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POLITICS, CREDIT ALLOCATION AND BANK CAPITAL REQUIREMENTS

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Abstract

I develop a normative theory of political influence on bank lending and capital structure. Legislators want banks to make politically-favored loans that reduce bank profits but generate social or political benefits. The regulator uses asset-choice regulation and capital requirements to induce the lending desired by legislators. There are four main results. First, if regulators dislike bank fragility, then credit-allocation regulation should be accompanied by higher capital requirements. Second, banks will resist higher capital requirements, which will be lower when banks have more bargaining power. Third, when politics matters more in bank regulation, the banking sector is larger and more competitive, with higher capital requirements. Fourth, the optimal reporting mechanism, in which banks report their privately-known profitability and the regulator endogenously determines capital requirements and stringency of credit-allocation regulation in response, shows that political influence is stronger when banks are more profitable.

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"Never let a good crisis go to waste."

Winston S. Churchill

I. INTRODUCTION

Financial crises and other periods of distress in banking are usually followed by a spate of new regulations. The S&L crisis of the 1980s and the subprime crisis of 2007–09 are two prominent examples. Each was followed by landmark legislations—the Basel I capital regulations, FIRREA and FDICIA after the S&L crisis, and Dodd-Frank and Basel III after the subprime crisis. One reason for this is that in the aftermath of the crisis, the failure of regulation to proscribe or at least limit actions that contributed to the crisis is often highlighted in discussions about what went wrong. Legislators proclaim their resolve to address these deficiencies and pass new laws that bank regulators are then asked to operationalize by working out the regulatory and compliance details. And the crisis may provide legislators an opportunity to include in the new legislation directives for banks to do things that may serve political and social goals. In other words, there is often additional regulation, layered on top of what is needed for efficient prudential regulation, and it is not uncommon for some of this regulation to pertain to credit allocation. There is a large literature on the influence of politics on banking regulation, so the idea that some legislative outcomes pertaining to bank regulation are politically motivated is hardly radical. Indeed, politics has influenced banking for centuries, and Calomiris and Haber (2014) have recently proposed that the "...banking system is an outcome of political deal making." They provide numerous examples of political influence on bank credit allocation.

What are the implications of such regulation for financial fragility? This paper develops a theoretical model to address this question. For concreteness, the model focuses on two aspects of regulation—capital requirements and asset-choice directives. The latter can most directly be thought of as requiring banks to make loans that generate political benefits for legislators or serve social goals at the expense of the bank's shareholders. Some of these political and social benefits may be linked to the view that some borrowers would lack access to bank credit in the absence of such directives and would not have access to other viable credit (e.g., see Bond and

Townsend (1996)). That is, there may be social efficiency considerations related to correcting distributional inequities or credit allocation distortions arising from market frictions or failures. More broadly, it can be thought of as a combination of directives to make certain types of loans as well as various taxes on bank profits through reporting requirements, consumer protection regulations and so on.[1] The effect of this regulation is to reduce the expected profitability of bank lending.

To examine the effect of this on bank fragility, I begin with a simple bank capital-structure model in which deposits have rents associated with them due to deposit-related services provided by banks and there is an agency problem in that the bank's insider (owner-manager) may choose a socially-inefficient loan portfolio to avail of private benefits. Uninsured depositors "protect" themselves by conditioning the price of deposits on the bank's capital structure. Specifically, the more capital the bank has in its capital structure, the less expensive are its deposits. This leads the bank to select a (value-maximizing) capital structure that trades off deposit rents against the lower cost of funding with deposits due to higher capital.

A legislator is then introduced.[2] The legislator's objective is a weighted average of the value of the bank[3] and some political benefit attached to the bank making loans of a particular type. The legislator's political benefit may include social welfare, but it may also include other political considerations and may induce the passage of legislation that requires the bank to make the politically-preferred loans.[4] The regulator then implements this legislation. However, since

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1 For example, U.S. banks were not only required to pay fines for transgressions during the financial crisis but also to lend certain amounts to low-income, minority borrowers. They are also subject to information reporting and consumer protection legislations like the Bank Secrecy Act (BSA), Home Mortgage Disclosure Act (HMDA) as well as additional requirements under the Dodd-Frank Act.

2 While new banking laws are enacted by elected legislators, the implementation details are typically worked out by bank regulators, so political considerations may affect both legislators and regulators. In what follows, it is assumed that laws are enacted by legislators and implemented by regulators.

3 The notion that the legislator cares about the value of the bank, rather than just social welfare, is somewhat non-standard, but is a reflection of actual practice in banking as well as in other industries. This is discussed later.

4 This is done by enacting regulation that requires the bank to invest some fraction of its loan portfolio in such loans. An example of such a regulation is the Community Reinvestment Act (CRA). Calomiris and Haber (2014) allude to this (pp.18-19): "There is no escaping the Game of Bank Bargains: politics always intrudes into bank regulation… The political coalition between unit bankers and small farmers was replaced by a new coalition between the rapidly growing mega banks and urban activist groups. Bankers had ambitious plans to merge and expand… They needed to be judged as good citizens of the communities they served in order for the Federal Reserve Board to approve the mergers. Activist groups wanted to be able to direct credit to their memberships and constituencies, and the "good citizenship" criterion gave them a powerful level with which to negotiate with merging banks. The bankers and the activists forged a coalition… That coalition was formed…by the contractual commitments of merging banks to channel more than $850 billion in credit through activist groups in exchange for the political support of the activist groups for bank mergers between 1992 and 2007."

these loans are less attractive to the bank's shareholders than the value-maximizing loans the bank would make in the absence of regulatory pressure, it becomes more attractive to the bank manager to invest in the socially-inefficient loans that yield the manager a private benefit than to invest in the politically-preferred loans.[5] Recognizing this moral hazard, bank regulation must require the bank to put up more capital than in the unregulated regime. That is, a binding regulatory minimum capital requirement emerges endogenously.[6] Thus, the first key result of the paper is that credit-allocation regulation, assuming it is not intended to increase financial fragility, must be accompanied by higher regulatory capital requirements. This linkage is not explicit in current bank capital regulation.

While a bank may be bound by regulation to comply with the higher capital requirement, it will also resist it.[7] The reason is that credit-allocation regulation imposes two costs on the bank. One is a direct reduction in value due to the lower expected profitability of these loans. And the other is the higher capital requirement that goes with such a lending directive. For banks, resisting one regulation is tantamount to resisting both. The assumption that the legislator's objective is to maximize a weighted average of the legislator's political benefit as well as the value of the bank is meant to capture the idea that views of bankers do have an impact on the regulations that banks are asked to comply with; regulators in all industries are attentive to the concerns of the regulated firms. Thus, banks will resist the call for higher capital requirements in the hope of moving the required amount of capital closer to what the bank would keep in an unregulated setting. This resistance is an attempt to counter the perceived political motivation underlying capital requirements, since banks recognize that a rational legislator / regulator would not impose credit-allocation regulation without a higher capital requirement. Thus, the second main result of the model is that the greater the bargaining power of the banking sector, the lower the capital requirement.

In this model, the amount of capital the bank keeps is a way to allocate control over asset choice between the bank's shareholders and the legislator/regulator. When capital is too low, the

[5] This is not to suggest that all politically-favored loans will reduce bank shareholder value. But this will be the case when the credit-allocation directive is a binding constraint on the bank.

[6] In the model developed here, this happens despite the absence of a government safety net.

[7] The notion that banks often go to great lengths to resist or circumvent regulation has empirical support. See, for example, Bouwman, Hu and Johnson (2018) who document that the Dodd-Frank Act created costs that banks—specifically those just below the size threshold at which these costs were triggered—attempted to avoid these costs by altering their behavior in economically significant ways.

probability of inefficient investments by the bank and hence the likelihood of failure is so high that the regulator can threaten to shut the bank down, and the power to do so means that control lies largely with the regulator. When capital is sufficiently high, the legislator/regulator will impose regulation on the bank that directs it to make politically-favored loans, so control is again largely in the hands of the regulator. It is only for intermediate levels of capital that the bank's shareholders have control. The political economy of bank regulation thus explains both why we need capital regulation in the first place, and why banks resist the call for higher capital requirements.

Two extensions of the base model are then considered. In the base model, banks earn rents, so there is the implicit assumption that entry into banking is controlled through the regulator's policy of issuing bank licenses. When the regulator's optimal licensing policy is examined, the result is that the regulator adopts a more liberal licensing policy when the legislator's objective function puts greater weight on the political benefit component. The third main result is that this leads to a larger (and more competitive) banking sector with higher regulatory capital requirements.

The second extension introduces private information by assuming that each bank knows more about the profitability of its assets in place than the regulator does. It is shown that in this case, there is an incentive for banks to overstate their profitability. The reason is that higher profits associated with socially-efficient lending reduce asset-substitution moral hazard, so lower capital requirements are imposed on more profitable banks. It is shown that the regulator can elicit the truth from banks by constructing a direct reporting game that relies on the Revelation Principle (Myerson (1979)). This game involves designing a mechanism in which the stringency with which credit-allocation regulation will be implemented is a choice variable. The regulation requiring banks to make certain (politically-favored) loans is enforced more strictly for banks that report higher profitability and these banks are rewarded with lower regulatory capital requirements.[8] Thus, the fourth main result is that political influence in bank regulation is likely to be stronger when banks are more profitable. This is an untested prediction that has not been part of the discussion of political influence on regulation in the existing literature.

This paper is related to the vast literature on the influence of politics on economic

[8] While regulatory capital requirements are lower for banks that report higher profitability, these requirements are still higher than what they would be in an unregulated setting.

outcomes. The elevated influence of politics on economic variables during elections has been noted by Nordhaus (1975), Lindbeck and Weibull (1987), and Rogoff (1990). This influence is particularly salient in banking. Braun and Raddatz (2010) examine international data and show that the frequency with which former high-ranking politicians become bank directors is strongly negatively related to economic development. Agarwal, Lucca, Seru, and Trebbi (2014) document that state and federal regulators in the U.S. implement identical rules differently, possibly due to different degrees of political pressure. Peek and Rosengren (2005) argue that the misallocation of credit in Japan during its economic crisis was due to the perverse incentive of a government faced with a growing budget deficit.

There is additional evidence that there are significant economic costs due to political influence on banking. Anginer, Demirguc-Kunt and Zhu (2014) examine data on 63 countries and document that correlated risk-taking by banks is higher in countries with greater government ownership of banks.[9] If political influence is assumed to be greater in government-owned banks, then this is evidence that politics increases bank risk. Iannotta, Nocera and Sironi (2013) use cross-country data on large European banks and show that government-owned banks have higher operating risk than private banks, and that this risk increases in election years. Shen and Lin (2012) provide evidence that illuminates the various channels through which bank performance is affected by politics.[10] More closely related, Huang and Thakor (2016) provide direct causal evidence that anticipation of greater political pressure leads state-chartered U.S. banks to reduce capital and increase their fragility.

This paper also offers a fresh perspective on the well-publicized aversion of bankers to higher capital requirements (e.g., Thakor (2014)), despite the social benefits of higher capital in reducing systemic risk and financial fragility (e.g., Farhi and Tirole (2012)).[11] Specifically, the

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[9] There are other papers that have explained why government-owned banks underperform, due to political goals. See Beim and Calomiris (2000) and Brown and Dinc (2005).

[10] To the extent that political influence on banks affects the costs of intermediation that banks incur, there can be significant real effects, as shown by Ajello (2016).

[11] The role of bank capital in improving bank incentives and reducing risk has been highlighted previously (e.g., Holmstrom and Tirole (1997), Coval and Thakor (2005), and Mehran and Thakor (2011)). Acharya and Thakor (2016) develop a theory in which lower capital levels by banks lead to a higher probability of correlated liquidations of banks and thus higher systemic risk. The benefits of higher capital in reducing systemic risk can be empirically significant. For example, Gauthier, Lehar and Souissi (2012) show that optimal macroprudential capital requirements reduce the default probabilities of individual banks and the probability of a systemic crisis by about 25%. Berger and Bouwman (2013) document that higher capital increases the odds of a bank surviving a financial crisis, and also helps the bank to improve market share.

analysis highlights that one source of resistance may be linked to the recognition that higher capital requirements sometimes go hand in hand with credit-allocation directives that reduce bank profitability. It is also related to the literature on the role of capital regulation in depository institutions. For example, it is related to the idea developed by Dewatripont and Tirole (1994) that optimal regulation—designed to overcome the inadequacy in monitoring of banks by dispersed depositors—can be achieved using capital adequacy requirements.[12] See also Thakor (2018).

The rest of the paper is organized as follows. Section II presents the model. Section III contains the analysis. Section IV considers extensions of the analysis to examine: (i) regulatory bank licensing policy that affects industry competition; and (ii) a situation in which banks are privately informed about the profitability of their assets in place and the regulators designs a mechanism to elicit the truth. Section V concludes with a summary of the predictions of the theory. All the formal proofs are placed in the Appendix.

II. THE MODEL

In this section, the model is described. There are three dates: t=0, 1 and 2. All agents are risk-neutral and the riskless rate of interest is zero. The setting is one in which the bank is raising financing from deposits and equity to invest in a loan portfolio, and the funding mix defines the bank's capital structure. There is a regulator who may stipulate that the bank must operate with a minimum amount of equity.

Agents in the model: There are three key agents in the model: banks that choose their capital structures and the loans they wish to make, legislators and regulators who determine credit allocation regulations and capital requirements and implement them, and uninsured depositors who provide financing to banks.

Overview of Key Features of the Model and Their Roles: The model has three key building blocks. The first is that there are three types of loans from which the bank could choose one:[13] a

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[12] Chari and Kehoe (2016) develop a model in which there are bailouts of failing institutions and restricting leverage enables the regulator to achieve the constrained efficient outcome.

[13] The assumption that the bank can choose only one loan is meant to reflect size restrictions on the bank; see Millon and Thakor (1986) for a theory of banking in which finite size emerges endogenously as a tradeoff between intrabank incentive costs that increase with size and risk-sharing benefits—á la Ramakrishnan and Thakor (1984)—that also increase with size. But if banks could invest in both P and G loans, then there may be interesting spillover effects. For example, Balduzzi, Brancati and Schiantarelli (2018) document that when banks suffer negative shocks to their valuations, some of their borrowers (especially small firms) invest less. That is, investing in P may adversely affect G.

socially-preferred (G) loan, politically preferred (P) loan, and a bad (B) loan that produces no observable cash flow for the bank but produces private benefits for the manager. The choice of B cannot be distinguished from the choice of G or P, so there are only two distinguishable asset choices: G~B or P~B. That is, it is possible to see whether the bank chose G~B or P~B, but conditional on either of the two choices, it cannot be seen whether B was chosen. The presence of the bad loan leads to an optimal capital structure for the bank in the unregulated optimum and creates an endogenous rationale for capital requirements when there is credit-allocation regulation. It is shown that a sufficiently-high capital requirement can dissuade the bank from investing in the bad loan.

The second building block is the assumption that there are two types of banks – "efficient" and "inefficient" – that are observationally identical *ex ante* to "outsiders", but it is socially inefficient for the inefficient bank to operate. Each bank privately knows its own type. This introduces type uncertainty in the pool of banks and generates an economic rationale for a discerning regulator who decides which banks should be given licenses to operate.[14] That is, even though the regulator cannot tell ex ante whether the bank is efficient or inefficient, it is equipped with an auditing technology that will enable it to distinguish between the two types of banks, thereby screening out the inefficient banks, as will be explained later.

Finally, the third building block is that banks have assets-in-place in addition to the loans they make. This assumption allows us to later introduce private information about the value of assets-in-place and analyze a regulatory mechanism design problem in which the stringency with which the regulator enforces credit-allocation directives is a choice variable.

The Bank: Each type of bank will now be described. Consider first the efficient banks. At t = 0, each efficient bank has assets in place that will produce a random payoff $\tilde{y}$ at t = 2, where $\tilde{y} = y > 0$ with probability $(w.p.)\ q \in (0,1)$ and 0 ($w.p.$) $1-q$. Let D^0 be the legacy leverage associated with the previous financing of the bank's assets in place. Each of the efficient banks also raises deposit and equity financing at t=0. It is convenient to think of the equity as being provided by the insider (or owner-manager) who is running the bank.[15] Raising financing

[14] The principal role this assumption plays in the analysis is to provide a microfoundation for the regulator. It does little to affect the rest of the analysis.

[15] If it were assumed that some of the equity financing was provided by outside shareholders who also demand the riskless rate *in expectation* (consistent with the universal risk neutrality assumption), the analysis is qualitatively unaffected as long as the regulator can ask the banker to provide sufficient inside equity to ensure that the banker has enough "skin in the game". As Boyd and Hakenes (2014) show, if capital requirements are increased and

involves a transaction cost of $T>0$ per dollar of financing raised.[16] The financing raised by the bank for investing in a loan that will be made is at t=1. The loan size is a fixed amount $L>0,$ so if $\hat{D}$ is the amount of deposit financing raised and $\hat{E}$ is the amount of equity provided for the loan, then:

$$L=\hat{D}+\hat{E} \tag{1}$$

Define $D\equiv D^0+\hat{D},$ and total equity $E\equiv L-D$ and assume $E>0.$ At t=1, the bank can choose one out of two mutually-exclusive loan portfolios ("loans" henceforth): *G* and *B*. The payoff distribution for loan *G* is that it will pay the bank $\tilde{x}$ at $t=2,$ where $\tilde{x}=x>0$ w.p. $\theta\in(0,1)$ and 0 w.p. $1-\theta$ at t=2.[17] This payoff $\tilde{x}$ is observable and can be contracted upon to pay the bank's financiers.[18] Thus, the combined payoff from the bank's assets in place and the new *G* loan is $y+x$ w.p. $\theta q,$ x w.p. $\theta[1-q],$ y w.p. $[1-\theta]q,$ and 0 w.p. $[1-q][1\text{-}\theta],$ i.e. $\tilde{x}$ and $\tilde{y}$ satisfy $\tilde{x}\perp\tilde{y}.$ The payoff distribution for loan *B* is that it produces a contractible payoff of 0 w. p. 1 and a private benefit $\tilde{\pi}$ that accrues to the shareholder-insider (owner-manager) of the bank, but is not verifiable and cannot be contracted upon to pay the depositors. $\tilde{\pi}$ is stochastic when viewed at t=0, but its realization is privately observed only by the bank at t=1 before the bank decides whether to choose the *G* loan or the *B* loan. Viewed at t=0, $\tilde{\pi}$ is uniformly distributed on $[0,\bar{\pi}],$ with $\tilde{\pi}\perp\tilde{y}.$ The choice of loan *B* affects the contractible payoff from the assets in place, however, so the assets in place pay off 0 w.p. 1 if *B* is chosen.[19]

Our specification of private benefits associated with projects is similar to that in Holmstrom and Tirole (1997), with one difference. In Holmstrom and Tirole (1997) the private benefit associated with each project is common knowledge at the outset, whereas here it is not known at the time the bank chooses its capital structure. A private benefit could take many

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satisfied by higher outside equity, the ownership claim of insiders will be diluted, which could worsen the asset-choice incentive problem.

[16] The only role *T* plays in the analysis is to ensure that the bank does not raise any more capital than it needs to at a given point in time. See the poof of Proposition 1.

[17] As in Holmstrom and Tirole (1997), we can think of *x* as the pledgeable payoff on the borrower's loan.

[18] We can think of this as a relationship loan (see Boot and Thakor (2000)), so $\tilde{x}$ may embed the value added by the bank to the borrower's project.

[19] One way to think about the *B* loan is that it provides bank insiders with an opportunity to loot at the bank, as in Calomiris and Kahn (1991). That is, a bank that makes a *B* loan can essentially be viewed as bank insiders diverting assets in place for personal use (perquisites), with the utility of consumption of these assets, $\pi,$ being random.

forms. It may be additional perquisites the bank manager may be able to enjoy from the project/loan cash flows. The benefits that can be extracted this way may be higher with some projects than with others.

The bank's choice of *B* or *G* is privately observed by the bank's owner-manager, and is not observed by anyone else. It is assumed that loan *G* is socially efficient, whereas loan *B* is not. Thus,

$$\theta x > L \tag{2}$$

$$\bar{\pi} < L \tag{3}$$

It is also assumed that $qy > L.$[20] At t=2, the loan payoff is realized and the bank's financiers are paid off.

The role of capital, *E*, in this model is similar to that in Holmstrom and Tirole (1997)—it provides "skin in the game" to discourage the bank from choosing *B* unobservably. In some instances, private incentives will be strong enough to ensure that the bank will voluntarily choose a high enough *E* to preclude a subsequent choice of *B*. But in other instances, a regulatory capital requirement[21]—a restriction on the lowest value *E* can take—may be necessary.

Consider the inefficient bank next. It does not have access to the *G* loan, but it can invest only in a variant of the *B* loan, call it loan $\hat{B},$ which generates a non-stochastic, known (at t=0) private benefit of $\pi_n \in (0, \bar{\pi})$ for the owner-manager of the bank.[22] As a consequence, its total contractible payoff from the assets in place and the new loan is 0 at $t = 2.$ That is, even though an inefficient bank cannot be *a priori* distinguished from an efficient bank, it is common knowledge that such a bank's private benefit is $\pi_n.$

Each bank knows its own type. The commonly-shared prior belief is that the probability is $\lambda \in (0,1)$ that the bank is efficient. The objective of the bank is to maximize shareholder wealth, which consists of the observable monetary payoff to the bank's shareholders plus the private benefit.

Depositors: Investing in bank deposits gives depositors access to a host of deposit-related bank

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[20] This assumption is sufficient to ensure that depositors get repaid even if the loan defaults.

[21] Uluc and Wieladek (2018) document that retained earnings are an important channel of adjustment for banks that are faced with higher capital requirements. This militates against the notion that higher capital requirements on banks are very expensive due to possibly high adverse selection costs.

[22] This is equivalent to the assumption that if the inefficient bank invests in any loan other than $\hat{B},$ the payoff that will be generated will be exactly the same as that generated by $\hat{B}.$

services that have a value of $r(D)$ to the depositors for a deposit level of D.[23] It is assumed that:

$$r(D)=\overline{r}D \text{ with } \overline{r}>0 \text{ a finite constant.} \tag{4}$$

This value, $\overline{r}D,$ to the depositors is therefore increasing in the level of deposits.[24] There is *no* deposit insurance, so the depositors' claim on the bank is risky.[25] Let D_R be the repayment promised to the depositors at t=2 in connection with the legacy debt of D^o and the $\hat{D}$ in deposits raised at t=0. The market is competitive, so depositors receive their expected return equal to the riskless rate of zero in equilibrium.

Legislators and Regulators: Legislators have authority to set a minimum capital requirement for the bank and to direct the bank to lend to a particular borrower group, and the regulators enforce this. For simplicity, we will henceforth use the term "regulator" to refer to legislators *and* the regulator. The politically-favored loan the regulator might ask the bank to make, loan *P*, has the following payoff distribution for the bank: it pays off $\tilde{x}$, where $\tilde{x}=x$ w.p. $p\in(0,1)$ and 0 w.p. $1-p$ at t = 2. The random variable $\tilde{x}$ is independent of $\tilde{y},$ and $\tilde{y}=y$ w.p. q and 0 w.p. $1-q$ if *P* is chosen. The regulator can tell whether the bank chose *G* or *P*, but cannot detect a switch by the bank from either of those loans to *B*. That is, the *B* loan is the source of asset-substitution moral hazard at the bank level in this model, so it is essential to assume that the asset substitution can occur in an undetectable manner. This means that, rather than letting the bank choose between *G* and *B*, the regulator can compel the bank to choose between *P* and *B*, but the regulator cannot prevent the bank from investing in *B* through a direct prohibition of *B*, regardless of whether the bank's choice is between *G* and *B* or between *P* and *B*.

From a pure modeling standpoint, it may be easier to view the regulator as *prohibiting* lending to some borrower groups, as opposed to directing lending to some other groups. That is,

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[23] These could be transaction and liquidity services provided as part of the bank's qualitative asset transformation (e.g. Bhattacharya and Thakor (1993) and Greenbaum, Thakor and Boot (2015)). They could also be the value depositors attach to the safe-keeping services associated with keeping liquidity safely in the bank, protected from theft, for example. See Donaldson, Piacentino and Thakor (2018) for a theory of banking based on this perspective. Investing in U.S. government Treasury securities would provide a similar "safe asset" benefit, but a bank deposit would be more useful for transaction purposes.

[24] The main contribution of this assumption about $\overline{r}>0$ is to provide a cost advantage for deposits over equity, which then leads to an interior optimum for the bank's capital structure. A tax advantage for debt would serve a similar purpose.

[25] Merton and Thakor (forthcoming) develop a theory in which the efficient outcome is for the depository claims of the bank's customers to be riskless, but also discuss costs in the second-best case that may preclude the efficient outcome. Lambert, Noah and Schuwer (2017) document that an increase in deposit insurance coverage leads to higher risk taking and the *effect is stronger for banks affected more*.

the regulator can either allow the bank to choose from $\{P,B,G\}$ or restrict the bank to $\{P,B\}$. In the former case, it will turn out that the bank never chooses *P* over *G*, so $\{P,B,G\}$ becomes equivalent from a choice standpoint to $\{G,B\}$. One may think of asset portfolio restrictions (e.g., those that were mandated by the Glass-Stegall Act) on banks in this light. However, asset portfolio restrictions are typically meant to limit the ability of banks to take excessive risk. In the model here, *G* is less risky than *P*, even though both loans are positive NPV to the bank. So it seems *institutionally* more appropriate to think of *P* as being politically favored and the regulator as instructing banks to make certain kinds of loans than proscribing others.

Regulatory mandates for banks to invest in certain types of loans are common. In addition to this, there are often *ad hoc* directives from the government to banks that are also intended to influence credit allocation, as discussed in the Introduction.

In the context of the Basel risk weights for computing capital requirements, one implication of the analysis is that the regulatory choice of risk weights may also be skewed to encourage politically-favored lending.[26] However, this is beyond the scope of the model here and represents an interesting question for future research. It is also worth noting that the Basel capital regulation is global and should thus transcend national politics. But it is also true that the Basel capital requirement is a *minimum*, and individual countries are free to impose *higher* capital requirements, as the U.S. has done.

If the bank makes the *P* loan, it produces a political benefit of $\beta > 0$ for the regulator if the loan does not default. This may also include a social benefit if it does not default, as perceived by the regulator. The benefit $\beta > 0$ is not available to the bank, and is not verifiable. It is thus not useful for contracting. It is assumed that

$$\theta x > px > L \tag{5}$$

This means that financing can be raised for P, but the bank strictly prefers G to P.

The regulator's objective is to maximize a weighted average of the total value of the bank at t=0 and the political and social benefits of the loan:

$$U_{reg} = \alpha_1 [V] + [\alpha_2] E(\beta) \tag{6}$$

[26] For example, Basel I assigned a 50% risk weight to home mortgages and a 100% risk weight to other consumer loans. However, attaching lower risk weights to politically-favored loans exacerbates the effects modeled here because it will lead banks to choose even lower capital ratios when they make such loans.

where V is the total value of the bank at t=0, and $\alpha_1 > 0, \alpha_2 > 0$ are constant weights, and $E(\bullet)$ is the expectation operator.[27] These weights, α_1 and α_2, can be interpreted in various ways. One interpretation is that the ratio α_1 / α_2 measures the effectiveness with which banks are able to lobby politicians and regulators to attend to the interests of bankers. Another interpretation is that this ratio represents the effectiveness with which banks are able to resist higher capital requirements. A third interpretation is that it represents the regulator's innate concern with bank value.

The regulator also has the ability to conduct a regulatory audit at t=1 that enables it to (noisily) determine the bank's type after the bank has raised its deposit and equity financing and made its loan choice. If the regulator discovers that the bank is inefficient, it shuts the bank down and takes it over. The auditing generates a signal $\xi \in \{\text{efficient, inefficient}\}$ that has the probability distribution:

$$\Pr(\xi = \text{efficient} \mid \text{efficient}) = 1 \tag{7}$$

$$\Pr(\xi = \text{not efficient} \mid \text{bank is inefficient}) = \delta \in (0,1) \tag{8}$$

Thus, if the bank is efficient, regulatory auditing will unfailingly reveal it to be so, but if the bank is inefficient, auditing will reveal it to be so only with probability $\delta < 1$. If, based on the regulatory audit, the regulator liquidates or shuts down a bank at t=1, nothing can be recovered, i.e., a prematurely liquidated loan is worthless.[28]

The Social Planner's Objective: Without loss of generality, the social planner can be assumed to be attaching equal weights to the total value of the bank and the utility of the regulator.[29] That is, the social planner maximizes $V + U_{reg}$ in order to maximize social welfare. The reason why this is without loss of generality is that the problem with unequal welfare weights is equivalent to a problem with equal welfare weights and different coefficients in the regulator's utility function.

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[27] Note that β is non-stochastic, so the expectation is taken with respect to the probability distribution that determines whether the bank will choose P. This objective function introduces a regulatory tradeoff between bank value and social and political benefits. Clearly, there are circumstances in which what maximizes bank value also maximizes social and political benefits. In these cases, no regulatory capital requirement is necessary. Without denying the existence of such circumstances, the focus here is on the more interesting case in which regulatory goals are (partly) at odds with bank objectives.

[28] It will be seen later that the regulator never shuts down a bank along the path of play.

[29] This means that the social planner also attaches positive weight to political benefits. This is consistent with the notion that if legislators/politicians represent a distinct entity, then the social welfare function cannot ignore the utility of this entity.

Summary of Sequence of Events: This sequence is summarized in *Figure 1.* At t=0, there is an owner-manager of a bank who raises financing to make a loan at t=1. This financing is in the form of deposits, *D*, and equity *E*. The equity is provided by the owner-manager. To raise *D* in uninsured deposit financing at t=0, the bank must promise to repay D_R at t=2. There are "efficient" and "inefficient" banks and the regulator can conduct an audit to noisily identify the bank's type in order to screen out "inefficient" banks. Minimum regulatory capital requirements and regulatory asset-choice directives are put in place at $t=0$ if the regulator decides to impose these. Note that both these regulatory requirements are adopted at the same time. An important message of the analysis is that asset-choice directives should not be implemented before the appropriate capital adequacy regulation.

At t=1, the bank will be able to choose whether to invest in a *G* loan or a *B* loan, if it is an efficient bank that has not been directed by the regulator to invest in a *P* loan. The bank's choice will depend, in part, on the realization at t=1 of the private benefit, $\tilde{\pi}$, associated with the *B* loan, and in part on its capital structure chosen at t=0. Only the bank observes its realized $\tilde{\pi}$. If the regulator has directed the bank to make a *P* loan, then the bank chooses between loans *P* and *B* at t=1. The regulator cannot detect the choice of loan *B* by the bank, but can discern whether the bank is choosing from the $\{G, B\}$ loan portfolio set or the $\{P, B\}$ loan portfolio set. If the bank is inefficient, then it is *locked into* loan *B*, which generates a private benefit for the owner-manager, but no contractible payoff. This bank is unable to invest in either the *G* or the *P* loan and produce a payoff with either loan that differs from its payoff with loan *B.* All payoffs are realized at t=2 and contractual payments are made at that time.

Figure 1 goes here.

III. ANALYSIS AND RESULTS

The analysis will proceed as follows. First, the problem of the unregulated efficient bank will be analyzed. The focus here will be on the bank's capital structure choice. The inefficient bank will then be introduced and a *raison d'etre* for bank regulation will be established. Then the analysis will focus on the capital structure the regulator would want the bank to have when the regulatory prescription is for the bank to invest in the *P* loan. It will be shown that any minimum regulatory capital requirement will be higher than the capital the bank would choose to keep in an unregulated environment, even though there is no deposit insurance or any other government safety net.

A. The Unregulated Environment for an Efficient Bank

Given (2) and (3), it is clear that loan *G* produces a higher total bank value than loan *B*. It is useful to begin with a characterization of the first-best solution for an efficient bank in the absence of regulation. In the first best, the depositors are assumed to be able to observe the bank's choice of loan. Clearly, they will refuse to deposit money with the bank if it chooses loan *B*. Thus, the following result is immediate:

Lemma 1: *In the first-best case in an unregulated environment, the efficient bank invests in loan G, raises deposits D=L, thereby financing the loan entirely with deposits, and promises to repay depositors*

$$D_R^O = \frac{L}{\hat{\theta}} - r(L) \tag{9}$$

where $\hat{\theta} \equiv \theta q + [1-\theta]q + [1-q]\theta$

Thus, the bank uses maximum leverage in the first-best case. The intuition is that deposits carry with them the surplus that accrues to depositors. In a competitive equilibrium, the depositors earn an expected return equal to the riskless rate, so this surplus enjoyed by the depositors lowers the effective interest rate that is paid on deposits by the bank. Since there is no such rent with equity, the value of the bank is maximized with maximum leverage.

Now consider the bank's capital structure choice in the second-best case in which depositors cannot observe the bank's loan choice. Define $\theta x + qy \equiv Z$ as the total expected payoff from the bank's assets in place and the new *G* loan. Then the incentive compatibility (IC) constraint for the bank to prefer loan *G* to loan *B* is:

$$Z - \hat{\theta} D_R \geq \pi \ \forall \pi \in [0, \bar{\pi}] \tag{10}$$

where D_R is the bank's repayment obligation to the depositors. At the critical value of π, call it π^*:

$$\pi^*(E) = Z - \hat{\theta} D_R \tag{11}$$

the bank is indifferent between the *G* and *B* loans. If $\pi > \pi^*$, the bank prefers the *B* loan; if the inequality is reversed, the bank prefers the *G* loan. This means that the bank's optimization problem is to choose a capital structure (D, E), a promised repayment D_R to depositors, and the resulting critical value π^* to solve:

$$\underset{E, D, D_R, \pi^*}{Max} \left\{ \int_0^{\pi^*} \left\{ Z - \hat{\theta} D_R \right\} \{\bar{\pi}\}^{-1} d\pi + \int_{\pi^*(E)}^{\bar{\pi}} \pi \{\bar{\pi}\}^{-1} d\pi - E \right\} \tag{12}$$

subject to:

$$\int_0^{\pi^*} \left\{ \hat{\theta} D_R + \bar{r} D \right\} \left\{ \bar{\pi} \right\}^{-1} d\pi = D \tag{13}$$

$$D + E = L \tag{14}$$

$$\pi^* = \begin{cases} Z - \hat{\theta} D_R & \text{if } Z - \hat{\theta} D_R \in \left(0, \bar{\pi}\right) \\ 0 & \text{if } Z - \hat{\theta} D_R < 0 \\ \bar{\pi} & \text{if } Z - \hat{\theta} D_R > \bar{\pi} \end{cases} \tag{15}$$

where (13) is the individual rationality (IR) condition for depositors, (14) is the feasibility constraint for the bank's lending, and (15) comes from the IC constraint for the bank's loan.

Returning now to (11), we have two results:

Lemma 2: *Assume*

$$Z + r(L) > 2\sqrt{\bar{\pi} L} \tag{16}$$

Then a real-valued $\pi^*\left(E\right) > 0$ *exists.*

Lemma 3: *Assume that* $\bar{r}$ *is small enough to satisfy:*

$$\bar{r} < \bar{\pi}\{Z + r(L)\}^{-1} \tag{17}$$

Then $\pi^*(E)$ *is strictly increasing and concave in E.*

The reason why (17) is useful is that if the deposit rent *r* is too high, the bank's capital structure is always a corner solution of all debt. Henceforth, it will be assumed that (16) and (17) hold.[30] The efficient bank's optimal capital structure is analyzed below.

Proposition 1: *The maximization program in (12)-(15) has a unique interior solution. That is, the bank chooses* $D^* \in \left(0, L\right)$ *and* $E^* \in \left(0, L\right)$, *with* $D^* + E^* = L.$

The intuition for the interior optimum is that the bank has to choose a level of capital *ex ante* (at t=0) such that it trades off the lost deposit rents due to higher capital against the lower cost of deposit funding due to higher capital.[31] The depositors recognize that, for any capital *E*, the bank will choose the *G* loan if the realized private benefit $\pi < \pi^*$, and π^* is increasing in *E*. Thus, the higher the *E*, the higher is the value of the private benefit that will tempt the bank to switch to the *B* loan, and thus the higher is the probability that the bank will choose loan *G* at

[30] Essentially (16) requires that *Z*, the total expected payoff from the assets-in-place and the *G* loan, is high enough. It is a technical condition that is sufficient for π^* to be a real-valued solution.

[31] The result that the bank's deposit funding cost declines with its capital finds empirical support in Gambacorta and Shin (2018). In a cross-country bank-level study, they find that a one percentage point increase in the equity-to-total assets ratio is associated with a four basis point reduction in the cost of debt financing.

t=1. Consequently, the cost of deposit funding is lower when the bank keeps higher capital. Note that once the bank has determined its capital structure at t=0, it will have no incentive to add equity at t=1 if $\pi > \pi^*$ is realized.

Corollary 1: *The bank's optimal capital level,* E^*, *is strictly decreasing in Z and therefore in q.* The intuition is as follows. The bank experiences a lower cost of deposit funding with higher capital because the likelihood of the bank choosing *B* goes down as capital increases. A higher quality of assets in place has the same effect in attenuating project-choice moral hazard, so the marginal value of capital in doing so is reduced.

B. The Inefficient Bank and the Rationale for Regulation

Now assume that, in addition to the efficient bank, there is also the possibility that the bank could be inefficient. If $\pi_n < E^*$, where E^* is the optimum in Proposition 1, then the inefficient bank will be unwilling to put up E^* in equity to mimic the efficient bank. And unless it mimics the efficient bank, it can never raise deposit financing.

But what if $\pi_n > E^*$? In this case, the inefficient bank will have an incentive to mimic the efficient bank and choose E^*. If the efficient bank does not alter its capital structure, this will increase the cost of deposit financing for the efficient bank in a pooling equilibrium. If the efficient bank would like a separating equilibrium in which the inefficient bank chooses not to participate, it will have to choose $E > \pi_n > E^*$. In either case, the efficient bank's value will be lower than if the inefficient bank is not in the market.

This is where a regulator can help to improve welfare. By auditing the bank, it can discover with probability δ that the bank is inefficient, and shut the bank down at *t*=1, denying the bank's owner-manager the private benefit π_n at *t*=2. Moreover, the owner-manager loses the equity invested in the bank at *t*=0. Thus, given capital E^*, the critical probability, $\hat{\delta}$, needed to deter the inefficient bank from participating is the solution to:

$$\left[1-\hat{\delta}\right]\pi_n - E^* = 0 \tag{18}$$

where $\hat{\delta} \in (0,1)$, since $\pi_n > E^*$.

Then if the regulator's auditing technology is sufficiently precise in the sense that $\delta \geq \hat{\delta}$, the efficient bank can keep its capital at E^* and depositors will be assured that the inefficient bank will not be in the market. The regulator thus improves welfare. Any bank proposing to keep capital lower than E^* at *t*=0 is denied a license to operate. That is, at low capital levels (those below E^*) control shifts from the bank's owners to the regulator. This provides an endogenous economic rationale for having a regulator.

Henceforth, it will be assumed that $\delta \geq \hat{\delta}$, and the regulator (efficiently) stipulates a minimum capital requirement of E^*. This is not binding for the efficient bank, but it deters the inefficient bank from entry. The effectiveness of this capital requirement in ensuring that the efficient bank makes the "right" choice of loan (when it has the flexibility not to) will be examined later. Thus, in the rest of the analysis the only bank that the regulator deals with is the efficient bank. However, suppose now that the regulator wishes to have the bank invest in the *P* loan because the political benefit, β, of having the bank make the loan is sufficiently large. Then, for equal levels of deposits with the *P* and *G* loans, the regulator will prefer that the bank choose loan *P* rather than the *G* loan if

$$\alpha_1\left[px+qy+\bar{r}L\right]+\alpha_2\beta p>\left[\theta x+qy+\bar{r}L\right]\alpha_1$$

which can be expressed as:

$$px+qy+\bar{r}L+\left[\alpha_2/\alpha_1\right]\beta p>\left[\theta x+qy+\bar{r}L\right] \tag{19}$$

This regulatory preference for the *P* loan can exist even if the loan is socially inefficient, i.e., if the social planner would prefer the *G* loan to it. This requires:

$$\left[1+\alpha_1\right]\left[px+qy+\bar{r}L\right]+\alpha_2\beta p<\left[1+\alpha_1\right]\left[\theta x+qy+\bar{r}L\right]$$

which can be expressed as:

$$px+qy+\bar{r}L+\left[\frac{\alpha_2}{1+\alpha_1}\right]\beta p<\theta x+qy+\bar{r}L \tag{20}$$

It will be assumed henceforth that both (19) and (20) hold.[32] These assumptions are intended primarily to enable focus on the main case of interest—a regulatory preference for the *P* loan regardless of its social efficiency.

The regulator can write regulation that requires the bank to invest in the *P* loan. Similarly, the regulator can impose on the bank a minimum capital requirement. Both these are done at t=0.

C. The Optimal Regulatory Capital Requirement

[32] It is easy to see that there are values of α_1 and α_2 for which (19) and (20) can both simultaneously hold. For example, if $\alpha_1=\alpha_2=1$, then (19) and (20) become:

$$px+qy+\bar{r}L+\beta p>\theta x+qy+\bar{r}L>px+qy+\bar{r}L+\frac{\beta p}{2} \text{ or } p\left[x+\beta\right]>\theta x>p\left[x+\left(\beta/2\right)\right].$$

Now, consider the regulator's maximization program. If the regulator was solving the (efficient) bank's capital structure problem with the goal of having the bank limit its loan choice to the set $\{P,B\}$ rather than the set, $\{G,B\}$, it would solve the following problem:

$$\underset{E,D,D_R,\hat{\pi}^*}{Max} \quad \alpha_1\left\{\int_0^{\hat{\pi}^*}\left[Z_p+\overline{r}D\right]\left[\overline{\pi}\right]^{-1}d\pi+\int_{\hat{\pi}^*}^{\overline{\pi}}\pi\left[\overline{\pi}\right]^{-1}d\pi\right\}+\alpha_2\left\{\int_0^{\hat{\pi}^*}\left[p\beta\right]\left[\overline{\pi}\right]^{-1}d\pi\right\} \tag{21}$$

where $Z_p \equiv px+qy$, $\hat{\pi}^*$ is the critical private benefit for the bank such that the bank chooses *P* if $\pi \le \hat{\pi}^*$ and chooses *B* if $\pi > \hat{\pi}^*$. That is, consistent with (6), the regulator maximizes a weighted average of the total value of the bank and the perceived social and political benefits. This leads to the following result.

Proposition 2: *The maximization program in (21) has a unique interior solution,* $\hat{D}^* \in (0,L)$ *and* $\hat{E}^* \in (0,L)$. *The capital,* $\hat{E}^*$*, the regulator would like the bank to keep when it wants the bank to limit its loan choice to the set of* $\{P,B\}$*, is higher than the capital,* E^**, the bank chooses optimally when its investment opportunity is the set* $\{G,B\}$. *Moreover, the cut-off value of the bank's private benefit,* $\hat{\pi}^*$*, such that the bank will prefer P to B if* $\pi \le \hat{\pi}^*$ *is lower than the cut-off,* π^**, such that the bank prefers G to B when* $\pi \le \pi^*$.

The intuition for $\hat{E}^* > E^*$ is that the regulator's political benefit does not show up in the bank's private optimum, so even though the regulatory political benefit with the *P* loan makes it more attractive for the regulator than the *G* loan, *G* is preferred to *P* by the bank's shareholders.[33] Consequently, for any level of equity capital, the critical private benefit below which the bank chooses *G* rather than *B* is *higher* than the critical private benefit below which the bank chooses *P* rather than *B*. This generates a positive measure of the set of private-benefit realizations for which the bank would choose *G* if confronted with the $\{G,B\}$ investment opportunity set but would choose *B* if confronted with the $\{P,B\}$ investment. To ensure that the bank eschews *B*, a higher amount of equity capital must be posted by the bank when the regulatory mandate limits the bank to $\{P,B\}$ rather than $\{G,B\}$.

Now consider the privately-optimal capital level the bank would choose if it were

[33] The existence of a positive social benefit, $S > 0$, associated with the *P* loan creates a bigger wedge between the regulator's preference and the bank's preference, but is not necessary for Proposition 2.

instructed to invest in *P* but is free to choose its own capital structure. In this case the bank solves the problem in (12)–(15) with Z replaced by Z_p. Suppose the optimal solution to this problem is $\bar{E}^*$. Then we have the following result.

Corollary 2: $\bar{E}^* < \hat{E}^*$.

This means that, left to its own devices, the bank will choose a lower amount of equity capital than what the regulator would like, which rationalizes a minimum regulatory capital requirement of $\hat{E}^*$. Such a capital requirement is unnecessary when the bank is free to choose any loan it wants and it opts for *G*. The intuition for why a regulatory capital requirement is needed with *P* is that in choosing its privately-optimal capital level, the bank does not attach any weight to β, the politician's political benefit. Other than that, the maximization program in (21) is the same as that of the bank (since substitution of (13) and (14) into (12) yields (21) if we replace Z by Z_p and add the term with the political benefit).

If the bank were asked by the regulator to keep capital, $\hat{E}^*$, instead of E^*, it would oppose the higher capital requirement, since the higher capital requirement goes with the regulator asking the bank to make the *P* loan. There are two reasons for this resistance. First, when the regulator pushes the bank to keep capital that is higher than needed to induce a choice of the *G* loan, it lowers bank value *ceteris paribus* in this model.[34] Second, the asset-choice directive that goes with the higher capital requirement also lowers bank value.

Our analysis also suggests potentially significant macro effects of political influence on banking that we have not explicitly examined but which may be worthy of further exploration. When the regulator imposes a capital requirement of $\hat{E}^*$ in conjunction with a directive for the bank to invest in the *P* loan, bank credit is directed *away* from *G* loans. If these borrowers exhibit any bank dependence, then it implies that alternative funding sources will either be unavailable

[34] One reason for this is that there is no monitoring decision for the bank here as in Holmstrom and Tirole (1997) and Mehran and Thakor (2011). With monitoring, more equity in the bank can lead to higher bank value. Note, however, that even if we include loan monitoring in our model as something that positively impacts the value of *G*, each bank will choose a value-maximizing level of capital consistent with choosing the *G* loan, absent capital requirements (see Mehran and Thakor (2011)). Political influence will be distortionary only if the capital requirement set by the regulator is higher, and the bank is asked to invest in the *P* loan. Once the bank is forced to invest in the *P* loan, the positive impact of capital on bank value via the monitoring channel is lost. If banks vary in the cross-section based on their marginal cost of equity capital (as in Mehran and Thakor (2011)), then the distortionary effect of politics will be stronger on banks whose privately optimal capital levels are lower, i.e., banks with higher marginal costs of capital.

or more expensive. If they are unavailable, there will be a decline in the aggregate investment in good projects in the economy. If they are available but more expensive, the good borrowers may prefer to switch to riskier projects (e.g., as in Stiglitz and Weiss (1981)), thereby causing an increase in risk in the economy.[35]

Another interesting issue is how the weights α_1 and α_2 are determined. If banks have greater bargaining power, then we would expect α_1 to be higher.[36] This may be the case, for example, if the economy has some very large (assets relative to GDP) banks. This leads to the following result.

Corollary 3: *If the distribution of banks in the economy has a higher proportion of banks that have greater bargaining power with the regulator, the regulatory capital requirement on banks will be set a lower level even when a regulatory asset-choice directive to make P loans is in place. Moreover, for* α_1 *sufficiently large, there will be no asset-choice directive to invest in P.*

The intuition is that when the regulator puts more weight on bank value, there is less political influence on banks. This implies that, even with a credit-allocation directive to invest in *P*, capital requirements will be lower in economies dominated by banks with more bargaining power.

Another implication of Corollary 2 is also that a banking system with greater bargaining power with legislators will be more resistant to political pressure to allocate credit in certain ways. When α_1 is high enough, (19) does not hold, so the regulator prefers *G* over *P*. Because *P* is a riskier loan than *G*, more effective resistance by banks to politically-motivated credit-allocation directives also means a lower probability of bank failures.

D. Comparative Statics

In this subsection, various comparative statics properties of the optimal solution are examined. The first of these related to the quality of the bank's assets in place, and the regulatory implications of this.

Proposition 3: *Both* E^* *and* $\hat{E}^*$ *are decreasing in q, the quality of the bank's assets in place, and are also decreasing in the deposit rent* $\bar{r}$. E^* *is decreasing in* θ*, the success probability of the G loan, and* $\hat{E}^*$ *is decreasing in p, the probability of success of the P loan.*

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[35] This result is driven in part by the fact that we have no borrower collateral in the model. Besanko and Thakor (1987) show how collateral can diminish rationing. See also Boot and Thakor (1994).

[36] The analysis here is somewhat related to the literature on how union bargaining power affects firm leverage. See Woods, Tan and Taff (2019) for recent evidence.

The economic intuition for E^* and $\hat{E}^*$ being decreasing in *q* is that as the quality of the bank's assets in place increases, it makes it less attractive for the bank to invest in the *B* loan. Thus, capital requirements can be reduced when *q* goes up. The intuition for the other comparative statics is as follows. An increase in $\bar{r}$ reduces the bank's repayment obligation to depositors, but this benefit accrues to the bank only with the *G* and *P* loans, not with the *B* loan, because the bank never repays depositors if it makes a *B* loan. This makes both the *G* and *P* loans more attractive to the bank relative to the *B* loan, reducing both E^* and $\hat{E}^*$. An increase in θ makes the *G* loan more attractive to the bank relative to the *B* loan, so it reduces E^*. Similarly, an increase in *p* makes the *P* loan more attractive to the bank relative to the *B* loan, so it reduces $\hat{E}^*$.

The final proposition of this section shows that the set of exogenous parameter values for which the results hold is non-empty.

Proposition 4: *The set of exogenous parameters satisfying (2), (3), (5), (16), (17), (19) and (20) is non-empty.*

E. Discussion of the Analysis

A couple of points are worth noting. First, regulatory insistence on the *P* loan can occur even if it is socially inefficient and $S > 0$. For example, with $\alpha_1 = \alpha_2 = 1$, we can have:

$$p[x+\beta] > \theta x > L > p\left[x + \left\{\frac{\beta}{2}\right\}\right]. \tag{22}$$

Thus, for sufficiently large political benefits, regulators may be asked to push socially-inefficient loans.

Second, the analysis reveals that the amount of capital that the bank has can act as a mechanism for allocating control. If the bank is unable to post at least E^* in capital, the regulator does not give it a license to operate, so all control rests with the regulator. But if the bank keeps capital in excess of $\hat{E}^*$, then it is accepting the level of capital a politically-motivated regulator would view as being compatible with asking the bank to make the *P* loan.

V. EXTENSIONS

A. Bank Licensing Policy, the Size of the Industry, and Competition:

Thus far it has been assumed that the bank has access to rents on the lending side. This means implicitly that entry into banking is controlled by the regulator. However, the use of entry restrictions as a policy instrument by the regulator has not been considered explicitly in the analysis. This is done now in order to extract additional implications.

For this purpose, it will be necessary to create a regulatory concern with the size of the banking industry. The idea is that entry restrictions can affect both industry size and rents banks can earn on their loans. This is formally done as follows.

Assume that each bank is atomistic relative to the size of the entire banking sector, and that the measure of the entire industry is $\mu \in \mathbb{R}_+$, where $\mathbb{R}_+$ is the positive real line. How large μ is depends on the regulator's licensing policy, ℓ. A more lenient licensing policy leads to more banks being given licenses. That is, $\partial\mu / \partial\ell > 0$. Because it does not qualitatively affect the analysis, it is assumed that ℓ does not affect λ.[37] Assume further that $\partial^2\mu / \partial\ell^2 < 0$.

Competition affects the rents banks can earn on loans.[38] Thus, it is assumed that $\partial x(\ell) / \partial\ell < 0$, $\partial^2 x(\ell) / \partial\ell^2 < 0$, with $\theta x(\bar{\ell}) > L$, where $\ell \in [\underline{\ell}, \bar{\ell}]$, which means that even when regulatory licensing policy allows competition to be at its maximum, the *G* loan is socially efficient.

The regulator's objective can now be stated as (analog of (6)):

$$U_{reg} = \{\alpha_1 V + \alpha_2 E(\beta)\}\mu(\ell) \tag{23}$$

The social planner's objective will now be[39]:

$$\{V + U_{reg}\}\mu(\ell) \tag{24}$$

This leads to the following result.

Proposition 5: *The larger is the weight,* α_2, *that the regulator attaches to political private benefits, the higher is the regulator's choice of* ℓ *(more lenient licensing policy), the larger is the banking sector and the higher are capital requirements for banks.*

The intuition is that a more lenient licensing policy creates a bigger banking sector and hence generates more political benefits from banks making politically-favored loans. The downside is that banks have to be subjected to higher capital requirements, but the regulator is willing to do this because an increase in α_2 means a higher α_2 / α_1, and hence a greater weight is attached to political benefits relative to bank value.

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[37] The idea is that sorting out efficient banks from the inefficient banks is something the regulator does through auditing in the post-licensing stage.

[38] There is a large literature on how increased bank competition affects bank profits and charter values. See, for example, Jiminez, Lopez and Saurina (2007).

[39] Note that nothing is being assumed about whether $V\mu(\ell)$ is increasing or decreasing in ℓ. It could well be that higher competition leaves the aggregate profits in banking unchanged, i.e., $V\mu(\ell)$ stays the same as ℓ changes.

A key assumption in the analysis above is that aggregate political benefits from banks making *P* loans increase in the size of the banking sector linearly. If, alternatively, one were to assume that there was an upper bound on the amount of politically-favored lending done by banks that the regulator desired, then regulatory licensing policy would be lenient until that amount of lending was achieved. The regulator's licensing policy beyond that size of the banking sector would be strict in order to limit entry. This is because limiting entry allows banks to earn higher rents than if the licensing policy continued to be lax, and this facilitates satisfaction of the incentive compatibility constraints of banks to avoid *B* loans with lower levels of capital.

B. Incentive Compatible Capital Regulation When Banks Are Privately Informed

Thus far it has been assumed that the regulator knows as much as the bank about all the parameters relevant to the determination of capital requirements. However, if banks are privately informed, then the regulator's task would be complicated by the potential strategic behavior of banks. The regulator's task of designing an incentive compatible mechanism, given a licensing policy, is analyzed in this section. That is, it is assumed that the regulator has determined its licensing policy and hence the size of the banking industry, and now confronts the question of setting capital requirements when banks are privately informed.

Suppose there are two types of (efficient) banks that are identical in all respects, except that some banks have $q = q_H$ and others have $q = q_L$, where $0 < q_L < q_H < 1$. Both types of banks look observationally identical to the regulator and depositors. They share a common prior belief that the probability is $\xi \in (0,1)$ that the bank has $q = q_H$. Using the Revelation Principle (Myerson (1979)), we can imagine the regulator asking each bank to report its *q*. It is useful to begin by noting that the full-information solution is not incentive compatible, i.e., the regulator cannot implement the full-information solution contingent on each bank's reported *q*.

Lemma 4: *Suppose the regulator wants all banks to invest in loan P and asks banks to directly and truthfully report their q's to the regulator. Then all banks, including those with* $q = q_L$, *will report* $q = q_H$.

The intuition is that a bank that reports a higher quality of assets in place is able to have a lower capital requirement. This enables it to rely more on rent-generating deposits. Moreover, the deposits it does raise are available at a lower cost. This creates an incentive for the bank with $q = q_L$ to misrepresent itself as a bank with $q = q_H$.

Now suppose the regulator wishes to implement the capital requirements implemented with full information about q, i.e., and for despite the incentive-compatibility challenge in doing so. Regardless of what kind of loan the regulator prefers the bank to make, there is a rationale for keeping capital requirements at these levels—capital levels lower than that precipitate moral hazard in asset choice, and higher capital levels sacrifice valuable economic services associated with deposits.[40] In what follows, it is shown that the regulator can use the strictness with which it enforces its credit-allocation regulation as a mechanism design tool to elicit the truth from banks. That is, the regulator can ask each bank to directly and truthfully report its q to the regulator and, contingent on that report, the regulator determines a probability, $\gamma(q)\in[0,1]$ with which the bank will be required to invest in the P loan; with probability $1-\gamma(q)$ the bank is allowed to invest in the G loan. If the bank is required to invest in the P loan, the capital requirement is $\hat{E}^*(q)$. If the bank is allowed to invest in the G loan, the capital requirement is $E^*(q)$. Thus, the regulator pre-commits to a menu

$$\left\{\gamma(q_i),\ \hat{E}^*(q_i),\ E^*(q_i)\,|\,i\in\{L,H\}\right\} \tag{25}$$

in the reporting game.[41]

The probability γ can be interpreted as a measure of the strictness with which the credit-allocation regulation is enforced by the regulator. Greater strictness (higher γ) would mean fewer exceptions to the rule and applicability in a broader set of circumstances. The idea is that every regulator has discretion in how strict to be in enforcing existing regulations in circumstances ranging from risk management to credit directives.[42] The next result describes the optimal mechanism. Recall that $Z(q_L)\equiv\theta x+q_L y$ and $Z_p(q_L)\equiv px+q_L y$.

Proposition 6: *Assuming that the regulator prefers that banks invest in P loans and that* $Z(q_L)-Z_P(q_L)$ *is sufficiently large, the optimal mechanism involves* $\gamma^*(q_H)=1$ *and* $\gamma^*(q_L)\in[0,1)$.

The intuition is that the bank with $q=q_L$ covets the allocation of the bank with $q=q_H$ (Lemma 4), so the regulator discourages mimicry by the bank with $q=q_L$ by requiring the bank

---

[40] This assumes that the bank has a fixed amount of financing, L that it needs to raise.

[41] As is standard in mechanism design based on the Revelation Principle, the regulator is presumed to be able to make a binding pre-commitment to banks.

[42] For example, the government has discretion in the stringency of regulation relating to speed limits. More stringent regulation means more police on the highway and a higher probability of detecting speeding.

that reports $q = q_H$ to invest in the less-desirable *P* loan with a higher probability. Given the regulator's preference for banks to invest in *P* loans, this probability is set at 1 for the bank reporting $q = q_H$. How low γ can be set for the bank reporting $q = q_L$ depends on how attractive mimicry is for the bank with $q = q_L$—the more attractive it is for such a bank to mimic a bank with $q = q_H$, the lower is $\gamma^*(q_L)$.

One implication of this analysis is that politicians/regulators will be more inclined to enact regulations that direct banks to make politically-favored investments when banks have more valuable assets in place, i.e., when they are more profitable. To put it a little differently, it is when banks are doing well that politics is more likely to be mixed with banking.

VI. CONCLUSION

This paper has formally modeled the idea that legislators/regulators may be politically motivated and may enact regulations aimed at influencing who banks lend to. The political preference for such lending may arise from social efficiency considerations, fairness/equity concerns, and/or private benefits for legislators/regulator. However, when the regulator's control over the loans the bank actually makes is imperfect, such asset-choice directives need to be accompanied by an indirect control mechanism, namely a higher capital requirement. In this way, regulatory capital requirements become an instrument for the exercise of political control over banks, even when such control may be socially inefficient. More importantly, it links prudential bank regulation to credit-allocation regulation in an explicit way—a link that has previously not been formally made.

This theory points out that how much capital the bank has determines the allocation of control between the owners of the bank and its regulator. When capital is "too low"—say it falls below E^*—the bank is not allowed to operate, so control rests with the regulator. When capital is "too high"—say the bank voluntarily raises it above $\hat{E}^*$—the regulator may direct the bank to make politically-favored loans that it would rather not make. It is only for "intermediate" values of bank capital that control rests with the bank's shareholders. Thus, banks have a stronger incentive to reduce their capital when they perceive a greater likelihood of being asked to make politically-favored loans.

In addition to these results, the theory also produces numerous predictions. First, regulatory pressure on banks to make politically-favored loans will be lower in economies dominated by banks that have greater bargaining power with regulators. Second, pressure on banks to make politically-favored loans will be greater when the banking industry has higher-valued assets in place (is more profitable) and/or the regulator attaches a bigger weight to the political benefits of bank lending. Third, political influence on credit allocation leads to a larger banking sector with higher capital requirements.

This paper has focused on direct credit-allocation directives. There are, of course, more subtle ways for regulators to influence credit allocation, such as via government loan guarantees for some types of loans and loan-to-value restrictions for others.[43] Future research could examine whether these mechanisms produce similar effects.

Finally, since political influence affects the kinds of loans banks make and the capital ratios they choose, they can also affect financial system architecture (see, for example, Song and Thakor (2010) for an analysis of the dynamics of financial system architecture), and hence potentially the boundaries between banks and non-banks as well as between banks and markets. These issues may also be worth exploring in future research.

[43] Wilcox and Yasuda (2019) provide evidence that government loan guarantees increase bank risk taking. Morgan Regis and Salike (2019) provide evidence that loan-to-value (LTV) restrictions are effective in limiting bank lending. Thus, regulators may impose LTV limits on loans that are *not* politically favored to push credit supply in the direction of politically-favored loans.

APPENDIX

Proof of Lemma 1: Assuming that $x > D_R$, $y > D_R$ (borrowing by the bank does not create a repayment obligation that exceeds the maximum loan payoff), the bank's optimization problem in the first best case is:

$$\underset{D\in[0,L]}{Max}\left\{\theta q\left[x+y-D_R\right]+\left[1-\theta\right]q\left[y-D_R\right]+\left[1-q\right]\theta\left[x-D_R\right]\right\}-E \tag{A-1}$$

subject to

$$\hat{\theta}D_R+\overline{r}D=D \tag{A-2}$$

$$D+E=L \tag{A-3}$$

The $\hat{\theta}$ in (A-2) is defined in the statement of the lemma. Note that (A-2) is the deposit pricing constraint that guarantees the depositors will receive their equilibrium expected return of zero. Substituting for $\hat{\theta}D_R$ from (A-2) into (A-1) and using (A-3) yields a maximum and of:

$$qy+\theta x-\left[D-\hat{\theta}\overline{r}D\right]-\left[L-D\right] \tag{A-4}$$

Differentiating (A-4) with respect to D gives us:

$$\overline{r}>0. \tag{A-5}$$

Thus, the bank's objective function is strictly increasing in *D* and achieves its maximum at *D* = *L*. Substituting *D* = *L* in (A-2) gives us $\hat{\theta}D_R+r\left(L\right)=L,$ which then gives (9). ■

Proof of Lemma 2: From the deposit pricing constraint (13) we get:

$$\pi^*\left[\hat{\theta}D_R+\overline{r}D\right]=\overline{\pi}D \tag{A-6}$$

Substituting for $\hat{\theta}D_R(E)$ from the IC constraint (11) into (A-6) and rearranging yields the quadratic:

$$\pi^*-\pi^*\left[Z+\overline{r}\left[L-E\right]\right]-\overline{\pi}D=0 \tag{A-7}$$

The solution to this quadratic noting $\overline{r}\left[L-E\right]\equiv r$ is:

$$\pi^*\left(E\right)=\frac{\left[Z+r\right]+\sqrt{\left[Z+r\right]^2-4\overline{\pi}\left[L-E\right]}}{2} \tag{A-8}$$

Clearly, $\pi^*\left(E^*\right)>0$ and real-valued given (16).

The quadratic equation also has another root, which involves a smaller value of π^*. Under a parametric restriction that differs from that in (17), it can be shown that this π^* is also increasing in E^*, thereby leading to qualitatively similar results in the rest of the analysis. Thus, the solution in (A-8) will be the one that will be used subsequently. ■

Proof of Lemma 3: Henceforth $r \equiv \bar{r}D$. Differentiating π^* in (A-8) with respect to E gives:

$$
\begin{aligned}
\partial \pi^* / \partial E &= \frac{1}{2}\left\{-r' + \frac{\{2[Z+r][-r'] + 4\bar{\pi}\}}{2\sqrt{[Z+r]^2 - 4\bar{\pi}D}}\right\} \\
&= \frac{2\bar{\pi} - \bar{r}\left\{\sqrt{[Z+r]^2 - 4\bar{\pi}D} + [Z+r]\right\}}{2\sqrt{[Z+r]^2 - 4\bar{\pi}D}}
\end{aligned}
\tag{A-9}
$$

> 0 given (17).

To see the last step, note that for $\partial \pi^*/\partial E > 0$, we need

$$
2\bar{\pi} > \bar{r}\{\sqrt{[Z+r]^2 - 4\bar{\pi}D} + Z + r\} \tag{A-10}
$$

The maximum value of the right-hand side of (A-10) occurs at $r(L)$ and $D = 0$. Thus, a sufficient condition for (A-10) to hold is that:

$$
\begin{aligned}
2\bar{\pi} &> \bar{r}\left\{\sqrt{[Z+r(L)]^2} + Z + r(L)\right\} \\
&= 2\bar{r}\left[Z + r(L)\right]
\end{aligned}
$$

which yields (17). Thus, $\partial \pi^*/\partial E > 0$ if (17) holds.

Next, using (A-9), we have:

$$
\partial^2 \pi^* / \partial E^2 = \frac{1}{2}\left\{\frac{\left[(\bar{r})^2\sqrt{[Z+r]^2 - 4\bar{\pi}D} - \frac{[2\bar{\pi} - \bar{r}[Z+r]]^2}{\sqrt{[Z+r]^2 - 4\bar{\pi}D}}\right]}{[Z+r]^2 - 4\bar{\pi}D}\right\} \tag{A-11}
$$

To obtain $\partial^2 \pi^*/\partial E^2 < 0$, we need:

$$
\frac{[2\bar{\pi} - \bar{r}[Z+r]]^2}{\sqrt{[Z+r]^2 - 4\bar{\pi}D}} > (\bar{r})^2\sqrt{[Z+r]^2 - 4\bar{\pi}D}
$$

which requires that:

$$
2\bar{\pi} > \bar{r}\left\{Z + r + \sqrt{[Z+r]^2 - 4\bar{\pi}D}\right\} \tag{A-12}
$$

The right-hand side of (A-12) attains its maximum value when $r = r(L)$ and $D = 0$. Thus, a sufficient condition for (A-12) to hold is that:

$$
2\bar{\pi} > \bar{r}\left[Z + r(L) + [Z+r]\right]
$$

which clearly holds given (17). Thus, it has been proved that $\partial^2 \pi^*/\partial E^2 < 0.$ ■

Proof of Proposition 1: Substituting (13) into the bank's objective function (12) and rearranging, we can write the bank's problem as:

$$\underset{E}{Max}\left\{\int_0^{\pi^*}[Z+r][\bar{\pi}]^{-1}d\pi - L + \int_{\pi^*(E)}^{\bar{\pi}}\pi[\bar{\pi}]^{-1}d\pi\right\} \quad \text{(A-13)}$$

The first-order condition for, E^*, the optimal E is:

$$[\bar{\pi}]^{-2}\left\{-\bar{r}\pi^* + [Z+r][\partial\pi^*/\partial E] - \pi^*\left[\partial\pi^*/\partial E\right]\right\} = 0 \quad \text{(A-14)}$$

The second-order condition for E^* to be a unique global optimum is:

$$\{\bar{\pi}\}^{-1}\left\{\begin{matrix} -\bar{r}\left[\partial\pi^*/\partial E\right] + [Z+r]\left[\partial^2\pi^*/\partial E^2\right] - \bar{r}\left[\partial\pi^*/\partial E\right] \\ -\pi^*\left[\partial^2\pi^*/\partial E^2\right] - \left[\partial\pi^*/\partial E\right]^2 \end{matrix}\right\} < 0 \quad \text{(A-15)}$$

which is clearly satisfied since $\partial\pi^*/\partial E > 0$ and $\partial^2\pi^*/\partial E^2 < 0$ by Lemma 3.

Also note that the bank will not raise financing in excess of *L* because that would incur additional transaction costs of *T* per dollar of financing raised. ■

Proof of Corollary 1: We know that $\partial Z/\partial q > 0,$ so we can evaluate the impact of an increase in *Z* in order to assess the impact of an increase in *q*. Fix a *Z* and consider the first-order condition (A-14). What will happen to the equality in (A-14) if we replace *Z* by $\tilde{Z} > Z,$ but keep $E^*(Z)$ as the value of *E* satisfying (A-14) for *Z*? Designate the left-hand side of (A-14) as $\Im(E^*(Z), Z)$ when the capital employed is $E^*(Z)$ for *Z*, i.e. (A-14) can be written as:

$$\Im(E^*(Z), Z) = 0 \quad \text{(A-16)}$$

From (11) we know that $Z = \pi^*(E) + \hat{\theta}D_R(E),$ which means $Z + r > \pi^*.$

Now note that $\partial\pi^*/\partial Z > 0$ and

$$\begin{aligned}&\partial^2\pi^*/\partial E\partial Z \\ &= \frac{\left\{-\bar{r}\sqrt{[Z+r]^2 - 4\bar{\pi}D} - \left\{2\bar{\pi} - \bar{r}[Z+r]\right\}[Z+r]\left\{[Z+r]^2 - 4\bar{\pi}D\right\}^{-1/2}\right\}}{2\left\{[Z+r]^2 - 4\bar{\pi}D\right\}} \\ &< 0.\end{aligned} \quad \text{(A-17)}$$

Moreover,

$$Z + r - \pi^* = \frac{Z + r - \sqrt{[Z+r]^2 - 4\bar{\pi}D}}{2} \quad \text{(A-18)}$$

So,

$$\partial\left[Z+r-\pi^*(E^*)\right]/\partial Z$$
$$=\frac{1}{2}-\frac{[Z+r]}{\sqrt{[Z+r]^2-4\bar{\pi}D}} \tag{A-19}$$
$$<0$$

From (A-17), (A-18), (A-19) and the facts that $\partial\pi^*/\partial E>0$ and $\partial\pi^*/\partial Z>0,$ it follows that if we replace Z by $\tilde{Z}>Z$ but keep $E^*(Z)$ unchanged in (A-16), the quantity $\bar{r}\pi^*(E^*(Z)\tilde{Z})$ increases, whereas the positive quantity $\left[\tilde{Z}+r-\pi^*(E^*(Z),\tilde{Z})\right]$ decreases and the quantity $\partial\pi^*/\partial E$ decreases. That is,

$$\Im(\mathrm{E}^*(\mathrm{Z}),\tilde{Z})<0. \tag{A-20}$$

Given the concavity of the bank's objective function in *E,* this implies that

$$E^*(\tilde{Z})<E^*<E^*(Z)\text{ for }\tilde{Z}>Z \tag{A-21}$$

Thus,

$$E^*(\tilde{q})<E^*(q)\text{ for }\tilde{q}>q \tag{A-22}$$

This completes the proof. ■

Proof of Proposition 2: The objective function (21) can be written as:

$$\underset{E}{Max}\left\{\int_0^{\hat{\pi}^*}\left\{\alpha_1\left[Z_P+r\right]+\alpha_2 p\left[\beta\right]\right\}[\bar{\pi}]^{-1}d\pi+\alpha_1\int_{\hat{\pi}^*(E)}^{\bar{\pi}}\pi[\bar{\pi}]^{-1}d\pi\right\} \tag{A-23}$$

Now the incentive compatibility (IC) constraint for the bank to choose *P* rather than *B* is

$$Z_P-\hat{\theta}_P\hat{D}_R\geq\pi\ \forall\ \pi\in\left[0,\bar{\pi}\right] \tag{A-24}$$

and $\hat{D}_R$ satisfies the creditors' participation constraint:

$$\int_0^{\hat{\pi}^*(E)}\left\{\hat{\theta}_P\hat{D}_R+\bar{r}\hat{D}\right\}\left\{\bar{\pi}\right\}^{-1}d\pi=\hat{D} \tag{A-25}$$

which is the analog of (13), where

$$\hat{\theta}_P\equiv pq+\left[1-p\right]q+\left[1-q\right]p \tag{A-26}$$

and the budget constraint

$$\hat{D}+E=L \tag{A-27}$$

The critical value of $\pi,$ call it $\hat{\pi}^*,$ such that IC constraint (A-24) holds tightly, is:

$$\hat{\pi}^*=Z_P-\hat{\theta}_P\hat{D}_R \tag{A-28}$$

Proceeding as in the proof of Lemma 2, we have:

$$\hat{\pi}^*(E) = \frac{[Z_P + r] + \sqrt{[Z_P + r]^2 - 4\bar{\pi}[L-E]}}{2} \tag{A-29}$$

which is the analog of (A-8). Now define a scalar κ satisfying:

$$\kappa Z + r = Z_P + r \tag{A-30}$$

Clearly $\kappa \in (0,1)$.

The regulator's choice of *E*, call it $\hat{E}^*$, that solves the maximization in (A-23), must satisfy the first-order condition (recognizing that $r = \bar{r}D = \bar{r}[L-E]$):

$$-\alpha_1 \bar{r}\hat{\pi}^* + \left[\alpha_1\{\kappa Z + r\} + \alpha_2 p\{\beta\} - \alpha_1\hat{\pi}^*\right]\left[\partial\hat{\pi}^*/\partial E\right] = 0 \tag{A-31}$$

where

$$\partial\hat{\pi}^* / \partial E = \frac{\left\{2\bar{\pi} - \bar{r}\left[\sqrt{(\kappa Z + r)^2 - 4\bar{\pi}[L-E]} + \kappa Z + r\right]\right\}}{2\sqrt{(\kappa Z + r)^2 - 4\bar{\pi}[L-E]}} \tag{A-32}$$

Proceeding as in the proof of Lemma 3, it can be shown that $\partial\hat{\pi}^* / \partial E > 0$ and $\partial^2\hat{\pi}^* / \partial E^2 < 0$, and that the second-order condition for a unique global maximum is satisfied. Now note that (A-28) and (11) imply that

$$\hat{\pi}^* < \pi^* \;\forall\; E \in (0, \mathrm{L}) \tag{A-33}$$

Moreover, (A-33) and (19) imply that $\forall E \in (0, L)$:

$$\alpha_1\{\kappa Z + r\} + \alpha_2 p\{\beta\} - \hat{\pi}^* > Z + r - \pi^* \tag{A-34}$$

With these results in hand, define the left-hand side of (A-31) as $\Im_P$, so (A-31) can be written as:

$$\Im_P(\hat{\mathrm{E}}^*) = 0 \tag{A-35}$$

Now, holding *E* fixed at $\hat{E}^*$, evaluate $\partial^2\hat{\pi}^*/\partial\kappa\partial E$ at $\kappa = 1$:

$$\partial^2\hat{\pi}^*/\partial\kappa\partial E\,\big|\,\hat{E}^*, \kappa = 1$$
$$= \left\{\frac{-2A_1\bar{r}\left[\{Z + r\}A_1^{-1} + Z\right] - \left[2\bar{\pi} - \bar{r}\{A_1 + Z + r\} + Z + r\right]\left[2\{Z + r\}\right]A_1^{-1}}{4A_1^2}\right\} \tag{A-36}$$

where

$$A_1 \equiv \sqrt{[Z + r]^2 - 4\bar{\pi}[L - \hat{E}^*]} \tag{A-37}$$

Clearly, the expression in (A-36) is negative. This means that $\partial\hat{\pi}^*/\partial E$ with *G* loan (corresponding to $\kappa = 1$) is smaller than $\partial\hat{\pi}^*/\partial E$ with the *P* loan (corresponding to $\kappa < 1$) at $E = \hat{E}^*$. Combining this result with (A-33) and (A-34) implies that, holding fixed $E = \hat{E}^*$, $\Im_P$ with loan P ($\kappa < 1$) is bigger than $\Im_G$ with loan G ($\kappa = 1$) where $\Im_G(\hat{E}^*)$ is defined as the left-hand side of (A-14) with E^* replaced by $\hat{E}^*$. Now, given (A-35), the first-order condition with the P loan, we see that the first-order condition (A-14) becomes

$$\Im_G(\hat{E}^*) < 0 \tag{A-38}$$

when E^* is replaced by $\hat{E}^*$. Since $\Im_G(E^*) = 0$ and the objective function is concave in E, it follows that

$\hat{E}^* > E$ ■

Proof of Corollary 2: Since the only difference between the bank's optimization problem and the regulator's problem in (21) is that β is absent in the bank's problem, we can rewrite the first-order condition (A-31) with $\lambda_2 = 0$. It is clear from inspecting (A-31) that this reduces the positive quantity on the left-hand side of (A-31). Since $\hat{\pi}^*(\hat{E}^*)$ is increasing in $\hat{E}^*$ (see (A-32)), it follows that the $\bar{E}^*$ that satisfies (A-31) with $\lambda_2 = 0$ will be less than $\hat{E}^*$. ■

Proof of Corollary 3: Assume banks are directed to make P loans. Examine the first-order condition for $\hat{E}^*$ in (A-31). Since $-\alpha_1 \bar{r} \hat{\pi}^* < 0$, the second term in (A-31) is positive. Moreover, since, $\frac{\partial \hat{\pi}^*}{\partial E} > 0$, we know that

$$\alpha_1 \{kZ + r\} + \alpha_2 p \{\beta\} - \alpha_1 \hat{\pi}^* > 0 \tag{A-39}$$

An increase in α_1 therefore increases the absolute value of the negative term $-\alpha_1 \bar{r} \hat{\pi}^*$.

Moreover, an increase in α_1 also decreases the expression in $-\alpha_1 \bar{r} \hat{\pi}^*$. Thus, $\frac{\partial \hat{\pi}^*}{\partial E}$ must increase in (A-31). Since $\hat{\pi}^*$ is concave in E, it follows that $\hat{E}^*$ must decrease in α_1, i.e., $\frac{d\hat{E}^*}{d\alpha_1} < 0$. Finally, if α_1 is large enough, (19) is reversed as an inequality and the regulator prefers G over P. ■

Proof of Proposition 3: The results $\partial \hat{E}^* / dZ < 0$ and $d\,E^* / dq < 0$ were proved in the proof of Corollary 1. The proof for $d\,\hat{E}^* / dZ < 0$ and $d\,\hat{E}^* / dq < 0$ is similar. Now consider E^* and the first-order condition (A-14). The proof that $d\,E^*/dr<0$ proceeds along exactly the same lines as the proof that $d\,E^*/dZ<0$ in the proof of Corollary 1. Moreover, since $\partial Z/\partial\theta>0$, it follows immediately that $d\,E^*/d\theta<0$. The proof for $d\,\hat{E}^*/dZ_P<0$ and $d\,\hat{E}^*/dr<0$ is similar, and the result that $d\,\hat{E}^*/dp<0$ follows from the observation that $\partial Z_P/\partial p>0$. ■

Proof of Proposition 4: The following set of exogenous parameter values satisfies (2), (3), (5), (16), (17), (19) and (20): $\theta=0.9, \overline{\pi}=9, L=10, x=14, p=0.6, q=0.7, y=20, \overline{r}=0.2, \beta=5, \alpha_1=1, \alpha_2=2.$ ■

Proof of Lemma 4: Define $\mathrm{U}(\tilde{q}|q)$ as the NPV to the shareholders of a bank whose true quality of assets in place is q but it reports it to be $\tilde{q}$. Let $\mathrm{U}(q|q)\equiv U(q)$. Then we can use (12) to see that:

$$\mathrm{U}(\mathrm{q}_H\,|q_L)=\int_0^{\hat{\pi}^*(\hat{E}_H^*,\mathrm{q}_L)}\left[Z_P(q_L)-\hat{\theta}_L D_R(\hat{E}_H^*)\right][\overline{\pi}]^{-1}\,d\pi+\int_{\hat{\pi}^*(\hat{E}_H^*,q_L)}^{\overline{\pi}}\pi[\pi]^{-1}d\pi-\hat{E}_H^* \tag{A-40}$$

where $\hat{E}_H^*$ is the capital requirement for a bank that reports $\tilde{q}=q_H, D_R(\hat{E}_H^*)$ is its repayment obligation on deposits, and

$$\hat{\pi}^*(\hat{E}_H^*,q_L)=\frac{Z(q_L)+r(\hat{\mathrm{D}}_H^*)+\sqrt{\left[Z(q_L)+r(\hat{D}_H^*)\right]^2-4\overline{\pi}\hat{D}_H^*}}{2} \tag{A-41}$$

$$\hat{D}_H^*+\hat{E}_H^*=L \tag{A-42}$$

$$\int_0^{\hat{\pi}^*(E_H^*,q_H)}\left\{\hat{\theta}_H D_R(\hat{E}_H^*)+r(\hat{D}_H^*)\right\}[\overline{\pi}]^{-1}d\pi=\hat{D}_H^* \tag{A-43}$$

Let $\hat{E}_L^*$ be the capital requirement for a bank that reports $\tilde{q}=q_L$ and let $D_R(\hat{E}_L^*)$ be its requirement obligation on deposits. Then by the pricing constraint (13) we know that:

$$\int_0^{\hat{\pi}^*(\hat{E}_H^*,q_H)}\left[r(\hat{D}_H^*)+\hat{\theta}_H D_R(\hat{E}_H^*)\right][\overline{\pi}]^{-1}\,d\pi+\hat{E}_H^*=\int_0^{\hat{\pi}^*(\hat{E}_L^*,q_L)}\left[r(\hat{D}_L^*)+\hat{\theta}_L D_R(\hat{E}_L^*)\right][\overline{\pi}]^{-1}\,d\pi+\hat{E}_L^*$$

Rearranging the above equality yields

$$\int_0^{\hat{\pi}^*(\hat{E}_H^*,q_H)}D_R(\hat{E}_H^*)[\overline{\pi}]^{-1}\,d\pi=\left[\hat{\theta}_H\right]^{-1}\left\{\begin{array}{l}\int_0^{\hat{\pi}^*(E_L^*,q_L)}\left[r(\hat{D}_L^*)+\hat{\theta}_L D_R(\hat{E}_L^*)\right][\overline{\pi}]^{-1}\,d\pi\\ +E_L-E_H-\int_0^{\hat{\pi}^*(\hat{E}_H^*,q_H)}r(\hat{D}_H^*)[\overline{\pi}]^{-1}\,d\pi\end{array}\right\} \tag{A-44}$$

which implies (since $\hat{\pi}^*(\hat{E}_H^*,q_L)<\hat{\pi}^*(E_H^*,q_H)$) that:

$$\int_0^{\hat{\pi}^*(E_H^*,q_L)}D_R(\hat{E}_H^*)[\overline{\pi}]^{-1}\,d\pi<\left[\hat{\theta}_H\right]^{-1}\left\{\begin{array}{l}\int_0^{\hat{\pi}^*(\hat{E}_L^*,q_L)}\left[r(\hat{D}_L^*)+\hat{\theta}_L D_R(\hat{E}_L^*)\right][\overline{\pi}]^{-1}\,d\pi\\ +\hat{E}_L^*-\hat{E}_H^*-\int_0^{\hat{\pi}^*(\hat{E}_H^*,q_H)}r(\hat{D}_H^*)[\overline{\pi}]^{-1}\,d\pi\end{array}\right\} \tag{A-45}$$

Now recognizing that $\hat{\pi}^*(E_H^*, q_L) > \hat{\pi}^*(\hat{E}_L^*, q_L)$ and using (A-40), we can write:

$$
\begin{aligned}
U(q_H \mid q_L) &= \int_0^{\hat{\pi}^*(\hat{E}_H^*, q_L)} [Z_P(q_L) - \hat{\theta}_L D_R(\hat{E}_H^*)][\bar{\pi}]^{-1} d\pi + \int_{\hat{\pi}^*(E^*_H, q_L)}^{\bar{\pi}^*} \pi[\bar{\pi}]^{-1} d\pi - \hat{E}_H^* \\
&> \int_0^{\hat{\pi}^*(\hat{E}_L^*, q_L)} Z_P(q_L)[\bar{\pi}]^{-1} d\pi + \int_{\hat{\pi}^*(\hat{E}_L^*, q_L)}^{\bar{\pi}} \pi[\bar{\pi}]^{-1} d\pi - \int_0^{\hat{\pi}^*(\hat{E}_H^*, q_L)} \hat{\theta}_L D_R(\hat{E}_H^*)[\bar{\pi}]^{-1} d\pi - \hat{E}_H^* \\
&> \left[\begin{array}{l} \int_0^{\hat{\pi}^*(\hat{E}_L^*, q_L)} Z_P(q_L)[\bar{\pi}]^{-1} d\pi + \int_{\hat{\pi}^*(\hat{E}_L^*, q_L)}^{\bar{\pi}} \pi[\bar{\pi}]^{-1} d\pi - \hat{E}_H^* \\ -\hat{\theta}_L \left[\hat{\theta}_H\right]^{-1} \left\{ \int_0^{\hat{\pi}^*(\hat{E}_L^*, q_L)} \left\{ r(\hat{D}_L^*) + \hat{\theta}_L D_R(\hat{E}_L^*) \right\} [\bar{\pi}]^{-1} d\pi + \hat{E}_L^* - \hat{E}_H^* - \int_0^{\hat{\pi}^*(\hat{E}_H^*, q_H)} r(\hat{D}_H^*)[\bar{\pi}]^{-1} d\pi \right\} \end{array} \right]
\end{aligned}
\qquad \text{(A-46)}
$$

where the last step uses (A-45).

Now define

$$
\Delta \equiv \hat{\theta}_L \left[\hat{\theta}_H\right]^{-1} \left(\int_0^{\hat{\pi}^*\left(\hat{E}_H^*, q_H\right)} r(\hat{D}_H^*)[\bar{\pi}]^{-1} d\pi - \int_0^{\hat{\pi}^*\left(\hat{E}_L^*, q_L^*\right)} r(\hat{D}_L^*)[\bar{\pi}]^{-1} d\pi \right) > 0. \qquad \text{(A-47)}
$$

Returning to (A-46), we can write:

$$
\begin{aligned}
\mathrm{U}(q_H \mid q_L) &> \left[\begin{array}{l} \int_0^{\hat{\pi}^*(\hat{E}_L^*, q_L)} Z_P(q_L)[\bar{\pi}]^{-1} d\pi + \int_{\hat{\pi}^*(E_L^*, q_L)}^{\bar{\pi}} \pi[\bar{\pi}]^{-1} d\pi - \hat{E}_H^* + \Delta \\ -\hat{\theta}_L \left[\hat{\theta}_H\right]^{-1} \left[\int_0^{\hat{\pi}^*(\hat{E}_L^*, q_L)} \hat{\theta}_L D_R(\hat{E}_L^*)[\bar{\pi}]^{-1} d\pi + \hat{E}_L^* - \hat{E}_H^* \right] \end{array} \right] \\
&> \left[\begin{array}{l} \int_0^{\hat{\pi}^*(\hat{E}_L^*, q_L)} \left[Z_P(q_L) - \hat{\theta}_L D_R(\hat{E}_L^*) \right] [\bar{\pi}]^{-1} d\pi + \int_{\hat{\pi}^*(\hat{E}_L^*, q_L)}^{\bar{\pi}} \pi[\bar{\pi}]^{-1} d\pi + \Delta \\ -\hat{E}_H^* \left[1 - \hat{\theta}_L \left\{\hat{\theta}_H\right\}^{-1} \right] - \hat{E}_L^* \hat{\theta}_L \left\{\hat{\theta}_H\right\}^{-1} \end{array} \right] \\
&> \int_0^{\hat{\pi}^*(\hat{E}_L^*, q_L)} \left[Z_P(q_L) - \hat{\theta}_L D_R(\hat{E}_L^*) \right] [\bar{\pi}]^{-1} d\pi + \int_{\hat{\pi}^*(\hat{E}_L^*, q_L)}^{\bar{\pi}} \pi[\bar{\pi}]^{-1} d\pi - \hat{E}_L^* \\
&\qquad \left(\text{since } \hat{E}_H^* < \hat{E}_L^* \right) \\
&= U(q_L).
\end{aligned}
$$

■

Proof of Proposition 5: The regulator's objective function is given by (23). The first-order condition for the optimal choice of ℓ is:

$$
\begin{aligned}
\partial U_{reg} / \partial \ell &= \left\{ \alpha_1 \frac{\partial V(\ell)}{\partial \ell} + \alpha_2 E[S + \beta] \right\} \mu + \left\{ \alpha_1 V + \alpha_2 E[S + \beta] \right\} \frac{\partial \mu(\ell)}{\partial \ell} \\
&= 0
\end{aligned}
\qquad \text{(A-48)}
$$

The second-order condition is:

$$
\frac{\alpha \partial^2 V(\ell)}{\partial \ell^2} \bullet \mu + \left\{ \alpha_1 V + \alpha_2 E[S + \beta] \right\} \frac{\partial^2 \mu(\ell)}{\partial \ell^2} < 0 \qquad \text{(A-49)}
$$

which is satisfied since $\partial^2 V(\ell) / \partial \ell^2 < 0$ (due to $\partial^2 x(\ell) / \partial \ell^2 < 0$) and $\partial^2 \mu(\ell) / \partial \ell^2 < 0$.

Now totally differentiating (A-48) yields (and designating ℓ^* as the optimal choice of ℓ):

$$
E[S + \beta]\mu + \frac{\alpha \partial^2 V(\ell)}{\partial \ell^2} \bullet \frac{d\ell^*}{d\alpha_2} + \left\{ \alpha_1 V + \alpha_2 E[S + \beta] \right\} \frac{\partial^2 \mu}{\partial \ell^2} \bullet \frac{d\ell^*}{d\alpha_2} = 0
$$

which gives us:

$$\frac{d\ell^*}{d\alpha_2} = \frac{-E\left[S+\beta\right]\mu}{\left\{\frac{\alpha_1\partial^2 V\left(\ell\right)}{\partial\ell^2} + \left[\alpha_1 V + \alpha_2 E\left[S+\beta\right]\right]\frac{\partial^2\mu}{\partial\ell^2}\right\}} > 0 \tag{A-50}$$

Thus, ℓ^* is strictly increasing in α_2. A higher ℓ^* reduces $x\left(\ell^*\right)$. It follows from the IC constraint (10) that since this leads to a lower Z, it also leads to a higher regulatory capital requirement. ■

Proof of Proposition 6: Since the regulator prefers the bank to invest in loan *P*, it will set $\gamma(q_H)=1$ for the bank that reports $\tilde{q}=q_H$. Now satisfaction of the IC constraint for the bank with $q=q_L$ to not mimic the bank with $q=q_H$ is

$$\gamma(q_L)\,\mathrm{U}_P(q_L|q_{L1}) + \left[1-\gamma(q_L)\right]U_G(q_L|q_L) \geq U_P(q_H|q_L) \tag{A-51}$$

where $U_k(q_i|q_j)$ is the net wealth of the shareholders of a bank with $q=q_j$ that reports $\tilde{q}=q_i$ and is instructed to invest in loan $k\in\{P,G\}$. Since $U_P(q_L|q_L) < U_P(q_H|q_L)$ (see Lemma 4) and $U_G(\mathrm{q}_L|q_L) > U_P(\mathrm{q}_H|q_L)$ for $Z(q_L)-Z_P(q_L)$ sufficiently large, $\exists\gamma^*(q_L)\in[0,1)$ such that (A-51) holds as an equality. ■

Figure 1: Summary of sequence of events

t=0	t=1	t=2
• Bank is either "efficient" or "inefficient". • Regulator decides on the bank's minimum skin in the game (modeled as an inside equity requirement), and whether or not to direct the bank's lending decision. • Bank raises financing: *D* deposits and *E* equity. • Bank has AIP (assets in place) with random payoff $\tilde{y}$ that will be realized at t=2. The availability of AIP affects the bank's cost of financing at *t*=0.	• Bank observes private benefit drawer π. • Bank choses loan among alternatives {*P*,*B*} or {*G*,*B*}. • Regulator can audit bank for "efficient" or "inefficient" and can shut down the bank based on what it learns.	• All payoffs, including the realization of $\tilde{y} \in \{0, y\}$, are observed and contractual payments are made.

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