

BANKING LICENCES, BAILOUTS AND REGULATOR ABILITY

*Alan D. Morrison**

ABSTRACT

I analyse a model in which it is socially optimal for banks to manage depositor funds but in which concerns about fraud discourage depositing and justify regulation. The regulator screens bankers and decides the level of charter value which they will receive as incentive to prevent fraud. She can also encourage deposits by insuring them. The optimal policy depends upon the regulator's screening ability: high ability regulators rely upon charter value and low ability regulators rely upon deposit insurance. I relate these findings to the regulation of transition economy banks, to operational risk management, and to banking competition policy.

I INTRODUCTION

Charter value is the rent which accrues to the possessor of a banking licence. When charter value is high, bankers are more inclined to manage their business with sufficient care to retain their licences. Charter value is usually a consequence of deposit rate ceilings or anti-competitive behaviour and therefore comes at a social cost. Charter value can be affected by policy and the trade-off between the positive incentive effects of charter value and its negative efficiency-reducing effects is thus of obvious importance. In this paper I construct a partial equilibrium model which allows me to examine the way that this trade-off is affected by the regulator's ability to distinguish good from bad bankers and by the level of deposit insurance provision. I also examine the optimal trade-off between charter value and deposit insurance. This work provides a conceptual framework which sheds some light upon competition policy discussions in the developed world, and which indicates how policy in developing countries should evolve as regulator ability increases.

The model which I develop incorporates in reduced form insights from the pre-existing banking literature. I follow previous authors by assigning an economic role to banks in resolving informational asymmetries and enforcing first-best behaviour.¹ In contrast to other authors, I assume that monitoring is

*Saïd Business School, University of Oxford

¹ See for example Diamond (1984), Mayer (1988), Sharpe (1990) and Hellwig (1991).

always incentive compatible for bankers.² There is however, a moral hazard problem between bankers and depositors which arises as a consequence of fraud. I model this by assuming that the verifiable proportion of returns on bank investments is stochastic and that bankers will expropriate the non-verifiable returns and use them to consume perquisites. This does not affect the net social benefits of bank investment but, because the depositors fail to account for the benefits which accrue to the bankers, it can destroy their incentives to invest in banks. If this happens depositors will instead place their endowment in a non-productive storage technology. This constitutes a social cost.

The wedge which funds expropriation drives between the interests of the depositors and those of society results in a market failure which drives my model and which is a rationale for regulation. The only role of the regulator in this model is to ensure the existence of a banking sector and thus to maximize the productivity of the real sector. She is unconcerned with distributive questions and she does not have the selfish career concerns which Boot and Thakor (1993) model.

This approach to regulation is in contrast to pre-existing work, which typically assumes that the regulator's role is to represent the interests of the dispersed bank depositors: see for example Dewatripont and Tirole (1993). In restricting banker activities, the regulator in this model ensures that they earn rent, whilst restricting depositors' income to their outside option. Her monitoring remit is therefore a commitment device which acts in the interests of the bankers rather than those of the depositors. Nevertheless, a regulator of the type which I describe could not arise as a professional banker association: her goal is to minimise the social costs of regulation whilst ensuring that depositors choose to invest in banks, rather than to maximise the benefits to the bankers subject to the same constraint. My discussion of regulatory tools is therefore normative: rather than explaining the regulator's genesis, I attempt to determine socially optimal policy.

The regulator in this paper has three policy tools. Firstly, she allocates banking licences and thus controls entry into the banking sector. Secondly, she can establish charter value levels. Thirdly, she can render depositing more attractive by providing deposit insurance. I examine the optimal mix of the second and third policy tools. The paper has two conclusions.

Firstly, I demonstrate that the optimal policy will involve a trade-off between the social costs of the two mechanisms. It follows that an increase in banking sector competition which reduces charter value should be accompanied by an increase in deposit insurance.

Secondly, I depart from previous studies by explicitly modelling the regulator's ability to distinguish good from bad banks and its consequence for socially optimal policy. Although the banker benefits from the expropriation of returns, he may fear that expropriation will result in the loss of his banking licence and with it the associated charter value. Since fraud is non-verifiable, no

²This is reduced form for an effect which would arise endogenously in a fuller, but regrettably intractable, general equilibrium model. I discuss this and other simplifications in Section III.

ex ante verbal commitment to refrain from it will be credible.³ The only course of action open to the banker is therefore to put in place accountancy and control systems which will increase the transparency of his business and hence reduce the likelihood that returns will be only partially verifiable.

The incentive to invest in control systems is affected by two parameters: firstly, by the size of the charter value which the banker earns if his application for a banking licence is accepted, and secondly by the ability of the regulator to interpret the control systems. The optimal policy depends upon regulator ability. If the regulator has poor screening skills then irrespective of charter value levels the banker will make little effort to create control systems, as his effort will not be rewarded. In this case the provision of charter value will not be cost-effective and it will instead be necessary for the regulator to supply deposit insurance to induce depositing. If the regulator has higher screening ability then bankers will anticipate a return upon investments which they make in management control systems. Such investments will attract depositors into the banking system. In this case the most cost effective policy for the regulator is to provide banks with charter value rather than to supply deposit insurance. The total social cost of the regulator's optimal policy is a continuous decreasing function of her ability. Very able regulators can rely solely upon their screening skills to maintain a banking sector of sufficient quality and hence will require neither deposit insurance nor charter value to incentivize depositing.

My conclusion that high ability regulators should substitute charter value for deposit insurance rests upon the importance of charter value as an incentive device. Successful licence applicants receive charter value and will work hard for their licence precisely when they believe that the regulator can detect their effort. Deposit insurance does not enter the banker's objective function and so cannot function in this way. The model does not include deposit insurance premia, but these would not affect this reasoning: in equilibrium all licence applicants would anticipate paying the premia if successful and they could not therefore function as *ex ante* incentives. Deposit insurance premia, like capital adequacy requirements, serve to resolve moral hazard problems which arise after banking licences have been allocated. These are discussed in Section III, but are not formally modelled in this paper.

The importance of the issues which I address in this paper is acknowledged in the literature on financial intermediation. I cite the literature on bank monitoring above. Another body of work has examined the importance of charter value: see Marcus (1984) and Keeley (1990), who documents the steady erosion of charter value in the United States. Boot and Greenbaum (1993), Gorton (1995) and Bhattacharya, Boot and Thakor (1998) examine the role of charter value in curbing excessive risk-taking, and Besanko and Thakor (1993), Petersen and Rajan (1995) and Boot and Thakor (2000) examine the deleterious effect of competition upon banking relationships.

Bank fraud is modelled in reduced form in this paper by assuming that the verifiable portion of realized funds is stochastic. In a sound bank, the probability

³ I discuss in the conclusion the possibility that in a repeated game the banker may wish to build a reputation by refraining from fraud.

of fraud is reduced. Several other papers have considered related questions. Diamond and Rajan (2000, 2001) examine models in which banks extract surplus by threatening to withdraw their monitoring services. In my model, regulators trade off higher levels of deposit insurance against reduced banker effort to commit to prevent fraud. Other papers have examined the trade off between higher levels of deposit insurance and the associated increased incentive for banker risk-shifting (Giammarino, Lewis and Sappington, 1993; Mailath and Mester, 1993). Hellman, Murdock and Stiglitz (2000) examine the relationship between bank rents and capital adequacy requirements. Morrison and White (2002) consider the effect of regulator ability upon optimal capital requirements. The role of optimal competition policy in reducing risk-shifting is discussed by Caminal and Matutes (1997a, 1997b).

The remainder of this paper is organized as follows. Section II outlines some of the policy implications of this work: it is used later in the paper to place some of the technical results in context. Section III outlines a model of banking. Section IV introduces a regulator who is able to set rent levels and deposit insurance policies and Section V describes her optimal policy. Section VI contains some concluding remarks about the model and suggests possible extensions. The proofs appear in the Appendix.

II POLICY IMPLICATIONS

The analysis of this paper is helpful in understanding three policy issues. Firstly, it has implications for the regulation of developing and transition country banking systems in which fund expropriation of the type which I discuss is a problem. It suggests that when regulators are inexperienced and are not well able to screen banks, charter value will not incentivize good behaviour and that a superior policy would be to allow unfettered banking sector competition and to provide generous levels of deposit insurance: in the simple framework which I employ, this is equivalent to committing *ex ante* to bail out failing institutions. As the regulator learns about banking sector management she can increase charter value, possibly by suppressing competition, and allow more troubled institutions to fail. Note that as a consequence of this conclusion, banking sector restructuring is likely to be inevitable as such economies develop and that it may be evidence of regulator learning, rather than of earlier mismanagement.

The insights provided by this paper stand in stark contrast to recent experience in the Russian banking sector. In the early days of transition the Central Bank had little expertise in evaluating bank types and was subject to political constraints which circumscribed its ability to clamp down upon fraud and it is now well documented that fund expropriation became a significant problem in the Russian banking system (see Schoors, 1999, for a detailed survey). The depositors in only one institution, the Central-Bank owned Sberbank, received *de facto* deposit insurance and Sberbank captured 90% of the deposit market. The other 1,500 or so banks competed for the remaining 10% of the market. The largest part of the banking sector therefore combined no competition with generous deposit insurance while the remainder constituted

a small and highly competitive sector in which there was no deposit insurance. The situation in both parts of the banking sector is of course in contradistinction to that prescribed by this paper and, by combining poor incentives for both sound banking and for depositing, may have contributed to the credit crunch which Russia experienced in the early years of transition.⁴ More recently poor deposit insurance provision coupled with fund expropriation through the so-called 'bridge banks' were contributory factors to the 1998 banking sector crisis.

The paper's discussion of auditing and reporting systems is also of relevance in the light of new proposals from the Basle Committee for the regulation of international banks. In addition to risk-sensitive capital requirements, the proposed new Accord (Basle Committee on Banking Supervision, 2001) contains proposals for the regulation of management control systems, which are referred to in the banking industry as *operational risk management systems*. The accord provides incentives for the improvement of such systems in the form of reduced capital requirements and hence, when external capital is costly (see for example Froot and Stein, 1998), increased charter value. My model indicates that this proposal will be effective only when the regulator's screening reputation is strong enough to imbue the depositors with confidence. Moreover, there is a clear case for allowing national regulators to substitute deposit insurance provision for operational risk management systems.

The third policy debate to which this analysis can make a contribution concerns the regulation of bank competition levels in developed countries. For example, a recent policy debate in the United Kingdom has concerned the difference between banking competition levels in that country and those which obtain in the United States. The United States is generally perceived as having a far more competitive banking sector than the United Kingdom, where the return on equity for retail banks is as high as 30%. The two systems are also characterized by differing levels of deposit insurance provision: protection in the United Kingdom amounts to £16,000 per depositor, while the corresponding figure in the United States is \$100,000.

The debate over an apparently uncompetitive British banking sector resulted in a government commissioned broad review of banking services, which concluded (Cruickshank, 2000) that the regulator should have a primary competition objective, in addition to its existing regulatory activities. My work supports the conclusion that competition regulation is important in the banking sector, but it suggests that the differences between the two systems may be a consequence of a trade-off between charter value and deposit insurance. Moreover, it suggests that an increase in UK competition levels should be accompanied by heightened levels of deposit insurance.

III BANKS AND BANK INCENTIVES

In this section I describe a model of banks as delegated monitors when the verifiable portion of project returns is stochastic and the effort which banks

⁴ Schoors (2001) describes the credit crunch and discusses the extent to which tight monetary policy may have been a contributing factor.

make to reduce fraud is non-verifiable. I delineate my analysis by identifying explicitly the reduced form assumptions in the model.

Consider a single period economy.⁵ Investors in the economy have an initial endowment of \$1. They are risk neutral and derive utility C from the consumption of C at the end of the period.

Two investment vehicles are available to investors: a storage technology which will return $r > 1$, and a bank deposit. I will refer to the storage technology as a *bond*. A bank is an institution which accepts unsecured deposits from investors and then invests them on their behalf in projects. I assume that banks have no capital reserves: my substantive results are unaffected if their reserves are fractional. It is a consequence of this assumption that bankers do not assume principal risk.

The role of bankers is in project selection and monitoring: a substantial literature which supports this assertion is cited in the introduction. As a consequence of their superior project management skills, I assume that the return on bank-intermediated projects is $R > r$. In making this assumption I am ignoring incentive issues which would arise in a more general equilibrium setting: it is necessary for my welfare conclusions for the depositors and the regulator to know that monitoring will definitely occur. This is generally accomplished in theoretical papers by ensuring that the returns which the banker receives are sufficiently high to render monitoring incentive compatible, as for example in Holmström and Tirole (1997). To maintain tractability in this paper I abstract away from detailed contractual modelling of this nature.

Bankers can earn a return upon their activity in two ways. Firstly, they will earn rent, or *charter value*, from their operation of their bank. This could be a consequence of collusive practices when there is little competition in the banking sector, as a consequence of severe informational frictions which create a winner's curse for bankers who compete on price, or as a consequence of regulatory strictures which disallow the payment of high returns on deposit contracts, as for example in France. Literature indicating the existence and importance of charter value is cited in the introduction. Once again, I do not model the process by which charter value is acquired; one can think of it as the extent to which the margin between depositor rates and lending rates exceeds the cost of capital for the banker. A full analysis of this could only occur in a production economy model, which would again require the sacrifice of tractability: I simply denote by m the total rent which a banker derives from running a bank and I assume that this quantity can be affected by policy.

The second source of income which bankers earn is from the expropriation of project returns, which I term *fraud*. I assume that although the total return on bank intermediated projects is R , this need not be verifiable. The verifiable return which bankers earn is either R or $(1 - f) R$. In the latter case, the banker

⁵ Investors in this model earn their outside option and so will not respond to regulation by moving their capital to another jurisdiction. Provided that, as in the US and the EC, the institution which assigns banking licences also administers the deposit insurance fund it does not matter for the purposes of this paper whether the economy is open or closed.

will defraud the depositors by expropriating the non-verifiable component Rf of returns.

This specification of fraud is the final reduced form in my model. A more complete specification would require an explicit model of the governance structure of the bank and of its associated informational asymmetries and incentives. Once again, this would entail a loss of tractability and it would not add greatly to the essential insights of the paper. The assumption in this model that the verifiable component of returns is stochastic has two consequences. Firstly, it guarantees that the banker will with positive probability extract some of the social surplus from managing the loan and thus ensures a divergence between the incentives of the depositors, who allocate capital, and those of society. Secondly, it ensures that it is impossible for the banker to sign a credible contract which commits him *ex ante* to refrain from *ex post* expropriation of funds.

The *ex ante* commitment problem which the banker faces can be resolved only through a reduction in information asymmetry which reduces the probability that some of the return will be non-verifiable. This is accomplished though investment in risk management and reporting systems. Such systems are costly: I assume that if the banker spends $e(\sigma)$ on reporting systems the probability of non-verifiability and hence of fraud will be $1 - \sigma$, where $\sigma \in [0, 1]$. I will refer to σ as the banker's *effort level* and I assume that $e(\cdot)$ is an increasing and convex function of effort level.

Bankers are risk neutral with utility functions which are separable in income and effort. The utility $v(m, \sigma)$ which the banker derives from charter value m and effort level σ is the sum of the rent which he earns and his expected fraud income, less the expense which he incurs in fraud reduction:

$$v(m, \sigma) = m + Rf(1 - \sigma) - e(\sigma).$$

The managerial effort of bankers adjusts the probability with which fraud occurs and it is not observable. It cannot form the basis of an enforceable incentive contract between bankers and depositors, since banker effort will not be affected by the *ex post* division of verifiable funds. The optimal contract therefore gives all of the verifiable returns to the depositors. In the absence of regulatory intervention bankers will have no incentive to exert effort and fraud will occur with probability 1.

Finally, I assume that the expected return from investment in a fraudulent bank is below that obtained from bond market investment which is in turn below the return from bank investment when there is no fraud:

$$R(1 - f) < r < R. \quad (\text{A1})$$

With a banker effort level of σ , the expected return to depositors will be $R(1 - (1 - \sigma)f)$. In the absence of regulation bankers will make no effort and by assumption A1 there will be no banking system. Define b as follows:

$$b = 1 - \frac{R - r}{Rf}. \quad (1)$$

b is the lowest level of banker effort which depositors will accept. Note that assumption 1 implies that $b \in (0, 1)$.

IV BANK REGULATION

The (unmodelled) project selection and monitoring activities of bankers in this economy are welfare increasing but, because their effects are not fully internalized by the depositors who allocate capital, in the absence of regulation there will be a market failure and banks will not attract deposits. There is a role in this situation for a regulator who maximises social welfare by ensuring the existence of a banking sector. She accomplishes this by providing investors with the minimal level of protection required to render bank depositing more attractive than bond investment. Regulation does not therefore increase depositor utility: as discussed in the introduction, this is a departure from previous models of bank regulation which emphasise the protection of minority investors.

Regulatory instruments

The regulator issues banking licences and thus controls entry to the banking sector. She also has two policy instruments: she can provide deposit insurance and she can set the level of rent m which accrues to the holder of a banking licence. In the interests of model tractability, the mechanism by which rent is controlled is not modelled: three possible sources of rent are identified in Section III. Distribution of deposit insurance takes the form of an ex-post bailout. The regulator announces at the start of the game that she will underwrite bank returns with probability β . I refer to β as the regulator's *bailout policy*.⁶

The regulators, the bankers and the investors play the game illustrated in Figure 1. In period 0 the regulator announces a bailout policy $\beta \in [0, 1]$ and a rent $m \geq 0$ which bankers in the time t economy will extract from their licences. I assume that there are many potential bankers, each of whom has only one opportunity to apply for a licence. One at a time, bankers select their effort level σ and incur a utility cost $e(\sigma)$ in the reduction of fraud. The regulator audits the bank: a licence is awarded if and only if the audit returns a positive signal. This process is repeated until all potential bankers have been screened.⁷

Regulatory technology

In allocating licences, the regulator operates an imperfect auditing technology which returns either a 'sound' or an 'unsound' signal. The auditing technology is

⁶The assumption of a stochastic bailout policy is equivalent with risk-neutral agents to full insurance of a fixed *proportion* of deposits and therefore differs from observed deposit insurance contracts, which typically protect a fixed *quantity* of deposits; it is made to ensure model tractability.

⁷I do not determine in this model the appropriate number N of licences. One obvious way to do so would be to make charter value a decreasing function of N , but to do so would not add fresh insights.

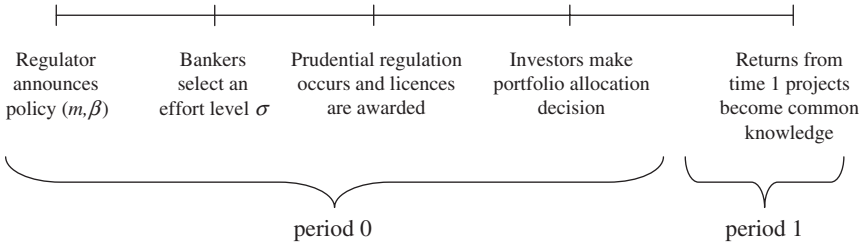


Figure 1. Time line for the regulatory game.

intended to identify and to reward banker effort. It comprises all of the mechanisms by which a bank’s performance may be judged: it includes such items as the disclosure requirements to which the bankers are subject and the regulatory environment in which they operate. Licences are awarded only to banks which are judged to be sound.

The quality of the auditing technology is given by a variable

$$\alpha \in [0, 1]$$

which I refer to as the regulator’s *ability*; α is common knowledge at the start of the game. A licence applicant who exerts effort σ to reduce fraud will be successful with probability

$$\pi = \alpha\sigma + \frac{1}{2}(1 - \alpha).$$

The sensitivity of π to σ is increasing in α : when $\alpha = 0$, the regulator’s auditing technology is completely uninformative; when $\alpha = 1$ the probability of successful licence application is precisely equal to the effort expended on fraud reduction.

Investors know the policy (m, β) ; they make their investment decisions after licence allocation.

Banker effort decision

When the regulator controls entry to the banking sector the banker’s expected income from effort σ to reduce fraud is

$$v(m, \sigma, \alpha) = \left(\alpha\sigma + \frac{1 - \alpha}{2} \right) (m + Rf(1 - \sigma)) - e(\sigma).$$

In order to derive comparative statics, I assume the following simple quadratic functional form for $e(\cdot)$:

$$e(\sigma) = \frac{1}{2}\sigma^2.$$

The banker chooses σ to maximize $v(m, \sigma, \alpha)$ subject to the constraint that $0 \leq \sigma \leq 1$. This problem has the following solution:

$$\sigma(m, \alpha) = \begin{cases} 0, & \text{if } s(m, \alpha) < 0 \\ s(m, \alpha), & \text{if } s(m, \alpha) \in [0, 1], \\ 1, & \text{if } s(m, \alpha) > 1 \end{cases}$$

where

$$s(m, \alpha) \equiv \frac{\alpha \left(m + \frac{3Rf}{2} \right) - \frac{Rf}{2}}{1 + 2Rf\alpha}. \quad (2)$$

I prove in the Appendix that $s(m, \alpha)$ is increasing in α and in m : in other words, the banker works harder to prevent fraud, the more effective he believes the regulator's technology to be, and the greater is the charter value which he obtains if he makes a successful application for a banking licence. Recall from Section II that much of the Russian banking system is characterised by low charter value and inept regulation; the implication of this section that bankers will in these circumstances make little effort to reduce fraud is consistent with the empirical evidence of fund expropriation by Russian banks.

Regulator's objective function

I conclude this section by describing the regulator's objective function. As discussed above, I assume that the regulator maximizes social welfare and does not exhibit career concerns. It is not possible in this partial equilibrium framework to derive an expression for welfare, so I assume that it has a particular functional form.

The regulator wishes to maximize the difference between the productive output of the economy and the social costs of the deposit insurance and charter value policies which she adopts to accomplish this. Deposit insurance will be paid for using distortive taxation; charter value will be created by socially costly interference in the operation of financial markets. Suppose that the ratio between the social cost of one extra dollar of bank rent and one more dollar of expected bailout costs is η ; there is no reason *per se* why η should be equal to 1. The expected cost per depositor of bailout is $Rf(1 - \sigma)\beta$ and so the net cost in units of expected bailout per investor is

$$C(m, \beta) \equiv \eta m + Rf(1 - \sigma)\beta. \quad (3)$$

I assume that the associated welfare loss will be an increasing convex function $g(\cdot)$ of the expected cost $C(m, \beta)$.

Suppose that the policy (m, β) generates a total output $h(m, \beta, \alpha) \in \{r, R\}$. It will then yield a total welfare of

$$\mathcal{W} \equiv h(m, \beta, \alpha) - g(C(m, \beta)).$$

V OPTIMAL POLICY

In this section I derive the regulator's optimal policy in two situations: where the bailout policy β is imposed politically, and where it is a regulatory choice variable. Firstly, I determine the form of the output function $h(m, \beta, \alpha)$. Given policy (m, β) and regulator reputation α , the expected income for depositors is $R - R(1 - \sigma)(1 - \beta)f$ and they will invest in banks when this exceeds r : in other

words, when $(1 - \sigma)(1 - \beta) \leq 1 - b$. It follows that

$$h(m, \beta, w) \equiv \begin{cases} R, & \text{if } (1 - \sigma)(1 - \beta) \leq 1 - b; \\ r, & \text{if } (1 - \sigma)(1 - \beta) > 1 - b. \end{cases}$$

Optimal policy when β is not a choice variable

When β is given to the regulator exogenously, possibly as a political decision, she must select the optimal charter value $m^*(\alpha, \beta)$ to solve the following problem:

$$\min_m C(m, \beta) \text{ subject to } (1 - \sigma)(1 - \beta) \leq 1 - b. \tag{4}$$

The policy $m^*(\alpha, \beta)$ achieves production R at the lowest cost given the regulator’s ability α , the bailout policy β , and the need to ensure that depositing is individually rational. I prove the following result in the Appendix:

Proposition 1: For a given regulator ability α , optimal charter value is decreasing in the generosity β of the bailout policy: $\frac{dm^*}{d\beta} < 0$.

In other words, as β varies exogenously the regulator will use charter value to substitute for deposit insurance. As noted in Section II, this result may explain observed differences between the banking sectors in the United States and the United Kingdom. In the former country deposit insurance levels are relatively high; in the latter they are lower. If these policies are hard to change, Proposition 1 suggests that the regulator in the United Kingdom will tolerate higher levels of bank charter value. In practice, these are evidenced in the differing levels of banking sector competition which obtain in the two countries.

Optimal policy when β is a choice variable

For the remainder of this section, I assume that the regulator is able to choose both the charter value m and the bail out policy β so as to maximise social welfare.

Let $\bar{m}(\alpha)$ and $\bar{\beta}(\alpha)$ solve the following problem:

$$\min_{m, \beta} C(m, \beta) \text{ subject to } (1 - \sigma)(1 - \beta) \leq 1 - b. \tag{5}$$

The policy $(\bar{m}, \bar{\beta})$ achieves production R at lowest cost given the regulator’s ability and the need to ensure that depositing is individually rational. It will be adopted whenever its social cost is low enough (when $R - g(Rf(1 - \sigma)\beta + \eta m) \geq r$) and the regulator will otherwise set $m^* = \beta^* = 0$.

I derive the optimal policy (m^*, β^*) when β and m are both regulatory choice variables in the Appendix. The result is presented in two stages. Firstly, Proposition 2 describes the solution $(\bar{m}, \bar{\beta})$ to problem (5). I later describe the circumstances under which $(\bar{m}, \bar{\beta})$ is a cost effective policy and so will be adopted.

Proposition 2: Define the ability levels α_1 and α_2 as follows:

$$\alpha_1 = \begin{cases} \frac{\eta}{Rf(1-2\eta)}, & \text{if } \eta \leq \frac{Rf}{1+2Rf}; \\ 1, & \text{otherwise.} \end{cases} \quad (6)$$

$$\alpha_2 = \begin{cases} \frac{b+\frac{Rf}{2}}{Rf(\frac{3}{2}-2b)}, & \text{if } b \leq \frac{Rf}{1+2Rf}; \\ 1, & \text{otherwise.} \end{cases}$$

Then the expressions for \bar{m} and $\bar{\beta}$ have the following form:

1. For $\alpha \leq \frac{1}{3}$, $\bar{m} = 0$ and $\bar{\beta} = b$;
2. If $b \leq Rf(\eta - \frac{1}{2}) + \frac{3\eta}{2}$ then:
 - (a) For $\alpha \in [\frac{1}{3}, \alpha_2]$, $\bar{m} = 0$ and $\bar{\beta}$ is a strictly decreasing continuous function of α ;
 - (b) For $\alpha \in (\alpha_2, 1]$, $\bar{\beta} = \bar{m} \equiv 0$.
3. If $b > Rf(\eta - \frac{1}{2}) + \frac{3\eta}{2}$ then:
 - (a) For $\alpha \in [\frac{1}{3}, \alpha_1]$, $\bar{m} \equiv 0$ and $\bar{\beta}$ is a strictly decreasing continuous function of α ;
 - (b) For $\alpha \in (\alpha_1, \alpha_2]$, $\bar{\beta} \equiv 0$ and \bar{m} is a strictly decreasing function of α ;
 - (c) For $\alpha \in (\alpha_2, 1]$, $\bar{\beta} = \bar{m} \equiv 0$.

The cost $C^*(\alpha) \equiv C(\bar{m}, \bar{\beta})$ of the optimal regulatory policy is a continuous and monotonic decreasing function of the regulator's ability α .

Proof. In the Appendix, where I provide analytic expressions for \bar{m} , $\bar{\beta}$ and $C^*(\cdot)$. \square

Proposition 2 is the key result of the paper. In summary, it states that the least able regulators will provide only deposit insurance, while more able regulators will rely upon the provision of charter value. The quantity of deposit insurance and of charter value in these regions is a monotonic decreasing function of the regulator's ability, so the cost of regulation is itself a monotonic decreasing function of regulator ability.

The intuition for this is straightforward: charter value will only incentivise bankers to prevent fraud if the regulator is sufficiently able to detect their efforts. Less able regulators have to supply more charter value than able regulators to achieve the same level of banker effort in fraud reduction and at some point it becomes more cost effective for them to underwrite a deposit insurance scheme in order to incentivise depositing.

As I discuss in Section II, these observations are of relevance to lesser developed country bank regulation and in the context of the new Basle Accord. The Russian experience illustrates the low ability of transition economy regulators to identify fraudulent behaviour. In this situation Proposition 2 implies that the optimal policy is to reduce charter value to zero by encouraging

competition, and simultaneously to provide a generous deposit insurance scheme. The proposition is also of relevance in the design of cross-border banking regulation agreements: the clear implication of my analysis is that one-size-fits all arrangements such as the new Basle Accord are inappropriate. Although Proposition 2 is supportive of proposals to regulate operational risk management systems in developed economies where the regulator is able to interpret them, it suggests that these systems will be less effective in emerging banking markets.

To understand the detailed intuition underlying Proposition 2, it is helpful to consider the incentives which face the bankers. Effort is costly for bankers and, conditional upon obtaining a banking licence, it reduces their expected income from fraud. Their incentive to make an effort therefore depends upon two parameters: the ability of the regulator, and the charter value which they will earn if they acquire a licence. If the regulator has a low ability then a banker's effort will have little effect upon his likelihood of earning a licence. In such a situation, charter value will have a minimal effect upon effort levels. If the regulator has a higher ability then bankers will anticipate that higher effort levels will be rewarded with a higher probability of success in their licence application. In this case charter value will have an incentive effect whose relevance is increasing in the regulator's ability.

Now consider a regulator with a very low ability. With the parameterization of this paper this corresponds to $\alpha \leq \frac{1}{3}$, as in part 1 of the proposition. Potential bankers will then have a very low opinion of the regulator's abilities and will exert no effort to protect either charter value or fraud income. The regulator therefore sets $m = 0$. By definition, the deposit insurance policy is equal to the probability with which a fraudulent bank will be bailed out; since in this case all banks are fraudulent, deposit insurance is from the depositors' perspective a perfect substitute for banker effort to reduce fraud. The cheapest policy which renders depositing incentive compatible therefore sets the bailout policy β equal to the lowest level of banker fraud reduction effort which is acceptable to depositors, which by equation (1) is b .

When the regulator's ability is higher, bankers will make an effort to acquire a licence so as to capture income from fraud and from charter value. The social costs of regulation will therefore be lower. The regulator's choice between charter value and deposit insurance is ability dependent. For lower values of α ($\alpha \leq \alpha_1$), charter value will not provide a particularly effective incentive and it will be cheaper to provide deposit insurance. I demonstrate in the Appendix that the volume of deposit insurance is continuously decreasing from b for $\alpha \leq \frac{1}{3}$ and hence that the cost of regulation is also continuously decreasing.

When the regulator's ability is sufficiently high ($\alpha > \alpha_1$), charter value provides an effective incentive and hence will be used in place of deposit insurance. Note that the threshold ability α_1 at which providing charter value becomes the optimal policy is increasing in the relative social cost η of bank rent. For $\alpha > \alpha_1$ I demonstrate in the Appendix that the optimal level of charter value is decreasing in α and I demonstrate also that the cost of optimal regulation is continuous at the cross over point α_1 .

For very high quality regulators, it is conceivable that bankers will make sufficient effort in pursuit of income from fraud (which will be lower in expectation as a consequence of their efforts) to attract depositors without the provision of any charter value. In this case the optimal regulatory policy has $m = \beta = 0$ and it has a cost of 0. The trigger value α_2 for this policy is increasing in b , which is an effective measure of the quality of the depositors' outside option. When b exceeds $\frac{Rf}{1+2Rf}$ the outside option is so good that $\alpha_2 > 1$ and some charter value or deposit insurance is always required to maintain the banking sector. When $b < Rf(\eta - \frac{1}{2}) + \frac{3\eta}{2}$, $\alpha_2 < \alpha_1$ and the depositors' outside option is so poor that the regulator will cease to spend anything on regulation at lower ability levels than those at which charter value would be preferred to deposit insurance. For interim levels of b , $\alpha_1 < \alpha_2$ and the region $(\alpha_1, \alpha_2]$ within which the regulator's optimal policy involves the provision of charter value is non-empty. Note that the critical value $Rf(\eta - \frac{1}{2}) + \frac{3\eta}{2}$ of b below which charter value is never used is increasing in the social cost of charter value.

It remains only to determine under what circumstances the solution $(\bar{m}, \bar{\beta})$ described in Proposition 2 will be cost effective. Proposition 3, which I prove in the Appendix, states when this will occur:

Proposition 3: There exists $\alpha^* > 0$ such that:

$$(m^*, \beta^*) = \begin{cases} (0, 0), & \text{if } \alpha \leq \alpha^* \\ (\bar{m}, \bar{\beta}), & \text{if } \alpha > \alpha^* \end{cases}$$

α^* has the following properties:

1. If $b \leq Rf(\eta - \frac{1}{2}) + \frac{3\eta}{2}$ so that the solution to problem 5 is given by part 2 of Proposition 2 then $\alpha^* < 1$ if and only if

$$b < \frac{Rf}{1+2Rf} + \frac{(1+2Rf)g^{-1}(R-r)}{Rf}; \quad (7)$$

2. If $b > Rf(\eta - \frac{1}{2}) + \frac{3\eta}{2}$ so that the solution to problem 5 is given by part 2 of Proposition 2 then $\alpha^* < 1$ if and only if

$$b < \frac{Rf}{1+2Rf} + \frac{g^{-1}(R-r)}{\eta}. \quad (8)$$

In this case $\alpha^* < \alpha_1$, so that deposit insurance is cost effective for abilities in the range (α^*, α_1) , if and only if

$$b < \frac{1}{2}[3\eta - Rf(1-2\eta)] + \frac{g^{-1}(R-r)}{Rf}. \quad (9)$$

The intuition for this result is simple. For any regulator ability α , the cost of the optimal regulatory policy $(\bar{m}, \bar{\beta})$ is increasing in the quality b of the depositors' outside option. For a given b , the cost of the optimal policy is decreasing in α . We therefore expect banking to be feasible only when α is sufficiently high and b is sufficiently low. Equations (7) and (8) demonstrate that this is indeed the case. When $b > Rf(\eta - \frac{1}{2}) + \frac{3\eta}{2}$ the optimal solution space $(\bar{m}, \bar{\beta})$

includes a region $\alpha \in [\frac{1}{3}, \alpha_1]$ within which deposit insurance is preferred to charter value and a region $\alpha \in (\alpha_1, \alpha_2]$ within which charter value is preferred. When equation (8) is satisfied and some part of the solution space is cost effective the deposit insurance region will be cost effective when the outside option is of still lower quality, as given by equation (9).

VI CONCLUSION

The paper examines in a partial equilibrium framework a world in which there is a difference between the objective function of society and that of the investors who allocate capital. Optimal investment from a societal perspective is performed by bankers, who have special skills which allow them to maximize the productivity of their investments. Depositors are however, concerned only with the returns which they receive on their investments. A wedge between their objectives is introduced in the model as a consequence of fund expropriation by bankers which does not affect the productivity of investments, but which does affect the way in which their returns are allocated. Fund expropriation, or *fraud*, occurs when project returns are not verifiable and hence is not susceptible to contractual solutions. In the absence of outside controls the threat of fraud will be so severe as to render the operation of a banking sector impossible. In this situation there is a role for a welfare maximizing regulator whose role is to implement the most cost effective policy which guarantees the existence of a banking sector and hence maximizes production.

The regulator is endowed with a technology which allows her to determine *ex ante* the quality of the reporting systems which the banker has implemented to prevent fraud. Her licence allocation decision will be guided by the signals which she receives from her technology. She can provide further incentives for depositing through the provision of deposit insurance and for bankers to invest in fraud prevention systems by affecting through policy the amount of charter value which they receive. I do not explicitly model the way in which policy is implemented, but I assume that it has a social cost and I discuss the regulator's objective function. The model examines the way that the optimal policy mix is affected by the quality of the regulator's screening technology. When the regulator has low quality technology, charter value does not provide effective incentives and she instead relies upon deposit insurance. When her technology is of higher quality, charter value is an effective incentive device and will be cheaper than deposit insurance as it need only be provided to a relatively small number of bankers.

I discuss in Section II the implications of my findings for international banking standards, for emerging market banking regulation, and for competition policy in developed markets. I conclude the paper by discussing some possible repeated game extensions of the model.

A multi-period model would be complicated by the possibility that bankers may elect to refrain from fraud in order to build a good reputation, which would itself be a source of charter value. In this case the incentive problems identified in this paper could be resolved by the market. Although reputation building would clearly mitigate the difficulties which I identify here it seems unlikely that it

would eradicate them. When the payoff from fraud is sufficiently large it will pay bankers to run down their reputations. The 1995 failure of the British Barings Bank occurred when senior executives chose to ignore poor signals from management reports and auditors, despite a reputation of such magnitude that Barings managed funds for the British royal family.

Finally, the informational source of charter value identified in Section III could be better examined in a repeated game. Relationships become deeper the longer they last and rather than making charter value an explicit policy variable one could therefore argue in a multi-period model that the oldest banks would have the largest charter value and hence would find it easiest to attract depositors. If one assumed in addition that charter value is decreasing in competition levels then in such a model one might expect cycles to arise endogenously. When a technological shock reduced confidence in the regulator's ability to screen bank licence applicants, younger banks with lower charter value and hence fewer incentives to make effort would fail to attract deposits and the size of the banking sector would shrink. A smaller banking sector would reduce competition levels and would have the effect of further increasing charter value. Increased charter value for mature banks would act as an incentive for new banks to make an effort when applying for licences. The size of the banking sector would gradually increase and charter value would be eroded in response to the heightened levels of competition until another shock to the regulator's technology triggered another credit crunch. Such a model would of course be a very non-trivial extension of the one which I have presented, but it illustrates the further possibilities which detailed modelling of confidence in the regulator present for better understanding the connections between the real and the financial sectors.

ACKNOWLEDGEMENTS

This paper supersedes my earlier working paper 'Regulator Reputation and Optimal Banking Competition Policy.' I am grateful to seminar participants in Oxford and Barcelona and at the 2001 European Econometric Society meetings in Lausanne and in particular to Xavier Freixas, Tim Jenkinson, Colin Mayer, Hyun Shin, Oren Sussman, Lucy White and Bill Wilhelm for their observations. The paper was improved as a result of the helpful comments of two anonymous referees.

APPENDIX

Comparative statics of $s(m, \alpha)$

Direct differentiation immediately yields the following:

$$\frac{\partial s}{\partial m} = \frac{\alpha}{1 + 2Rf\alpha} > 0;$$

$$\frac{\partial s}{\partial \alpha} = \frac{m + \frac{3Rf\alpha}{2}}{(1 + 2Rf\alpha)^2} > 0.$$

Proof of Proposition 1

Note that for $m > 0$, the constraint $(1 - \sigma)(1 - \beta) \leq 1 - b$ can never be slack, since if it were the regulator could reduce m without violating it and hence decrease the cost function. The result then follows from total differentiation of the constraint.

Proof of Proposition 2

The Lagrangian for the problem (5) is:

$$\mathcal{L}(m, \beta; \alpha) = Rf(1 - \sigma)\beta + \eta m + \lambda[(1 - \sigma)(1 - \beta) - (1 - b)],$$

which yields the following first order conditions, each pair of which holds with complementary slackness:

$$-Rf\beta \frac{\partial \sigma}{\partial m} + \eta - \lambda(1 - \beta) \frac{\partial \sigma}{\partial m} \geq 0; m \geq 0 \tag{Cm}$$

$$(Rf - \lambda)(1 - \sigma) \geq 0; \beta \geq 0 \tag{C\beta}$$

$$(1 - \sigma)(1 - \beta) \leq 1 - b; \lambda \geq 0. \tag{C\lambda}$$

Firstly, note that in equilibrium $s \leq 1$. The proof is simple: if $s > 1$ then $\frac{\partial \sigma}{\partial m} = 0$ and Cm implies that $m = 0$. Substituting this back into expression (2) yields a value for s below 1, which is a contradiction. When $s \in [0, 1]$ so that the banker's maximization problem has an interior solution, constraint Cm takes the following form:

$$-(Rf\beta + \lambda(1 - \beta))\alpha + \eta(1 + 2Rf\alpha) \geq 0; m \geq 0. \tag{Cm'}$$

The optimal policy $(\bar{m}, \bar{\beta})$ will satisfy one of the following:

1. $\bar{\beta} > 0$ and $\bar{m} = 0$;
2. $\bar{m} > 0$ and $\bar{\beta} > 0$;
3. $\bar{\beta} = 0$ and $\bar{m} > 0$;
4. $\bar{\beta} = \bar{m} = 0$.

I proceed by determining necessary conditions for each case.

Case 1. If $\bar{\beta} > 0$ then equation (C\beta) implies that either $\lambda = Rf$ or $\sigma = 1$. I consider the former case first. Substituting into equation (Cm) implies that $\eta \geq Rf \frac{\partial \sigma}{\partial m}$. There are two possibilities: either $s < 0$ or $s \geq 0$. In the first case (Cm) implies that $m = 0$ and so we must have

$$\alpha \leq \frac{Rf/2}{m + 3Rf/2} = \frac{1}{3}. \tag{10}$$

Equation (C\lambda) implies that

$$\beta = b, \tag{11}$$

$$\text{and } C(m, \beta) = Rfb. \tag{12}$$

When $s \geq 0$, $\alpha \geq \frac{1}{3}$, and equation (Cm') implies that

$$\eta \geq Rf\alpha(1 - 2\eta). \quad (13)$$

This implies that $\eta \geq \frac{1}{2}$, or $\eta < \frac{1}{2}$ and

$$\alpha \leq \frac{\eta}{Rf(1 - 2\eta)}. \quad (14)$$

When this solution obtains we know that constraint (C λ) must bind (because $\lambda = Rf > 0$) and hence that $(1 - \sigma)\beta = b - \sigma$. Substituting this expression into equation (3) yields the following expression for the cost function:

$$C(m, \beta) = \frac{Rf}{1 + 2Rf} \left[b + \frac{Rf}{2} + Rf\alpha \left(2b - \frac{3}{2} \right) \right]. \quad (15)$$

Case 2. Consider the case where $\beta > 0$ and $\sigma = 1$. I have already demonstrated that for $\sigma > 0$, $\sigma = s$ and it follows immediately that

$$m = \frac{1}{\alpha} \left[1 + \frac{Rf}{2}(1 + \alpha) \right] > 0. \quad (16)$$

Constraint (Cm') binds: $\eta + Rf(2\eta - \beta) = 0$, and

$$\beta = \frac{\eta}{Rf\alpha}(1 + 2Rf\alpha). \quad (17)$$

Since $\beta \leq 1$ we must have

$$\eta \leq Rf\alpha(1 - 2\eta). \quad (18)$$

Since $\sigma = 1$, substituting equation (16) into equation (3) yields the following cost function:

$$C(m, \beta) = \frac{\eta}{\alpha} \left[1 + \frac{Rf}{2}(1 + \alpha) \right]. \quad (19)$$

Case 3. If $m > 0$ then $\beta > 0$ reduces to Case 2. If $\beta = 0$ then $s \geq 0$, for if not $\sigma \equiv 0$ and constraint (10) is slack, which implies that $m = 0$, which is a contradiction. Constraint (Cm') is therefore applicable and binds. It follows that $\lambda = \frac{\eta}{\alpha}(1 + 2Rf\alpha) > 0$, so that constraint (C λ) binds: $\sigma = b$, and

$$m = \frac{1}{\alpha} \left[b + Rf\alpha \left(2b - \frac{3}{2} \right) + \frac{Rf}{2} \right]. \quad (20)$$

Since $\sigma = b < 1$, constraint (C β) implies that $\lambda \leq Rf$. Substituting for λ gives us the following condition:

$$\eta \leq Rf\alpha(1 - 2\eta). \quad (21)$$

It follows immediately that $\eta < \frac{1}{2}$ and

$$\alpha \geq \frac{\eta}{Rf(1 - 2\eta)}. \quad (22)$$

Direct substitution of the expressions for m and β into equation (3) yields:

$$C(m, \beta) = \frac{\eta}{\alpha} \left[b + Rf\alpha \left(2b - \frac{3}{2} \right) + \frac{Rf}{2} \right]. \tag{23}$$

Case 4. If $\beta = m = 0$ then equation (C λ) implies that

$$\sigma \geq b. \tag{24}$$

By assumption A1 $b > 0$ and so $\sigma = s$. Substitute $\sigma = s$ into equation (24) to obtain

$$b + Rf\alpha \left(2b - \frac{3}{2} \right) + \frac{Rf}{2} \leq 0, \tag{25}$$

so that $b < \frac{3}{4}$ and

$$\alpha \geq \frac{b + \frac{Rf}{2}}{Rf \left(\frac{3}{2} - 2b \right)}. \tag{26}$$

$\alpha \leq 1$ if and only if

$$b \leq \frac{Rf}{1 + 2Rf}. \tag{27}$$

Finally, note that when $m = \beta = 0$, $C(m, \beta) = 0$.

The proof of the proposition is now straightforward. Note that only when Case 1 obtains can s be negative, so that part 1 of the proposition is proved by equations (10) and (11).

When equation (13) is satisfied conditions (18) and (21) are not and either Case 1 or Case 4 must therefore obtain. By condition (14), this occurs whenever $\alpha \in [\frac{1}{3}, \alpha_1]$, where α_1 is given by equation (6). Since the cost function is at least 0, the Case 4 solution will be adopted whenever feasible. Equation (26) implies that this will occur whenever $\alpha \geq \alpha_2$, where α_2 is defined in equation (6).

If $\alpha_2 \leq \alpha_1$ the Case 1 solution will be adopted for $\alpha \in [\frac{1}{3}, \alpha_2]$ and the Case 4 solution will be adopted for $\alpha > \alpha_2$: the Case 2 and Case 3 solutions will not be required. It is easy to demonstrate that $\alpha_2 \leq \alpha_1$ if and only if $b \leq Rf \left(\eta - \frac{1}{2} \right) + \frac{3\eta}{2}$, which proves part 2 of the proposition.

If $\alpha_2 > \alpha_1$ the Case 1 solution will be adopted for $\alpha \in [\frac{1}{3}, \alpha_1]$ and either the Case 2 or the Case 3 solution will be adopted for $\alpha \in (\alpha_1, \alpha_2]$. The Case 4 solution will be employed when $\alpha > \alpha_2$. The Case 2 solution will be adopted when the cost function given in equation (19) is less than that of equation (23). This is the case if and only if $1 + 2Rf\alpha < b + 2bRf\alpha$, which is impossible, so the Case 2 solution will be adopted for $\alpha \in (\alpha_1, \alpha_2]$. $\alpha_2 > \alpha_1$ if and only if $b > Rf \left(\eta - \frac{1}{2} \right) + \frac{3\eta}{2}$, which proves part 3 of the proposition.

For the final part, note that $C^*(\alpha)$ is given by equation (12) for $\alpha \leq \frac{1}{3}$, by equation (15) when Case 1 solutions obtain, by equation (23) when Case 3 solutions obtain and is equal to 0 when Case 4 solutions are employed. The cost expression for each of the relevant cases is continuous and monotonically decreasing (strictly so in Cases 1 and 3) and so it remains to show that $C^*(\alpha)$

is continuous at the boundaries between the cases. Substituting $\alpha = (b + \frac{Rf}{2})/Rf(\frac{3}{2} - 2b)$ into equation (15) gives a cost of 0, which proves the result when $\alpha_2 \leq \alpha_1$. Direct substitution demonstrates that equations (15) and (23) yield the same cost when $\alpha = \frac{\eta}{Rf(1-2\eta)}$ and that the Case 3 cost when $\alpha = (b + \frac{Rf}{2})/Rf(\frac{3}{2} - 2b)$ is again 0, which proves the result when $\alpha_1 > \alpha_2$.

Proof of Proposition 3

Recall from Proposition 2 that the optimal cost function $C^*(\cdot)$ is a decreasing function of regulator reputation α . It follows that if the policy $(\bar{m}, \bar{\beta})$ breaks even for some α^* then it is cost effective for all $\alpha > \alpha^*$. A break even point $\alpha^* < 1$ exists if and only if $C^*(1) < g^{-1}(R - r)$. For $b \leq Rf(\eta - \frac{1}{2}) + \frac{3\eta}{2}$ substituting $\alpha = 1$ into equation (15) and rearranging yields equation (7). For $b > Rf(\eta - \frac{1}{2}) + \frac{3\eta}{2}$, substituting $\alpha = 1$ into equation (23) and rearranging yields equation (8). When condition (8) is satisfied, $\alpha^* < \alpha_1$ if and only if $C^*(\alpha_1) < g^{-1}(R - r)$. In this case $C^*(\cdot)$ is given by equation (23) and equation (9) follows immediately.

REFERENCES

- BASLE COMMITTEE ON BANKING SUPERVISION (2001). The new Basle Capital Accord. Consultative paper, Bank for International Settlements, Basle.
- BESANKO, D. and THAKOR, A. V. (1993). Relationship banking, deposit insurance and bank portfolio choice. In C. Mayer and X. Vives (eds.), *Capital Markets and Financial Intermediation*. Cambridge University Press, Cambridge, pp. 292–319.
- BHATTACHARYA, S., BOOT, A. W. A. and THAKOR, A. V. (1998). The economics of bank regulation. *Journal of Money, Credit and Banking*, **30**, 4, pp. 745–70.
- BOOT, A. W. A. and GREENBAUM, S. I. (1993). Bank regulation, reputation and rents. In C. Mayer and X. Vives (eds.), *Capital Markets and Financial Intermediation*. Cambridge University Press, Cambridge.
- BOOT, A. W. A. and THAKOR, A. V. (1993). Self-interested bank regulation. *American Economic Review*, **83**, 2, pp. 206–12.
- BOOT, A. W. A. and THAKOR, A. V. (2000). Can relationship banking survive competition? *Journal of Finance*, **55**, 2, pp. 679–713.
- CAMINAL, R. and MATUTES, C. (1997a). Bank solvency, market structure and monitoring incentives. Discussion Paper 1665. CEPR, London.
- CAMINAL, R. and MATUTES, C. (1997b). Can competition in the credit market be excessive? Discussion Paper 1725. CEPR, London.
- CRUICKSHANK, D. (2000). *Competition in UK Banking: A Report to the Chancellor of the Exchequer*. HM Treasury Stationery Office, London.
- DEWATRIPONT, M. and TIROLE, J. (1993). *The Prudential Regulation of Banks*. MIT, Cambridge, Mass.
- DIAMOND, D. W. (1984). Financial intermediation and delegated monitoring. *Review of Economic Studies*, **51**, pp. 393–414.
- DIAMOND, D. W. and RAJAN, R. G. (2000). A theory of bank capital. *Journal of Finance*, **55**, 6, pp. 2431–65.
- DIAMOND, D. W. and RAJAN, R. G. (2001). Liquidity risk, liquidity creation, and financial fragility: a theory of banking. *Journal of Political Economy*, **109**, 2, pp. 287–327.
- FROOT, K. A. and STEIN, J. C. (1998). Risk management, capital budgeting, and capital structure policy for financial institutions: an integrated approach. *Journal of Financial Economics*, **47**, pp. 55–82.
- GIAMMARINO, R. M., LEWIS, T. R. and SAPPINGTON, D. E. (1993). An incentive approach to banking regulation. *Journal of Finance*, **48**, 4, pp. 1523–42.
- GORTON, G. (1995). Bank regulation when ‘banks’ and ‘banking’ are not the same. *Oxford Review of Economic Policy*, **10**, 4, pp. 106–19.

- HELLMAN, T. F., MURDOCK, K. C. and STIGLITZ, J. E. (2000). Liberalization, moral hazard in banking, and prudential regulation: are capital requirements enough? *American Economic Review*, **90**, 1, pp. 147–65.
- HELLWIG, M. (1991). Banking, financial intermediation and corporate finance. In A. Giovanni and C. Mayer (eds.), *European Financial Integration*. Cambridge University Press, Cambridge, UK.
- HOLMSTRÖM, B. and TIROLE, J. (1997). Financial intermediation, loanable funds and the real sector. *Quarterly Journal of Economics*, **112**, 3, pp. 663–91.
- KEELEY, M. (1990). Deposit insurance, risk, and market power in banking. *The American Economic Review*, **80**, 5, pp. 1183–200.
- MAILATH, G. and MESTER, L. (1993). A positive analysis of bank closure. *Journal of Financial Intermediation*, **3**, pp. 272–99.
- MARCUS, A. (1984). 'Deregulation and bank financial policy'. *Journal of Banking and Finance*, **8**, 4, pp. 557–65.
- MAYER, C. (1988). New issues in corporate finance. *European Economic Review*, **32**, pp. 1167–88.
- MORRISON, A. D. and WHITE, L. (2002). Crises and capital requirements in banking. Working paper 2002-FE-05. Oxford Financial Research Centre, University of Oxford.
- PETERSEN, M. A. and RAJAN, R. G. (1995). The effect of credit market competition on lending relationships. *Quarterly Journal of Economics*, **110**, pp. 407–43.
- SCHOORS, K. (1999). The mired restructuring of Russia's banking system. *Russian Economic Trends*, pp. 35–45.
- SCHOORS, K. (2001). The credit squeeze during Russia's early transition: a bank-based view. *Economics of Transition*, **9**, 1, pp. 205–28.
- SHARPE, S. (1990). Asymmetric information, bank lending and implicit contracts: a stylized model of customer relationships. *Journal of Finance*, **45**, pp. 1069–87.

Date of receipt of final manuscript: 29 September 2003