The Marketability of Bank Assets and Managerial Rents: Implications for Financial Stability*

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Abstract

Ongoing financial innovation and greater information availability increase the tradability of bank assets and reduce banks' dependence on individual bank managers as private information in the lending process declines. In this paper we argue that this has two effects on banks, with opposing implications for banking stability. First, the hold-up problem between bank managers and shareholders becomes less severe. Consequently, banks' capital structure needs to be less concerned with disciplining the management. Deposits -the most effective disciplining device- can be reduced, increasing banks' resilience to adverse return shocks. However, limiting the hold-up problem also diminishes bank managers' rents, reducing their incentives to properly monitor and screen borrowers, with adverse implications for asset quality. Thus, even though the improved marketability of bank assets allows banks to adopt a safer capital structure, the default risk of banks does not necessarily decline.

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1 Introduction

A main determinant of banks' capital structure is the need to mitigate the hold-up problem between bank managers and banks' financiers.[1] The problem arises because bank managers accumulate specific knowledge in the lending process which is valuable for the bank. By threatening to quit and renegotiating their compensation, managers can extract a part of their value added. This reduces the willingness of financiers to provide funds to the bank and may lead to worthwhile projects not being undertaken.

Demandable deposits from multiple investors allow the hold-up problem to be reduced. Any attempt to renegotiate with depositors would immediately trigger a bank run, as depositors fear a reduction in their repayments. However, in contrast to equity, deposit financing runs the risk of inefficient liquidations, because it causes runs when bad luck leads to asset returns that are insufficient to repay deposits in full. The optimal capital structure trades off these two effects.

In recent decades, new technologies have significantly improved the availability of firm-specific information. This has reduced private information in relationship lending. The emergence of credit derivatives, in particular, has led to the accurate pricing of credit risks on a variety of exposures. Hence, the specific knowledge that bank managers accumulate in the lending process provides less of an advantage over investors who are not closely involved in the lending. At the same time, greater information availability and financial innovations have boosted securitization, such as through asset-backed securities and collateralized loan obligations. As a result, the tradability of bank credit has increased. Taken together, these changes in the financial system have improved the value of bank assets to outsiders. Therefore, managers' ability to take advantage of their acquired knowledge has fallen.

Consequently, there is less need for adopting a fragile capital structure in order to discipline the management. This is consistent with the decline in the importance of demandable deposit financing in recent years. For example, their share of total liabilities at U.S. commercial banks has fallen from 21% to 8% over the last 15 years. The resilience of banks to adverse return shocks should, therefore, improve.

However, bank managers' rents also serve as an incentive device for providing effort in

[1] This argument is central to recent theories of banking, see, for example, Calomiris and Kahn (1991), Flannery (1994) and Diamond and Rajan (2000).

the monitoring and screening of borrowers. The improved marketability of bank assets, and the resulting mitigation of the hold-up problem, reduce this rent. Due to the very reason for the existence of the hold-up problem -the difficulty of verifying managerial performance in banks- this reduction cannot be easily offset through explicit compensation schemes, such as equity or options. Managerial incentives for achieving high returns may decline, with the consequence that the quality of bank assets deteriorates. This undermines banking stability.

Taking these effects together, this paper argues that even though the improved marketability of bank assets might cause banks to adopt a safer capital structure, the stability of the banking sector is not necessarily enhanced, and may even decline. This is because better marketability also undermines managerial incentives and may thus lead to a deterioration in banks' asset quality, with adverse consequences for bank risk. The worsening of the incentives also has a negative effect on the overall attractiveness of bank financing, as their *raison d'être* is the ability to monitor and screen borrowers.

In the remainder of this section, we briefly discuss related literature. In the next section we present a model where banks optimally use deposits to mitigate a renegotiation problem and where asset quality depends on managerial effort. In Section 3 we carry out a comparative static analysis for changes in the marketability of bank assets. Conclusions follow.

1.1 Related literature

The analysis is based on recent banking theory which has emphasized the difficulty of disciplining bank managers and the merits of deposits in alleviating the ensuing problems. Although disciplining managers is an issue for all companies, the problem is thought to be more pronounced in the banking context because the private information contained in bank loans makes common compensation schemes, such as options, less effective. Calomiris and Kahn (1991) show that demandable deposits can be used to mitigate incentive problems by providing informed investors with an incentive to monitor bank managers. In Flannery (1994), short-term debt requires banks to come regularly to the market to raise funds and thus has a disciplining effort on managerial behavior. Our setup is most closely based on Diamond and Rajan (2000, 2001a, 2001b) who have developed a framework where deposits reduce managerial rents. As in the present paper, these

rents arise from bank managers' ability to use their specific knowledge to renegotiate their compensation.

Our argument that an improvement in the hold-up problem may have adverse incentive effects relates to contributions which, following Grossman and Hart (1984), have shown that the ex-post allocation of property rights affects incentives ex-ante. In an application to the bank-firm relationship, Rajan (1992) shows that due to the information gained in the financing process, a bank can ex-post threat to liquidate even good projects in order to extract the surplus from the entrepreneur. As this is anticipated, entrepreneurial incentives are worsened (in contrast to the present paper, improvements in information availability would be beneficial in Rajan's setting, as it makes it easier for a firm to switch to other sources of financing if faced with the bank's liquidation threat). A related argument is made in the context of equity financing by Burkhart, Gromb and Panunzi (1997), who argue that creating ownership structures which exercise tight control over managers may be detrimental, by reducing managers' initiative.

Typically, a decline in the private information contained in bank loans and the resulting improvement in the liquidity of bank assets are viewed as beneficial (for example, because they allow for better diversification at banks). Nevertheless, several studies have also pointed to potential costs. In Myers and Rajan (1995), asset liquidity is undesirable as it increases the manager's ability to trade assets against the interest of the owners. Cordella and Yeyati (1998) show that when investors are less informed about bank assets, banks may be more stable because interest rates are then less sensitive in risky states. Wagner (forthcoming) shows that the relative illiquidity of bank assets has beneficial effects as it increases the costs of selling assets in a crisis and thus makes shareholders more averse to bank failure. The present paper differs from these contributions in that adverse effects from an improved liquidity arise through its impact on bank managers' incentives for achieving high returns.[2]

[2]Our paper also relates to the discussion on information disclosure and transparency as both should increase the marketability of assets. For example, in Chen and Hasan (2006), higher transparency of banks can also reduce welfare by increasing the chance of contagious runs.

2 The model

The economy lasts for two periods ($t = 1, 2$) and there are two types of agents: bank managers and investors. All agents are risk neutral and only care about consumption in period 2.

Bank managers have no initial endowment but each of them has access to an investment project. This investment project requires a fixed investment of \$1 in $t = 1$ and matures in $t = 2$. If a bank manager makes the effort to monitor the project ($e = 1$) and completes the project, the date 2 return of the project $\tilde{c}$ is uniformly distributed in $[c_{\min}, c_{\max}]$ ($c_{\max} > c_{\min}$) and hence has a density of $\phi(\widetilde{c}) = 1/(c_{\max} - c_{\min}) = \phi$. If he does not make the effort to monitor ($e = 0$), the project's return upon completion is lowered by $\Delta c > 0$, i.e., $\tilde{c}$ is uniformly distributed in $[c_{\min} - \Delta c, c_{\max} - \Delta c]$. Exercising the effort causes a fixed disutility $G > 0$ to the manager. We assume that effort is worthwhile, i.e.

$$\Delta c > G \tag{1}$$

Effort is taken as unobservable and is hence not contractible.

Investors are each endowed with one unit of funds in $t = 1$. They are inferior users of the project. Hence, if they complete the project they can only extract a fraction β ($0 \leq \beta < 1$) of its return $\tilde{c}$ in $t = 2$. If, for whatever reason, they force the premature liquidation of the project (i.e., the project is not completed), the project's value is Γ with $\Gamma < \beta(c_{\min} - \Delta c)$ (i.e., the value of the project always falls if it is prematurely liquidated).

We assume that funds are scarce, that is there are more bank managers than entrepreneurs in the economy. This implies that, in order to have a chance of being financed, bank managers have to promise the maximum possible return to investors in $t = 2$. However, their ability to do so credibly is limited because the project's return $\tilde{c}$ can not be verified.

The uncertainty about the project's return ($\tilde{c}$) is revealed at the beginning of date 2. Afterwards (and before completion of the project), a hold-up problem arises because a bank's manager can threaten to withdraw from the project. Suppose that the bank is fully financed by equity. Assuming that he has full bargaining power, the bank manager can then negotiate down any initial claim equity may have to $\beta\widetilde{c}$, as this is equity's outside option from replacing the banker and completing the project itself. Hence, for a given effort choice e ($e = 0, 1$), the maximum return $W(e)$ that the bank manager can pledge

to investors is only

$$W(e) = \int_{c_{\min}(e)}^{c_{\max}(e)} \beta c \phi dc \tag{2}$$

where $c_{\min}(0) := c_{\min} - \Delta c$, $c_{\max}(0) := c_{\max} - \Delta c$ and $c_{\min}(1) := c_{\min}$, $c_{\max}(1) := c_{\max}$.

Demandable deposits can solve this renegotiation problem. Because a depositor can reclaim his deposits at face value by withdrawing immediately, any incentive to enter into renegotiations is eliminated. Moreover, a depositor must fear that others will withdraw instead of participating in the renegotiation so that he can no longer be paid in full. Thus, trying to renegotiate with depositors immediately triggers a run, causing the liquidation of the investment project and leaving the bank manager with no return. Deposit financing thus allows the bank manager to refrain credibly from renegotiating and to commit to pay out depositors in full, if feasible. As a result, the bank's pledgeable return increases.

However, deposits also entail costs because they cause a run when the project's return is low and depositors cannot be paid in full. Thus, there is a trade-off. On the one hand, increasing deposits implies higher payouts to investors for when returns are sufficiently high to repay depositors. On the other hand, a higher level of deposits raises the probability that the bank cannot meet the promised repayment to depositors. Since the resulting run causes liquidation of the project, this reduces investors' return.

More formally, if the bank manager promises a repayment D on deposits, depositors can be paid in full if $D \leq \tilde{c}$. If $D > \tilde{c}$, they can only realize the liquidation value Γ because there is then a run. Hence, the pledgeable return in a deposit financed bank is

$$W(e) = \int_{c_{\min(e)}}^{D} \Gamma \phi dc + \int_{D}^{c_{\max}(e)} D \phi dc \tag{3}$$

The optimal choice of financing (in terms of maximizing the pledgeable income) will generally entail both deposits and equity. This is because raising equity besides deposits is beneficial for when there are high realizations of $\widetilde{c}$. Equity's threat from completing the project itself may then exceed the level of deposits, allowing further payments to be extracted from the bank manager. The pledgeable return from a mixed capital structure with a level of deposits D is hence

$$W(e) = \int_{c_{\min}(e)}^{D} \Gamma \phi dc + \int_{D}^{D/\beta} D \phi dc + \int_{D/\beta}^{c_{\max}(e)} \beta c \phi dc \tag{4}$$

where the difference to (3) arises because when $\widetilde{c} > D/\beta$, equity's threat $\beta\widetilde{c}$ is larger than the level of deposits D. In these cases, the bank manager can be forced to pay out $\beta\widetilde{c} > D$ to investors (of which D will go to depositors and $\beta\widetilde{c} - D$ to equity).

The timing in our economy can be summarized as follows

t=1:

1. Capital structure is chosen
2. Bank manager chooses effort

t=2:

1. Uncertainty about project's return ($\widetilde{c}$) is revealed
2. Bank manager renegotiates and bank owners may decide to run the project themselves
3. Depositors and equity are paid; if depositors cannot be repaid, there is a run and the project is liquidated
4. Project matures if it has not been liquidated before

Since bank managers are in competition for funds, they have to choose the capital structure which maximizes the pledgeable return to investors, because otherwise their chances of obtaining financing are zero. Hence, bank managers set D in (4) in order to maximize $W(e)$. Solving the FOC wrt. D, it follows that the equilibrium level of deposits D^* fulfills

$$\int_{D}^{D/\beta} \phi dc = (D - \Gamma)\phi \tag{5}$$

Rearranging, this yields

$$D^* = \frac{\Gamma}{2 - 1/\beta} \tag{6}$$

We restrict the subsequent analysis to cases where banks optimally choose a risky capital structure. This is the case when $D^* > c_{\min}(e)$, implying that for sufficiently low return realizations there will be bank runs. Furthermore, we also require banks to raise some funds through equity. Therefore, we assume $\beta c_{max}(e) > D^*$, i.e., for the highest return realization equity's threat exceeds the level of deposits. Using (6) these conditions can written as

$$\frac{1}{2 - \Gamma/c_{\min}(e)} > \beta > \frac{\Gamma/c_{\max}(e) + 1}{2} \tag{7}$$

Consequently we have

Lemma 1 *For parameter values determined by (7), banks choose a mixed capital structure with equity and deposits and there is a positive probability of a run.*

We study next the bank manager's effort choice, which will depend on his rents. When $\widetilde{c} < D$, there is a run and hence the bank manager obtains no rent. When $\widetilde{c} \geq D$, his rents depend on equity's threat. When $\beta\widetilde{c} < D$, equities' threat is below the level of deposits and the bank manager obtains $\widetilde{c} - D$. By contrast, when $\beta\widetilde{c} \geq D$, his payout is determined by equity's threat and his rent amounts to $(1-\beta)\widetilde{c}$. Thus, the manager's expected rent is

$$R(e) = \int_{D^*}^{D^*/\beta} (c - D^*)\phi dc + \int_{D^*/\beta}^{c_{\max}(e)} (1-\beta)c\phi dc \geq 0 \tag{8}$$

Given that effort is not contractible, the bank manager only monitors if the additional rent obtained from monitoring at least compensates the effort disutility. Thus, in equilibrium there is monitoring ($e^* = 1$) if

$$\Delta R = R(1) - R(0) = \int_{c_{\max}(0)}^{c_{\max}(1)} (1-\beta)c\phi dc \geq G \tag{9}$$

and otherwise there is no monitoring ($e^* = 0$).

We define the efficiency E of the banking system as the sum of the expected payoffs of investors and bank managers. From (4) and (8) we have that for when effort is exercised

$$E(1) = \frac{c_{\max}(1) + c_{\min}(1)}{2} - \int_{c_{\min}(1)}^{D^*} (c - \Gamma)\phi dc - G \tag{10}$$

i.e., total pay-offs consist of the expected return on the project if it were never liquidated, $(c_{\max}(1) + c_{\min}(1))/2$, minus the expected losses from liquidation due to runs, $\int_{c_{\min}(1)}^{D^*}(c - \Gamma)\phi dc$, minus the effort costs G. When effort is not exercised, we have

$$E(0) = \frac{c_{\max}(0) + c_{\min}(0)}{2} - \int_{c_{\min(0)}}^{D^*} (c - \Gamma)\phi dc \tag{11}$$

Note that for given D^* we have $E(1) - E(0) > 0$ because of the assumption that effort is worthwhile ($\Delta c > G$).

Besides efficiency, we are also interested in the stability of the banking system, which will have repercussions when there are externalities from banking failure. We define the stability of the banking sector by the probability π of banking default,[3] which is given by

$$\pi(e) = \int_{c_{\min}(e)}^{D} \phi dc \tag{12}$$

[3]Our comparative static results also hold for the Loss Given Default (LGD), which is an alternative measure of the externalities associated with banking failure.

3 Comparative static analysis

An improved tradability of bank assets allows bank owners to sell assets to third parties more easily. Furthermore, reductions in the privateness of the information gained by the manager in the lending process lower the efficiency losses which arise if the project is completed without the bank manager. Therefore, in our model an improved marketability of bank assets is reflected in an increase in β, the value of bank assets to outsiders. We first analyze the consequences of a higher β for a given effort choice and then turn to the implications for effort.

A higher β has the effect of allowing equity to extract a higher fraction of the projects' returns in states where equity's threat exceeds the repayments on deposits ($\beta\widetilde{c} > D$). Therefore, the return that can be pledged to investors increases, which can also be verified by differentiating (4) with respect to β

$$\frac{\partial W(e)}{\partial \beta} = \int_{D/\beta}^{c_{\max}(e)} c\phi dc > 0 \tag{13}$$

Because equity holders can now enforce repayment more efficiently, the increase in β also lowers the relative merits of deposits. From (6) we have, consequently, that deposit taking is reduced

$$D'(\beta) = -\frac{\Gamma}{(2\beta - 1)^2} < 0 \tag{14}$$

It is easy to see from (10) and (11) that this decline in deposit financing increases the efficiency of bank financing, which is because it reduces the incidence of costly runs. Furthermore, it also lowers banks' probability of failure (from (12)).

Summarizing, we hence have

Proposition 1 *For given effort, the improved marketability of bank assets induces a less fragile capital structure of banks and thereby enhances bank stability and efficiency.*

However, higher marketability also has an effect on the manager's incentives to exercise effort. This is because the rents he derives for high project returns are lowered, as equity can extract larger payments in these situations. Therefore, his gains from exercising effort are reduced.

From (9) it can be appreciated that there is a critical level β_0 ($\beta_0 < 1$), defined through

$$\int_{c_{\max} - \triangle c}^{c_{\max}} (1 - \beta_0) c\phi dc = G \tag{15}$$

at which a further improvement in the marketability of bank assets reduces the manager's gain from monitoring below the effort costs G (note that for $\beta = 1$, his additional rents would be zero). Thus, if $\beta > \beta_0$, effort can no longer be induced. Intuitively, this is because there are then no means available for the manager to promise credibly sufficient rents for good performance of the project.

The manager can also not be easily guaranteed rents through other schemes, such as for example equity or options. Capital could always, after replacing the manager, renegotiate with the manager (or simply dilute his equity stake). Since after his replacement the manager's outside option is zero, equity would still be able to extract $\beta\widetilde{c}$. Effectively, the hold-up problem would then be reversed, preventing capital from promising additional rents to the manager.

Thus, if equity were issued to the manager, this would simply by compensated in the original renegotiation (that is, before replacement of the manager) through a higher pay-out per unit of equity. Suppose for example that the manager has a share of α in equity. Capital's pay-off is then $(1-\alpha)p$, where p is the pay-off the manager does per unit of equity. Since capital's outside option is still $\beta\widetilde{c}$, it can force the manager to pay out $(1-\alpha)p = \beta\widetilde{c}$. Thus, the pay-outs per unit of equity increase with the manager's stake in order for the total pay-out to be constant.[4]

At $\beta = \beta_0$, a further increase in β thus causes the manager to stop monitoring. As this reduces the return on the project, the pledgeable income falls

$$W(0) - W(1) = \int_{c_{\min}-\Delta c}^{c_{\min}} \Gamma\phi dc - \int_{c_{\max}-\Delta c}^{c_{\max}} \beta c\phi dc < 0 \tag{16}$$

There is no impact on the bank's capital structure, D^*, as effort neither affects the marginal benefits nor the marginal costs of deposit taking (equation 5).[5] Bank stability therefore declines, since the loss of effort implies that there are more low states at which bank runs occur ($\pi(0) - \pi(1) > 0$ from (12)). Moreover, as effort is assumed to be productive, there is also a reduction in the efficiency of bank financing ($E(0) - E(1) < 0$

[4] A possibility to induce effort, though, would be not to have equity at all. However, the resulting decline in pledgeable income may exceed the effort loss, and thus not allow for the project to be financed (this will always be the case, for example, when effort is not very productive (i.e., for small $\triangle c$)).

[5] This independence result is sensitive to our assumption that effort only affects the upper and the lower limits of the distribution but leaves the density $\phi(c)$ of a given return realization c constant. If this is not the case, then the loss of effort may have an effect on the capital structure through its effect on the densities in (5).

from (10) and (11)). An increase beyond β_0 may thus also cause disintermediation, as due to the loss of managerial effort (and hence the screening and monitoring of borrowers), arms-length financing may start to dominate bank financing.

Summarizing, we have

Proposition 2 *The improved marketability of bank assets reduces bank managers' incentives to generate high returns and thus eventually lowers effort. This causes a reduction in the pledgeable income and leads to a decline in both the stability and the efficiency of the banking system.*

Figures 1 and 2 summarize the effects of an improved marketability of bank assets.

Figure 1: The pledgeable return as a function of asset marketability

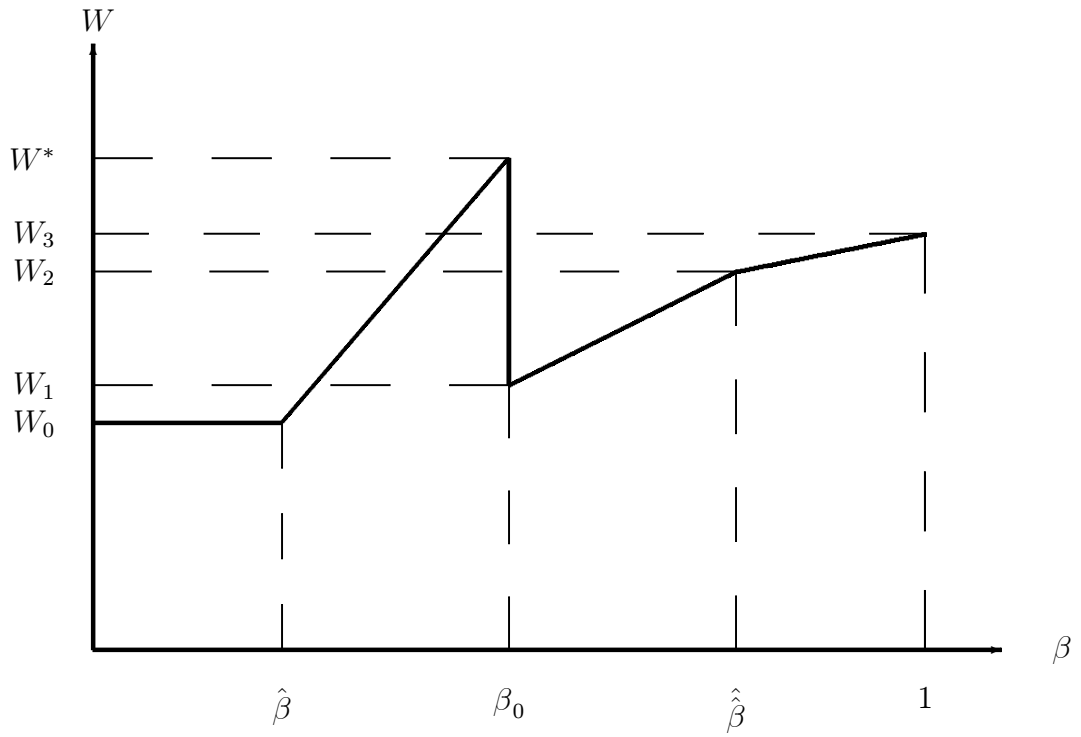
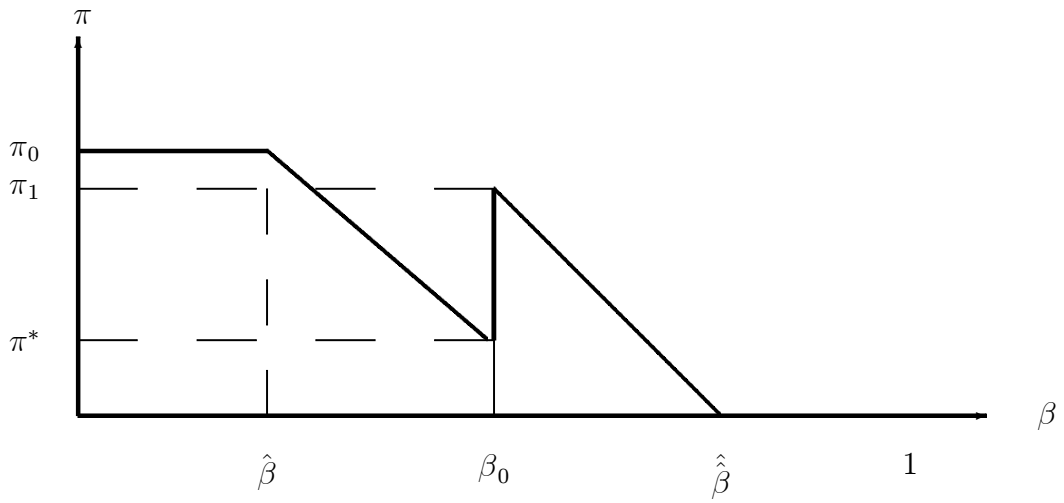


Figure 1 shows the impact on banks' pledgeable incomes. For very low market values of bank assets $\beta < \widehat{\beta}$ (where $\widehat{\beta}$ is implicitly defined by $D^*(\widehat{\beta}) = \widehat{\beta} c_{\max(1)}$, i.e., $\widehat{\beta} = (\Gamma/c_{\max(1)} + 1)/2$ from rearranging (6)), there is no equity since its payoff would be zero as $D^* > \beta\widetilde{c}$ for all $\widetilde{c}$. The bank's pledgeable return is then not affected by β. If the market value of bank assets is somewhat higher ($\widehat{\beta} < \beta < \beta_0$), the bank manager also pays out to equity. Pledgeable income then increases in β, as a higher β allows equity to extract

more from the bank manager. Since the market value is still rather low, equity holders do not extract much of the banks' returns, leaving the bank managers with sufficient incentive to monitor the project. The pledgeable income reaches a peak at W^* as β approaches β_0. For market values of bank assets larger than β_0 but below $\hat{\hat{\beta}}$ (where $\hat{\hat{\beta}}$ is defined through $D^*(\hat{\hat{\beta}}) = \hat{\hat{\beta}} c_{\min(0)}$), equity extracts most of the bank's return in the high states. The bank manager then no longer has an incentive to monitor. Therefore, at β_0 pledgeable returns drop to W_1 and afterwards increase to W_2 as β approaches $\hat{\hat{\beta}}$. For even better marketability of bank assets ($\beta > \hat{\hat{\beta}}$), equity refinancing is sufficiently effective in extracting rents such that it is optimal to have a safe capital structure without deposits (formally, we have then $D^*(\beta) < \beta c_{\min(0)}$). Bank runs then no longer occur. Still, higher marketability allows more to be extracted from the managers and thus W rises. Note that the pledgeable income at $\beta = 1$, W_3, may be lower or higher than W^*, depending on the productivity of effort.

The impact on efficiency (not depicted) mirrors that on pledgeable income. For a given effort choice, an increase in β tends to improve efficiency because the resulting decline in deposits makes bank runs less likely. However, as with pledgeable income, an increase of β beyond β_0 has the effect of destroying managerial incentives, with adverse consequences for efficiency.

Figure 2: The probability of default as a function of asset marketability



The impact of an increase in the marketability of bank assets on the probability of default is depicted in Figure 2. As long as β is lower than $\hat{\beta}$, changes in the market value

of bank assets do not affect the stability of the bank. This is because in this interval there is no repayment on equity and hence β does not matter. Within the interval $\hat{\beta} < \beta < \beta_0$, the default probability declines since banks increase the fraction of equity refinancing, which allows for sustaining lower and lower returns without incurring runs. If β exceeds β_0, expected returns fall as the bank manager stops monitoring. Therefore, banks' default probability increases. However, as the market value of bank assets increases even further, banking stability improves again. When β exceeds $\hat{\hat{\beta}}$, banks will be perfectly stable, as they then chose a safe capital structure.

4 Conclusions

Recent changes in the financial system have improved the tradability of bank assets and have reduced banks' dependence on their managers. We have argued that this has two effects. On the one hand, it reduces the hold-up problem between bank managers and shareholders. As a result, banks' capital structure needs to be less concerned with disciplining the management. Deposits can be reduced, which has the effect of increasing banks' resilience to adverse return shocks. On the other hand, reducing the hold-up problem also diminishes bank managers' rents, reducing their incentives to properly monitor and screen borrowers. This has negative repercussions for asset quality. Thus, even though the improved marketability of bank assets allows for a safer capital structure, the default risk of banks does not necessarily decline, and may even rise. Moreover, the loss of managerial incentives may also contribute to an overall reduction in the efficiency of bank financing.

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