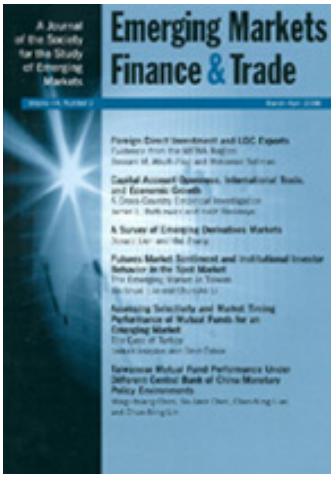

Emerging Markets Finance and Trade
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/mree20

Bank Quality, Loan Demand, and Market Discipline

Zeynep Önder [a] & Süheyla Özyıldırım [b]

[a] Faculty of Business Administration, Bilkent University in Ankara, Turkey

[b] Faculty of Business Administration, Bilkent University

Published online: 10 Dec 2014.

Bank Quality, Loan Demand, and Market Discipline

Zeynep Önder and Süheyla Özyıldırım

ABSTRACT: In this paper, we examine the disciplinary role of borrowers, who are one of the key stakeholders in Turkish banks and are heavily affected when their banks experience difficulty. In the theoretical model, we show that borrowers prefer to have a relationship with less risky banks although it increases their cost of getting funds. Empirically, we examine the relationship between quality of a bank and its loan demand and find that as riskiness of a bank decreases, its loan demand increases significantly, suggesting the disciplinary role of borrowers in Turkey.

KEY WORDS: bank risk, loan demand, market discipline.

Although the 2008–9 global financial crisis blunted faith in market discipline, a major policy issue for almost two decades has been how to reduce the moral hazard problem among banks. Theoretical and empirical studies on market discipline have primarily focused on the role of banks' stakeholders on the liability side and have presented ample evidence of the discipline imposed by holders of large-denomination deposit contracts and subordinated debts.[1] Several other bank stakeholders have incentives to prevent banks from taking excessive risk, but their roles have been ignored in the market discipline literature. In this paper, we study a multiperiod credit relationship between borrowers and banks to determine whether or not borrowers can penalize risky banks.

Borrowers are one of the key stakeholders in banks and are heavily affected when their banks experience difficulty. For example, Slovin et al. (1993) provided empirical evidence of the impact of bank failures on borrowers. They found that firms that borrowed from Continental Illinois National Bank and Trust Company of Chicago in 1984 experienced significant abnormal returns in the stock market during the failure of the bank and its rescue period. Mian and Khwaja (2008) estimated that if the liquidity of a bank declines by 1 percent, its loan amount will decrease by 0.6 percent. The positive effect of having a relationship high-quality lenders on borrowers is also well emphasized in the literature. For example, Chemmanur and Fulghieri (1994) showed that a lending relationship with reputable banks creates positive impressions about the borrowers. Moreover, Billett et al. (1995) documented that credits from high-quality lenders are associated with larger positive stock price reactions than loans from low-quality lenders.

To our knowledge, only two studies have examined the role of borrowers in disciplining banks. Kim et al. (2005) showed that borrowers pay higher interest rates to obtain loans from reputable banks. Their empirical finding that borrowers pay a significantly higher credit spread to well-capitalized banks in Norway suggests that borrowers can induce banks to improve their quality. In a different setting, Allen et al. (2011) found

Zeynep Önder (zonder@bilkent.edu.tr) is an associate professor on the Faculty of Business Administration at Bilkent University in Ankara, Turkey. Süheyla Özyıldırım (suheyla@bilkent.edu.tr) is an associate professor on the Faculty of Business Administration at Bilkent University. The authors thank Selçuk Caner, Robert DeYoung, Giuseppe Marotta, Tarık Kara, Marcel Tyrel, Jos Van Bommel, Ali Kutan, and anonymous referees for their comments and suggestions.

Emerging Markets Finance & Trade / May–June 2014, Vol. 50, No. 3, pp. 61–72.

ISSN 1540–496X (print)/ISSN 1558–0938 (online)
DOI: 10.2753/REE1540-496X500304

that in highly competitive credit markets, borrowers may demand that banks hold more capital than the minimum requirements. By that means, they can create a commitment device for banks to monitor the granted loans.

In this paper, we present a simple model to examine how borrowers can discipline banks, and whether or not they do so. In the model, having a long-term credit relationship with a highly rated bank is shown to be important for the borrower in order to maximize the borrower's expected return from a multiperiod project. A large number of empirical works have documented the various benefits of having a close and durable relationship with a bank. Among these benefits, reliance on a bank that provides liquidity to the borrower whenever needed is emphasized; this type of bank can be identified as the "main" bank of a borrower (see, e.g., Detragiache et al. 2000; Fazzari et al. 1988; Hoshi et al. 1991; Petersen and Rajan 1995; Wang et al. 2012). Although having a main bank provides some benefits, borrowers with a single bank relationship must be prepared for the cost of switching to another lender (Kim et al. 2003; Ongena 1999) or the complete liquidation of their project if the main bank fails. Considering the existence of these costs, we incorporate the health of a bank into the borrower's multiperiod problem. In line with the empirical evidence provided by Kim et al. (2005), our model suggests that borrowers are willing to pay higher interest rates on loans from highly rated or less risky banks. When the optimal behavior of the individual borrowers who received loans from their main bank is aggregated, the theoretical model implies that, all else being equal, an increase in the loan demand from less risky banks will increase the loan rates of those banks. This result can be interpreted as a disciplinary reaction from the asset side of the banks, because the decline in loan demand of risky banks would be an incentive for bank managers to avoid excessive risks.

To test the implication of our theoretical model, we use panel data from Turkish private commercial banks for the period 1988–2000. Turkey is an interesting country for examining market discipline from the asset side because participants from the liability side may have less motivation to influence bank managers' risk-taking behavior, for several reasons. First, during the sample period analyzed in this study, Turkey had generous deposit insurance for household deposits. Explicit deposit insurance was established in 1983 and was expanded to full coverage after the 1994 economic crisis. Although the impact of the crisis was short-lived, the generous deposit insurance was effective until 2004 and undermined the effective disciplinary role of depositors (Önder and Özyıldırım 2008).[2] Second, there were no subordinated debt contracts or large certificates of deposit in the Turkish banking system. Third, the disciplinary role of shareholders is very limited because most of the Turkish banks are controlled by their owners. For example, although fifteen banks were listed on the Istanbul Stock Exchange in 2000, the family members of the owners of these banks are among the major shareholders and members of the board of directors. Hence, the nonfamily shareholders have less incentive and power to influence management, even though they can identify the risk and conditions of their banks. Finally, there are no data on interbank transactions to permit the study of the role of other banks in disciplining their risky counterparts.

Bank loans are an important source of financing for Turkish private firms, even for publicly traded ones. On average, firms' debt ratio was 66 percent; almost one-fourth of their assets were financed by bank loans during the period 1991–2000 (Central Bank of the Republic of Turkey 2001). Hence, borrowers in Turkey may create a credible threat to banks in mitigating their moral hazard behavior in an environment in which other parties have less incentive to react.

We found that borrowers manifest significant reactions to their bank's risk-taking behavior by reducing their loan demand in Turkey. Our empirical results suggest that in an environment in which market participants on the liability side have little incentive to react, stakeholders on the asset side of the balance sheet can prevent banks from taking excessive risks, and hence can reduce the possibility of financial instability.

Theoretical Model

We consider a three-period model in which a risk-neutral borrower has a variable-sized project that lasts for two periods. It is assumed that the borrower does not have enough internal funds to finance this project and seeks a line of credit from a potential financier. The borrower receives L_0 for an initial investment at $t = 0$, and an additional fund L_1 at $t = 1$ to complete the project, yielding a positive value K at $t = 2$. L_0, L_1, and K are assumed to be publicly known at $t = 0$. There is a possibility that the borrower will abandon the project at $t = 1$ stage if the initial and alternative financiers do not provide the necessary fund L_1.[3] Hence, the existence of liquidity risk for borrowers at $t = 1$ might impede the progress of a profitable project, and compel borrowers to monitor the health of the potential financiers from the beginning.

To show this relationship explicitly, we assume that borrowers assess the riskiness of the potential financiers using a procedure similar to credit scoring by banks. More precisely, a borrower calculates a bank score $s \in [\underline{s}, \overline{s}]$ to select the main bank for a long-term borrowing relationship. In the model, this score is used to assess the possible liquidity problem of the bank at $t = 1$. Ultimately, the objective of the borrower is to maximize the expected net return from the project at $t = 2$:

$$\begin{aligned} &\max_{s\in[\underline{s},\overline{s}]} \theta(s)\left\{K-(1+r_i)\left[L_1+(1+r_0(s))L_0\right]\right\} \\ &+\ (1-\theta(s))\psi\left\{K-(1+r_{-i})\left[L_1+(1+r_0(s))L_0\right]\right\} \\ &+\ (1-\theta(s))(1-\psi)\lambda\left\{\nu K-(1+r_0(s))L_0\right\}, \end{aligned} \tag{1}$$

where $\theta(s)$ is the probability that the main financier with score s will not experience any temporary or permanent liquidity problem at $t = 1$; ψ is the probability that the second financier provides further liquidity if the main financier fails at $t = 1$; and $\lambda > 1$ is a compounding factor.

The first term in the objective function is the net return to the borrower at $t = 2$ when the project is completed, with the liquidity provided by the main bank. If funding for the project in both periods is provided by the same financier, the borrower will pay $(1 + r_i)[(1 + r_0)L_0 + L_1]$ at the end of $t = 2$, where $r_0 > 0$ and $r_i > 0$ are the interest rates offered by bank i and accepted by the borrower for $t = 0$ and $t = 1$, respectively. The initial-period interest rate is related to the bank score, $r_0(s)$. It is assumed that each borrower has a reservation price, $r_0(\overline{s})$, at $t = 0$, which would be paid to the safest bank with the highest bank score, $\overline{s}$. Similarly, the borrower pays $r_0(\underline{s})$ to the bank that is considered to be the most risky. The interest rate paid in the later period either to the first bank, r_i, or to another bank, r_{-i}, is assumed for simplicity not to be related to the a priori perceived riskiness of these banks.

The second term in Equation (1) is the expected future return when the funding need of the borrower at the intermediate period $(L_1 + (1 + r_0(s))L_0)$, is received from another bank with probability ψ. The last term in the objective function of the borrower indicates

the terminal value of the liquidated project. If the required liquidity at $t = 1$ cannot be obtained from any other bank in the market, the project is assumed to be liquidated, with a fixed value νK, at $t = 1$.

The first-order condition of the problem described in Equation (1) is

$$\theta'\left\{\left(K - R_i\left[L_1 + R_0L_0\right]\right) - \psi\left(K - R_{-i}\left[L_1 + R_0L_0\right]\right) - (1-\psi)\lambda\left(\nu K - R_0L_0\right)\right\} - r_0'L_0\left\{\theta R_i + (1-\theta)\left[\psi R_{-i} + \lambda(1-\psi)\right]\right\} = 0, \tag{2}$$

where $\theta' = d\theta/ds$, $r_0' = dr_0/ds$ and $R_j = (1 + r_j)$, $j = i, -i$. Under the simplifying assumption that the liquidation value of the project, νK, equals the loan amount due at that period, R_0L_0, we can rewrite Equation (2) as

$$r_0' = \frac{\left(K - R_i\left[L_1 + R_0L_0\right]\right) - \psi\left(K - R_{-i}\left[L_1 + R_0L_0\right]\right)}{L_0\left\{\theta R_i + (1-\theta)\left[\psi R_{-i} + \lambda(1-\psi)\right]\right\}}\theta'. \tag{3}$$

If the main bank has a temporary or a permanent liquidity problem, the loan received from the second bank is assumed to be priced at least equal to the rate offered by the main bank, that is, $r_{-i} = r_i + \varepsilon$, where $\varepsilon \geq 0$.[4] Several explanations can be provided for the increase in financing costs when the main bank changes. First, lenders have more bargaining power if the borrower has to switch to a new bank. Second, in the financial intermediation literature, each lender is assumed to have more information about its borrowers than other potential lenders. Hence, when the main bank fails, borrowers will receive credit with less advantageous terms or will be subject to credit rationing, at least initially (Ongena 1999). Third, searching for a new lender would increase the net cost of financing in case the main bank fails. Fourth, considering the fact that banking shocks might hit more than one bank simultaneously, the borrower might be required to pay a higher interest rate than the locked-in rate, in the case of declining loan supply in the market. Therefore, Equation (3) provides the main implication of the theoretical model:

$$r_0' = \frac{(1-\psi)\left(K - R_i\left[L_1 + R_0L_0\right]\right) + \psi\varepsilon\left[L_1 + R_0L_0\right]}{L_0\left\{\theta R_i + (1-\theta)\left[\psi\left(R_i + \varepsilon\right) + \lambda(1-\psi)\right]\right\}}\theta'. \tag{4}$$

Result. Under perfect information, the borrower who tries to maximize the expected return pays a higher interest rate to the bank that is perceived to be less risky at the outset.

This result follows immediately from Equation (4). If the borrower has a profitable project ($K - R_i[L_1 + R_0(s)L_0] > 0$, and $\theta' > 0$, the interest rate paid at $t = 0$ increases with the bank score ($r_0' > 0$). As the bank score increases, the possibility that the first bank provides liquidity during the interim period increases. To maintain a durable, long-term borrowing relationship, it would be optimal for firms to borrow from banks that are perceived to be less risky at the beginning of the project.[5]

The implication of this result for the disciplining role of borrowers is as follows: A rational borrower prefers to demand credit from banks that are perceived to be of higher quality or to be less risky at the outset and is willing to pay a higher price for the credit extended by these banks.[6] This reaction of borrowers is similar to the market-disciplining behavior of uninsured depositors. In the depositor-discipline literature, it has been hypothesized that uninsured depositors may prefer to deposit in less risky banks by accepting lower interest rates on their deposit accounts (Martinez Peria and Schmukler 2001).

Theoretically, the disciplinary strength of market forces derives from the power of the price system to aggregate information. However, market forces can also raise the cost by restricting the volume of business activities with their banks to deter possible excessive risk taking. Hence, we hypothesize that the borrower, who prefers to have a long-term relationship with one bank, will choose to demand loans from the bank that is perceived to be less risky or of higher quality. When the loan demand of these borrowers is aggregated at the bank level, both loan demand and the lending rate of banks with high quality increases. In the empirical analysis, we estimate the true riskiness of banks by examining publicly available information and test whether borrowers demand more loans from banks with better fundamentals, controlling for loan supply and interest rate.

Empirical Evidence

In our theoretical model, we show that borrowers prefer to have a relationship with less risky banks and are willing to pay higher interest rates to these banks on their multiperiod loan contracts. Unfortunately, the availability of bank level credit data at the bank level rather than at the bank-firm-level restricts the direct estimation of the results of our theoretical model. Thus, to examine the empirical implication of the theoretical model, we aggregate the demand for loans from a single bank and test whether loan demand and bank quality are positively related and, hence, higher interest rates on loans can be a result of a rightward shift of the loan demand curve of less risky banks. If we observe a positive relationship, it implies that borrowers can also discipline risky banks.

More precisely, we follow a simultaneous equation framework with the reduced-form demand and supply functions for commercial bank loans. Following empirical works by Carbó-Valverde et al. (2009), King (1986), Laffont and Garcia (1977), Pazarbaşıoğlu (1997), and Sealey (1979), our loan demand equation is as follows:

$$\begin{aligned}\mathrm{Ln}(L_{it}^{D}) = {} & \alpha_0 + \alpha_1 BS_{it} + \alpha_2 r_{L,it} + \alpha_3 Spread_{L-S,it} + \alpha_4 Growth_t \\ & + \alpha_5 CV(Inflation)_t + \alpha_6 Crisis_t + \alpha_7 \mathrm{Ln}(L_{it-1}) + \varepsilon_{it}.\end{aligned} \tag{5}$$

Based on the results of the theoretical model, it is hypothesized that, all else being equal, real loan demand significantly decreases as the riskiness of a bank (*BS*) increases or the bank score declines. We use various measures from the financial statements of banks as a proxy for bank score. They are similar to CAMEL measures (capital adequacy, asset quality, management, earnings, and liquidity management) and include the capital-to-asset ratio (*CARATIO*), the ratio of nonperforming loans to total loans (*BADLOAN*), the before-tax return on assets (*ROA*), and the liquidity ratio (*LIQUID*). In addition to these ratios, the bank failure probability (*PFAIL*) is also used as a bank score.[7] We assume that borrowers can appropriately assess the bank's risk from publicly available financial statements.

The real interest rate on loans charged by bank i at time t, $r_{L,it}$, is included in the model specified in Equation (5). The ratio of total interest income on credits to the average credits of bank i in year t is used to calculate the implicit interest rate on loans. Several other variables that might affect the demand for bank loans are controlled in the model. The difference between the implicit interest rate on loans and the return in the stock market, $Spread_{L-S}$, and output growth, $Growth_t$, measured with the growth rate in real GDP, are included in the model. Uncertainty in the economy is measured by the coefficient of the variation of the monthly inflation rate over the year t, $CV(Inflation_t)$. A crisis-period dummy variable, $Crisis_t$, which takes a value of one for 1991, 1994, and 2000, is used to

control for the effects of financial and economic crises on the loan market. The lagged dependent variable, L_{it-1}, is included in the model because it might be a good proxy for omitted variables.

The loan supply by bank i, L_{it}^{S}, is specified as follows:

$$\begin{aligned}\mathrm{Ln}(L_{it}^{S}) = {} & \beta_0 + \beta_1 BS_{it} + \beta_2 r_{L,it} + \beta_3 r_{L,it}^2 + \beta_4 \mathrm{Ln}(Deposits)_{it} + \beta_5 Spread_{L-D,it} \\ & + \beta_6 Spread_{L-TB,it} + \beta_7 Crisis_t + \beta_8 CV(Inflation_t) + \beta_9 \mathrm{Ln}(L_{it-1}) + \varepsilon_{it}.\end{aligned} \tag{6}$$

To allow for the possibility of credit rationing, we include the squared lending interest rate, r_L^2, in our loan supply model. The availability of funds is measured by the natural logarithm of the real deposits, Ln(*Deposit*). The measure of bank score, *BS*, is included in the model to control for any impact of bank characteristics on supply decision. $Spread_{L-D}$, the difference between the real interest rates on loans and deposits, is used as a proxy for default risk of borrowers (see Agénor et al. 2004) or as a proxy for interest rate volatility (Saunders and Schumacher 2000). The difference between the interest rate on loans and the interest rate on T-bills, $Spread_{L-TB}$, is taken as an opportunity cost of providing credits by banks; as Özkan et al. (2010) mentioned, holding government securities is a safer investment alternative for banks in emerging economies. The coefficient of variation of the monthly inflation rate, *CV*(*Inflation*), and a crisis dummy variable, *Crisis,* as proxies for economic uncertainty are also included in the loan supply equation. Both variables are expected to have negative effects on the loan provisions by Turkish banks because Rhoades and Güner (2003) showed that economic uncertainty, proxied by unanticipated inflation, has negative significant effects on both loan demand and supply in the Turkish banking system.

We assume that the loan market is in disequilibrium to capture the effect of credit rationing (Sealey 1979). Hence, the observed loan, L_{it}, is actually either the amount demanded by the borrowers or the amount supplied by bank i at time t, whichever is the minimum amount. In other words, it is assumed that the short side of the market might prevail during imperfect price adjustments. In the empirical analysis, the disequilibria are assumed to be demand driven (see Moore 1988), and the change in the loan rate is related to the amount of excess demand. The parameters of loan demand and supply models are estimated using full information maximum likelihood (FIML) estimation, as proposed by Maddala and Nelson (1974).[8]

The Case for Turkey

To study the existence of market discipline from the asset side of banks' balance sheets, the empirical models described in Equations (5) and (6) are tested for Turkish private (domestic and foreign) commercial banks for the period 1988–2000.[9] The descriptive statistics of the bank risk measures used in the analysis are reported in Table 1. The average predicted probability of failure (*PFAIL*) is 7.89 percent, which indicates that, on average, Turkish banks were very risky in the sample period. An abnormally high mean and standard deviation of the predicted riskiness of banks can be explained partly by the 2000 banking crisis in Turkey. The average capital-to-asset ratio and liquidity seem to be more than adequate. Moreover, private commercial banks in Turkey are, on average, profitable but have a notable amount of bad loans. Overall, the volatility of bank quality among banks provides an ideal setting for examining borrowers' reactions to bank quality or risk.

The empirical estimates of the disequilibrium loan demand model are presented in Table 2. As the predicted insolvency probability of a bank (*PFAIL*) increases, loan demand

Table 1. Descriptive statistics of bank scores (BS), 1988–2000

	Mean	Standard deviation	Minimum	Maximum
PFAIL	0.0789	0.1760	0.0000	0.9999
CARATIO	0.1483	0.1567	–1.2245	0.6025
LIQUID	0.6414	0.1394	0.0267	1.0144
ROA	0.0138	0.1536	–1.4494	0.3034
BADLOAN	0.1182	0.5648	0.0000	9.1194

Table 2. FIML estimates assuming disequilibrium in the credit market (dependent variable is loan demand, Ln(L^D))

	PFAIL	***CARATIO***	***ROA***	***LIQUID***	***BADLOAN***
Intercept	0.2841***	0.1989***	0.2158***	0.0893	0.2551***
	(0.0638)	(0.0609)	(0.0592)	(0.1378)	(0.0596)
PFAIL	–0.5156***				
	(0.1597)				
CARATIO		0.1047			
		(0.1601)			
ROA			0.3748**		
			(0.1639)		
LIQUID				0.1845	
				(0.1987)	
BADLOAN					–0.1774***
					(0.0433)
r_L	–1.2925***	–1.4673***	–1.4214***	–1.2967***	–1.1801***
	(0.2984)	(0.2733)	(0.2807)	(0.3029)	(0.2814)
$Spread_{L-S}$	0.0101	0.0150	0.0121	0.0176	0.0199
	(0.0139)	(0.0132)	(0.0129)	(0.0124)	(0.0130)
CV(*Inflation*)	–1.3244***	–1.2281***	–1.2483***	–1.0372***	–1.1313***
	(0.3275)	(0.3232)	(0.3229)	(0.3489)	(0.3233)
Crisis	–0.2074***	–0.2615***	–0.2487***	–0.2796***	–0.2468***
	(0.0666)	(0.0666)	(0.0661)	(0.0674)	(0.0654)
Growth	0.2362	0.4099*	0.3595	0.2313	0.2573
	(0.2274)	(0.2289)	(0.2207)	(0.1886)	(0.1978)
$\text{Ln}(L_{t-1})$	0.9062***	0.9064***	0.9066***	0.9205***	0.9157***
	(0.0151)	(0.0158)	(0.0152)	(0.0168)	(0.0153)
ϕ	0.8059***	0.7510***	0.7483***	0.7238***	0.7405***
	(0.2331)	(0.2241)	(0.2275)	(0.2539)	(0.2349)
N	362	364	364	349	349

Notes: This table reports the results of the full information maximum likelihood (FIML) estimates, which test whether or not riskiness of a bank affects its loan demand, assuming that the credit market is in disequilibrium. ϕ indicates the market adjustment parameter. Unbalanced panel data are used in the estimations. The numbers in parentheses are standard errors. * Statistical significance at the 10 percent level; ** statistical significance at the 5 percent level; *** statistical significance at the 1 percent level.

from that bank declines significantly. The other bank risk measures have similar effects on loan demand, confirming the implication of the theoretical model. More precisely, borrowers increase their loan demand from banks that improve their capitalization,

liquidity, profitability, and asset quality. Except for the capital-to-asset ratio and liquidity measures, coefficients on all of the bank risk measures are significant. Hence, a rise in profitability and a decline in nonperforming loans significantly increase borrowers' loan demands from those banks. These findings suggest that, because firms prefer to borrow from sound banks, risky banks should improve their balance sheets.[10] In general, the coefficients on the other variables in the demand equations are consistent with expectations. The coefficients on excess demand, φ, are found to be positive and differ significantly from zero in all models. They indicate that there exists price adjustment in the loan market in response to excess demand.[11]

Conclusion

In this paper, we theoretically and empirically study how borrowers react to banks' riskiness. In the theoretical model, we show that borrowers choose to have relationships with banks perceived to be less risky and pay high interest rates to these banks in order to minimize possible liquidity problems in the interim stages of their long-term projects. We empirically test the implication of the result of our theoretical model for Turkish banks. It is hypothesized that borrowers can punish those banks with deteriorating fundamentals by reducing their loan demand. The empirical test of this hypothesis during the period 1988–2000 shows that, as the riskiness of a bank increases, its loan demand declines significantly. In particular, it is found that probability of failure, profitability, and asset quality significantly affect the loan demand of borrowers.

The results of this study have several policy implications. First, our findings support the importance of increased transparency and disclosure of financial institutions, as emphasized by the revised version of the Basel accord in 2004. By observing the financial statements of banks, borrowers can predict the riskiness of their banks. Second, a capital-to-asset ratio calculated from book values is not adequate to identify bank riskiness, so a better measurement of bank capitalization is necessary. Third, regulators should emphasize the monitoring of large banks, because borrowers do not have much power to discipline them against moral hazard behavior. Finally, in markets with generous deposit insurance, stakeholders on the liability side, such as depositors, have lower incentive to discipline banks. Hence, the reactions of other market players, such as borrowers and other stakeholders, must be encouraged in order to lower both riskiness of the banking system and instability in the economy.

Notes

1. In the literature, there is evidence of depositor discipline from both developed and developing countries. Flannery (1998), Flannery and Sorescu (1996), Goldberg and Hudgins (2002), and Park and Peristiani (1998) are examples from developed countries. As evidenced from developing countries, depositors disciplined banks by withdrawing deposits and requiring higher interest rates in Argentina, Chile, and Mexico during the 1980s and 1990s (Martinez Peria and Schmukler 2001). Russian depositors also disciplined riskier banks by requiring higher interest rates (Peresetsky 2008), even for the period where there was deposit insurance. It is also documented that deposit rates are viewed by depositors as a proxy for unobservable risk by depositors (Karas et al. 2010).

2. It is well documented that deposit insurance increases the likelihood of banking crises and reduces the effectiveness of depositor discipline. For example, Demirgüç-Kunt and Detragiache (2002) provided evidence for a sample of sixty-one countries in the period 1980–97. Peresetsky et al. (2007) reported that banks increased their risk with the introduction of deposit insurance in Russia. Moreover, Karas et al. (2010) found that the introduction of deposit insurance programs in Russia reduced the relative sensitivity of households to bank capitalization.

3. For example, Diamond and Rajan (2001) argued that the possibility of better investment opportunities emerging in the interim stages of long-run loans may limit the willingness of financiers to lend the full amount of the loan at the beginning or in the middle of a project. Furthermore, some external factors, such as unanticipated monetary shocks, speculative bank runs, and exchange rate volatility, may cause the initial financier to refuse the necessary funds at $t = 1$.

In a dynamic, entrepreneurial, moral hazard model, Holmstrom and Tirole (1998) showed that borrowers may face liquidity risk at the interim stage of their project, which necessitates the arrangement of a line of credit for their projects. However, they argued that a firm might face a liquidity shock, due to a wedge between the full value of the firm and the external value of the firm, over the investment period.

4. The possibility that a borrower might be willing to change to a new lender because of the decline in interest rates is ignored in order to simplify the model.

5. In a similar line of research, Kim et al. (2005) showed that the interest rate asked for by a high-quality bank will be higher than the interest rates offered by other banks. Allen et al. (2011), however, argued that higher loan rates do not work, because the borrower would be negatively affected by higher loan rates with the increase in the probability of default. High-interest-paying borrowers may benefit from the increased monitoring efforts of banks and their contribution to borrowers' performance (Besanko and Kanatas 1993).

6. Allen et al. (2011) argued that borrowers prefer banks that charge lower interest rates; otherwise, there might be a moral hazard problem. Moreover, a higher lending rate may reduce demand for loans by other firms. Unfortunately, we do not have data on loan rates offered by banks at the borrower level to test whether firms default more when they borrow from banks that charge a higher loan rate or they withdraw their loan applications due to higher lending rates.

7. It is estimated using a logit model in which various observed characteristics of the bank and the state of the economy are employed as explanatory variables, including bank size, capital-to-asset ratio, nonperforming loans-to-capital ratio, liquid assets-to-total deposits ratio, short-term credits-to-assets ratio, return to assets, expense ratio, spread between imputed interest rates on loans and deposits, credit growth rate of a bank, industrial production growth rate, and crisis dummy variable.

8. Maddala and Nelson (1974) showed that in the absence of any information concerning the price adjustment process, and assuming that the errors are normally distributed random variables, the model itself will determine which observation belongs to the demand and which to the supply equation. Furthermore, under the assumption of normally distributed error terms, FIML is an efficient estimator.

9. The beginning of this period is determined by the electronic availability of bank data. We ended our sample period in 2000 because the new supervisory authority, the Banking Regulation and Supervision Agency, was established in August 2000 to regulate the banking sector. Because of the establishment, failure, and merger of some banks, the number of banks included in the sample changes every year. The sample starts with twenty-five banks in 1988 and ends with thirty-six banks in 2000.

10. We also classify banks as large and small using their asset size and test our hypothesis for these banks. The declining loan demand of risky banks is observed for small banks but not for large banks.

11. Disequilibrium loan supply estimations with different bank risk measures are presented in the Appendix. The findings from the supply side of the loan market are mostly in line with our expectations. Interest rate on loans and their supply are found to be positively related. When the risk of a bank increases, the bank is found to supply fewer loans. The coefficients on only four measures, *PFAIL*, *ROA*, *LIQUID*, and *BADLOAN*, are found to be significant.

References

Agénor, P.R.; J. Aizenman; and A.W. Hoffmeister. 2004. "The Credit Crunch in East Asia: What Can Excess Liquid Assets Tell Us?" *Journal of International Money and Finance* 23, no. 1: 27–49.

Allen, F.; E. Carletti; and R. Marquez. 2011. "Credit Market Competition and Capital Regulation." *Review of Financial Studies* 24, no. 4: 983–1018.

Besanko, D., and G. Kanatas. 1993. "Credit Market Equilibrium with Bank Monitoring and Moral Hazard." *Review of Financial Studies* 6, no. 1: 213–232.

Billett, M.T.; M.J. Flannery; and J.A. Garfinkel. 1995. "The Effect of Lender Identity on a Borrowing Firm's Equity Return." *Journal of Finance* 50, no. 2: 699–718.
Carbó-Valverde, S.; F. Rodriguez-Fernandez; and G.F. Udell. 2009. "Bank Market Power and SME Financing Constraints." *Review of Finance* 13, no. 2: 309–340.
Central Bank of the Republic of Turkey. 2001. "Sectorial Balance Sheet." Ankara.
Chemmanur, T.J., and P. Fulghieri. 1994. "Reputation, Renegotiation, and the Choice Between Bank Loans and Publicly Traded Debt." *Review of Financial Studies* 7, no. 3: 475–506.
Demirgüç-Kunt, A., and E. Detragiache. 2002. "Does Deposit Insurance Increase Banking System Stability? An Empirical Investigation." *Journal of Monetary Economics* 49, no. 7: 1373–1406.
Detragiache, E.; P. Garella; and L. Guiso. 2000. "Multiple Versus Single Banking Relationships: Theory and Evidence." *Journal of Finance* 55, no. 3: 1133–1161.
Diamond, D.W., and R.G. Rajan. 2001. "Liquidity Risk, Liquidity Creation, and Financial Fragility: A Theory of Banking." *Journal of Political Economy* 109, no. 2: 287–327.
Fazzari, S.M.; R.G. Hubbard; and B.C. Petersen. 1988. "Financing Constraints and Corporate Investment." *Brookings Papers on Economic Activity* 1: 141–195.
Flannery, M.J. 1998. "Using Market Information in Prudential Bank Supervision: A Review of the U.S. Empirical Evidence." *Journal of Money, Credit and Banking* 30, no. 3: 273–305.
Flannery, M.J., and S.M. Sorescu. 1996. "Evidence of Bank Market Discipline in Subordinated Debenture Yields: 1983–1991." *Journal of Finance* 51, no. 4: 1347–1377.
Goldberg, L.G., and S.C. Hudgins. 2002. "Depositor Discipline and Changing Strategies for Regulating Thrift Institutions." *Journal of Financial Economics* 63, no. 6: 263–274.
Holmstrom, B., and J. Tirole. 1998. "Private and Public Supply of Liquidity." *Journal of Political Economy* 106, no. 1: 1–40.
Hoshi, T.; A. Kashyap; and D. Scharfstein. 1991. "Corporate Structure, Liquidity, and Investment: Evidence from Japanese Industrial Groups." *Quarterly Journal of Economics* 106, no. 1: 33–60.
Karas, A.; W. Pyle; and K. Schoors. 2010. "The Effects of Deposit Insurance on Market Discipline: Evidence from a Natural Experiment on Deposit Flows." BOFIT Discussion Paper no. 8/2010, Bank of Finland Institute for Economies in Transition, Helsinki.
Kim, M.; D. Kliger; and B. Vale. 2003. "Estimating Switching Costs: The Case of Banking." *Journal of Financial Intermediation* 12, no. 1: 25–56.
Kim, M.; E.G. Kristiansen; and B. Vale. 2005. "Endogenous Product Differentiation in Credit Markets: What Do Borrowers Pay For?" *Journal of Banking and Finance* 29, no. 3: 681–699.
King, S.R. 1986. "Monetary Transmission: Through Bank Loans or Bank Liabilities." *Journal of Money, Credit and Banking* 18, no. 3: 290–303.
Laffont, J.J., and R. Garcia. 1977. "Disequilibrium Econometrics for Business Loans." *Econometrica* 45, no. 5: 1187–1204.
Maddala, G.S., and F.D. Nelson. 1974. "Maximum Likelihood Methods for Models of Markets in Disequilibrium." *Econometrica* 42, no. 6: 1013–1130.
Martinez Peria, M.S., and S.L. Schmukler. 2001. "Do Depositors Punish Banks for Bad Behavior? Market Discipline, Deposit Insurance and Banking Crises." *Journal of Finance* 56, no. 3: 1029–1051.
Mian, A., and A.I. Khwaja. 2008. "Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market." *American Economic Review* 98, no. 4: 1413–1442.
Moore, B.J. 1988. *Horizontalists and Verticalists: The Macroeconomics of Credit Money.* Cambridge: Cambridge University Press.
Önder, Z., and S. Özyıldırım. 2008. "Market Reaction to Risky Banks: Did Generous Deposit Guarantee Change It?" *World Development* 36, no. 8: 1415–1435.
Ongena, S. 1999. "Lending Relationship, Bank Default and Economic Activity." *International Journal of the Economics of Business* 6, no. 2: 257–280.
Özkan, F.G.; A. Kipici; and M. Ismihan. 2010. "The Banking Sector, Government Bonds, and Financial Intermediation: The Case of Emerging Market Countries." *Emerging Markets Finance & Trade* 46, no. 4 (July–August): 55–70.
Park, S., and S. Peristiani. 1998. "Market Discipline by Thrift Depositors." *Journal of Money, Credit and Banking* 30, no. 3: 347–364.

Pazarbaşıoğlu, C. 1997. "A Credit Crunch? Finland in the Aftermath of the Banking Crisis." *IMF Staff Papers* 44, no. 3: 315–327.
Peresetsky, A.A. 2008. "Market Discipline and Deposit Insurance in Russia." BOFIT Discussion Paper14/2008, Bank of Finland Institute for Economies in Transition, Helsinki.
Peresetsky, A.A.; A.M. Karminsky; and S.V. Golovan. 2007. "Russian Banks' Private Deposit Interest Rates and Market Discipline." BOFIT Discussion Paper 2/2007, Bank of Finland Institute for Economies in Transition, Helsinki.
Petersen, M.A., and R.G. Rajan. 1995. "The Effect of Credit Market Competition on Lending Relationships." *Quarterly Journal of Economics* 110, no. 2: 407–443.
Rhoades, S.D., and Z.N. Güner. 2003. "Economic Uncertainty and Credit Crunch: Evidence from an Emerging Market." *Emerging Markets Finance & Trade* 39, no. 4 (July–August): 5–23.
Saunders, A., and L. Schumacher. 2000. "The Determinants of Bank Interest Rate Margins: An International Study." *Journal of International Money and Finance* 19, no. 6: 813–832.
Sealey, C.W., Jr. 1979. "Credit Rationing in the Commercial Loan Market: Estimates of a Structural Model Under Conditions of Disequilibrium." *Journal of Finance* 34, no. 3: 689–702.
Slovin, M.B.; M.E. Sushka; and J.A. Polonchek. 1993. "The Value of Bank Durability: Borrowers as Bank Stakeholders." *Journal of Finance* 48: 247–266.
Wang, C.Y.; Cheng, H.L.; and Chang, Y.H. 2012. "A Question of Loyalty: Bank-Firm Relationships in Taiwan." *Emerging Markets Finance & Trade* 48, supp. 3: 190–201.

Appendix

Table A1. FIML estimates assuming disequilibrium in the credit market (dependent variable is Loan Supply, Ln(L^s))

	PFAIL	CARATIO	ROA	LIQUID	BADLOAN
Intercept	0.6980***	0.5543***	0.5830***	0.2860*	0.5734***
	(0.1128)	(0.1030)	(0.1025)	(0.1685)	(0.0983)
PFAIL	–0.8125***				
	(0.1769)				
CARATIO		0.2372			
		(0.1671)			
ROA			0.5963***		
			(0.1689)		
LIQUID				0.3316*	
				(0.1952)	
BADLOAN					–0.2229***
					(0.0455)
r_L	1.3917**	0.9743*	0.9923*	0.8147	1.0812**
	(0.5779)	(0.5399)	(0.5333)	(0.5266)	(0.5284)
r_L^2	2.3486***	2.0780***	2.0270***	1.8091***	2.0225***
	(0.6992)	(0.6386)	(0.6290)	(0.6564)	(0.6644)
$Spread_{L-D}$	–1.3190***	–1.2311***	–1.2434***	–0.9062***	–0.9451***
	(0.4027)	(0.3864)	(0.3925)	(0.3385)	(0.3237)
$Spread_{L-TB}$	–0.5215***	–0.5535***	–0.5134***	–0.4688***	–0.5142***
	(0.1580)	(0.1699)	(0.1602)	(0.1699)	(0.1682)
Ln(*Deposits*)	–0.0074	–0.0163	–0.0104	–0.0265*	–0.0256*
	(0.0132)	(0.0132)	(0.0123)	(0.0142)	(0.0140)
CV(*Inflation*)	–1.8517***	–1.8674***	–1.7997***	–1.4565***	–1.6883***
	(0.4394)	(0.4572)	(0.4383)	(0.4619)	(0.4525)
Crisis	–0.1986***	–0.2674***	–0.2524***	–0.2912***	–0.2487***
	(0.0714)	(0.0690)	(0.0681)	(0.0684)	(0.0684)
Ln(L_{t-1})	0.9215***	0.9297***	0.9228***	0.9546***	0.9458***
	(0.0197)	(0.0203)	(0.0191)	(0.0214)	(0.0206)

Notes: This table reports the results of the full information maximum likelihood (FIML) estimates, which test whether or not riskiness of a bank affects its loan demand, assuming that the credit market is in equilibrium. Unbalanced panel data are used in the estimations. The numbers in parentheses are standard errors. * Statistical significance at the 10 percent level; ** statistical significance at the 5 percent level; *** statistical significance at the 1 percent level.