Will provision of liquidity be effective if conditioned on performance?*

By

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ABSTRACT

When commitments to bailing out are conditioned on the banks' performance and a bad shock occurring, we find the following results: *First*, banks will enforce higher effort and grant fewer risky loans yielding higher returns than in the case when there are no commitments. *Second***,** if the government commits to bailing out, it will require to bailout less but will need to invest more in a monitoring technology. *Third*, by committing the problem of multiple equilibria, arising under non-commitment, is avoided. In fact, there is then a unique equilibrium where the incidence of banking crisis is reduced. These results depend on the government minimising the moral hazard effects of bailing out on effort and lending, the costs to the economy of having crises, and the costs of bailing out.

1. Introduction

The issue of how to handle financial and currency crises is today at the top of the agenda for international economists and policy makers alike. Much of the discussion is, indeed crucial and controversial, on the degree the authorities ought to meet such crises *ex-post* by rescuing ("bailing out") agents in economic and financial distress. The discussions on the *ex-ante* measures to meet such crises are instead made around the role of the BIS to guarantee a solid international financial arquitecture and avoid systemic risk.

Regarding liquidity provision, the literature points to two opposing effects of *ex-post bailouts*. The first is, which most researchers have focused on, the largely negative effect that bailouts have on "moral hazard" in the sense that they lead economic agents to set their "efforts" at sub-optimal levels, or take excessive risks, in anticipation of future bailouts when things go wrong. The second is, more positive, that bailouts can have favourable consequences once a crisis has already materialised and is unfolding, by softening its effect on the overall economy and avoiding systemic risk. This latter effect is however played down by most observers and analysts. We economists are aware that certain minimum criteria need to be fulfilled to avoid such crises, or to minimise their adverse effects once occurring. The issue of what to do when a country is in the middle of such crises, in the initial stage of a crisis, or in anticipation of future crises, is however in general extremely complicated. Financial crises, whatever their causes, often impose huge costs on the countries affected. Few general rules have been devised to deal with financial crises when they occur and in anticipation to such crises. Exceptions are the theoretical works of Aghion, Bolton and Fries (1999) and Cooper and Corbae (2002). These authors however only consider schemes to recapitalisation *after* the outbreak of a banking crisis. The current paper seeks to add to this small literature by considering and compare ex-ante and ex-post measures to provide liquidity when this is acute. Bolton (2003) argues that bailouts both in the domestic and sovereign context, even when

only a bankruptcy mechanism is in place, serve if anything an important economic role in overcoming liquidity crises and contagion.

Mundaca (2003) has already found out that when *governments commit to an optimal bailout* and conditions it *only* to the occurrence of a bad shock, and not for example on the private sector's performance, one obtains a unique equilibrium. This equilibrium is however characterised by inefficient effort, extremely low investment, and extremely high level of bailout when devaluation is completely avoided. This should mean that commitments to bailouts have very strong moral hazard effects on performance (i.e. effort) so that the private sector will find it difficult to acquire lending and consequently investment will be extremely low. One way to avoid sub-optimal solutions is to make bailouts conditional, as we suggest here.

We share the worries of the opponents of bailouts emphasising the moral hazard problems created by excessive bailouts. The main features of the model are as follows. *First of all,* bailout will always be conditioned both on a bad shock occurring, and on banks that do not have moral hazard problems.[1] By the latter we mean that banks should maximize their expected profit choosing levels of lending and effort, without assuming that they will be receiving any bailout, not even when a bad shock occurs. *Secondly,* under such conditionality, we consider *two different bailout policies:* One policy *is not committing* to any bailout until a bad shock occurs. The other implies *commitment* to bailing out before a bad shock occurs and banks make their decisions on lending and effort. We will determine the optimal level of bailout in each type of policy.

Thirdly, the government's policy, regarding the degree of bailing out and monitoring (in both the non-committed or committed cases), is chosen to minimise bailout costs as well

[1] See Jeanne and Zettelmeyer (2001) suggest another type of conditionality: The international community should provide official crisis lending both in terms of availability and size, conditional on government policies before the crisis.

as the dead-weight costs to the economy associated with financial crises. It also needs to invest in certain monitoring technology to disincentive banks to have moral hazard problems, but it will also minimize the costs of it. With that it attempts to induce banks to exert enough effort to avoid excessive bad lending that could otherwise lead to insolvency. Insolvency, in this paper, occurs due to both a "bad" shock and when banks have shown to have had moral hazard problems. In only the former takes place, as mention above, there will be government intervention with bailing out. Banks will face uncertainty about the state of the economy and the likelihood of being monitored and such uncertainty will affect their incentives to avoid insolvency can arise.[2] We will show that *only* ex-ante commitments to bailing out, gives the government the greatest possibility of taking into account and dealing with moral hazard effects while minimises its costs, including those of bailing out. This is in contrast to for example, Burnside et al. (2002) and Corsetti et al. (1999) (among others) who at the outset assume that the government *is unable to credibly commit to a no-bailout policy.* Under such assumption, private sector agents must then rationally expect a rise in future transfer payments (bailouts) financed by seignorage when they have liquidity problems. When these transfers are made unconditional on the private sector performance and the seignorage is not determined optimally but only use to decrease the present value of the government's deficit caused by the bailout, it is not surprising that the government will be always self-fulfilling expectations. Moreover, under such circumstances, government implicit guarantees ought to create moral hazard. We believe that liquidity transfers, that are not determined optimally (i.e. from utility maximisation principles), given unconditionally, and not considered costly

[2]As Tirole (2002) discusses firms and financial institutions satisfy their liquidity (*inside liquidity*) needs by selling the securities that they usually hold in other firms and financial institutions. Holmstrøm and Tirole (2001) find this *inside liquidity* to be sufficient for the private sector's liquidity needs as long as i) the shock faced by private sector entities are independent, and ii) inside liquidity is properly allocated within the private sector. Otherwise *outside liquidity* will be needed and certainly a LOLR. Our analysis is based on the assumption that there are instead aggregate shocks and that the condition (ii) is not satisfied, as is usually the case in emerging economies. *The private sector* must then search for outside insurance. For our purpose, we do not distinguish between domestic and foreign outside liquidity. See Tirole (2002) for further discussion.

(independent of the origin of them, internationally or domestically) cannot yield optimal solutions to financial crises as one can demonstrate.

In this paper, we then assume that when the government finds it optimal to bail out, it implicitly needs to reallocate its expenditures in terms of fiscal policy reforms. These changes in the government's expenditure structure are costly for society but these costs are weighted against the benefits of avoiding systemic crisis that can be usually born as a result of having certain banks to go bankrupt.

The fourth feature of the model is that we assume that banks will decide whether to have moral hazard problems or not. This will depend on their expectations about the government's monitoring intensity. The government can only detect the bank's type by monitoring them. This uncertainty plays a very crucial role *in the commitment case* because the government cannot observe ex-ante the number of banks who have those moral hazard problems but by committing it attempt to influence the banks' decisions both regarding lending and effort. Without commitments, bailouts are given to the ones who are detected not to have those moral hazard problems. Note that ex-ante; the government cannot know with certainty how many banks will have moral hazard problems. These results are fundamentally different from the ones obtained in works that advocate against government guarantees, and they ought to be since the assumptions and set up of the model are very different, especially when in that literature, liquidity transfers to the private sector are not determined optimally and it is not made conditioned on the private sector performance.

To our knowledge, the above issues have not been yet analysed before in the relevant literature, and neither considers the issue of how to avoid or ameliorate the effects of financial crisis by committing to a conditional but optimal bailout policy. We hope to be making a contribution in these matters.

In chapter 2 presents a short overview to the related literature. Chapter 3 describes the three-stage sequential game theoretical model. Chapter 4 interprets bank's optimal decisions, while chapter 5 presents the government's problem. Chapter 6 presents the sub-games perfect Nash equilibria from the game between the government and banks, both in the case of commitment and non-commitment. Chapter 7 concludes.

2. Background to the literature

As mentioned, it has been argued that a safety net provided by insurance schemes and (implicit or explicit) bailout promises may create moral hazard problem, and by incentives for excessive risk-taking on the part of banks (Schwartz (1998) and Bordo and Schwartz (2000)). Burnside, Eichenbaum and Rebelo (2002) also, as noted above, conclude that the Asian crisis was caused by large prospective deficits associated with implicit bailout guarantees to failing banking systems.

Other contributions to the related literature do not always find bailouts to be negative. As in this paper, they attempt to contribute to policy analysis by assessing whether or not a central bank can, by increasing money supply, eliminate confidence driven financial collapse through liquidity provision. From the microeconomic perspectives, Freixas, Parigi and Rochet (1998), Freixas (1999), Aghion, Bolton and Fries (1999) and Cole and Kehoe (2000), Cooper and Corbae (2002), and T. Cordella, E. L. Yeyati (2003) find that under certain conditions, bailing out banks may be efficient.

Goodhart (1988, 1995) has suggested that the access to a lender of last resort (LOLR) should not be a priori denied to any bank. In general, central banks face a trade-off between being too "tough", thus increasing the likelihood that the failure of a single bank hampers the confidence in the whole banking system, and being to "soft", thereby creating incentives for banks to engage in excessive risk-taking.

To what extent and under what conditions do a soft LOLR approach to induce moral hazard and a higher risk appetite? Much of the discussion is crucial and controversial. In contrast to the conventional view, we show that a central bank/government[3] that announces and commits ex-ante to bailing out insolvent institutions, increases the value of the bank, creates a risk-reducing 'value effect' that more than offsets the moral hazard component of such a policy by reducing both frequency of bankruptcies and overall bank risk.

The introduction of a bailout scheme has two mutually offsetting effects. On the one hand, it creates moral hazard. Banks set their "efforts" at sub-optimal levels, or take excessive risks, in anticipation of future bailouts when things go wrong. Thus, the probability of surviving becomes less dependent on the bank's choice of risk and more on the central bank's actions. On the other hand, a bailout increases the bank's probability of survival, thus raising the charter value at stake in case of failure and, in turn, the bank's incentives to protect itself by choosing safer investments. This latter effect is however played down by most observers and analysts. Among the few formal models of bank bailouts in the literature, perhaps the one that more explicitly represents the standard social cost-moral hazard trade-off is Goodhart and Huang (1999). They show that the central bank has incentive to provide LOLR assistance in as much as concerns about bank contagion are weighted more strongly than moral hazard consideration. Moreover, the authors argue that, in order to minimize the moral hazard component, it is optimal for the central bank to use discretion in the bailout decision. In a related paper, Freixas (1999) finds that depending on the characteristics of the bank's balance sheets and on the social cost of bank failure, the optimal policy may be either a systematic bailout or a mixed strategy, with the latter providing a theoretical foundation for the constructive ambiguity doctrine.

[3] We will indifferently use government or central bank.

Goodhart and Huang (1999) and Freixas (1999) suggested that tougher bailout policies used with discretion and conditional on effort may have the advantage of limiting moral hazard. Some authors have argued that a "soft" policy can be used to induce bank managers to reveal private information about the realization of portfolio returns. Povel (1996), for example, shows that a soft policy can induce an entrepreneur protected by limited liability to reveal at an early stage that his firm is in financial distress, thus allowing for a less expensive rescue. A similar idea, for the case of bank's bailout, is proposed by Aghion et al. (1999). Mailath and Mester (1994) look instead at the incentives that a distressed bank has in investing in excessively risky projects and show that when regulators can not commit to future actions, then forbearance arises as an equilibrium outcome. This result is also in the spirit of Boot and Thakor (1993) who look at the problems induced by regulators' reputation incentives and find that a reputation-seeking regulator will tend to delay bank closure relative to the optimum. On these grounds they favor a rule-based regulation that limits regulatory discretion.

Mundaca (2003) shows, in a *four-stage sequential game* where the players are the government and the private sector, that exchange rate crises and debt crises can be driven by *self-fulfilling expectations* as in the second-generation models of crises (Obstfeld (1986), (1994), (1996), Chang and Velasco (1998), Schneider and Tornell (2000), and Burnside, Eichenbaum and Regel (2002)), but they can alternatively be *fundamentals-based* driven as in the "first-generation" models of crises (Henderson and Salant (1978), Krugman (1979) and Flood and Garber (1984)). She however finds that when the government commits to an optimal bailout and conditions it not only to the occurrence of a bad shock, and also on the bank's behavior, moral hazard problems can be avoided.

T. Cordella, E. L. Yeyati (2003) also find that, first, that with an explicit commitment to rescue insolvent banks, the associated moral hazard problem can be alleviated rather than

worsen it. However, the 'constructive ambiguity' approach often recommended to attenuate moral hazard, in which the terms of the LOLR arrangement are left to the discretion of the central bank, is always dominated by a policy that commits to rescuing failed banks with certainty, conditional upon the realization of an adverse aggregate shock.

In this paper we will follow Mundaca's (2003) model, a sequential game theoretical model, to analyze the link between bailout and monitoring of the banking system, and the rate of return of banks. In contrast to Mundaca (2003), we consider here a close economy.

When there are no ex-ante commitments to bailing out, the model here yields multiple equilibria. One of the equilibriums is characterized by total bailout of the banks leaving the banks still unsounded, another where all banks go bankrupt, and a third where bank crises is avoided only partially. With ex-ante commitments, it is more likely to avoid all the multiple equilibria and reach an equilibrium where a much smaller amount of banks will go bankrupt.

Our conclusion is that when bank's optimal decisions are dependent on bailout policy without ex-ante commitment, an increase in bailout will increase lending and induce banks to exert lower effort. We can conclude that if the government does not make sure that banks do not present moral hazard problems, such problems will worsen and be difficult to avoid.

3. Three-stage sequential-game theoretical model

The model here is present as a three-stage sequential game in which the players are the government and the banks. It is assumed that the government obtains disutility from bankruptcies and from bailing out. The government will need to supervise and/or monitor the banks to maintain a competitive and healthy banking system. If the banking system becomes too fragile, the government may need to bail them out. In the absence of government intervention, banks will close in the bad state because they will be holding too many Non-performing loans (NPL). It is always preferred that banks avoid having too many bad/risky

loans, and for that they will likely need to implement strong corporate governance and clear internal authorization procedures, to set up sound financial disciplinary mechanism, risk prevention system and high financial standards. We will however assume that banks do not participate in the management of the projects they financed. This may come from a self-imposed policy decision by these financial institutions, aimed at preserving their reputation, or because the law may penalize such a behavior by lowering the rank of the bank in the creditor's line in the case of bankruptcy, if it is proved to has been involved in the management of the bankrupt firm. Consequently, it is not always easy for the banks to enforce a particular use for the credit granted to the borrowers. Nor is it easy to ascertain whether a borrower will have the capacity to repay. Thus, banks can only decide how much risky lending they wish to grant and effort they will exert to discriminate riskiest loans.

Stage 1

The government and banks receive probabilistic information about a future shock that will occur in the last stage and affect the banks' net returns (net of debt repayment) on lending made. There will be a bad shock, S_1, or a good shock, S_2 that will occur with probability q and (1-q), respectively. The banks' returns will be badly affected if shock S_1 occurs. In contrast to what happen in the good state (when S_2 occurs), banks will have too many NPL in the bad state (S_1). At this stage, the government announces that it will bail out part of the private's outstanding debt to the banks conditioned on bad shock and if the banks demonstrate not to have moral hazard problems. The latter implies that bailouts will be conditioned on that banks' lending activities and effort (to discriminate against the most risky loans) are independent of the government's bailout policy. At this stage the government may or may not commit to an optimal bailout to be given at stage 3. Not committing at this stage implies that when the government will act with discretion (still conditional). The government will also

announce that it will invest in some monitoring technology that will help to detect which banks have the worse moral hazard problems. Thus, a certain degree of monitoring generates certain probability of detecting the type of bank.

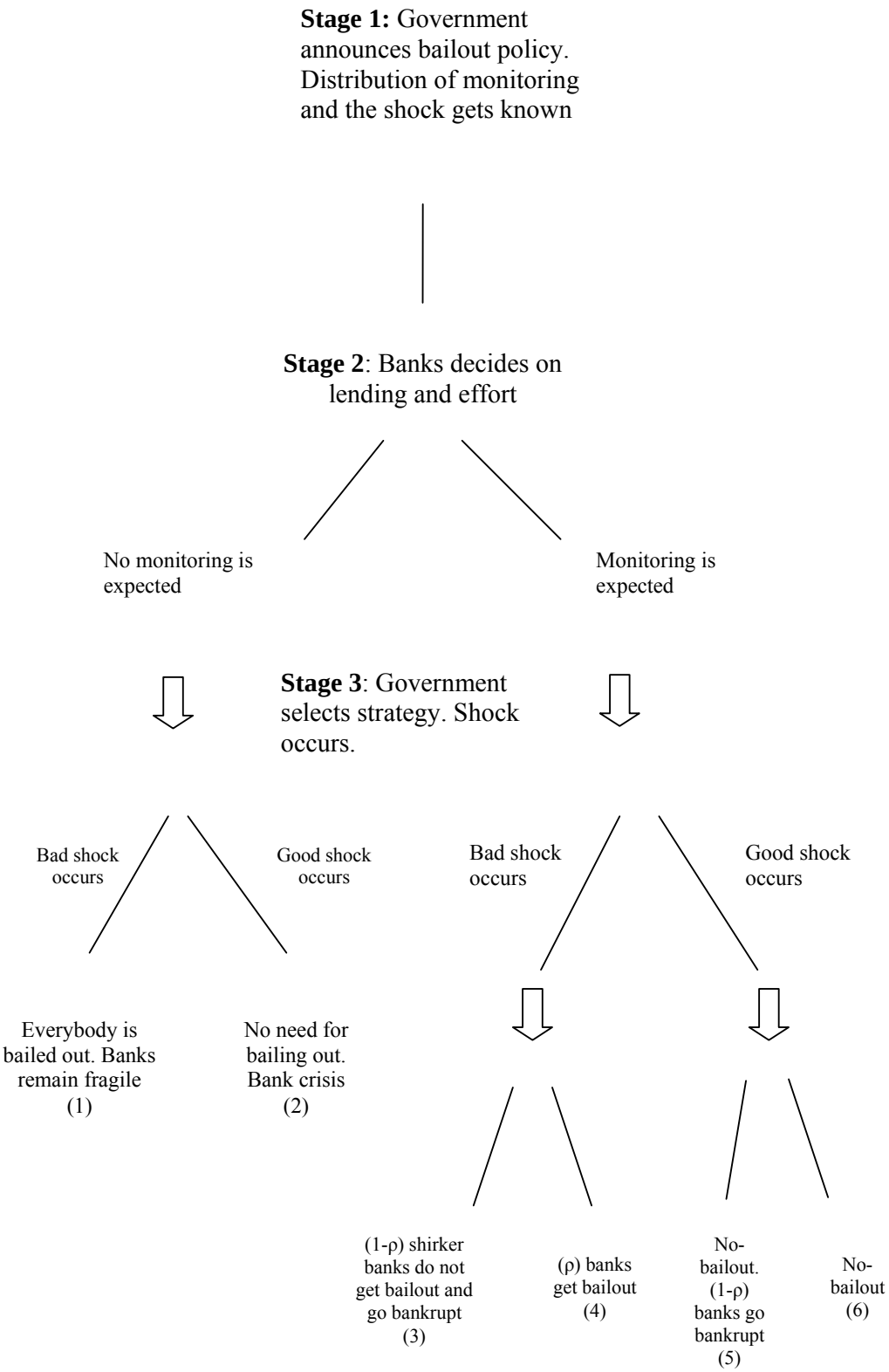
Stage 2

At this stage the banks form expectations about the government's monitoring intensity, and accordingly make decisions on lending and effort. Banks may put some effort to avoid too much bad lending. The banks' returns will then depend partly on the quality of the loans, but they are also state contingent. Because the government cannot observe perfectly which banks have moral hazard problems, in spite of monitoring, some banks may let their lending decisions and effort to be dependent on the bailout policy if they expect a modest monitoring.

Stage 3

Only the government moves here and selects its strategies. A stochastic shock, either S_1 or S_2, occurs and affects the net returns of the banks. If the government has *not committed* in stage 1 to bailing out, it will act *with discretion*: It will decide on the proportion of the losses that will bail out at this stage if S_1 occurs. Now, if monitoring is not expected, the government best strategy is to fulfill such expectations by not monitoring. In such case all the banks will be bailed out in the bad state, when a bad shock occurs. When there is a good shock, no bank will receive a bailout and all banks will be bankrupt. Such sub-game perfect equilibria are illustrated in nodes (1) and (2) respectively in Figure 1. It is important to remark that even when banks receive a bailout, the banking system will remain fragile because banks have ended up with too many non-performing loans. As we will show, this will be always the case

Figure 3 Game tree describing possible strategies in the sequential game



when they expect bailouts in the bad state (i.e. they have moral hazard problems) and not monitoring. Moreover, the government does bailout losses of banks with no moral hazard problems, and such bailout will not be sufficient to cover the losses of those banks with such problems. Such result resembles what has been obtained in the related literature, where governments are only concerned with their budget constraint and decide (ex-post) to bail out usually finance with seignorage. The private sector agents will rationally anticipate a collapse of the government's finances given that the government's present value of the deficit is expected to increase due to permanent rise in future transfer payments (i.e. bailouts), especially when supervision and monitoring are absent.

If monitoring is expected, the government will do so and decide optimally on the bailout if there is a bad shock and banks are shown that they do not have moral hazard problems. As mention above, the government will be able to recognize banks that have such problems if it uses a monitoring technology. It will be then necessary for the government to invest in such technology. Therefore, without commitment, the government's policies are discretionary: If there are bailouts at this stage, the government will take into consideration the realization of loans/credit from banks and effort that banks exerted.

We believe that only when liquidity transfers are determined optimally (by welfare maximizing agents) and made conditional, one can demonstrate formally the consequences of bailing out. Note that in contrast to previous work in the subject, the government is here concerned with minimizing the social costs of both financial crises, the costs of bailing out, and the moral hazards that bailing out would imply.

With commitments to bailing out in the bad state, the government faces uncertainty on which banks have moral hazard problems. Commitments at stage 1 can however affect bank's decisions regarding loans and effort. The main purpose of committing is to provide the best ex-ante incentives to individuals to avoid moral hazard problems. We will also demonstrate

that committing to a certain optimal bailout will simultaneously determine the optimal level of monitoring that is higher than when there is no commitment to any bailout. Note that in *the non-commitment case*, the number of banks of one type or another does not become relevant until the last stage of the game, when the shock occurs. The banks that will receive a bailout in stage 3 are those that the government successfully detect to be the ones free of moral hazard problems.

When there are commitments, the banks' optimal decisions and expectations at stage 2 will however depend on the guaranteed optimal bailout and monitoring decided optimally by the government at stage 1. However, in contrast to the non-commitment case, banks will be here more certain about the level of monitoring and bailout. It is then more worthwhile to avoid moral hazard problems as much as possible. Keep in mind that monitoring is still costly and some banks still may present such problems. The government's decisions will be always the best response to the banks.

This is then one main difference between the cases with and without commitments, which we consider to be one of main contribution of the present paper and to relate literature. *Without commitments, all agents will expect that a bad shock will occur with certain probability at the last stage (stage 3), but banks will be also uncertain about the level of monitoring, in the meanwhile devastating effects on the banking sector may occur if there are expectations of little or none monitoring by the government. With commitment, most of the uncertainty remains on the realization of the shock.*

4. Banks' Problem

The banks decide optimally on the amount of loans to be granted and effort. Note that we will not study the banks' choice between safe and risky loans. We will be here more

concerned about the amount of risky loans that the banks will grant to borrowers. The effort that banks exert will serve to avoid granting too many risky loans. We will here emphasize on the returns to such type of lending, which will include debt repayments. Note that these returns will be also state contingent. We assume that repayment of the loan cannot be enforceable unless the banks incur in some costs which are here too high. Thus, in a bad state, in the absence of government intervention, the returns will be low that banks are likely to declare bankruptcy.

The banks cannot know for certain not only how much monitoring the government will be doing, but if there will be any monitoring at all. There is though common knowledge on the probabilistic distribution of detecting the type of bank for a given monitoring. Expectations about the degree of monitoring affect the incentives and risk taking behavior of the banks. The least monitoring is expected the greater the incentive for banks to have moral hazard problems. Recall that the more the government monitors the greater the possibilities of being detected the type of bank, whether this has moral hazard problems or not.

When banks' return is equal to $\overline{R}$, the optimal social return (say trigger value) for at a bank cannot go bankrupt, we say that a good shock has occurred and this is likely to happen in state 2. In such case there will be then no need for bailing out. On the other hand, when a bad shock occurs, the banks' returns are less than $\overline{R}$, the bank could go bankrupt (i.e. unable to be listed). The government will, solely in state 1 (the "bad" one), bail out a fraction Φ [$\Phi \in (0, 1)$] of the difference between $\overline{R}$ and R_1, that is ($\overline{R}$ - R_1). In the absence of a bailout, most likely banks will be bankrupt.

As we indicated above, the government is interested in avoiding the moral hazard problems of bailing out. The type of monitoring technology used by the government allows it to detect the type of bank. The banks that will receive a bailout are those that the government with certain probability, is able to recognize to have made decisions on lending and effort

independent on the government's bailout policy (e.g. banks do not have moral hazard problems). Monitoring is however expensive, it is very unlikely that government will be able to recognize all the banks that have moral hazard problems. For this reason some banks may have incentive to grant risky loans and have moral hazard problems. Thus, the government may face two types of banks, some with moral hazard problems and other with none, even though both types involved with risky loans. Indeed, the decision for a bank to be of one type or the other depends on their beliefs on the government's monitoring intensity. The amount of bad loans that banks grant will then depend on such beliefs; whether they do or do not expect a bailout; and the effort they exert to avoid a large amount of risky lending. Banks also know that a bailout will be given if a bad shock occurs at stage 3. The government's decisions will the best response to the bank's decisions and vice verse.

4.1 Banks' optimal decisions on effort and lending independent of bailout policy

Banks are assumed to be risk neutral, and when they make their (risky) lending and effort decisions independent of any bailout, they maximize the following expected net return function E (R^{NB}), where R^{NB} will denote the return of banks that do not have moral hazard problems:

$$E\left(R^{NB}\right) = qR_1^{NB}\left(L,e\right) + (1-q)R_2^{NB}\left(L,e\right) - C^{NB}(e); \qquad (1)$$

Where L is bank's lending, e is effort, and q and (1- q) are the probability that $S_1$and S_2 occur respectively. C(e) is the cost function of effort.

Maximizing (1), the first order condition with respect to L is:

$$\frac{R_{1L}^{NB}}{R_{2L}^{NB}} = -\left[(1-q) \Big/ q \right] < 0 \qquad (2)$$

(2) tells us that the left-hand side is the ratio between the marginal return on lending in bad state and good state is negative. It is likely that at the optimal solution for L, the marginal return to L, R_{1L}, is negative in the bad state ($R_{1L} < 0$). On the other hand, we will have that $R_{2L} > 0$. Thus, in equilibrium, an increase in L will decrease the banks' return in the bad state, but increase it in a good state.

Maximizing (1) with respect to e, we can get the first order condition respect to e:

$$qR_{1e}^{NB} + (1-q)R_{2e}^{NB} = C_e^{NB}(e) \qquad (3)$$

We assume that in both the bad and good states, higher levels of effort increase the returns to the bank, thus, $R_{1e} > 0$ and $R_{2e} > 0$. The marginal cost of effort is also assumed to be positive since the cost function is assume to be convex.

4.2 The banks' optimal decisions depend on bailout policy

We say that banks that have moral hazard problems will take into account the possibilities of obtaining a bailout when a bad shock occurs. They will then maximize the following expected net return function $E(R^B)$, where R^B will denote the return of banks that do not have moral hazard problems:

$$E\left(R^B\right) = q\left\{R_1^B\left(L,e\right) + (1-\rho(m))\Phi\left[\bar{R} - R_1^{NB}\left(L,e\right)\right]\right\} + (1-q)R_2^B\left(L,e\right) - C^B\left(e\right) \qquad (4)$$

ρ(m) is the probability of recognizing whether a bank or banks have moral hazard problems. For a specific monitoring degree m that the government is involved, it will generate a certain probability of being able to detect the banks with moral hazard problems. The higher m is the better the possibilities for the government to recognize the type of bank. Banks here expect that the government will bail them out by a proportion $\Phi\left[\overline{R} - R_1^B\left(L,e\right)\right]$ with probability (1-ρ(m))q. Note that the expected bailout also depends on the government's capability to differentiate the banks and the probability that a bad shock will occur. The greater the monitoring the larger the probability of detecting the banks with moral hazard problems will be, and the lower the possibilities of obtaining a bailout.

Maximizing (4) with respect to L yields the following first-order condition for L:

$$\frac{R_{1L}^B}{R_{2L}^B} = -\left[\frac{(1-q)}{q\left(1-\Phi(1-\rho(m))\right)}\right] < 0 \qquad (5)$$

In (5), the left-hand side is the ratio between the marginal net return on lending in the bad state and the good state, and it is negative. We give (5) the same interpretation that we gave to equation (2). But we can find that when Φ increases, that ratio becomes more negative implying that at the optimal solution for L, R^B_{1L} also become more negative. The reason for that is that, as we will show below, a greater bailout increases the amount of risky lending when banks present moral hazard problems. This is the moral hazard effect of bailing out. Returns decrease as L increases because it is less profitable to engage in a larger amount of risky lending. On the other hand, since the probability of detecting the type of bank increases with monitoring, the larger the latter is, the greater the marginal return to lending, R_{1L}, will be. This must imply that when large monitoring is expected, as we will show below, banks

will engage in less risky lending so that returns will increase at the optimal solution. This is so even for banks that have moral hazard problems.

Maximizing (4) with respect to the banks' effort, e, yields the following first-order condition for e:

$$\left[q\left(1-\Phi(1-\rho(m))\right)R_{1e}^{B}\right]+(1-q)R_{2e}^{B}-C_{e}^{B}=0 \tag{6}$$

We get similar result to (3), where $R_{1e}>0, R_{2e}>0$. Here the expected marginal return with respect to e will decrease with Φ but increase with m (the degree of monitoring by the government).

From (5), we can find how the bailout will affect L:

$$\frac{\partial L^{B}}{\partial \Phi}=\frac{q(1-\rho(m))R_{1L}^{B}}{q[1-\Phi(1-\rho(m))]R_{1LL}^{B}+(1-q)R_{2LL}^{B}}>0 \tag{7}$$

Given that $R_{1L}{}^{B}<0$ (see equation (2)) and $R_{1LL}{}^{B}<0$, $R_{2LL}{}^{B}<0$, (7) indicates that when the government increases bailout the banks will lend more. Moreover, the more the bailout the stronger such effect is, and the opposite result is obtained when the government engages in more monitoring. It should then be clear that monitoring decreases the moral hazard effect of bailing out.

From (6) we can find how the bailout will affect effort e:

$$\frac{\partial e^{B}}{\partial \Phi}=\frac{qR_{1e}^{B}(1-\rho(m))}{q[1-\Phi(1-\rho(m))]R_{1ee}^{B}+(1-q)R_{2ee}^{B}-C_{ee}^{B}}<0 \tag{8}$$

If $R_{1ee}^{B}<0$, $R_{2ee}^{B}<0$, $C_{ee}>0$, and $R_{1e}^{B}>0$, we will get that $\partial e/\partial \Phi<0$. This implies that when banks' expected returns depend on bailouts, the more bailout the government gives the lower effort the banks will exert. Here also, when bailout (monitoring intensity) increases such effect ($\partial e/\partial \Phi<0$) becomes weaker (stronger).

Similarly from (6), we find out how the monitoring intensity will affect the banks' loans and effort decisions. These are:

$$\frac{\partial L^{B}}{\partial m}=\frac{-q\,\Phi\,\rho'(m))R_{1L}^{B}}{q[1-\Phi(1-\rho(m))]R_{1LL}^{B}+(1-q)R_{2LL}^{B}}<0\,; \tag{9}$$

and

$$\frac{\partial e^{B}}{\partial m}=\frac{-q\,\Phi\,\rho'(m)\,R_{1e}^{B}}{q[1-\Phi(1-\rho(m))]R_{1ee}^{B}+(1-q)R_{2ee}^{B}-C_{ee}^{B}}>0 \tag{10}$$

To summarize results, independent on whether banks make their decisions independent or dependent on any bailout, we find that: (i) At the optimal solution for lending, L, the marginal return with respect to L is a decreasing function in the bad state but decreasing in the good state; and (ii) higher levels of effort, increases the return in both states. For the banks that have moral hazards, (iii) higher bailouts increase the amount of risky lending and decrease the amount of effort that banks exert to avoid larger amounts of such risky lending. It is only with greater monitoring intensity of the banks by the government that the moral hazard problems can be ameliorated (see (9) and (10)). Recall that monitoring affect not only the probability of detecting these banks with moral hazard problems, but also the number of risky borrowers in the banking system because banks will have incentive to avoid moral hazard and large amount of risky lending. As we show above, in the absence of monitoring, the number of banks of

such type will not only increase but also typically be the ones that will have a greater amount of risky lending when a bailout is expected to be received in the bad state.

One main conclusion is that when bank's optimal decisions are dependent on bailout policy (or have moral hazard problems), a decision to bail out banks will increase risky lending and the bank's return is likely to be decreasing in the bad state since lending is more risky. Bailouts also induce banks to exert lower effort. More importantly, without sufficient monitoring, the moral hazard problems are going to be present and difficult to avoid.

5. Government's problem

5.1 The non-commitment case

We assume that the government does not like bankruptcies but bailing out is also expensive. When the government does not commit to bailing out at stage 1, it faces the following loss function at stage 3:

$$\Gamma_3(S_1) = \beta_1\left(\frac{1}{\xi+\rho(m)}\right)\left[\Phi(\bar{R}-R_1^{NB})\right]^2 + \beta_2(1-\Phi)(R_1^{NB}-R_1^{B})(1-\rho(m)) + \Omega(m) \qquad (11)$$

In (11), β_1 and β_2 take positive values and indicate the preferences of the government for the corresponding arguments. $\Omega(m)$ is the government's costs of monitoring. Recall that the government will only bailout the proportion Φ of the difference ($\bar{R}$ - R_1^{NB}) and in the bad state. $[1/(\xi+\rho(m))][\Phi(\bar{R}$ - $R_1^{NB})]^2$ are the losses for bailing out and monitoring. The smaller (larger) the difference between $\bar{R}$ and R_1^{NB} the smaller (larger) the losses for given bailout and monitoring levels will be. Also, bailouts are expensive for the government because of the burden that it entails in terms of government budget fiscal deficit. On the other hand, if there is not monitoring (m=0), the cost of bailing out increases by $(1/\xi)$. The more monitoring there

is from the government size, the greater the number of banks that will be detected to pretend not to have moral hazard problems. Given this, banks will have fewer incentives to make their optimal decisions dependent on the potential bailout that they could receive in the bad state. More monitoring should decrease the total amount of risky loans and it should consequently increase the banks' expected return. Therefore more monitoring should decrease the losses of the government that incurs when deciding to bail out banks.

Now, $(R_1^{NB} - R_1^{B})$ indicates the difference in return between bank with and without moral hazard problems, and such difference represents a social cost resulting from a large number of banks granting not only too many risky loans and exerting too little effort to discriminate among the bad loans but also relying on the bailout policy. To this, another cause can be added, a deficiency in the monitoring device from the government side. The term $(1-\Phi)(R_1^{NB} - R_1^{B})(1-\rho(m))$ then represents the loss for the government for not bailing out all the banks and let them to go bankrupt, and for not involving itself into sufficient monitoring, m. The latter will be costly to the government: (i) the probability to detect those banks with moral hazard will decrease, and (ii) banks will have more incentive to make decisions relying on bailout possibilities which always yield a larger difference between R_1^{NB} and R_1^{B}.

We will show that when there are expectations that there will not be any monitoring, it will not be optimal for the government to monitor even in the bad state of the economy, and the opposite when monitoring is expected. In either case the government will need to solve for an optimal level of both monitoring and bailout.

To solve for these key variables at this stage 3 one needs to use the backward induction method. To obtain the sub-game perfect equilibria of this game, we will first consider the case when monitoring is expected and then when it is expected

5.1.1 Monitoring by the government is not expected by the banks

In this case the government's loss function in the bad state is:

$$\Gamma_3(S_1) = \beta_1\left(\frac{1}{\xi}\right)\left[\Phi(\bar{R} - R_1^{NB}\right]^2 + \beta_2(1-\Phi)(R_1^{NB} - R_1^B) \qquad (12)$$

In the good state, the government's loss function is zero because no bailout is given when a good shock occurs, $\Gamma_3(S_2)=0$.

a) When a bad shock (S_1) occurs, and banks do not expect to be monitored, most of the banks will rationally make decisions relying on that they will receive a bailout in the bad state (i.e. they will have moral hazard problems). The final return will be less than $\bar{R}$ and even less than R_2^{NB}, due to the moral hazard problems which always result in more risky lending and poor effort to discriminate against too much bad lending. Rationally, the government will not engage in any monitor activity because if they do, even if it does it at small scale, some banks will expect monitoring to happen so that a proportion ρ(m) of banks can be detected to have moral hazard problems. Some of them will then avoid relaying on the possible bailout they could receive at stage 3 because there will be a certain probability of being detected to be a bank with moral hazard problems. Thus, when no monitoring is expected, all banks will be bailed out in the bad state and no bankruptcy will occur.

b) When a good shock (S_2) occurs, there will be no need for bailing out since this is conditional on that a bad shock occurs. The government expects that all banks could have obtained in returns $R_2^{NB}=\bar{R}$. However, since no monitoring was expected, all the banks will have moral hazard problems and will obtain a return equal to R_2^B instead, where $R_2^B < R_2^{NB} < \bar{R}$. Since $\bar{R}$ is the required return not to go bankrupt, there will be complete banking crisis, with not bailout. Such sub-game perfect equilibrium is compatible with node (2) in figure 1.

5.1.2 Monitoring by the government is expected by the banks

a) When a bad shock s_1 occurs, we will have that $R_1^{NB} < \overline{R}$. Expectations of being monitor and the possibilities that a bad shock will occur, will induce the government to invest some resources to monitor the banks. If the government does not do this, it will be rational for the banks to expect rather not any monitoring. The final equilibrium will be either node 1 or node 2 depending on whether there is bad or good shock, as we solved for above.

When a bad shock occurs and monitoring is expected, the government will minimize the loss function represented by equation (11) with respect to the proportion of bailout, Φ, and the monitoring intensity, m.

b) When a good shock (S_2) occurs, the government expects that $R_2^{NB} = \overline{R}$, and therefore not any bank will receive a bailout. The loss function again will take the value of zero. There will be some bankruptcies, that is (1-ρ(m)) banks will become insolvent.

Now, going back to the case in which a bad shock is expected, the optimal level of Φ is obtained by minimizing (11) with respect to Φ. That is:

$$\Phi = \frac{\beta_2 (R_1^{NB} - R_1^B)(1-\rho(m))}{\beta_1 \left[\frac{1}{\xi + \rho(m)}\right]\left[(\overline{R} - R_1^{NB}\right]^2} \qquad (13)$$

The larger R_1^{NB} is the larger the optimal bailout will be. Thus, for given monitory intensity, to compensate for the social costs of not bailing out the banks with moral hazard, the government will have incentive to give a greater bailout to the banks that are detected not to have moral hazard problems.

The optimal Φ will then depend on the probability of being detected to be a bank with moral hazard problems, but it also depends on the optimal levels of L and e chosen by the

bank through R_1^{NB} and R_1^{B}. Recall that the latter will be also affected by the expected monitoring intensity by the banks.

The optimal solution for the monitoring intensity will be obtained by again minimizing (11) with respect to e. We obtain the following:

$$\Omega_m(m) - \beta_1\left(\frac{1}{\xi+\rho}\right)^2 \rho_m(m) = \beta_2(1-\Phi)(R_1^{NB} - R_1^{B})\rho_m(m) \qquad (14)$$

We are not able to solve explicitly for m but we can notice that also for deciding on the optimal monitoring, the difference between R_1^{NB} and R_1^{B} matter a lot. The greater this difference is the greater the monitoring intensity should be for at the government can minimize its loss function.

5.1.3 Sub-game perfect equilibria

The government's optimal level bailout and monitoring will depend on the final shock, S_1 and S_2, as well as the returns by the banks without and with moral hazard problems, R_1^{NB} and R_1^{B}, respectively. It becomes then important for the government the effort the banks will exert to discriminate against a large number of risky loans and the level of this loans themselves because these will affect R_1^{NB} and R_1^{B}. Without commitments, the government using the optimal monitoring intensity will detect with certain probability, ρ(m), the banks that do not have moral hazards and that will receive an optimal bailout (that minimizes the government's loss function) if a bad shock occurs. We have following propositions:

Proposition 1

When no monitoring by the government is expected, rational expectations equilibrium can only be compatible with the end node (1) if a bad shock occurs, but node (2) if a good shock occurs, in figure 1.

Proof

- The government will not monitor banks if these do not expect this to happen. If the government does monitor, banks will anticipate this and find that it is not rational to expect no monitoring.
- If a bad shock occurs, the perfect sub-game equilibrium corresponds to node (1) in figure 1 where every bank is bailed out. If the requirement not to go bankrupt requires to be as close as possible to $\overline{R}$ (for being listed in the stock exchange), all the banks that did not achieve R_1^{NB} but only R_1^{B} (which it will be actually the case since moral hazard problems will be present) will face a bankruptcy because the government only bailout certain proportion of ($\overline{R}$ - R_1^{NB}). If the consequences are not that extreme, one can say that the banks receiving bailouts will continue to be fragile even though they do not declare bankruptcy.
- When a good shock occurs, no banks will receive any bailout. It may happen though that all banks will have moral hazard problems but they will not in any case receive any bailout at all. In this case the perfect sub-game equilibrium is represented by node 2 in figure 1, where there is total bankruptcy.
- We find that $\Gamma_3(S_2) < \Gamma_3(S_1)$, that is, the loss of the government is greater when a bad shock occurs.

Proposition 2

When monitoring by the government is expected, and a bad shock occurs, rational expectations equilibrium can only be compatible with the end node (3), and end node (4) in figure 1. If a good shock occurs, the only possible equilibria are nodes (5) and (6).

Proof

- The government will monitor the banks because again if it does not do so, bank will anticipate this and will always expect no monitoring. Banks will then rationally make their decisions expecting no monitoring and one will obtain the equilibrium describe in Proposition 1.
- When a bad occurs, for given optimal level of monitoring, m, the government will be able to detect that a proportion $\rho(m)$ of banks may not have moral hazard problems. These are the ones that will be receiving a bailout so that we reach node (4). The rest of the banks will likely go bankrupt so we reach node (3).
- When a good shock occurs, no banks will receive any bailout. In comparison to the case where no monitoring takes place, only some banks (a proportion equal to $(1-\rho(m))$ will go bankrupt, and this is compatible with node (5). The rest of the banks will be spared from bankruptcy since they obtain $R_2^{NB}=\overline{R}$, and this sub-game perfect equilibrium is compatible with node (6).
- Here also, we find that $\Gamma_3(S_2) < \Gamma_3(S_1)$, that is, the loss of the government is greater when a bad shock occurs.

5.2 The commitment case

We have found so far that that *when the government does not commit* ex-ante to an optimal bailout, banking crisis can be driven by self-fulfilling expectation in which case there will be

multiple equilibria. One can reach node (1), node (2), node (3) or node (4), all depending on the expectations about the type of shock that will occur and the degree of monitoring intensity that the government may engage. When banks expect that the government will not use any monitoring technology and not bailout commitments before stage 3 has been made, we have found that there will be a great deal of moral hazard problems so that in the bad state all banks will be bailout, but we do not necessarily end up with a healthy banking system. The reason for that is that the banks' optimal decisions regarding lending and effort to discriminate against risky lending will depend on the expectations of bailed out without occurrence of any monitoring. For this reason, the banks' returns of their activities will much less than suboptimal. On the contraire, when there is a good shock there will be likely a full bankruptcy of the banking system, because one of the conditions for the government to bailout is that it has to occurred a bad shock.

In this section we analyze a situation in which the government commits ex-ante to bail out. This implies that it will need to announce it optimal commitment at stage 1 and before the market forms expectations about the shock and the government's monitoring activity. Committing in stage 1 is relevant when banks have expectations of being either monitored or not in anticipation that a bad shock may occur (with probability q).

We address the following question: Can the government, by committing ex-ante to an optimal bailout (i.e. that minimizes its loss function) avoid not only the multiple equilibria outcome but also a total or a great deal a banking crisis, in spite that a bad shock is anticipated? Can the government, by committing ex-ante, ameliorate the moral hazard problems that are common in the presence of asymmetric information?

If the answer to the above question is yes, we can argue that by committing to a certain bailout, the government may avoid the costs of banking crises that it is well known is so devastating for the economy. Then, the only reason to commit ex-ante to an optimal bailout, it

should be to avoid a large deterioration of the economic fundamentals that could arise as a result of an anticipated or the occurrence of banking crises. It is important to notice that also when there is not any type of commitments from the government side, banks should be more uncertain about whether the government will engage in monitoring them since this is costly. It may seem reasonable that in the presence of commitment, banks should be more certain about not only the monitoring activity of the government but also the intensity of such monitoring. As a consequence, the probability of being detected to be of the type having moral hazard problems will increase. We will then analyze what are the consequences of committing in the banks' decision making regarding their loans and effort.

The scenario that the government faces to determine whether or not it is beneficial to commit or not ex-ante to an optimal bailout is the following. In stage 1, the government views that there is a probability (q) that there could be a bad shock. It also knows that the degree of monitoring intensity will affect the possibilities of detecting the banks with moral hazard problems. We still keep the assumption that the government will bailout banks in the bad state and when they show that their decisions do not depend on the bailout policy (i.e. they do not present moral hazard problems).

The definition of the government's loss function in such a case, say Γ_1, will then include the expected difference in the returns between the banks with moral hazard problems and those without them, the bailout and monitoring expenditures given that a bad shock at stage 3 can occur. The government will minimise this loss function in order to find the optimal bailout. Having this established, the loss function can in general be defined as follows:

$$\Gamma_1(S_1) = q\left[\beta_1\left(\frac{1}{\xi+\rho(m)}\right)\left[\Phi^{comm}(\bar{R}-R_1^{NB})\right]^2+\beta_2(1-\Phi^{comm})(R_1^{NB}-R_1^{B})(1-\rho(m))+\Omega(m)\right]; \quad (15)$$

where Φ^{comm} will represent the optimal committed bailout which is determined by minimizing (14). As we will show later, since commitment occurs before the banks forms expectations about the relevant variables, will be the banks' optimal decisions about lending and effort will take into account such commitment, and consequently R_1^{NB} and R_1^{B} will be affected when there are ex-ante commitments.

The government will take into account how banks will respond, regarding their lending and effort under such commitment. At the same time banks will also consider their expectations about the type of shock that it will occur at the last stage of the game, stage 3, expectations about the monitoring intensity by the government, and how such commitment to bailing out will all affect their net return to thereafter decide on the levels of risky lending and effort.

Thus, the optimal bailout (say Φ^{comm}) that the government can commit in stage 1 is obtained from the following expression:

$$\frac{d\Gamma_1}{d\Phi} - \frac{dR_1^B}{d\Phi} = q\frac{d\Gamma_3}{d\Phi} - q\beta_2(1-\Phi)(1-\rho(m))\left[\underset{(-)}{\frac{\partial R_1^B}{\partial L}} * \underset{(+)}{\frac{dL}{d\Phi}} + \underset{(+)}{\frac{\partial R_1^B}{\partial e}} * \underset{(-)}{\frac{de}{d\Phi}}\right] = 0 \qquad (16)$$

The optimal monitoring in this case will be determined by solving:

$$\frac{d\Gamma_1}{dm} - \frac{dR_1^B}{dm} = q\frac{d\Gamma_3}{dm} - q\beta_2(1-\Phi)(1-\rho(m))\left[\underset{(-)}{\frac{\partial R_1^B}{\partial L}} * \underset{(-)}{\frac{dL}{dm}} + \underset{(+)}{\frac{\partial R_1^B}{\partial e}} * \underset{(+)}{\frac{de}{dm}}\right] = 0 \qquad (17)$$

Note first that Γ_3 is the government's loss function when it does not commit. This implies that when committing the government has q probability of facing the same costs that it faces when it does not commit when it minimizes those costs with respect to bailout and monitoring. By taking a closer look to the last expression (16), we can see that it is optimal for the

government to ex-ante commit to a smaller bailout that the one when there are no commitments, especially when the moral hazard problems of bailing out are very severe.[4] The effect of the moral hazard effects of bailing out are represented by the second part of (16). Regarding monitoring, from (17), we notice that the government will need to monitor more in order to minimize its losses when committing.[5]

Thus, committing requires a larger investment in a monitoring technology that allows not only to detect the bank type but also to give the banks the proper incentives to avoid the moral hazard problems and avoid getting involved in too many risky loans.

We conclude that ex-ante conditional commitment to bailing out cannot only lead us to a better equilibrium where the incidence of banking crises can decrease and the number of banks that go bankrupt can decrease, but also solve the dilemma of multiple equilibria.

In contrast to the conventional view, we then show that a central bank/government that announces and commits ex-ante to bailing out insolvent institutions, increases the value of the bank, creates a risk-reducing 'value effect' that more than offsets the moral hazard component of such a policy by reducing both frequency of bankruptcies and overall bank risk

7. Conclusions

We have studied the model that analyzes the interrelationships between banks' returns, and government's bailout and monitoring policiy. The model is presented as a three-stage sequential game where the players are the government and banks. Information about probability distribution of states (good or bad shock occurs) is given in the first stage. This shock will be realized in the third stage and will affect bank's return. Bailout will be given in

[4] For given $q(d\Gamma_3/d\Phi)$, a larger bailout will only increase the loss function Γ_1 since the second part of (16) enters with a positive sign. If this second part would not be there, it should be clear that the bailout under commitment should be larger than in the case of no commitment.

the last stage and conditional on the bank not having moral hazard problems and the occurrence of a bad shock o at stage 3. The government cannot observe perfectly which bank have moral hazard problems and may decide to invest in some monitoring technology to deal with that problem. In stage 2, the banks form expectations about the shock and the possibilities of being monitor to decide the scale of lending and effort they will exert to discriminate against a large amount of risky loans. In the final stage 3, when there are no ex-ante commitments on bailing out, the shock occurs and the government decides on the optimal bailout and the monitory intensity that makes it capable to recognize which banks have moral hazard problems. Bailouts are then here, conditional on the state of economy and bank's performance. With ex-ante commitments, banks will take these into account when they form expectations and make their optimal decisions. The purpose of committing ex-ante is to avoid multiple equilibria and avoid a total or almost total bankruptcy.

Our main results can be summarized as follows: *First,* if banks' expected return depends on bailout (i.e. banks have moral hazard problems), an increase in bailout will increase the amount of risky lending and it will decrease the level of effort exerted. Thus, if the government bails out unconditionally, bailouts will deepen the moral hazard problems. *Second,* if the government fulfill expectations that there will not be any monitoring to the banks, there will be full banking crises even when a good shock occurs since at this state no bailout will be given and banks, due to their inherently have moral hazard problems, have in their portfolio a large number of risky loans because little effort has been put into sorting out the type of loans that it granted. In the bad state all banks will be bailed out but not necessarily be sounded because again, these banks did not expect any monitoring and as consequence did not have any incentive to avoid their moral hazard problems. Notice that in the absence of monitoring, the government becomes unable to recognize the type of bank is

[5] For given $q(d\Gamma_3/dm)$, a larger monitoring will decrease the loss function Γ_1 since the second part of (16) enters with a negative sign. If this second part would not be there, the monitoring under commitment should be still

facing. *Third*, when there are banks' expectations of being monitored there will be only a fraction of the banks that will go bankrupt. It should be pointed out that the greater the monitoring intensity, the smaller the number of banks that will go bankrupt because banks will also have larger incentives to avoid their moral hazard problems. *Fourth,* in contrast to the conventional view, we show that a central bank/government that announces and commits ex-ante to bailing out insolvent institutions, increases the value of the bank, creates a risk-reducing 'value effect' that more than offsets the moral hazard component of such a policy by reducing both frequency of bankruptcies and overall bank risk.

We then recommend here that if government wishes to provide the ex-ante incentives to banks to exert the first-best effort, bailouts should be conditional on the banks' effort. The bailout policy should be one that indicates that only the ones who exert the best effort will receive bailouts in the bad state. In such case, banks need to maximize their' expected return without taking into account that a bailout will be received in the bad state. Their decisions on lending and effort should be independent of the bailout policy.

These results are different from other related literature, where bailouts rather lead to cause financial crisis as well as worsening moral hazard problems. Those works do not provide a complete characterization of an optimal bailout policy and the government is not either concerned with minimizing the social costs of financial crisis and to find the right incentives to the banks to affect their ex-ante decision as we do here. We share the worries of ones who emphasis the moral hazard problems created by excessive bailouts. But here, moral hazard problems effects of bailing out are taken into account when government minimizes its costs. Moreover, we assume that when the government finds if optimal to bailout, it reallocates its expenditures so that some fiscal policy reforms are implemented. This feature has been modeled here as costly to the government.

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larger than in the case of no commitment.

The most innovative part of this paper is the modeling of ex-ante commitment to bailing out, and how such policy can help to avoid or ameliorate the effects of banking crisis.

There are a couple of lessons from this work. The bank's performance needs to be monitor. There may be difficulties to observe the bank's performance, but certain mechanisms must be implemented in order to give the right incentives to the banks to reveal their true return. Rewarding high levels of effort and success may be important and when these two are truly revealed. Only in such circumstances, a necessary bailout will not cause moral hazards problems.

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