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***Optimal design of bank bailouts:
the case of transition economies***

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1 INTRODUCTION

In most recent banking crises bank regulators have been caught off their guard and have been forced to respond to the crisis in a hurry without the support of an institutional or legal framework designed to deal with bank failures. Unfortunately most bank regulations (and in particular the BIS regulations) are concerned with the ex-ante problem of how to avoid bank failures and few rules have been devised on how to deal with bank failures when they occur.

This situation is in sharp contrast with the non-financial sector, where a detailed and elaborate bankruptcy law governs the process of liquidation or reorganisation of financially distressed firms. In the case of banks it is generally up to the regulators to decide how to deal with an insolvent bank and regulators have by and large too much discretion and little guidance on how best to restructure or liquidate an insolvent bank. When faced with a banking crisis, regulators are often forced to improvise or imitate the hastily improvised solutions adopted by other regulators in some past crisis.

In this paper we address the question of how to design a bankruptcy institution for banks that would serve a similar purpose as existing bankruptcy laws for non-financial firms. Because of the specific nature of banking activities and because of deposit insurance it is not suitable to simply apply existing bankruptcy laws to banks. A special bankruptcy institution designed for banks is required. Such an institution would in all likelihood be as elaborate as current bankruptcy law and it is far beyond the scope of this paper, let alone the capabilities of the authors, to outline such an institution in all its details. The more modest aim here is to outline a framework which could serve as a basis for the design of such an institution.

Most policy discussions of bank bailouts are concerned with regulatory forbearance and public confidence in the banking sector, with the supporters of bailouts emphasising the dangers of a confidence crisis and the opponents emphasising the moral hazard problems created by excessively soft bank bailouts. We shall take for granted that deposits must be insured and we shall sidestep the forbearance question by assuming that regulators can com-

mit to an optimally designed bank bailout scheme.¹ Our focus will be on how to design the scheme optimally given that regulators can commit to the scheme.

The main questions we shall be dealing with are: i) when and whether to bailout a failing bank? ii) if a bailout is desirable, how to bailout the bank? We shall be concerned with both the incentive effects of bailout policies on bank managers and the cost implications of the bailout for the government. In other words, the objective is to design a bailout scheme which preserves bank managers' investment and reporting incentives, while keeping the bailout bill as small as possible.

A common response of regulators in recent financial crises (e.g. in Norway, Mexico or Japan) has been to inject new funds (unconditionally) into distressed banks by purchasing preferred stock or subordinated bonds. The size of these injections has been massive (of the order of several percentage points of GDP).² With the benefit of hindsight, one may question both the rescue method and the size of the rescue. These capital injections have had the advantage of buying precious time and breathing space for regulators but they did not address the underlying non-performing loans problem.

To address this problem, it is essential to give banks adequate incentives to liquidate bad loans. We argue in this paper that bank managers' incentives to misreport the extent of their bank's loan losses is a major source of inefficiency leading generally to inefficiently low liquidations of bad loans, and, thus, to a magnified banking crisis down the road. We show how the form of an efficient bank bailout scheme is to a large extent determined by how it mitigates or overcomes bank managers' incentives to hide loan losses.

Once it is recognised that bank managers can delay insolvency by hiding the

¹The forbearance problem is somewhat tangential to the issues addressed in this paper. While we believe that this problem is of real concern, we think that it is best to address this question separately.

²The latest rescue package set up by the Japanese authorities this year, of the order of \$102bn, represents about 2.5% of GDP (see *Financial Times* of 28 February 1998). The overall bailout cost of the Mexican banking sector as disclosed to parliament by President Zedillo was estimated to be 14.5% of GDP (see *Financial Times* of 20 April 1998).

extent of their bank's loan losses and that they may refrain from liquidating bad loans in an attempt to hide loan losses, it should be clear that strict bank closure rules requiring the closure of any insolvent bank may be counterproductive. Such rules may simply induce bank managers to hide the size of their loan losses for as long as they can. Such behaviour can result in huge misallocations of investments as well as massive bank failures.

Thus, this paper analyses the effects of various bank bailout rules on both ex-ante incentives to lend and ex-post incentives to disclose the size of the non-performing loan problem. The basic set-up considered here includes three types of agents: firms, banks and the regulators. Firms and banks are controlled by their managers who derive private benefits from their continued operations and the main source of discipline on their behaviour is the possibility of dismissal associated with insolvency. The regulators' objectives are to induce efficient ex-ante investments, avoid the dead-weight costs associated with excessive bank recapitalisations, and promote the efficient restructuring or liquidation of firms which have defaulted on their bank loans.³

Banks are assumed to have private information about the quality of their loan portfolio and the continuation value of firms in default. The regulators only know the probability distribution over the fraction of non-performing loans across banks in the economy. They therefore face an *adverse selection* problem in the design of bank recapitalisation.

Our analysis leads to a number of interesting results. First, a tough recapitalisation policy in which the bank manager is always dismissed results - as already suggested - in the bank managers rolling over bad loans in order to conceal the extent of their loan losses and therefore in the *softening* of the firms' budget constraints. Vice-versa, a soft approach to recapitalisation (in which the manager of a failing bank is not dismissed) encourages the bank to take an overly tough approach to firm liquidations, while exaggerating its own recapitalisation requirements.

However, and this is the second main conclusion of the paper, the socially

³Another objective we consider in an extension is to replace inefficient bank managers.

efficient outcome can generally be achieved through a soft bailout policy combined with the carving out of bad loans at a suitable *non-linear transfer price*. In other words, our analysis suggests that the recapitalisation of insolvent banks should be performed by buying out non-performing loans rather than through capital injections by buying subordinated bonds. Our key insight here is that a *non-linear* transfer pricing mechanism for bad loans can be used to combat effectively the adverse selection problem, and in particular to avoid over-reporting of non-performing loans by the healthier banks at the time of the bailout.

The existing theoretical literature on financial restructuring and bank recapitalisation in transition economies comprises only a handful of papers, all of which emphasise the implications of *moral hazard* on the selection and monitoring of projects by banks. For example, Mitchell (1995) sets up a formal model of a bank restructuring where banks must incur a (convex) cost of effort to avoid asset dissipation by firms. Also taking a moral hazard approach to bank restructuring, Berglof and Roland (1996) argue that the ex-ante recapitalisation of banks by governments can limit the extent to which banks will take on additional risky loans and then gamble for resurrection.

These studies do not provide a complete characterisation of all possible bailout schemes and of the optimality of different bailout policies under different circumstances. While moral hazard considerations (and in particular the problem of excessive risk-taking in the choice of banks' portfolios) is reasonably well understood and arises in transition and developed market economies alike, informational asymmetries of the kind emphasised in this paper are more likely to be relevant in the context of transition economies where the institutions for evaluating and disclosing the credit worthiness of both firms and banks are inherently weak.

Two other related papers are Suarez (1995) and Povel (1997). The former paper studies bank closure rules and recapitalisation in a dynamic complete information model. Given the informational assumptions stressed in this paper, it is not entirely surprising that it finds that the closure of insolvent banks has good ex-ante incentive properties. The latter paper deals with bankruptcy of non-financial firms but emphasises the same incentive prob-

lems as we do here for banks, relating to the manager's discretion on when to declare the firm bankrupt.

The remainder of the paper is organised as follows. Section 2 sets out the basic model, specifying the objectives and constraints of firms, banks and regulators. Section 3 compares "tough" and "soft" bank recapitalisation policies taken in isolation. Section 4 derives necessary and sufficient conditions for the existence of an efficient non-linear pricing mechanism for the carving out of bad loans. Section 5 examines the effects of high-powered incentives for bank managers. Section 6 explores the effects of less stringent informational assumptions. Section 7 briefly considers an extension where bank managers may have different managerial abilities. Finally, section 8 provides a brief summary of the main lessons of our analysis.

2 THE MODEL

The model builds on Bolton and Scharfstein (1990) by enlarging their framework to allow for three types of agents: firms, banks and regulators. We consider each in turn.

2.1 Firms

For simplicity, we assume that all firms are run by self-interested managers. Be they state-owned or privatised firms, shareholders do not play a significant governance role; rather the focus is on bank debt as a disciplining device. A firm is represented by an asset, which yields a random return. In the first period, the return is either high, $\pi > 0$, or low (equal to zero). The probability of receiving a high return is $p \in (0, 1)$. This probability could be controlled by the manager's actions, but we shall take it to be exogenously given. In the second period, the firm also has a random continuation value, which is the discounted stream of future returns.

Each firm has an outstanding stock of bank debt and, for simplicity, no other liabilities. This stock of debt imposes a repayment obligation on the firm of $D \in [0, \pi]$. When a firm defaults, the bank can either liquidate the firm,

making the manager redundant, or it can allow the firm to continue. The certain liquidation value of the firm is L . The continuation value is either high, $v > 0$, or low (equal to zero), with $v > L > 0$. The probability of a high continuation value is $(1 - \beta)$. In the event of default, the continuation value can be costlessly observed.

For simplicity, we shall assume that the *private* continuation value of firms' managers is sufficiently large that they will always honour their debt repayment obligations if they can. This assumption rules out strategic defaults by firms.⁴

2.2 Banks

As with firms, we assume that self-interested managers run banks. On the asset side of their balance sheets, banks have a portfolio of loans to firms, each of which has a scheduled debt service payment of D . As specified above, each firm may default on its loan with probability $(1 - p)$. In the event of a default, and in the absence of strategic behaviour by the bank manager, the bank liquidates the firm with probability β and obtains L . The alternative to liquidation is firm continuation with a realised return v . If all firms have independently and identically distributed returns, and each bank holds a large and well diversified portfolio of loans, then each bank has approximately a fraction $(1 - p)$ of non-performing loans.

On the liability side of their balance sheet, banks issue deposits in the amount d to fund each loan. The net worth of the bank per loan is thus:

$$W = (1 - p)[\beta L + (1 - \beta)v] + pD - d. \quad (1)$$

For the bank to have a positive net worth, the weighted average payoff from non-performing and performing loans must thus exceed the value of deposits issued to fund the representative loan.

⁴It is possible to extend the model to allow for strategic defaults. The results obtained in this extension are qualitatively similar to those reported in this paper.

The fact that banks do fail in reality suggests that they cannot build completely diversified portfolios and that they are exposed to aggregate shocks. To introduce the possibility of bank failures, we shall suppose that firms' returns are correlated to some extent so that the fraction of the bank's performing loans is a random variable which takes on a range of values, $p_1 > p_2 > p_3 > p_4 > 0$, with respective probabilities $\mu_1, \mu_2, \mu_3, \mu_4 > 0$. We denote the expected fraction of non-performing loans to be $p = \sum_{i=1}^4 \mu_i p_i$. The bank's realised net worth under each realisation is then given by equation (2), but p_i ($i = 1, \dots, 4$) now substitutes for p . Thus, under the four possible outcomes p_i , the bank's realised net worth is equal to:

$$W_i = (1 - p_i)[\beta L + (1 - \beta)v] + p_i D - d, \quad (2)$$

where we assume that:

$$W_4 < W_3 < W_2 = 0 < W_1. \quad (3)$$

That is, only banks in states 1 and 2 are solvent while banks in states 3 and 4 are insolvent. As will become clear in the next section, we need at least four different states of nature in order to compare alternative bank bailout policies.

We shall also suppose that bank managers can expend effort *ex ante* to reduce the probability of a bank failure. That is, by being more diligent in evaluating the distribution of firms' period-one cash flows and in structuring efficient loan portfolios, they can reduce the likelihood that a large fraction of projects will fail. For simplicity, a bank manager's decision to expend effort is an all-or-nothing choice $e \in \{0, 1\}$. The cost to the bank manager of expending this effort is $c(e)$, where $c(0) = 0$ and $c(1) = c$. We assume that when $e = 1$, the probability distribution $\mu_i(1)$ (first-order) stochastically dominates the probability distribution $\mu_i(0)$ when $e = 0$:

$$\sum_{i=1}^j \mu_i(1) > \sum_{i=1}^j \mu_i(0) \quad (4)$$

for all $j = 1, 2, 3$.

Finally, to simplify notation, we let $\phi_i = (1 - p_i)\beta$ denote the fraction of liquidated loans. We obviously have: $\phi_1 < \phi_2 < \phi_3 < \phi_4$.

When a firm defaults, the manager of its bank must decide whether to allow the firm to continue or to seek its liquidation. We assume that the sale of the firm's assets can be observed costlessly so that the liquidation decision is observable and verifiable. However, loan continuation and write-down decisions are entirely at the discretion of the bank manager and cannot be verified. In other words, unless a non-performing loan is actually liquidated, it is not possible to verify whether the loan is performing or not. This limited verification of the bank manager's behaviour in turn allows for strategic behaviour on her part.

For example, the bank manager may want to inefficiently refinance bad loans in order to hide (or understate) the overall extent of the non-performing loans problem. This seems to be a wide spread banking practice, particularly in transition economies, but also in developing and industrialised market economies. Similarly, when the bank is to be bailed out, the bank manager may want to overstate the proportion of non-performing loans in order to elicit a greater recapitalisation from the government. The core analysis of this paper centres on these two forms of strategic behaviour by bank managers.

A bank manager's objective function involves a monetary and a private benefit component. The monetary component is the sum of a fixed salary (which we normalise to zero) and, in the case of a high-powered incentive scheme, a share of the bank's (reported) net worth, say equal to b . The private benefit component reflects the facts that: (i) bank managers like power; and (ii) bank managers, like firm managers, would rather retain their job than be fired. In addition, the bank manager's objective function includes the cost of effort, if any, in managing the bank's loan portfolio.

Formally, we can express the bank manager's objective as:

$$U_B = b \max(0, \widehat{W}_i) + \widetilde{B}[1 + \max(0, W_i + R)] - c(e), \quad (5)$$

where $\widetilde{B} = B$ if the bank manager keeps the job and $\widetilde{B} = 0$ if fired. \widehat{W}_i is the reported net worth of the bank (absent recapitalisation) and W_i is the true net worth. Any additional resources accruing to the bank in period one, in particular as a result of recapitalisation, is given by R .

To keep the analysis simple, we shall begin by assuming that a bank manager has only a low-powered incentive scheme, so that $b = 0$, and, therefore, that

$$U_B = \tilde{B}[1 + \max(0, W_i + R)] - c(e). \quad (6)$$

The effects of high-powered incentive schemes will be considered in Section 4.

2.3 The regulator

The regulator's dilemma is to form a policy towards the recapitalisation of banks with announced negative net worth. A constraint on this policy is that any bank which declares its net worth as negative must receive a recapitalisation to bring its declared net worth back to zero. In other words, in our model all depositors are fully insured.⁵ Our results and analysis do not critically hinge on this assumption. If only a fraction of deposits $\hat{d} < d$ is insured our analysis would be unchanged when d is replaced by \hat{d} .⁶

The regulator's problem is to design a bank bailout policy to: i) maximise the expected social return of the underlying assets of firms, ii) induce maximum effort of bank managers in the ex-ante evaluation firms' returns, and iii) to minimise the costs associated with any excessive recapitalisation of banks.

With full information about the true net worth of banks, the regulator would avoid excessive recapitalisations and the corresponding dead-weight losses, by simply transferring $-W_i$, to those banks in states $i = 3, 4$ in period one. It would also maximise bank managers' incentives by committing to dismiss them whenever the bank is insolvent.

⁵Banks must have fully insured deposits for two basic reasons. First, the failure of a large institution may adversely impact other banks in the system through the payment system and the inter-bank market, which can precipitate a generalised loss of confidence. Secondly, depositors in a large bank may effectively exert political pressure for deposit guarantees. In addition, banks are *de facto* perceived by depositors as being fully backed by the government.

⁶However, under partial deposit insurance, new issues must be addressed, such as the behaviour of uninsured depositors. These issues are undoubtedly important but they are somewhat orthogonal to our analysis.

The regulator's problem is made difficult, however, because it does not generally know the period-one net worth of banks. So if the government wants to guarantee that all banks reach at least a minimum reported net worth of zero, it must be prepared to bailout banks up to an amount $-W_4$, the worst possible net worth. Since the government does not know the net worth of banks, their managers may be able to get away with claiming to be in the worst possible state. Such misrepresentation by all bank managers would lead to an excessive recapitalisation with an ex-ante dead-weight of

$$\lambda[\mu_1(W_1 - W_4) + \mu_2(W_2 - W_4) + \mu_3(W_3 - W_4)] = \lambda E. \quad (7)$$

Of course, the government has the option to limit the size of the recapitalisation to an amount less than $-W_4$, but then it exposes itself to the possibility of inadequate recapitalisation of those banks in the worst state of nature.

The expected social return of the underlying assets of firms is given by their expected first period cash flows, $\bar{p}(e)\pi$ (where $\bar{p}(e) = \sum_{i=1}^4 \mu_i(e)p_i$) plus their expected continuation values

$$\Omega_i = p_i(1 - \beta)v + (1 - p_i)\{\min[(1 - \beta), (1 - \widehat{\beta}_i)]v + \widehat{\beta}_i L\} \quad (8)$$

That is, for the proportion p_i of firms with high cash flows, the expected continuation value is $(1 - \beta)v$, since these firms will never be liquidated by their managers. For the proportion $(1 - p_i)$ of firms with low cash flows, the manager is forced to default and the average continuation value per loan is $\min[(1 - \beta), (1 - \widehat{\beta}_i)]v + \widehat{\beta}_i L$. Here $\widehat{\beta}_i$ denotes the fraction of defaulting loans the bank manager chooses to liquidate in each state $i = 1, \dots, 4$.

Formally, the regulator's objective can be summarised in the following expression:

$$U_G = \bar{p}(e)\pi + \sum_{i=1}^4 \mu_i \Omega_i - \lambda E - c(e). \quad (9)$$

Thus, in our model social efficiency requires fulfilment of three conditions. First, a firm should be liquidated if, and only if, its liquidation value exceeds the continuation value \tilde{v} , that is, $\widehat{\beta}_i$ should be equal to β for $i = 1, \dots, 4$. Secondly, only those banks with truly negative net worth should be recapitalised; that is, E should be equal to zero. Thirdly, bank managers should

expend effort in managing their loan portfolio provided that

$$\bar{p}(1)\pi - \bar{p}(0)\pi + \sum_{i=1}^4 \mu_i(1) - \mu_i(0)]\Omega_i > c. \quad (10)$$

We assume that this condition is satisfied, in other words that the ex-ante evaluation of firms' returns by bank managers is socially efficient.

Throughout the remainder of the paper we make the (realistic) assumption that the liquidation value, L , is greater than the manager's private benefit from the firm's continued operation. In other words, it is socially efficient to liquidate the firm whenever the bank's continuation value of the project is zero, even though the firm's manager always prefers not to liquidate. This assumption introduces an ex-post inefficiency when firms which are able to service their current debt obligations but have a low continuation value remain in operation because of the private benefits derived by their managers. While first-best social efficiency would require that these firms be liquidated in period one, this inefficiency is independent of the form of bank recapitalisation and is thus not a factor in evaluating the government's policy alternatives.

3 TOUGH VS SOFT RECAPITALISATION POLICY

The regulator's problem is to design a bank recapitalisation policy that maximises its objective (social efficiency) subject to the constraint of limited knowledge of a bank's true net worth in period one. Since the banks are managerially controlled, one possible condition to impose with a recapitalisation relates to the dismissal of the bank manager. In particular, how "tough" or "soft" should the government be towards the manager of a bank in the event of its recapitalisation.

Again, start with the benchmark case where the net worth of banks is known to the government in the first period. The optimal bailout policy is then straightforward; restore the net worth of banks in states $i = 3, 4$ to zero after allowing for the expected recovery of non-performing loans, and dis-

miss the manager if these recoveries deviate from expectations. This policy satisfies two of the three conditions for first-best efficiency. In particular, it guarantees both that only those banks with truly negative net worth are recapitalised and that firms in default are liquidated if, and only if, their liquidation value exceeds their continuation value. Satisfaction of the third condition for first-best efficiency, the ex-ante evaluation of firm returns and the structuring of an efficient loan portfolio, depends on the incentives faced by the bank manager.

Such a policy would clearly have perverse effects when the regulator must rely on bank managers' reports to learn about period-one net worth. We illustrate these perverse effects in this section by considering two extreme bailout policies that are often discussed in practice:

1. A tough recapitalisation policy, which results in the liquidation of a bank that is found insolvent and the ensuing dismissal of the bank's manager.
2. A soft recapitalisation policy, which maintains the insolvent bank's manager in control and fully bails out the bank.

We also consider an "in-between" policy, which involves the liquidation of an insolvent bank and the dismissal of its manager only in the worst state of nature, $i = 4$. Any bank in state $i = 3$ is fully bailed out by the government, leaving the bank manager in control.

3.1 Tough recapitalisation policy

Consider first the case in which the manager of a bank which reports a negative net worth is dismissed. Assuming for the moment that $b = 0$, the manager of a bank with realised p_1 or p_2 has no incentive to manipulate either the accounts of the bank or the decisions to liquidate firms or to write-down their loans. However, the bank would be insolvent if either p_3 or p_4 were realised. With such outcomes, the bank manager will act as if $p_k = p_2$

has occurred in order to preserve his job. Since the liquidation of firms is verifiable, the bank manager will pretend that $p_k = p_2$ by liquidating a fraction ϕ_2 of firms in its portfolio, where ϕ_2 is defined as the fraction of liquidated loans in the portfolio of a bank with realised p_2 , (that is $\phi_2 = (1 - p_2)\beta$).

In other words, the bank manager will liquidate a fraction $\widehat{\beta}_k$ of defaulting firms, such that:

$$(1 - p_k)\widehat{\beta}_k = \phi_2 = (1 - p_2)\beta. \quad (11)$$

Therefore, the proportion of defaulted loans that are actually liquidated by the bank manager in states p_3 or p_4 is less than the socially efficient proportion, that is $\widehat{\beta}_k < \beta$. The incentive of bank managers to maintain the appearance of bank solvency under a tough bailout policy thus leads to a softening of debt as a disciplining device on firms and thereby a softening of firms' budget constraints.

More formally, a tough bailout policy leads to an ex-ante payoff of:

$$U_G = \bar{p}(e)\pi + \sum_{i=1}^2 \mu_i(c)[p_i(1 - \beta)v + (1 - p_i)(1 - \beta)v + \beta L] \\ + \sum_{i=3}^4 \mu_i(e)[p_i(1 - \beta)v + (1 - p_i)(1 - \beta)v + \widehat{\beta}_i L], \quad (12)$$

where, from equation (11) $\widehat{\beta}_i < \beta$ for $i = 3, 4$. A tough bailout policy thus leads to an insufficient number of firm liquidations. The loss in social surplus due to the softness of banks on firms in default is the foregone liquidation value of those firms which are continued even though they have a zero continuation value.⁷

Introducing the possibility of strategic defaults by firms would amplify the loss in social surplus due to banks hiding the extent of their non-performing loans. More precisely, suppose that the private continuation value of firms' managers is such that they would choose not to default strategically if the probability of liquidation in case of default is β , but might decide to default if they anticipate a lower probability of liquidation by banks. Then, not only

⁷The loss in social surplus also includes the misallocation of funds which could have been directed to better investments. An important limitation of our model is that it is not set up to account for that cost.

will the number of firm liquidations be less than is socially optimal but there will also be a further build-up of non-performing loans in banks' portfolios.⁸

There is, however, no dead-weight cost due to excessive recapitalisation under a tough bailout policy. Indeed, no bank recapitalisations take place under this rule because bank managers will not declare their institution insolvent.

Whether bank managers are induced to expend effort in managing loan portfolios under this policy depends only on the private benefits derived from this activity. In particular, a bank manager will expend such effort under a tough policy only if,

$$E[U_B(1)] = \sum_{i=1}^4 \mu_1(1)B[1 + \max(0, W_i + R)] - c >$$

$$E[U_B(0)] = \sum_{i=1}^4 \mu_1(0)B[1 + \max(0, W_i + R)],$$

or equivalently

$$[\mu_1(1) - \mu_1(0)]BW_1 > c. \quad (13)$$

Note that no bank manager is ever dismissed in equilibrium under this policy because of the costless ability to misrepresent a bank's net worth. Note also that a manager receives private benefits in all states of nature. The value of private benefits equals B in all states of nature except state 1, when the value of private benefits equals $B(1 + W_1)$. The expected value of private benefits thus rises with managerial effort to the extent that this effort raises

⁸For example, suppose that the private continuation value of firms' managers is random, equal to V with probability $(1 - \epsilon)$ and to zero with probability ϵ . Assuming that

$$\beta[1 - p_2(1 - \epsilon)]V < D < \beta V.$$

we then leave it to the reader to verify that in the case of a solvent bank (in state 1 or 2), the pair of strategies $(\hat{\beta}_i = \beta, \text{strategic default with probability } \epsilon)$ is the unique Nash equilibrium. In the case of a bank in state 4, there exists a Nash equilibrium involving a higher probability of strategic default, namely: $(\hat{\beta}_4 < \beta, \text{strategic default with probability one})$, where $\hat{\beta}_4$ satisfies

$$[1 - p_4(1 - 1)]\hat{\beta}_4 = \phi_2 = [1 - p_2(1 - \epsilon)]\beta.$$

the probability that state 1 will occur.

3.2 Soft bailouts

Under a “soft policy” towards bank recapitalisation, a bank manager is immune from dismissal, regardless of reported net worth. This approach creates an incentive for bank managers to overstate their problem loans so as to increase the amount of recapitalisation. Bank managers can easily overstate the extent of their anticipated losses by taking excessively high charges.⁹ The change in bank manager utility from reporting the worst possible net worth W_4 instead of the true net worth W_i is always positive and equal to

$$\Delta U_B = B(W_i - W_4) \quad (14)$$

One benefit of soft bailouts, however, is that they restore a bank manager’s incentives to impose financial discipline on the firms they lend to. Indeed, without a hard budget constraint, their incentive is to liquidate every defaulted loan if and only if the continuation value is less than the liquidation value. Thus, with a soft recapitalisation policy, the bank manager hardens the budget constraint on firm managers.

The social payoff achieved through a soft bailout policy is then:

$$U_G = \bar{p}(e)\pi + \sum_{i=1}^4 \mu_i(e) \{p_i(1 - \beta)v + (1 - p_i)[(1 - \beta)v + \beta L]\} - \lambda[\mu_1(e)(W_1 - W_4) + \mu_2(e)(W_2 - W_4) + \mu_3(e)(W_3 - W_4)] \quad (15)$$

There are thus at least two social costs of a soft bailout policy. One is the dead-weight costs from excessive recapitalisation.¹⁰ The second is an inadequate incentive for bank managers to expend effort in evaluating the investment returns of firms and in structuring efficient loan portfolios. As with the “tough” recapitalisation rule, the only incentive for bank managers to expend such effort under a “soft” rule arises from the associated private

⁹Note that by taking charges, banks only bring forward in their books anticipated loan losses. They do not report actual loan losses.

¹⁰In practice, this cost is reduced somewhat since by purchasing preferred stock or taking a stake in the bank, the regulatory authorities get a cut in all future profits of the bank. It is not clear, however, that regulators are able to fully recover an excessively generous recapitalisation.

benefits.

More specifically, under the soft recapitalisation policy, note that the government recapitalisation of banks equals the net worth of a bank in the worst state of nature. A bank manager would thus exert effort only if:

$$\sum_{i=1}^3 [\mu_i(1) - \mu_i(0)] B [\max(0, W_i) - W_4] > c \quad (16)$$

Now since,

$$-\sum_{i=1}^3 [\mu_i(1) - \mu_i(0)] = \mu_4(1) - \mu_4(0)$$

this incentive constraint is equivalent to:

$$(\mu_1(1) - \mu_1(0))B \cdot \max(0, W_1) + (\mu_4(1) - \mu_4(0))BW_4 > c \quad (17)$$

Comparing equations (13) and (17) reveals that whenever $\mu_4(1) - \mu_4(0) < 0$ the incentive-compatibility constraint on managerial effort is less tight under a “tough” than under a “soft” recapitalisation policy provided that $|W_4|$ is not too large.

The reason that the “tough” policy is not necessarily more effort-inducing than the “soft” policy is that under a soft bailout policy, the benefit of overstating loan losses is an increasing function of the extent of the overstatement. It may thus not always be a good idea for the government to minimise the scope for ex-post overstatement of the bad loans problems (e.g. by implementing a tough bailout policy) because this may sometimes have adverse ex-ante incentive effects.

We summarise our discussion so far in the proposition below:

Proposition 1: *(a) ex-post efficiency comparison: When μ_4 is close to 1, that is when the banking system as a whole is known by the government to be in crisis, a soft bailout policy dominates a tough bailout. However, when $\mu_1 + \mu_2$ is sufficiently close to 1, that is, when the banking system is basically sound, a tough bailout dominates a soft bailout.*

(b) *ex-ante incentives*: a tough bailout policy will generally provide stronger *ex-ante incentives* than a soft bailout policy, except when $|W_4|$ is large.

While tough (soft) bailout policies dominate *ex post* when the banking system is known by the government to be basically sound (in deep crisis), the comparison between these two extremes become less clear cut in intermediate situations. For example, when μ_3 is close to 1, then the excessive recapitalisation of banks in state p_3 and the excessive liquidation of firms by those banks under soft bailout policy must be weighted against the insufficient liquidations by banks in state p_3 (and p_4) under tough policy. The balance depends upon the dead-weight loss parameter λ , and upon the cost of excessive liquidation ($v - L$).

3.3 An “In-between” policy

Now consider a less extreme approach towards bank recapitalisation, under which dismissal of the bank manager depends on the amount of required recapitalisation. Specifically, if a bank reported that p_3 has occurred, the bank would be recapitalised without the manager being dismissed. But if a bank manager reports p_4 , the bank would be liquidated and the manager dismissed. In other words, a bank manager would be held accountable only for an extremely poor outcome.

Under this policy, banks in states p_1 and p_2 will seek to increase their size by attracting excessive recapitalisations while banks in state p_4 hide the true extent of their insolvency problem. Banks in state p_3 , however, accurately reveal their net worth and take efficient liquidation decisions. Thus, although an in-between bailout policy combines inefficiencies present in the two extreme policies, it involves a smaller dead-weight cost of excessive recapitalisation than under soft bailout and less under-liquidations of defaulted firms than under a tough policy.

In terms of *ex-ante incentives*, this policy may provide worse incentives for bank managers. Under the “in-between” recapitalisation policy, a bank manager would exert effort only if

$$\sum_{i=1}^2 [\mu_1(1) - \mu_i(0)] B(W_i - W_3) > 0, \quad (18)$$

A comparison of equations (18) and (16) readily reveals that the incentive-compatibility constraint on managerial effort is less tight under an “in-between” than the “soft” recapitalisation policy. Whether the incentive-compatibility constraint is less tight than under a “tough” policy depends again on the amount of the recapitalisation that banks receive. As before, the reason that the “tough” policy is not necessarily less tight is because recapitalisation yields private benefits, which increase with the size of the overstatement of loan losses.

Our discussion in this section can be summarised by the following:

Proposition 2: (a) *ex-post efficiency:* When μ_3 is close to 1, the “in-between” bailout policy dominates both the “tough” and “soft” bailout policies from an *ex-post* efficiency viewpoint.

(b) *ex-ante incentives:* An “in-between” bailout policy will provide less effort incentives than a tough bailout policy, except when $|W_3|$ is sufficiently large.

While an “in-between” policy may under certain circumstances reduce the ex-post dead-weight cost of recapitalisations and the costs of excessive continuation of defaulted firms, other policies may perform as well or better both from an ex-post and an ex-ante point of view. Such an alternative is explored in the next section.

4 BANK RECAPITALISATIONS CONDITIONAL ON FIRM LIQUIDATIONS

Since one observable and verifiable action of bank managers is the liquidation of defaulted firms, this parameter can provide a possible condition for the regulator’s policy towards bank recapitalisation. The purpose of this section is to examine whether the regulator can use this parameter to achieve its overall objective of first-best social efficiency and, if so, under what circumstances.

We shall show that it is possible to use this action of bank managers as a conditioning parameter for bank recapitalisations in order to achieve two of the three criteria for first-best social efficiency. These criteria are: the efficient liquidation of firms in default so that $\widehat{\beta}_i = \beta$ for $i = 1, \dots, 4$ and the absence of any excessive bank recapitalisation. A complementary policy, however, may be required to provide a sufficiently strong incentive for bank managers to expend effort in the ex-ante evaluation of firms' returns. The next section considers such a policy.

A key issue in the design of a bank recapitalisation policy, which is conditional on the liquidation of defaulted firms, is the relationship between the liquidation of firms by a bank and the amount, if any, of its recapitalisation. Consider first a simple linear transfer scheme, under which the government pays a fixed amount t for any loan to a firm which is liquidated by the bank manager (with proceeds L). To achieve a zero net worth for banks in the worst state of nature, p_4 , the transfer amount t must raise the true net worth of such a bank to break-even:

$$\phi_4(L + t) + (1 - p_4)(1 - \beta)v + p_4D = d. \quad (19)$$

However, this recapitalisation policy would be too generous for those insolvent banks in state p_3 , increasing their net worth beyond zero. Banks with positive net worth, moreover, would be encouraged to participate in the scheme even though they are not in need of recapitalisation.

The excessive recapitalisation can be eliminated, however, if the government introduces a non-linear transfer scheme. Suppose that the government sets a low transfer amount, t_L , for loans in default which are liquidated, up to a threshold $\bar{m} \leq \phi_2$ of the bank's portfolio. And that beyond that threshold transfers per liquidated loan are increased to $t_H > t_L$. We can then establish the following:

Proposition 3: *There exists an $\bar{m} \leq \phi_2$, such that the above two-part transfer scheme price (t_L, t_H, \bar{m}) implements the bank recapitalisation that leads to the efficient liquidation of firms in default, that is, $\widehat{\beta}_i = \beta$ for $i = 1, \dots, 4$, and that recapitalises only those banks which are truly insolvent if, and only*

if,

$$p_4 D + (1 - p_4)(1 - \beta)v + (\phi_4 - \phi_2)v + \phi_2 L \geq d. \quad (20)$$

Proof: Without loss of generality we can assume $D > v$.

First, in order to avoid excessive liquidation of non-performing loans by bank managers, the high transfer price t_H cannot be larger than the minimum possible recovery on a defaulted loan, v . With $t_H > (v - L)$, managers of all banks would have an incentive to engage in excessive liquidation since doing so would increase their recoveries on non-performing loans, including the per-loan transfer from the government. So we must have $t_H \leq (v - L)$. Without loss of generality, we restrict the analysis to two-part transfer schemes, such that $t_H = (v - L)$.

Now, it is sufficient to show that the low transfer t_L , and cut-off level, \bar{m} , can be chosen so as to deter solvent banks in state p_2 (and *a fortiori* those in state p_1) from participating in the scheme. This requires that the pair (t_L, \bar{m}) satisfy the condition

$$(\phi_2 - \bar{m})v + \bar{m}(L + t_L) \leq \phi_2 L. \quad (21)$$

The left-hand-side of equation (21) is the payoff that a bank in state p_2 would receive by participating in the government's recapitalisation scheme and the right-hand-side is the bank's revenue from remaining outside the scheme and from liquidating those non-performing loans which have a zero continuation value. One set of parameter values for which this condition is satisfied is $t_L = 0$ and $\bar{m} = \phi_2$.

It is also sufficient to show that the two-part transfer scheme $(t_L = v - L, t_L = 0, \bar{m} = \phi_2)$ succeeds in fully recapitalising insolvent banks in states p_3 and p_4 . Consider in particular a bank in state p_4 , the worst possible state. The realised net worth of such a bank under this recapitalisation scheme, which links government transfers to the bank of its liquidation of insolvent firms, is

$$p_4 D + (1 - p_4)(1 - \beta)v + (\phi_4 - \phi_2)v + \phi_2 L - d. \quad (22)$$

From equation (22), it is clear that condition (20) in Proposition 3 must hold in order for a bank in state p_4 to be fully recapitalised. This condition is

therefore sufficient to ensure the full recapitalisation of insolvent banks but also to avoid both the excessive liquidation of non-performing loans and the excessive recapitalisation of insolvent banks. These are two of the three requirements for first-best social efficiency.

To complete the proof of Proposition 3, we must show that condition (20) is also necessary. This requires showing that the condition cannot be relaxed by allowing a more generous two-part transfer scheme with $t_L > 0$.

Suppose we take $t_L > 0$. The necessary condition on t_L and m for banks in state p_4 to be fully recapitalised becomes

$$p_4 D + (1 - p_4)(1 - \beta)v + (\phi_4 - \bar{m})v - \bar{m}(L + t_L) \geq d. \quad (23)$$

In choosing the optimal t_L and \bar{m} , the government seeks to ease the above constraint, while discouraging the solvent banks from participating in the scheme. In other words, the government is to choose (t_L, \bar{m}) so as to:

$$\begin{aligned} & \max[(\phi_4 - m)v + m(L + t_L)] \\ & \text{s.t.: } (\phi_2 - m)v + m(L + t_L) \leq \phi_2 L. \end{aligned} \quad (24)$$

At the optimum the incentive constraint for a bank in state p_2 is binding so that the above problem simplifies to

$$\max_m [(\phi_4 - \phi_2)v + mL + (\phi_2 - m)L], \quad (25)$$

for which there is no unique maximum. Setting $\bar{m} = \phi_2$ and $t_L = 0$ thus involves no loss of generality, provided that condition (23) is satisfied. With $t_L = 0$, this is nothing by condition (20) in Proposition 3.

This establishes that condition (20) is both necessary and sufficient, and therefore completes the proof of Proposition 3. \square

Whenever condition (20) is satisfied, a bank bailout policy which is conditional on the liquidation of firms in default can meet two of the requirements for first-best social efficiency: efficient liquidation decisions by bank managers and no excessive recapitalisation of banks by the government. Moreover, this result obtains regardless of the government's knowledge (or beliefs) $\mu_i(e)$ about the state of the overall banking system. In particular, it dominates

the “tough”, “soft” and “in-between” policies considered in the previous section, none of which would achieve these requirements for first-best efficiency, except perhaps on a negligible (measure-zero) subset of parameter values for $\mu_i(e)$. If condition (20) is not satisfied, this conditional recapitalisation policy would lead to excessive recapitalisation of solvent banks in state p_2 (and/or of insolvent banks in state p_3), with the associated dead-weight costs. In which case, a “tough” bailout policy may sometimes dominate, in particular if $\mu_1 + \mu_2$ is close to one.¹¹

The analysis of this section thus shows that conditioning bank recapitalisation on an observable and verifiable action of bank managers can increase the ex-post efficiency of bank bailouts and, under certain circumstances, meet the two requirements for ex-post efficiency.

As for ex-ante effort incentives, it turns out that the “tough” recapitalisation policy analysed in Section 3 and the more complicated conditional recapitalisation developed in this section provide bank managers with precisely the same incentive to expend this effort. It is straightforward to show that the incentive-compatibility constraint for a bank manager to expend effort under the conditional bank recapitalisation policy simplifies to

$$[\mu_1(1) - \mu_1(0)]BW_i > c. \tag{26}$$

which is the same as under the “tough” recapitalisation policy. This equivalence arises because the expected value of private benefits rises with managerial effort only to the extent that this effort raises the probability that state 1 will occur, since the bank manager gets exactly B in all other states of nature.

That our conditional recapitalisation scheme provides the same ex-ante effort incentives as a tough bailout policy should come as no surprise. Both policies give the bank manager the option of distorting the ex-post report about loan losses (i.e. about β_i), although our conditional scheme is designed in such a way that bank managers are *indifferent* between distorting (and announcing

¹¹Another potential problem with this non-linear pricing scheme is that it may create incentives for solvent banks to sell their bad loans to insolvent banks. To prevent such profitable arbitrage from taking place, the regulator would need to monitor the secondary market for loans and scrutinise more closely net purchasing banks.

state 1) and not distorting. This in turn explains why ex-ante effort incentives are the same under the two policies, even though our scheme avoids the ex-post inefficiencies induced by a tough bailout policy. Our scheme should thus be seen as a strict improvement over a tough recapitalisation policy.¹²

To conclude this section, we point to a limitation of our findings and to a possible further extension. The analysis shows that by reducing the incentive of bank managers to exaggerate the extent of their bad loans, a suitably designed conditional recapitalisation scheme, in which government transfers to insolvent banks are linked to their liquidation of firms in default can achieve some of the first-best social efficiency conditions. However, in somewhat more complex circumstances, these efficiency gains could be lost. For example, if we allow for heterogeneity in the quality of non-performing loans (such as differences in the liquidation values of each loan) and if the exact quality of bad loans were the private information of bank managers, then the two-part transfer scheme considered above would fail to deliver first-best efficiency because there would no longer be a simple relationship between the proportion of liquidated loans in bank's portfolio and its true net worth. Characterizing a more sophisticated nonlinear transfer scheme that would "solve" this problem, and more generally deriving the conditions under which such a scheme can dominate some simpler schemes (such as those analyzed in Section 3) is left for further research.

5 HIGH-POWERED INCENTIVES AND BANK PRIVATISATION

The analysis has so far proceeded under the assumption that bank managers were not provided with high-powered monetary incentives linked to banks' reported net worth. We now consider the more general case where a bank manager's expected utility takes the form

¹²This conclusion hinges, however, on the fact that the manager is never dismissed in equilibrium under any recapitalisation policy. In Section 7 we consider an extension of the model where the true state of nature is publicly revealed in period 2.

$$E[U_B(e)] = \sum_{i=1}^4 \mu_i(e) \{ b \max\{0, \widehat{W}_i\} + \widetilde{B}_i(1 + \max(0, W_i + R)) \} - c(e), \quad (27)$$

where $b > 0$, and \widehat{W}_i is the reported net worth per loan of the bank, and R is the government-funded recapitalisation. The first term in equation (27) depicts utility derived by the bank manager from monetary compensation and the second term utility obtained from private benefits.

The introduction of a high-powered monetary incentive scheme affects the analysis of the various bank recapitalisation policies first through its impact on the incentive to misreport banks' net worth ex post. Now, bank managers have an additional incentive to hide loan losses, since by boosting reported net worth (and hiding loan losses), they not only avoid losing their job but also increase their bonus. In particular, a bank manager may now want to misreport net worth of W_1 instead of only W_2 as argued in Section 3.1.

However, with a "soft" bailout policy, a high-powered incentive scheme raises the cost of overstating the size of the non-performing loans problem. The trade-off between monetary and private benefits in this case can lead bank managers to misreport net worth of W_1 instead of W_4 .

While the introduction of a high-powered incentive scheme alters the incentive to overstate banks' net worth, it provides no incremental incentive to expend effort in managing loan portfolios beyond that provided by private benefits with either a tough or soft recapitalisation policy. This result follows immediately from equation (27) and the fact that reported net worths are independent of the states of nature. Expected utility from monetary benefits does not depend on the probabilities of various states of nature which a bank manager can influence by expending effort in managing the loan portfolio.

Under a conditional bank recapitalisation policy linked to liquidations of firms in default, high-powered incentive schemes for bank managers have yet another effect. The introduction of such incentives can undermine the conditional bank recapitalisation scheme's effectiveness by creating a monetary incentive for managers of insolvent banks not to participate in the scheme and to misreport net worth. In fact, given the bank manager's objective of

the form given by equation (27), no bank manager would have an incentive to participate in the conditional recapitalisation scheme. Consider in particular a bank in state W_4 . The utility of its manager from misreporting a net worth of W_1 is $b\widehat{W}_1 + B$ while the utility from participating in the conditional recapitalisation scheme is only B . Thus all bank managers would report a net worth of W_1 under a conditional bank recapitalisation scheme with a high-powered incentive.

Finally, contrasting the various recapitalisation policies from the point of view of ex-ante effort incentives, we find that, since reported net worth under tough bailout is independent of the state of nature, high-powered incentives provide no additional ex-ante effort incentives beyond that associated with a bank manager's private benefits. Therefore, the ex-ante incentive constraint remains:

$$[\mu_1(1) - \mu_1(0)]BW_1 \geq c. \quad (28)$$

However, the ex-ante incentive constraint under a soft bailout is now changed to:

$$[\mu_1(1) - \mu_1(0)]B\widetilde{W}_1 + [\mu_4(1) - \mu_4(0)]bW_4 \geq c. \quad (29)$$

In particular, for given private benefits B , there exists a cut-off level of b , say b_s , such that for $b < b_s$ (respectively $b > b_s$) the tough bailout policy and/or our conditional scheme provide better (respectively worse) ex-ante incentives than a soft bailout policy. In other words, since the benefit of overstating loan losses under soft bailout increases with the manager's share of monetary benefits, then the larger b the bigger the ex-ante incentive effects under soft bailout as compared with tough bailout or our conditional recapitalisation scheme.

A high-powered incentive contract based on a parameter that can be manipulated by bank managers thus not only fails to strengthen incentives for bank managers to perform, but it also introduces new - or exacerbates existing - distortions of bank recapitalisation schemes.

If banks are state-owned, a possible strengthening of managerial incentives might be to privatise banks so that measures of performance can be based

on an observable and verifiable measure of banks' net worth. In particular, privatisation may introduce the possibility of basing high-powered incentives on the equity market's assessment of banks' net worth. In effect, privatisation could be one (admittedly imperfect) way of reducing the information asymmetry between bank managers and the government.

Equity market measures of private banks' net worth, however, reflect both their true net worth and expectations of any government bailouts. The careful design of bank recapitalisation and closure rules for private banks is thus of paramount importance if this measure of performance is to prove reliable. These are, of course, important policy issues in their own right, but ones which go beyond the scope of this particular paper.¹³

6 PARTIAL INFORMATION ASYMMETRY BETWEEN BANK MANAGERS AND THE GOVERNMENT

In this section, we relax the assumption that a bank manager can misreport the net worth of the bank without limit by introducing a constraint on the scope for misrepresentation. We shall assume that a bank manager can only misreport the net worth of the bank by at most an increment of one state of nature. Therefore, a bank in state 4 can only safely claim to be in state 3 without the misrepresentation being detected by government auditors. Similarly, a bank in state 1 can only safely claim to be in state 2.

In easing the extent of the information asymmetry between bank managers and the government, the distortions introduced by banks' strategic behaviour are naturally reduced. The results regarding the social costs associated with an excessive recapitalisation and with inefficient liquidation/continuation decisions for firms in default are stated here without proof.

First, the social inefficiency under the "tough" recapitalisation policy asso-

¹³For such analyses, see Fries, Mella-Barral and Perraudin (1997) and the references therein.

ciated with the excessive continuation of firms in default by bank managers seeking to hide their bad loans, declines. This social cost falls because banks in state 4 can no longer misrepresent their net worth as W_1 or W_4 . Secondly, the easing of the information asymmetry reduces the social inefficiencies associated with the excessive recapitalisation and liquidations under the “soft” recapitalisation policy, because banks in state 1 can no longer misrepresent their net worth as W_3 or W_4 . Thirdly, a similar result is obtained for the “in-between” policy, because banks in state 1 can no longer misrepresent their net worth as \widehat{W}_3 . Fourthly, the conditional recapitalisation policy is unaffected by this change.

Reducing the information asymmetry between bank managers and the government can either increase or decrease the incentive for bank managers to expend effort, depending on the government’s recapitalisation policy. Under the “tough” recapitalisation policy, the incentive-compatibility constraint becomes

$$[\mu_1(1) - \mu_1(0)]BW_1 - [\mu_4(1) - \mu_4(0)]B > c. \quad (30)$$

Because bank managers in the worst state of nature can no longer misrepresent the bank’s net worth to preserve their job, there is an increased incentive for expending effort with the reduced information asymmetry.

Under the “soft” recapitalisation policy, however, the incentive for managerial effort can be diminished by the reduction in the information asymmetry because banks in the two better states of nature are less able to attract excessive recapitalisations, with banks in state 1 being unable to misreport and banks in state 2 being only able to misreport that they are in state 3. More precisely, the incentive for managerial effort is diminished under the (general) conditions that $W_1 < \widetilde{W}_1 - W_4$, that the difference between the true net worths of banks in state 2, \widetilde{W}_2 , under the two information sets be small, and that $[\mu_2(1) - \mu_2(0)] > 0$.

Under the “in-between” recapitalisation policy, the effect of a reduction in the information asymmetry on the incentive for managerial effort is similar to that under the “soft” policy. This similarity arises from the fact that the misreporting by banks in the two better states of nature is the same under

the “soft” and “in-between” policies when the information asymmetry between bank managers and the government is only partial.

The easing of the information asymmetry between bank managers and the government thus improves unambiguously the social efficiency of the “tough” recapitalisation policy. Not only is there less misrepresentation of loan quality and fewer excessive recapitalisations of banks, there is also greater incentive for bank managers to expend effort compared with the case of a complete information asymmetry. However, for the “soft” and “in-between” policies, the gains from less misrepresentation of loan quality and fewer excessive recapitalisations are offset by diminished incentives for managerial effort. This adverse effect of the improved information arises from the fact that banks in better states of nature receive excessive recapitalisation under the “soft” and “in-between” policies with a complete information asymmetry. This consequence of the recapitalisation policies provides bank managers with an incentive to exert effort to increase the likelihood of these states occurring, an incentive which is curtailed by reducing the extent of the information asymmetry.

7 BANK MANAGERS OF HETEROGENEOUS QUALITY

In this section we explore another extension where bank managers differ in their abilities in managing a bank profitably. We shall suppose that managers can be either good (G) or bad (B). If they are bad they end up in state W_4 for sure, while if they are good, their bank never ends up in that state. Thus, the realisation of W_4 identifies the manager’s type perfectly. Also, bad managers are not able to generate as high liquidation and/or continuation values per loan as good managers. We shall assume that:

$$\begin{aligned} v_G &= \gamma v_B \\ L_G &= \gamma L_B \end{aligned} \text{ where } \gamma > 1$$

There is thus a potentially substantial efficiency gain in removing bad managers in state W_4 . Presumably, an advantage of “tough” bailout policies is then to facilitate the replacement of bad bank managers. Note, however, that in our model such a policy would not have the desired effect since bad

bank managers can conceal the true state of the bank. But, consider a small departure from our model, where the true state of the bank would become public with a small probability $\delta > 0$ despite the manager's efforts to conceal the bank's insolvency.

There is then the following trade-off in imposing a "tough" bailout policy: the policy brings about an ex-post improvement from replacing a bad manager when discovered, but it leads to a higher cost of misrepresentation. If we denote by ρ the prior probability that a manager is good and by

$$\begin{aligned} v &= (\rho\gamma + 1 - \rho)v_B \\ L &= (\rho\gamma + 1 - \rho)L_B \end{aligned}$$

the expected continuation/liquidation values under a new bank manager, then the expected gain per loan from replacing a bad manager is

$$(1 - p_A)(\widehat{\beta}_A(L - L_B) + (1 - \widehat{\beta}_A)(v - v_B))$$

while the expected misrepresentation cost is

$$(1 - p_A)(\beta - \widehat{\beta}_A)L$$

Thus, it pays to impose a "tough" bailout policy only if the probability of detection of insolvency is sufficiently high:

$$\delta > \frac{(\beta - \widehat{\beta}_A)L}{\widehat{\beta}_A(\gamma - 1)\rho L_B + (1 - \widehat{\beta}_A)(\gamma - 1)\rho v}$$

This observation underscores again the main underlying theme of this paper that "tough" bailout policies are efficient only if a powerful auditing and monitoring system is in place which limits bank managers' discretion in writing down non-performing loans. Such systems are unlikely to be in place in most transition economies or developing countries. Also, the evidence of recent banking crises in several advanced economies suggests that such a system was also missing in these economies.

8 CONCLUSION

The main lessons emerging from our analysis are first that recapitalisations should be made explicitly conditional on liquidations of non-performing

loans. Ideally, recapitalisations should not take the form of purchases of preferred stock or subordinated bonds. Of course, it may not be practical or feasible to set up such a conditional scheme at short notice following the outbreak of a banking crisis. This is why we advocate the institution of a bankruptcy procedure for banks in anticipation of future banking crises. We believe that, just as with non-financial firms, the establishment of such an institution can go a long way in resolving in an orderly and efficient way most banking crises.

The model in this paper is, of course, highly stylised and can only serve as a framework to organise our analysis of bank bailouts. While it does cover most important incentive aspects raised by bank failures and bailouts, it does so only in a highly simplified way. Much additional work is required to design a proper bankruptcy institution for banks, but we hope that this paper can serve as a first step in this direction.

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