I$.

As before, the informed bank bids different rates for $J = BD, GD, D$, while the uninformed bids $F_u(r)$ for any borrower, since it does not distinguish any types. It is clear, that as in the case with information sharing, the informed bank will bid $\bar{r}_{BD}$ for bad signal defaulting borrowers whenever $\varphi < \bar{\varphi}$, and will not bid otherwise. First note, that bidding $F_i^N(r)$ in $[\bar{r}, \bar{r}_{BD} \wedge R)$, and F_i^{GD} $[\bar{r}_{GD}, \bar{r}_{BD} \wedge R)$, cannot be not an equilibrium since now (unlike in information sharing case with two types for the incumbent) the uninformed can bid just below $\bar{r}_{BD}$, get all defaulting borrowers to get positive profits (since their break even rate is $\bar{r}_D$. In equilibrium, the informed bank starts bidding at $\bar{r}$ for the N. It can bid up until the average break-even rate for the other groups, that have lower quality, the BD and GD groups. The average break-even rate for these two groups is $\bar{r}_D$. To see that this is an equilibrium, let's suppose it's not, and that the inform bids in $[\bar{r}_N, x]$, $xin(\bar{r}_N, \bar{r}_{BD} \wedge R)$, and in $[y, \bar{r}_{BD} \wedge R)$ for GD. We show first that there can be no equilibrium with $y \neq x$

When $x < y \leq \bar{r}_D$, then the informed can increase profits by increasing x, without fear of undercutting by the uninformed. If $y < x \geq \bar{r}_D$, the informed can increase profits by increasing y. If $y > x \geq \bar{r}_D$ the uninformed can just undercut below y to get all defaulting borrowers without loss. the uninformed can undercut and get positive profits. If $x > y \geq \bar{r}_D$, then the uninformed can undercut x profitably. If $x > \bar{r}_D > y$, the informed can increase profit by increasing y. If $y > \bar{r}_D > x$ the uninformed can undercut profitably.

Thus, any equilibrium has to entail $y = x$. Moreover, if $y = x > \bar{r}_D$, the uninformed

will undercut, and $y = x < \bar{r}_D$, the informed can increase profits. Therefore, $y = x = \bar{r}_D$. For the informed bank, there are two sources of rents

$$\pi^N_{noshare} = N_N(p_N r - I)(1 - F_u(r))$$

which are constant across all r on $[\bar{r}, \bar{r}_D]$ and

$$\pi^{GD}_{noshare} = N_{GD}(p_{GD} r - I)(1 - F_u(r))$$

for every r on $[\bar{r}_D, \bar{r}_{BD} \wedge R)$. BD group yield 0 profits when offered break even, or do not get an offer.

From the first one, plugging in $\bar{r}$ we get

$$F_u(r) = 1 - \frac{p_N \bar{r} - I}{p_N r - I} = \frac{\lambda p r - I}{\lambda(pr - I)}$$

.

From the second one

$$\pi^{GD}_{noshare}(\bar{r}_D) = N_{GD}(p_{GD}\bar{r}_D - I)(1 - F_u(\bar{r}_D)) = N_{GD}(p_{GD}\bar{r}_D - I)\frac{p_N \bar{r} - I}{p_N \bar{r}_D - I}$$

we get

$$F_u(r) = 1 - \frac{p_N \bar{r} - I}{p_N \bar{r}_D - I}\frac{p_{GD}\overline{r}_D - I}{p_{GD} r - I} = 1 - \frac{\frac{1}{\lambda} - I}{\frac{\lambda(1-p)^+(1-\lambda)}{\lambda(1-p)} - I}\frac{p_{GD}\overline{r}_D - I}{p_{GD} r - I} = 1 - (1-p)\frac{p_{GD}\overline{r}_D - I}{p_{GD} r - I},$$

$$\begin{aligned}\pi_u(\overline{r}) = 0 =& N_N(p_N r - I)(1 - F_i^N(r)) + N_{GD}(p_{GD} r - I)(1 - F_i^{GD}(r)) + \\ &+ N_{BD}(p_{BD} r - I)(1 - F_i^{BD}(r)).\end{aligned}$$

To get the expression for $F_i^N(r)$, note that $F_i^{GD}(r)$,$F_i^{BD}(r)$ are equal to 0 in $[\overline{r}, \overline{r}_D]$. Thus, in equilibrium, the incumbent bank's strategy for N is characterized by the following cumulative density function:

$$F_i^{GN}(r) = 1 + \frac{N_{BD}(p_{BD} r - I) + N_{GD}(p_{GD} r - I)}{N_{GN}(p_{GN} r - I)} = \frac{\lambda p r - I}{\lambda p(pr - I)}$$

over the $[\overline{r}, \overline{r}_D]$.

Similarly, for non-defaulting borrowers we have,

$$F_i^{GD}(r) = 1 + \frac{N_{BD}(p_{BD} r - I)}{N_{GD}(p_{GD} r - I)}$$

Proof of Proposition 2.4

Sharing For the informed bank, GD group is the only source for informational rents

$$\pi^{GD}_{noshare} = N_{GD}(p_{GD}r - I)(1 - F_u(r)) = N_{GD}(p_{GD}\bar{r}_D - I) = I(1-\lambda)(2\varphi - 1)$$

No Sharing For the informed bank, there are two sources of informational rents

$$\pi_{noshare} = N_N(p_N r - I)(1 - F_u(r)) = N_N(p_N \bar{r}_N - I) = Ip(1-\lambda)$$

on $[\bar{r}, \bar{r}_D]$ and

$$\pi^{GD}_{noshare} = N_{GD}(p_{GD}r - I)(1 - F_u(r))$$

Total informational rents therefore are

$$\begin{aligned}\pi^{N}_{noshare} =& N_N(p_N\bar{r}_N - I) + N_{GD}(p_{GD}\bar{r}_D - I)(1 - F_u(\bar{r}_D)) \\ &= N_{GD}(p_{GD}\bar{r}_D - I)(1 - F_u(\bar{r}_D)) = N_{GD}(p_{GD}\bar{r}_D - I)\frac{p_N\bar{r} - I}{p_N\bar{r}_D - I} \\ &= Ip(1-\lambda) + I(1-p)(1-\lambda)(2\varphi - 1)\end{aligned}$$

Proof of Proposition 2.5

$$\pi^{GD}_{noshare} - c(\varphi - 0.5)^2 = I(1-\lambda)(2\varphi - 1) - c(\varphi - 0.5)^2$$

$$\varphi^*_{share} = 0.5 + \frac{I}{c}(1-\lambda)$$

$$\pi^{N}_{noshare} - c(\varphi - 0.5)^2 = Ip(1-\lambda) + I(1-p)(1-\lambda)(2\varphi - 1) - c(\varphi - 0.5)^2 =$$

$$\varphi^*_{noshare} = 0.5 + \frac{I}{c}(1-\lambda)(1-p) \leq \varphi^*_{share} = 0.5 + \frac{I}{c}(1-\lambda)$$

Proof of Proposition 2.8

Let $F^J(r)$ denote the c.d.f. of the paid rate for a borrower of $J = GD, N, BD$- the minimum of the two rates. Thus, $F^{GD}(r) = 1 - (1 - F^{GD}_i(r))(1 - F^D_u(r)) = F^{GD}_i(r) + F^D_u(r) - F^{GD}_i(r)F^D_u(r)$, under information sharing $F^{GD}(r) = 1 - (1 - F^{GD}_i(r))(1 - F_u(r)) = F^{GD}_i(r) + F_u(r) - F^{GD}_i(r)F_u(r)$ under no information sharing $F^N(r) = \bar{r}_N = F^N_i(r) = F^N_u(r)$ under information sharing $F^N(r) = 1 - (1 - F^N_i(r))(1 - F_u(r)) = F^{GD}_i(r) + F^D_u(r) - F^{GD}_i(r)F_u(r)$ under no information sharing. Finally, $F^{BD}(r) = min\{\bar{r}_{BD}, F_u(r)\}$ or $F^{BD}(r) = min\{\bar{r}_{BD}, F^D_u(r)\}$ under information sharing.

Under information sharing, observe above $F_i^N(r) = F_u^N(r) = \bar{r}_N$ and thus does not depend on φ.

For the informed bank

$$F_i^{GD}(r) = 1 + \frac{N_{BD}(p_{BD}r - I)}{N_{GD}(p_{GD}r - I)} = \frac{\lambda p(1-p)r - \big(\lambda(1-p) + (1-\lambda)\big)}{\lambda\varphi p(1-p)r - \big(\lambda\varphi(1-p) + (1-\lambda)(1-\varphi)\big)}$$

$$\frac{\partial F_i^{GD}(r)}{\partial \varphi} = \frac{-\Big(\lambda p(1-p)r - \big(\lambda(1-p) + (1-\lambda)\big)\Big)\Big(\lambda p(1-p)r - \big(\lambda(1-p) - (1-\lambda)\big)\Big)}{\Big(\lambda\varphi p(1-p)r - \big(\lambda\varphi(1-p) + (1-\lambda)(1-\varphi)\big)\Big)^2}$$

So,

$$\frac{\partial F_i^{GD}(r)}{\partial \varphi} = \frac{-\Big(\lambda^2(1-p)^2(pr-1)^2 - (1-\lambda)^2\Big)}{\Big(\lambda\varphi p(1-p)r - \big(\lambda\varphi(1-p) + (1-\lambda)(1-\varphi)\big)\Big)^2} \leq 0$$

which is true because $r \in [\bar{r}_D, R \wedge \bar{BD}$, so that $r > \bar{r}_D$, which implies $pr > \frac{1-\lambda+\lambda(1-p)}{\lambda(1-p)}$, which in turn implies $(pr-1)^2 > \frac{(1-\lambda)^2}{\lambda^2(1-p)^2}$

For the uninformed bank

$$F_u^D(r) = \varphi F_i^{GD}(r)$$

From the above

$$\frac{\partial F_i^{GD}(r)}{\partial \varphi} = \frac{-\Big(\lambda p(1-p)r - \big(\lambda(1-p) + (1-\lambda)\big)\Big)\Big(\lambda p(1-p)r - \big(\lambda(1-p) - (1-\lambda)\big)\Big)}{\Big(\lambda\varphi p(1-p)r - \big(\lambda\varphi(1-p) + (1-\lambda)(1-\varphi)\big)\Big)^2} =$$
$$- F_i^{GD}(r)\frac{\Big(\lambda p(1-p)r - \big(\lambda(1-p) - (1-\lambda)\big)\Big)}{\lambda\varphi p(1-p)r - \big(\lambda\varphi(1-p) + (1-\lambda)(1-\varphi)\big)} \leq 0$$

So

$$\frac{\partial F_u^D(r)}{\partial \varphi} = -\varphi F_i^{GD}(r)\frac{\lambda p(1-p)r - \big(\lambda(1-p) - (1-\lambda)\big)}{\lambda\varphi p(1-p)r - \big(\lambda\varphi(1-p) + (1-\lambda)(1-\varphi)\big)} + F_i^{GD}(r) =$$
$$\frac{-F_i^{GD}(r)(1-\lambda)}{\lambda\varphi p(1-p)r - \big(\lambda\varphi(1-p) + (1-\lambda)(1-\varphi)\big)}$$

Therefore,

$$\frac{\partial F(r)}{\partial \varphi} = \frac{\partial F_i(r)}{\partial \varphi} + \frac{\partial F_u(r)}{\partial \varphi} - \frac{\partial F_i(r)}{\partial \varphi}F_u(r) - F_i(r)\frac{\partial F_u(r)}{\partial \varphi} \leq 0$$

Finally, remember that

$$\frac{\partial \bar{r}_{BD}}{\partial \varphi} = \frac{(1-2\varphi)\lambda(1-\lambda)p(1-p)}{\big(\lambda(1-\varphi)p(1-p)\big)^2} \geq 0$$

So that minimum interest rates for the BD is non-decreasing, too.

Under no information sharing

$F_i^N(r) = \frac{\lambda pr - I}{\lambda p(pr-I)}$, and is independent of φ. $F_i^{GD}(r)$ is the same as above.

$F_u = pF_i^N$ on $[\bar{r}, \bar{r}_D]$, and so does not depend on φ

$F_u^D(r) = p + (1-p)\varphi F_i^{GD}(r)$ on $[\bar{r}_D, \bar{r}_{BD} \wedge R]$ and so is non-increasing from the above.

Proof for group BD is analogous to information sharing case.

Proof of Proposition 2.9

$$E[r] = \int_{\bar{r}}^{R} \big(1 - F(r)\big) + \bar{r}$$

and is increasing in φ because $\big(1 - F(r)\big)$ is increasing in it too.

Proof of Proposition 2.10 1. For non-defaulting borrowers, trivially, both banks bid break even rates $\bar{r}_N$ under information sharing: this is lower than any other rate on the supports in the two regimes.

2. For defaulting borrowers, *The informed bank:* a)Bad signal defaulting borrowers, either do not get credit from the incumbent ($\varphi > \bar{\varphi}$), or receive rate $\bar{r}_{BD} = \frac{\lambda(1-\varphi)(1-p)+(1-\lambda)\varphi}{\lambda(1-\varphi)p(1-p)}(\varphi \leq \bar{\varphi})$. In the latter case, remember that $\frac{\partial \bar{r}_{BD}}{\partial \varphi} \geq 0$

b) Good signal defaulting borrowers have the c.d.f, which, by proposition 2.8 implies (weakly) higher rates under information sharing:

$$F_i^{GD}(r, \varphi^{share}) \leq F_i^{GD}(r, \varphi^{noshare})$$

The uninformed bank bids $p + (1-p)\varphi_{noshare} F_i^{GD}(r, \varphi_{noshare}$ on $[\bar{r}_D, \bar{r}_{BD} \wedge R]$ under no information sharing. The result now follows from the fact that φF_i^{GD} is non increasing in φ so that $p+(1-p)\varphi_{noshare} F_i^{GD}(r, \varphi_{noshare}) > \varphi_{noshare} F_i^{GD}(r, \varphi_{noshare}) > \varphi_{share} F_i^{GD}(r, \varphi_{share})$.

3. Overall, from proposition **??** and **??**

$$F_u(R, \varphi^{share}) \geq F_u(R, \varphi^{noshare}) > (1-p)F_u(R, \varphi^{noshare})$$

where $F_u(R) = 1 - \frac{p_{GD}\bar{r}_D - I}{p_{GD}R - I}$. Thus, while all other borrowers receive at least one offer and accept one, we still have that a bad defaulting borrower is rejected by the incumbent ($\varphi > \bar{\varphi}$), and faces lower chances of receiving any credit from the outside as well under information sharing. Given that banks' overall profits are 0, this is a transfer to the creditworthy borrowers.

Proof of Proposition 2.11

	Sharing	No Sharing
Group N	Both bid equal rates $=> \frac{1}{2}$	$1-\int_{\bar{r}}^{\bar{r}_D}(1-pF_i^N)dF_i = p(\|F_i^2+\int_{\bar{r}}^{\bar{r}_D}F_i^N dF_i^N)$ $= p-\frac{1}{2}p = \frac{1}{2}p$
Group GD	$1-\int_{\bar{r}_D}^{R}(1-F_u^D)dF_i^{GD} = 1-1$ $+\varphi\int_{\bar{r}_D}^{R}F_i^{GD}dF_i^{GD} = \frac{1}{2}\varphi$	$1-\int_{\bar{r}}^{\bar{r}_D}(1-F_u)dF_i^{GD} = 1-$ $\int_{\bar{r}}^{\bar{r}_D}(1-p)(1-\varphi F_i^{GD})dF_i^{GD}$ $= p+\frac{1}{2}(1-p)\varphi$
Group BD	$\varphi > \bar{\varphi}$, the informed does not bid	$\varphi > \bar{\varphi}$, the informed does not bid.

$\varphi \leq \bar{\varphi}$, from proposition 2.1 it follows that the uninformed bank bids less than $\bar{r}_{BD}$ with probability φ_{share} under information sharing, so borrowers are switching $\frac{1}{2}(1-\varphi_{share})+\varphi_{share}$. Similarly, under no information sharing and from proposition 2.3, switching probability will be given by $p+(1-p)\varphi_{noshare}+\frac{1}{2}(1-p)(1-\varphi_{noshare}) = p+\frac{1}{2}(1-p)(1+\varphi)$

5 Appendix B

5.1 Dependent Variables

Source: BEEPS 2002 survey, except where other source is mentioned.

Stay. Definition: Dummy variable that takes value 1 if the firm has answered "no" to the question in the survey, 'Has your firm changed its main bank (the single bank with which your firm has the closest relationship) since 1998?'. Possible answers include "yes", "no", "no main bank". (8 percent of the firms report that they have no main bank, and we exclude those firms, this leaves us with a sample of 5209 firms).

React. Definition based on answer to the question: "Now I would like to ask you a hypothetical question. If your firm were to fall behind in its bank repayments, which of the following would best describe how you would expect the bank to react?" Possible answers include: 1. Extend the term of the loan without changing the conditions(=3) 2. Extend the term of the loan but increase the interest rate (=2) 3. Begin legal proceedings to take possession of some assets of the firm(=1).

Days. Definition:"How many days did it take to agree the loan with the bank from the date of application?" The mean is 25 while standard deviation is 37. The output is the robust OLS measure (we also do Poisson regressions, where we have high significance in all columns).

Checking Account. Definition: Dummy variable that takes value 1 if the firm has answered "yes" to the question in the survey,"Does your establishment have a

checking or saving account".(source BEEPS 2005)

Caccess. Definition: Caccess measures access to finance; higher values indicate higher access to finance. It equals 4, if access is reported to be of no obstacle, 3=moderate obstacle, 2= Minor obstacle, 1=No obstacle.

Ccost. Definition: Ccost is cost of finance; higher values indicate higher cost of financing. It equals 4, if cost of finance is reported to be of no obstacle, 3=moderate obstacle, 2= Minor obstacle, 1=No obstacle.

5.2 Firm Level

Source: BEEPS 2002 survey.
Soft. *Soft* measures how protected the borrower is from different *non-financial* factors. It summarizes answers to 19 questions on non financial problems of growth. The exact question in the survey asks: *Can you tell me how problematic are these factors for the operation and growth of your business?*. The factors include skills of workers, their education, contract violations by customers and suppliers, among others. Each of the questions is answered on a scale from 1-to 4, where higher values stand for less obstacles (4=no obstacle, 1=major obstacle). We take the sum of the 19 questions, and divide by 4*19. Thus, the variable ranges from 0.25 to 1, where a value of 1 indicates that the received soft signals about the quality of the borrower, have all been good/favorable (19 answers "no obstacle"). We then take 1 - the value of the variable, so that higher values mean less problems.

Management quality. adds: 1 point if the manager has prior experience in the company, 1 point if the manager is older than 40, 1 point if the manager has higher education.

Small firm. Definition: Dummy Variable that takes value 1 if total number of full-time employees is less then 50. Source: s4a2.

Large (and medium) firm. Definition: Sample of firms that are not small Source: s4a2.

Transition firm. Definition: Firm was established in the years 19891993. Source: s1a.

Post-transition firm. Definition: Firm was established after 1993. Source: s1a.

State-owned firm. Definition: State controlled firm (yes/no). Source: s2b.

Privatized firm. Definition: privatized firm (yes/no). Source: q9aa.

Sector. Definition: Mining, Construction, Manufacturing transport and communication, Wholesale, retail and repairs, Real estate, renting and business service, Hotels and restaurants, Others. Source: q2.

5.3 Country Level

Source: Brown et al. (2007).
Information sharing. For each year between 1996 and 2004 we compute an index for private credit bureaus and one for public credit registers: 1 point if it exists for more than 3 years; 1 point if individuals and firms are covered; 1 point if positive and negative data are collected; 1 point if PCR/PCB distributes data which is at least 2 years old; 1 point if threshold loan is below per capita GDP. We then take the maximum of the index for credit bureaus and public credit registers. We use 19961999 values for the 2002 BEEPS, and 20012003 value for the 2005 BEEPS.

Creditor rights. We use the index of creditor rights based on methodology of La Porta et al. (1998). A score of one is assigned when each of the following rights of secured lenders are defined in laws and regulations. First, there are restrictions, such as creditor consent or minimum dividends, for a debtor to file for reorganization. Second, secured creditors are able to seize their collateral after the reorganization petition is approved. Third, secured creditors are paid first out of the proceeds of liquidating a bankrupt firm. Fourth, if management does not retain administration of its property pending the resolution of the reorganization. We use 19962000 values for the 2002 BEEPS, and 20012003 value for the 2005 BEEPS.

Time to enforce payment. Definition: The time taken to resolve a dispute in which a debtor defaults on a payment equal to 50% of a countrys per capita GDP. The indicator measures the (log of the) number of days from the moment the plaintiff files the lawsuit in court until the moment of actual payment. We use 2005 value for both surveys, because earlier values are not available.

Foreign bank assets. Definition: The share of banking sector assets controlled by banks with a majority (at least 50%) foreign ownership. We use 19962000 values for the 2002 BEEPS, and 2001 2003 value for the 2005 BEEPS.

Av. GDP. Definition: Log of per capita GDP in thousands of US dollars. We use

19962000 values for the 2002 BEEPS, and 20012003 value for the 2005 BEEPS.

Inflation. Definition: average annual growth rate of consumer price index (CPI). We use 1996 2000 values for the 2002 BEEPS, and 20012003 value for the 2005 BEEPS.

Bank concentration. The fraction of deposits held by the five largest banks: Source Barth et al 2001.

NPL. Share of non-performing loans in total loans: Source, EBRD transition Report.

Bank reform index. A score of 1 represents little change from a socialist banking system apart from the separation of the central bank and commercial banks, while a score of 2 means that a country has established internal currency convertibility and has liberalized significantly both interest rates and credit allocation. A score of 3 means that a country has achieved substantial progress in developing the capacity for effective prudential regulation and supervision, including procedures for the resolution of bank insolvencies, and in establishing hardened budget constraints on banks by eliminating preferential access to concessionary refinancing from the central bank. A score of 4+ represents a level of reform that approximates the institutional standards and norms of an industrialized market economy. Source, EBRD transition Report.

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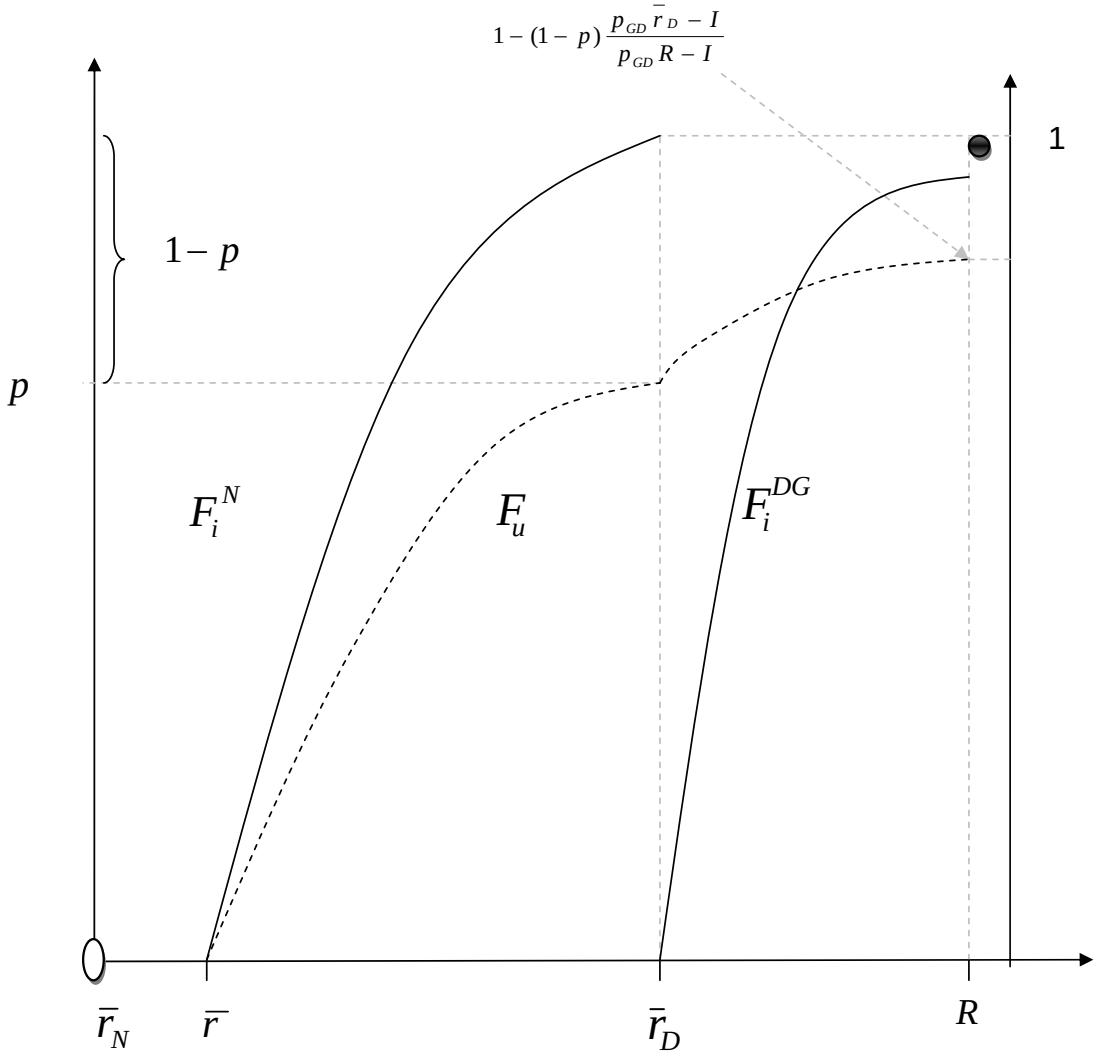

Figure 4: Interest rates under no information sharing. The dashed line represents uninformed banks' bidding

Table 1: Means of key variables by country.

Detailed explanations of variables are given in the Variables Section of the Appendix. *No Switching* is a binary indicator of not having changed the main bank since 1998. *Days* is number of days the bank needed to approve the last loan of the borrower. *React* is an ordinal score, higher values indicate more lenient reaction by the bank to a sudden non-payment by the borrower. *Caccess* is cost of access; higher values indicate higher cost of financing, *ccost* is capital cost, checking is an indicator for having a checking account. *Soft signal* is a score indicating soft information about non-financial problems of growth.

country	Mean						
	No Switching	Days	React	Caccess	Ccost	Checking	Soft Signal
Albania	0.74	53.94	3.02	2.07	2.59	0.96	8.29
Armenia	0.78	24.91	2.90	2.34	2.52	0.79	11.29
Azerbaijan	0.74	21.66	2.17	2.16	2.20	0.82	12.90
Belarus	0.74	18.91	2.92	2.47	2.78	0.84	9.75
Bosnia	0.72	36.75	3.00	2.52	2.79	0.07	10.01
Bulgaria	0.70	43.69	2.97	2.80	2.88	0.93	10.17
Croatia	0.71	38.39	2.70	2.18	2.27	0.21	11.16
Czech Rep	0.88	43.22	3.03	2.45	2.53	0.99	10.68
Estonia	0.93	12.63	2.27	1.94	2.01	0.97	11.05
Georgia	0.64	23.88	2.90	2.21	2.53	0.66	9.57
Hungary	0.80	27.96	2.87	2.22	2.31	0.99	11.76
Kazakhstan	0.77	21.18	2.64	2.00	2.16	0.88	11.99
Kyrgyzstan	0.58	13.78	2.67	2.24	2.40	0.82	11.15
Latvia	0.80	17.95	2.45	1.85	2.01	0.97	10.86
Lithuania	0.77	23.63	2.54	1.62	1.99	0.99	10.61
Macedonia	0.77	33.21	2.53	2.08	2.38	0.10	10.77
Moldova	0.87	13.16	2.71	2.49	2.95	0.65	9.15
Poland	0.76	24.46	2.56	2.65	3.17	0.93	9.02
Romania	0.74	21.36	3.04	2.55	2.80	0.98	9.63
Russia	0.68	14.94	2.55	2.31	2.24	0.92	10.59
Serbia	0.56	14.30	2.67	2.43	2.78	0.09	10.43
Slovak Rep	0.75	63.22	2.95	2.50	2.58	0.99	10.04
Slovenia	0.66	24.85	2.77	1.82	2.20	1.00	12.22
Ukraine	0.69	14.79	2.77	2.44	2.62	0.94	10.08
Total	0.74	25.61	2.74	2.31	2.53	0.82	10.46

Source: BEEPS 2002, except variable checking which is BEEPS 2005.

Table 2: Means of Macro-level variables by country

Information is an information sharing index (Brown et al 2007), 1996-2000: the index adds 1 point if PCR/PB exists for more than 3 years; 1 point if individuals and firms are covered; 1 point if positive and negative data are collected; 1 point if PCR/PCB distributes data which is at least 2 years old; 1 point if threshold loan is below per capita GDP. *Foreign Bank* is the share of banking sector assets controlled by banks with a majority foreign ownership, taken over 1996-2000 (Brown et al 2007), *Av. GDP* is the average per capita GDP during 1996-2000, *Creditor Rights* is the creditor rights index based on methodology of La Porta et al (1998), *CR* is the banking concentration ratio taken from -asset share of the largest five banks, and *NPL* is the share of non-performing loans in total loans.

country	Mean						
	Information	Foreign Bank	Av. GDP	Inflation	Creditor Rights	CR	NPL
Albania	0.00	27.10	1.20	0.10	3.00	86.70	3.75
Armenia	0.00	44.90	0.60	-0.80	2.00	54.60	1.97
Azerbaijan	0.00	4.40	0.60	1.80	3.00	71.90	2.67
Belarus	0.00	3.60	0.80	168.60	2.00	81.10	2.72
Bosnia	0.00	12.70	1.20	1.90	3.00	56.00	2.63
Bulgaria	0.80	59.10	1.60	10.30	1.50	56.50	2.39
Croatia	0.00	62.20	4.20	5.30	3.00	66.50	2.99
Czech Rep	0.00	51.90	5.50	3.90	3.00	69.00	3.68
Estonia	4.00	93.60	4.00	4.00	3.00	98.90	0.26
Georgia	0.00	16.80	0.70	4.10	2.00	57.30	1.97
Hungary	3.80	64.50	4.50	9.80	1.00	62.50	1.13
Kazakhstan	3.60	19.80	1.20	18.70	3.00	70.20	0.74
Kyrgyzstan	0.00	20.60	0.30	13.20	3.00	51.40	2.79
Latvia	0.00	74.20	3.20	2.70	3.00	66.20	1.61
Lithuania	4.60	45.90	3.30	1.00	2.00	87.90	2.38
Macedonia	2.00	32.50	1.80	6.60	3.00	72.10	3.84
Moldova	0.00	37.10	0.30	31.30	2.00	71.00	3.03
Poland	0.00	61.00	4.50	10.10	1.00	57.40	2.82
Romania	0.60	45.20	1.40	45.70	2.00	65.20	1.34
Russia	0.00	10.10	1.80	20.80	1.00	42.80	2.78
Serbia	0.00	0.50	1.00	8.80	3.00	42.40	3.33
Slovak Rep	1.20	33.40	3.70	60.40	2.00	66.50	3.27
Slovenia	2.80	10.10	9.50	12.00	2.00	69.00	2.23
Ukraine	0.00	10.80	0.60	28.20	2.00	37.00	3.48
Total	0.85	33.95	2.42	21.05	2.14	61.83	2.55

Source: BEEPS 2002.

Table 3: Cross-section estimation results (Robust OLS): Dependent variable: log of *Days*.

Dependent variable, log of *Days* until loan application approved. The first row is the total sample,the second row is the sample for small firms, the third one is the sample for large and medium firms. Columns 4-6 repeat the sequence with poisson regressions. The first and forth columns show that information sharing is relatedwith more time to conclude the loan application. Columns 2 and 5 show that the effect is largely driven by small firms, while columns 3 and 6 are for large firms, and show that less time is needed for loan approvals. Stars *, **, ***,indicate significance, at 10, 5, 1 percent respectively

variable	(1)	(2)	(3)
	All	Small	Large
information	0.048*	0.081**	0.029
	(0.027)	(0.037)	(0.041)
concentration	-0.824**	-0.491	-1.425**
	(0.360)	(0.457)	(0.599)
non-performing loan	0.198***	0.228***	0.172***
	(0.038)	(0.052)	(0.057)
creditor right*contract enforcement	0.052*	0.042	0.070
	(0.027)	(0.035)	(0.044)
foreign bank	0.017***	0.015***	0.019***
	(0.002)	(0.003)	(0.003)
bank reform index	-0.130	-0.120	-0.147
	(0.089)	(0.119)	(0.139)
debt/asset	0.356***	0.506***	0.269
	(0.117)	(0.164)	(0.170)
post-transition	-0.135*	-0.320**	-0.116
	(0.072)	(0.139)	(0.095)
transition	-0.044	-0.252*	0.013
	(0.077)	(0.145)	(0.101)
state own	-0.252***	-0.342	-0.209*
	(0.096)	(0.221)	(0.111)
GDP per capita	0.196***	0.143**	0.266***
	(0.057)	(0.072)	(0.092)
inflation	-0.031	0.071	-0.066
	(0.103)	(0.147)	(0.146)
Const.	2.051***	1.892***	2.604***
	(0.361)	(0.430)	(0.526)
Log-likelihood	-3332	-1840	-1479
Number of obs.	2135	1190	945
Pseudo R-squared	0.14	0.9	0.10

Table 4: Cross-section estimation results (Ordered-probit): Dependent variable: *React*.

React shows banks' reaction as perceived by borrowers. it is based on the hypothetical question, "If your firm were to fall behind in its bank repayments, which of the following would best describe how you would expect the bank to react?" Possible answers include: a). Extend the term of the loan without changing the conditions(=3) b). Extend the term of the loan but increase the interest rate (=2) c). Begin legal proceedings to take possession of some assets of the firm(=1).Regressions are ordered probit. The first row is the total sample,the second row is the sample for small firms, the third one is the sample for large firms. Stars *, **, ***,indicate significance, at 10, 5, 1 percent respectively

variable	(1)	(2)	(3)
	All	Small	Large
inform	0.056***	0.073***	0.020
	(0.020)	(0.028)	(0.029)
conc1	-0.062	-0.061	0.092
	(0.187)	(0.255)	(0.276)
npl1	-0.187	-0.047	-0.481
	(0.205)	(0.287)	(0.297)
llsv	-0.014	-0.049	0.020
	(0.029)	(0.041)	(0.043)
bforeign1	0.709***	0.763***	0.426
	(0.168)	(0.217)	(0.272)
bref	-0.412***	-0.411***	-0.352***
	(0.085)	(0.115)	(0.128)
posttransition	-0.110**	-0.157	-0.006
	(0.054)	(0.110)	(0.068)
transition	-0.058	-0.088	-0.011
	(0.059)	(0.114)	(0.076)
stateown	0.000	-0.001	0.000
	(0.001)	(0.002)	(0.001)
blyav	0.107***	0.092*	0.129**
	(0.038)	(0.051)	(0.058)
binf1	-0.350***	-0.297***	-0.423***
	(0.073)	(0.103)	(0.103)
Const.	3.208***	3.427***	3.073***
	(0.235)	(0.352)	(0.330)
Log-likelihood	-2367	-1277	-1074
Number of obs.	1937	1048	889
Pseudo R2	0.01	0.02	0.01

Table 5: Cross-section estimation results (probit): Dependent variable -*checking account*:

Checking account indicates the existence of checking account for the borrower. The first row is the total sample,the second row is the sample for small firms, the third one is the sample for large firms. The forth column includes an interaction term.Stars *, **, ***,indicate significance, at 10, 5, 1 percent respectively

variable	(1) All	(2) Small	(3) Large
information	0.287***	0.262***	0.402***
	(0.019)	(0.022)	(0.045)
concentration	-3.098***	-2.683***	-5.401***
	(0.181)	(0.204)	(0.484)
non-performing loan	-4.204***	-3.783***	-6.961***
	(0.284)	(0.314)	(0.837)
creditor right*contract enforcement	0.098***	0.095***	0.115***
	(0.009)	(0.010)	(0.022)
foreign bank	-0.882***	-0.745***	-1.638***
	(0.160)	(0.180)	(0.406)
bank reform index	-0.210**	-0.144	-0.627**
	(0.103)	(0.117)	(0.244)
post-transition	-0.063	-0.071	0.196*
	(0.055)	(0.069)	(0.114)
transition	0.058	0.012	0.248**
	(0.058)	(0.072)	(0.113)
state own	0.077	-0.040	-0.003
	(0.081)	(0.125)	(0.120)
GDP per capita	0.503***	0.490***	0.736***
	(0.045)	(0.052)	(0.102)
inflation	-0.230	0.077	-2.300**
	(0.459)	(0.526)	(1.041)
Const.	3.119***	2.399***	6.260***
	(0.346)	(0.426)	(0.827)
Number of obs.	7513	5331	2182
Pseudo R-Squared	0.17	0.16	0.26

Table 6: Cross-section estimation results(probit): *Switching* from the main bank.

Switching is the dependent variable. It equals 1 if the firm replies yes to the following question: *Has your firm changed its main bank (the single bank with which your firm has the closest relationship)?*. Information is an index of shared information- it is 0 for countries with no sharing. *Soft* is a summary measure for soft/proprietary information that is not shared by credit bureaus. It includes answers to questions regarding 19 nonfinancial problems.It shows how protected the borrower is from factors that may hinder operation and growth of business. Higher values of *soft* indicate *better* soft information. Sector dummies not reported. The first column is the baseline regression on total sample. The second column includes a third interaction term to see if small firms get larger impact as soft information improve. In both columns, all interactions are statistically significant. The third column is the regression of all firms above the median value of the soft-signal variable. The forth one is all the sample, but for values of the soft information variable that are below or equal to its median. Standard variations are clustered by country. The fifth and sixth column repeat the first two columns for *management quality*(manager experience, skills, education, age). Stars *, **, ***,indicate significance, at 10, 5 , 1 percent respectively.

variable	(1)All	(2)All	(3) Good	(4) Bad	(5)All M	(6)All M
information	0.165***	0.157***	-0.020	0.080**	0.073*	0.083**
	(0.060)	(0.060)	(0.034)	(0.035)	(0.039)	(0.039)
information*soft	-0.232**	-0.197*				
	(0.097)	(0.104)				
inform*soft*small		-0.112**				
		(0.049)				
concentration	-0.459*	-0.448*	-0.350	-0.713**	-0.248	-0.226
	(0.257)	(0.258)	(0.433)	(0.335)	(0.216)	(0.216)
non-performing loan	-0.258	-0.268	-1.034***	0.257	-0.231	-0.243
	(0.232)	(0.232)	(0.381)	(0.310)	(0.192)	(0.192)
creditor right*enforcing contract	-0.066***	-0.066***	-0.064	-0.044	-0.066***	-0.068***
	(0.025)	(0.025)	(0.041)	(0.033)	(0.021)	(0.021)
foreign bank	-0.360*	-0.385**	-0.477*	-0.198	-0.406**	-0.429***
	(0.187)	(0.187)	(0.253)	(0.290)	(0.163)	(0.164)
bank reform index	-0.148*	-0.143*	-0.101	-0.204*	-0.111*	-0.107*
	(0.076)	(0.076)	(0.112)	(0.107)	(0.063)	(0.063)
debt/asset	0.213*	0.188	0.383**	0.072	0.249**	0.221**
	(0.122)	(0.122)	(0.190)	(0.159)	(0.102)	(0.103)
post-transition	-0.159**	-0.147**	-0.133	-0.197**	-0.207***	-0.195***
	(0.064)	(0.065)	(0.095)	(0.089)	(0.055)	(0.055)
transition	-0.090	-0.082	-0.069	-0.122	-0.164***	-0.152**
	(0.072)	(0.072)	(0.106)	(0.099)	(0.061)	(0.061)
state own	-0.118	-0.128	-0.064	-0.170	-0.126*	-0.132**
	(0.078)	(0.078)	(0.105)	(0.118)	(0.066)	(0.066)
GDP per capita	0.012	0.015	0.035	0.021	-0.007	-0.007
	(0.044)	(0.044)	(0.068)	(0.058)	(0.036)	(0.036)
inflation	-0.204**	-0.206**	-0.128	-0.225**	-0.132*	-0.137*
	(0.087)	(0.087)	(0.140)	(0.114)	(0.072)	(0.072)
inform*managament					-0.021*	-0.008
					(0.012)	(0.013)
inform*management*small						-0.029***
						(0.008)
Number of obs.	3668	3668	1726	1942	5144	5144

Table 7: Cross-section estimation results(probit): *Switching* from the main bank.

Switching is the dependent variable. Overdue shows whether the firm has had to deal with an overdue payment. Stars *, **, ***,indicate significance, at 10, 5 , 1 percent respectively.

variable			
	(1)	(2)	(3)
	switch	switch	switch
	b/se	b/se	b/se
inform	-0.009	-0.083***	-0.001
	(0.021)	(0.030)	(0.033)
overdue*inform		0.097***	
		(0.029)	
overdue*days			0.003***
			(0.001)
concentration	-0.523***	-0.576***	-0.723**
	(0.180)	(0.181)	(0.293)
non performing loan	-0.480**	-0.514***	-1.080***
	(0.188)	(0.191)	(0.325)
creditor right	-0.032***	-0.035***	-0.014
	(0.012)	(0.012)	(0.019)
foreign bank	-0.510***	-0.513***	-0.507*
	(0.178)	(0.179)	(0.260)
banking reform	0.013	0.020	-0.038
	(0.079)	(0.080)	(0.121)
post-transition	-0.176***	-0.168***	-0.058
	(0.057)	(0.057)	(0.086)
transition	-0.139**	-0.150**	-0.138
	(0.063)	(0.063)	(0.094)
state-own	-0.002**	-0.002**	-0.002
	(0.001)	(0.001)	(0.001)
GDP per capita	-0.014	-0.020	-0.013
	(0.036)	(0.036)	(0.057)
inflation	-0.039	-0.025	-0.083
	(0.075)	(0.075)	(0.117)
Number of obs.	4986	4958	1985

Table 8: Cross-section estimation results (Ordered probit): Dependent variable - *Cost of capital*:

Cost of capital equals 4, if cost of finance is reported to be of no obstacle, 3=moderate obstacle, 2= Minor obstacle, 1=No obstacle. The first column is the regression of the total sample, the second column takes only small firms, while the third one takes large firms. Stars *, **, *** indicate significance at 1, 5, 10 percent respectively.

variable	(1) All	(2) Small	(3) Large
information	0.486***	0.513***	0.457***
	(0.048)	(0.059)	(0.081)
information*soft	-1.040***	-1.071***	-1.026***
	(0.079)	(0.097)	(0.140)
concentration	-0.004	0.069	-0.156
	(0.188)	(0.235)	(0.321)
non-performing loan	0.397**	0.591***	0.078
	(0.171)	(0.212)	(0.295)
creditor right*contract enforcement	-0.150***	-0.163***	-0.127***
	(0.017)	(0.021)	(0.029)
foreign bank	0.487***	0.698***	0.073
	(0.149)	(0.180)	(0.267)
bank reform index	0.097	0.094	0.111
	(0.061)	(0.076)	(0.106)
debt/asset	0.006***	0.006***	0.007***
	(0.001)	(0.001)	(0.002)
post-transition	0.017	0.029	-0.074
	(0.047)	(0.074)	(0.070)
transition	0.034	0.078	-0.078
	(0.055)	(0.082)	(0.081)
state own	0.153***	0.102**	0.150**
	(0.040)	(0.052)	(0.069)
GDP per capita	-0.153***	-0.164***	-0.136**
	(0.031)	(0.039)	(0.054)
inflation	0.235***	0.198**	0.349***
	(0.067)	(0.083)	(0.115)
Number of obs.	3906	2581	1325
Pseudo R-Squared	0.05	0.05	0.05

Table 9: Panel estimation results: Dependent variable -*Cost of capital*:

The first column is the fixed effects regression of the total sample, the second column is random effects estimation. The third one takes only small firms (Fixed effects), while the forth one takes large and medium firms (fixed effects). Stars *, **, ***,indicate significance, at 1, 5 ,10 percent respectively

variable	(1) All(FE)	(2) All (RE)	(3) Small(FE)	(4) Large(FE)
information	0.617***	0.286**	0.255**	0.592***
	(0.057)	(0.127)	(0.115)	(0.220)
information*soft	-0.061***	-0.038***	-0.047***	-0.055***
	(0.005)	(0.010)	(0.009)	(0.017)
bank reform	0.024	0.146	0.016	-0.122
	(0.087)	(0.310)	(0.336)	(0.455)
concentration	-0.005***	0.000	0.000	0.000
	(0.002)	(0.000)	(0.000)	(0.000)
non performing loan	-0.001	-0.014**	-0.003	-0.009
	(0.002)	(0.006)	(0.007)	(0.010)
GDP per capita	-0.009	-0.299	1.115*	-0.240
	(0.047)	(0.598)	(0.609)	(0.939)
Inflation	0.001**	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.002)
Foreign bank	-0.000	0.003	-0.002	0.002
	(0.001)	(0.005)	(0.005)	(0.007)
Const.	2.751***	2.389***	2.040**	2.935**
	(0.244)	(0.838)	(0.866)	(1.207)
Number of obs.	1843	1240	1248	595
R-squared	0.08	0.07	0.08	0.06