Self-Interested Bank Regulation

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"He's His Own Man, But Works For You."

—Election slogan of anonymous politician

This paper formalizes the notion that a bank regulator may pursue self interest rather than social welfare, and examines the implications of this for deposit insurance and regulatory reform in banking. We model the pursuit of self interest by introducing uncertainty about the regulator's ability to monitor the bank's asset choice. This uncertainty creates a desire for the regulator to acquire a reputation as a capable monitor, and this desire distorts his bank closure policy and inflates the liability of the deposit-insurance fund. We use this perspective on bank regulation to generate numerous policy prescriptions about banking reform.

The thrift and banking crises of the last decade have led to a surge in vitriol concerning the process of regulation. The need for reform is thus acknowledged by many, but despite limited progress made by the Federal Deposit Insurance Corporation Improvement Act (FIDICIA) of 1991, there seems to be disagreement on how to improve bank regulation. The bank regulation literature has provided reform suggestions, but these have to do with the *rules* of regulation rather than its *human* aspects (e.g., Finn Kydland and Edward C. Prescott, 1977; Fischer Black et al., 1978; Yuk-Shee Chan et al., 1992). Moreover, because of its focus on self-interested behavior by the *bank*, this literature has viewed the regulator as maximizing social welfare. However, as Edward Kane (1990) has forcefully argued, the delegation problem *between the taxpayer and her agent, the regulator* may be the key to comprehending recent banking history and desirable future regulation.

It is the manner in which this delegation problem manifests itself in regulatory behavior that is the focus of our paper. We wish to study the incentives a regulator has to undertake actions that protect his reputation. Our theory is based on the premise that even a small degree of uncertainty about the quality of the regulator can create significant departures from social optima. The departure of principal interest to us is the timing of bank closures, an issue about which regulators have been quite defensive lately (see Barbara A. Rehm and Bill Atkinson, 1991). Our analysis thus differs sharply from that of Tim S. Campbell et al. (1992) who examine the design of optimal incentive contracts for effort-averse regulators in a static setting.

The paper is organized as follows. Section I develops a two-period model of dynamic asset portfolio choice by the bank. A regulator of unknown ability (imperfectly) monitors this asset choice and also decides whether or not the bank should be closed. Section II shows that in a reputational equilibrium the regulator's closure policy is more lax than the social optimum, sometimes permitting the second-period continuation of a bank that should be (socially optimally) closed. The distortion in social welfare depends critically on the noise in the regulator's perceived ability. Section III concludes with a discussion of policy implications. The issues discussed are consolidation versus separation of regulatory tasks, duration of a

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regulator's appointment and the reappointment process, regulatory latitude in bank closure decisions, the role of asset portfolio restrictions on banks, and the management of public perceptions. All proofs are in our companion working paper (Boot and Thakor, 1992).

I. The Model and Social Optima

A. *The Model*

There are two time periods, the first from $t=0$ to $t=1$, and the second from $t=1$ to $t=2$. At $t=0$, the bank has assets which pay off a random amount $\tilde{y}$ at $t=1$ and nothing thereafter, where $\tilde{y}$ has a distribution $F(\cdot)$ and a probability density $f(\cdot)$ with support $[0,\bar{y}]$ and $\bar{y}>0$. In addition, the bank has a *discretionary* asset for which it can choose the payoff distribution. This asset requires a \$1 investment at $t=0$ and yields a random payoff $\tilde{R}_1$ at $t=1$, where $\tilde{R}_1=R(\theta_1)>0$ with probability θ_1 and 0 with probability $1-\theta_1$, and $R'(\cdot)<0$ and $R''(\cdot)\leq 0$ $\forall\,\theta_1\in\Theta$, a compact subset of $(0,1)$. The investment is financed with $\$K_1$ of book equity capital and $\$(1-K_1)$ of insured deposits. Deposit insurance is risk-insensitive, and to ease notation we set the premium at zero. In the second period, the bank can make a similar discretionary asset choice.

The bank's choice of θ_1 is directly observable only to the bank, and this choice is monitored by the regulator at $t=0$. The regulator's quality determines the probability with which he detects the bank's asset choice through monitoring. If the bank's asset choice is detected to be $\theta_1\neq\theta_1^*$ (the socially optimal choice), then the bank is forced to switch to θ_1^*. If undetected, the bank's asset choice stays at θ_1. The regulator can be either "good" (g) with detection probability $\rho_g\in(0.5,1)$ or "bad" (b) with detection probability $\rho_b\in(0.5,1)$, where $\rho_g>\rho_b$. For $i\in\{g,b\}$, $\rho_i\equiv\rho_i(\theta_1)$ is continuously differentiable with $\partial\rho_i/\partial\theta_1<0$, and $\rho_g(\theta_1)>\rho_b(\theta_1)$ $\forall\,\theta_1\in\Theta$. The regulator's type is unknown to all at $t=0$, but there is a commonly known prior probability $\gamma\in(0,1)$ that the regulator is good.

At $t=1$, the bank realizes $\tilde{y}+\tilde{R}_1$, and first-period depositors are paid off. The difference between $\tilde{y}+\tilde{R}_1$ and the payment to first-period depositors defines the bank's second-period capital; there is no new external equity capital. At this time, the regulator decides whether the bank should be allowed to continue for a second period. If the bank is allowed to continue, second-period deposits are raised at $t=1$ to ensure that, when added to second-period capital, \$1 is available for investing in its second-period asset. If $\tilde{y}+\tilde{R}_1$ is less than the obligation to first-period depositors but the bank is allowed to continue, second-period deposits are also raised to repay first-period depositors. However, if the bank is closed at $t=1$, the shortfall is covered by the deposit insurer. The second-period asset yields a random payoff of $\tilde{R}_2$ at $t=2$, at which time second-period depositors are paid off, where $\tilde{R}_2=R(\theta_2)$ with probability $\theta_2\in\Theta$ and 0 with probability $1-\theta_2$. If $\tilde{R}_2$ is insufficient, the deposit insurer covers the rest. For simplicity, the regulator does not monitor θ_2.

The bank observes its own capital and asset choice at each point in time. The regulator observes the bank's actual asset choice only if he detects it, and at the start of each period he observes the bank's book capital for that period. At $t=1$, the regulator observes the total asset payoff, $\tilde{y}+\tilde{R}_1$, but *not* the individual components $\tilde{y}$ or $\tilde{R}_1$. At $t=2$, the regulator observes $\tilde{R}_2$. The market is the least informed player. It observes the bank's book capital, but with a one-period lag (i.e., at $t+1$, it observes the capital at t). We assume that the market observes the bank's second-period capital only if the bank continues for a second period and that the continuation decision is publicly observed.

All agents are risk-neutral. The bank maximizes its expected net profit. The regulator maximizes the following objective function:

$$(1)\quad \lambda_1\{\gamma_1^{\mathrm{m}}+\delta\gamma_2^{\mathrm{m}}\}+\lambda_2[\theta_2R(\theta_2)-1]$$

where γ_t^{m} is the regulator's reputation for

quality at time $t \in \{1,2\}$; $\delta_1, \lambda_1, \lambda_2 > 0$; and $\theta_2 R(\theta_2) - 1$ is the social surplus from the bank's second-period asset. The term in the braces in (1) represents the personal gain to the regulator from reputation-building, so that the regulator is maximizing a weighted average (with λ_1 and λ_2 the weights) of his personal reputation and social welfare. The regulator's reputation γ_t^{m} is simply the market's posterior belief at time t that the regulator is good. The social surplus related to the first-period project does not appear in (1) because the regulator cannot take any actions to affect it, other than through his bank closure policy; the effect of "social-welfare pressure" on closure policy is already captured by the second-period social surplus.

B. *The Social Optima*

Consider first the second-period asset choice. The socially optimal choice is simply the *first best*, the asset choice an all-equity financed bank would make in the second period. That is, with r_{f} defined as 1 plus the riskless rate, the social optimum maximizes $\theta_2 R(\theta_2) - 1 \times r_{\mathrm{f}}$ with a choice of $\theta_2^* = -R(\theta_2^*)/R'(\theta_2^*)$.

Next, we solve for the socially optimal bank closure policy at $t = 1$. To analyze this, we must solve for the bank's actual second-period asset choice at $t = 1$. The bank's second-period capital is $\tilde{K}_2 = \tilde{y} + \tilde{R}_1 - (1 - K_1) r_{\mathrm{f}}$, where $(1 - K_1) r_{\mathrm{f}}$ is the payment made on the fully insured first-period deposits. If $\tilde{K}_2$ is negative, the bank's second-period deposits exceed \$1; we assume that exogenous parameters are such that $\tilde{K}_2 < 1$ with probability 1, thereby ensuring positive second-period deposits. Thus, the bank chooses θ_2 to maximize

$$(2) \qquad \theta_2 \left\{ R(\theta_2) - \left[1 - \tilde{K}_2\right] r_{\mathrm{f}} \right\} - \tilde{K}_2 r_{\mathrm{f}}$$

and the unique maximizer of (2) is $\hat{\theta}_2(\tilde{K}_2) = \{-R(\hat{\theta}_2) + [1 - \tilde{K}_2] r_{\mathrm{f}}\}\{R'(\hat{\theta}_2)\}^{-1}$. We now have the following lemma (see Boot and Thakor [1992] for the proof).

LEMMA 1: *In the second period, the bank chooses more risk than is socially optimal.*

We can now define the *socially optimal closure rule* as follows: close down the bank if its privately optimal second-period choice is a negative net present value (NPV) asset portfolio. The determining property of the socially optimal bank closure rule is given below.

PROPOSITION 1: *There exists a critical value of the second-period capital, say, $\bar{K}_2$, such that the socially optimal closure policy dictates that the bank should be closed if its actual capital $\tilde{K}_2 < \bar{K}_2$ and continued if $\tilde{K}_2 \geq \bar{K}_2$. Moreover, $\partial \bar{K}_2 / \partial r_{\mathrm{f}} > 0$ and there exists a critical value of the deposit funding cost (riskless interest rate), say, $\bar{r}_f - 1$, such that $\bar{K}_2 > 0$ if $r_{\mathrm{f}} > \bar{r}_{\mathrm{f}}$.*

(See Boot and Thakor [1992] for the proof.)

The intuition is that the bank's second-period asset choice, $\hat{\theta}_2$, depends on its second-period capital, $\tilde{K}_2$. Since the regulator cannot directly control $\hat{\theta}_2$, it prevents exploitation of the deposit-insurance fund by closing the bank when $\tilde{K}_2$ falls below a threshold. It is interesting that the socially optimal policy may dictate closure even when $\tilde{K}_2$ is positive. The reason is that the bank may pursue negative NPV investments even with positive capital, given deposit insurance. Of course, the social optimum here does not address the constitutional issues about the seizure of private property which such a recommendation has caused some bankers to raise (Robert Trigaux, 1991).

II. Properties of the Reputational Equilibrium

A. *First-Period Asset Portfolio Choice of Bank*

Given a socially optimal first-period asset choice of θ_1^*, let $\hat{\theta}_1 \in [\underline{\theta}, \theta_1^*)$ represent the bank's privately optimal first-period asset portfolio choice, where $\underline{\theta}$ is the smallest element of Θ. Since we are interested in the regulatory monitoring of bank activities that could *increase* the liability of the deposit insurance fund, we wish to focus on $\hat{\theta}_1 < \theta_1^*$. Suppose that in the reputational equilibrium, the regulator closes the bank at $t = 1$ if $\tilde{y} + \tilde{R}_1 < z^*$, where z^* is some critical

value; if $\tilde{y} + \tilde{R}_1 \geq z^*$, the bank is allowed to continue in the second period. If the regulator follows the socially optimal closure policy, then $z^* = \bar{K}_2 + (1 - K_1)r_f$.

Before we examine the regulator's closure policy in a reputational equilibrium, it is useful to explore a bank's incentive to restrain first-period risk-taking in light of its potential effects on second-period rents. Since the first-period asset portfolio affects the second-period capital $\tilde{K}_2$ in a well-defined way, the question is: what is the relationship between the bank's second-period rents and its second-period capital? Define the bank's second-period rents, conditional on being allowed to continue for a second period, as

$$(3) \quad M(\theta_2) \equiv \theta_2\{R(\theta_2) - [1 - \tilde{K}_2]r_f\} - \tilde{K}_2 r_f$$

with $\hat{\theta}_2(\tilde{K}_2)$ (given earlier) the (unique) maximizer of $M(\theta_2)$. What is the sign of $dM(\hat{\theta}_2)/d\tilde{K}_2$?

PROPOSITION 2: *At the beginning of the second period, for any fixed deposit insurance premium, the bank is better off with a lower second-period capital than with a higher second-period capital, conditional on being allowed to continue for the second period.*

(See Boot and Thakor [1992] for the proof.)

This result obtains because the value of the "deposit insurance put option" to the bank's shareholders is decreasing in the bank's equity capital. Note that, the expected value of $\tilde{K}_2$ (assume for now that the bank is never closed), assessed at $t = 0$, is

$$(4) \quad E_0(\tilde{K}_2|K_1, \theta_1) = \int_0^{\bar{y}} yf(y)\,dy + \theta_1 R(\theta_1) - K_1(1 - r_f)$$

which attains its unique maximum with respect to θ_1 at θ_1^{**}. If the bank's second-period rents were enhanced by its second-period capital, then at $t = 0$ the bank would choose a higher θ_1 (lower risk) than in a single-period setting; this would move θ_1 closer to θ_1^{**} and increase $E_0(\tilde{K}_2|K_1, \theta_1)$. However, Proposition 2 tells us that this is not so. At $t = 0$, the bank wishes to decrease $E_0(\tilde{K}_2|K_1, \theta_1)$, implying that *more* first-period risk is chosen at $t = 0$ than in a single-period setting. The intuition is that the deposit-insurance put option causes the bank's second-period rents to be decreasing in its second-period capital, so it encourages the bank to undertake actions that lower its expected second-period capital. Thus, first-period risk-taking incentives, already heightened by deposit insurance, are escalated rather than retarded by considerations of future rents per se. Note, however, that Proposition 2 assumes that the bank is always allowed to continue in the second period. If an insufficiently capitalized bank can be closed at the end of the first period, then it may curtail its first-period risk. An appropriately chosen closure policy can combat the perverse incentives created by deposit insurance.

B. *Closure Policy in the Reputational Equilibrium*

The regulator chooses z^* to maximize (1). We restrict exogenous parameters such that the bank will never be closed if $\tilde{R}_1 = R_1(\theta_1) > 0$. Hence, the closure of a bank at $t = 1$ tells the market that $\tilde{R}_1 = 0$ and $\tilde{y} < z^*$. We will say that the regulator's closure policy is "more lax" than the social optimum if $z^* < \bar{K}_2 + (1 - K_1)r_f$ and "less lax" than the social optimum if $z^* > \bar{K}_2 + (1 - K_1)r_f$.

PROPOSITION 3: *In a reputational (subgame-perfect) Nash equilibrium, the regulator's (privately) optimal bank closure policy is more lax than the socially optimal closure policy.*

(See Boot and Thakor [1992] for the proof.)

The intuition is as follows. Although the market's inference is noisy, closure at $t = 1$ means that the bank's capital was inadequate. Since this is likely when $\hat{\theta} < \theta_1^*$ (a more risky project) was chosen by the bank, the low capital realization at $t = 1$ tells the market something about the quality of the regulator. The market knows that a good regulator is more likely to have enforced a

choice of θ_1^* than a bad regulator; so the closure decision causes the market to revise downward its belief that the regulator is good. How much downward this belief is revised would depend, one would think, on the value of $\tilde{K}_2$, which the market does not know precisely. However, if the regulator were "completely selfish" and cared only about his own reputation, then there is an Akerlof lemons effect at work here. To see this, suppose there is a range of values of $\tilde{K}_2$ for which the "completely selfish" regulator closes the bank, and lower values of $\tilde{K}_2$ (if these are known to the market) convey progressively worse news about the regulator's quality. Then there must be a value of $\tilde{K}_2$, call it $\bar{K}_2^{\mathrm{H}}$, which is the highest capital the bank can have and yet be closed. Since the information conveyed upon closure about the regulator of a bank with $\tilde{K}_2 = \bar{K}_2^{\mathrm{H}}$ is just as adverse as that for a regulator of a bank with $\tilde{K}_2 < \bar{K}_2^{\mathrm{H}}$, a regulator whose bank has capital $\bar{K}_2^{\mathrm{H}}$ will wish to distinguish himself from those with lower $\tilde{K}_2$ realizations by not closing the bank. This argument applies sequentially for every $\tilde{K}_2$, so that there is an unraveling from the top down. Thus, if the regulator is "completely selfish", he never closes the bank at $t = 1$. On the other hand, if the regulator were "completely selfless," he would follow the socially optimal bank closure policy. A regulator who maximizes (1) will, therefore, choose $z^* \in (0, \bar{K}_2 + (1 - K_1)r_{\mathrm{f}})$.

Thus, even a little uncertainty about the regulator's ability—note that the qualitative nature of the result in Proposition 3 does not depend on the magnitude of γ—can distort the regulator's bank closure policy. This has two consequences. First, since the threat of future closure is the principal factor limiting the bank's risk-taking incentive in the first period, a more lax closure policy results in the bank taking more first-period risk, increasing the investment distortion away from first best in that period. Second, any distortion away from the socially optimal closure policy means that there is a positive probability that the bank will make a negative NPV asset choice in the second period; the more lax the regulator's closure policy, the greater is this probability. Thus, viewed from an *ex ante* perspective (at $t = 0$), regulatory pursuit of reputation increases the deposit insurer's liability on both first- and second-period deposits.

We will define the total distortion in social welfare (TDSW) as the sum of the social loss from the bank's choice of $\hat{\theta}_1$ as opposed to θ_1^* and the social loss from the bank's choice of a negative NPV asset portfolio in the second period. The higher is the TDSW, the greater is the loss on the deposit-insurance fund. This leads us to the following result.

PROPOSITION 4: *The lower the perceived quality of the regulator at the outset, the higher is the TDSW in a reputational equilibrium.*

(see Boot and Thakor [1992] for the proof.)

This proposition implies that *perceptions* of the abilities of regulators are important. The lower the assessment that banks (and the market) have of their regulators, the more severe will be the problems of deposit insurance. These problems will be manifested in both an increase in bank portfolio risk and lower bank capital levels on average. Moreover, there will also be an increase in the number of instances in which banks with inadequate capital will be allowed to continue.

III. Policy Implications of Analysis and Conclusion

A. *Consolidation versus Separation of Regulatory Tasks*

The distortion in closure policy arises because the regulator manipulates the closure decision to obscure possible ineptitude in his asset-quality monitoring. An obvious way to eliminate this distortion is to separate responsibility for bank closures from that for asset-quality monitoring.

B. *Duration of a Regulator's Appointment and the Reappointment Process*

We have ignored effort-related moral hazard in regulatory monitoring. If the regulator could also shirk in the provision of

monitoring, then the standard approach to resolving such moral hazard is to give the regulator a long-term contract (William Rogerson, 1985). However, our analysis suggests that when the problem of regulatory reputation-building must be considered in conjunction with moral hazard, long-term contracting may not be the answer; such contracting increases the informativeness of a closure decision since that decision reflects an outcome influenced by past regulatory monitoring. Distortionary closure incentives of the regulator may be exacerbated as a result. Of course, if the monitoring and closure decisions were separated, long-term contracting would not have this undesirable consequence. Further, our analysis shows that the regulator will be lax in closing banks even though issues related to potentially unethical links between the regulator and the regulated banks are absent. If the regulator's objective function were contaminated by such links, then the distortions would be even more severe. The introduction of political factors in the appointment decision increases the likelihood of such links and should therefore be avoided.

A somewhat more subtle issue is that the noise introduced by the politicizing of the appointment process would make it difficult to reduce λ_1 relative to λ_2 in the regulatory objective function in an attempt to reduce distortion in closure policy. A regulator's perception that the reappointment decision will be based partly on political considerations introduces greater noise in that decision and makes the regulator more concerned about his reputation. This increases λ_1 relative to λ_2 and causes greater distortion in bank closure policy.

C. *Regulatory Latitude in Bank Closure Decisions*

A simple way to minimize closure-policy distortions is to reduce regulatory discretion by stipulating a minimum (positive) amount of bank book capital needed to avoid closure. In our model, this capital is not observable publicly at the time that the closure decision is made; this assumption is meant to reflect in part the practical reality that capital is often hard to measure accurately under RAP and GAAP accounting (see Lawrence White, 1988). Clearly, observability and measurement problems would impede such a rigid closure policy. However, our analysis suggests the desirability of such a rigid policy, even if it is based on noisy surrogates of the bank's capital. Indeed, we advocate rules rather than discretion. This complements Kydland and Prescott's (1977) observation that rules can improve social welfare because they are unconstrained by the time-consistency requirements of discretionary policies.

D. *Asset Portfolio Restrictions*

The regulator pursues reputation-building because there is uncertainty about his ability to monitor bank asset quality. At one extreme, if Θ were a singleton, monitoring would be moot. In general, the smaller the (Lebesgue) measure of Θ, the more effective a regulator of given ability will be in monitoring the bank's asset quality. To the extent that it is common knowledge that the regulator is relatively efficient in monitoring a limited set of assets, the observed closure of a bank will be less important as a signal of the regulator's quality, and there will be lesser distortion in bank closure policy. This will induce the bank to choose lower asset portfolio risk at the outset. Thus, asset portfolio restrictions on banks may have an indirect role in reducing the liability of the deposit-insurance fund as well.

E. *The Management of Public Perceptions*

The importance of beliefs in our reputational equilibrium is transparent. If banks and the market have great confidence in the regulator's quality, then the regulator will sense a lesser need to influence their perceptions of his quality by delaying closure. This suggests the importance of carefully selecting high-quality regulators to facilitate the fostering of public confidence. For example, as with many professional occupations, we could require certification of regulators.

A related issue is the public availability of information. In our model, if the market is

as well informed about the bank's financial condition as the regulator, then the regulator's closure policy will not deviate from the social optimum at that point. This appears to have been borne out by the recent depository institution crisis in Rhode Island, for instance, during which many institutions were quickly closed after panic among depositors led to runs and it was obvious that regulators were no longer privately informed about the precarious financial condition of these institutions. This suggests the importance of bringing market pressure to bear on regulators by making information about banks available more freely to the market.

In conclusion, our view that a self-interested regulator's pursuit of reputation can distort bank closure policy and increase the liability of the deposit insurance fund has generated numerous policy implications for regulatory reform. Since perhaps the only meaningful distinction between man and machine is moral hazard, it may be too much to ask that banking reform eliminate *all* self-interested regulatory behavior. However, the mere recognition of the possibility of self-interest on the part of regulators is, we believe, a useful start.

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