Banks, Governments and the Intervention Dilemma

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Abstract

This paper investigates the long-term relationship between government-provided public goods and the banking sector's role in converting liquid assets into long-term investments. We explore how deposit insurance can lead banks to take on excessive risk, and assess the implications of three regulatory approaches—non-intervention, liquidity requirements, and bailouts. Each policy introduces trade-offs, especially concerning the government's capacity to maintain public goods provision. By incorporating individuals' preferences for public spending and the relative importance of depositors in the social welfare function, we map out the conditions under which each regulatory approach becomes optimal. Our analysis offers a novel perspective by framing financial regulation within a long-term public finance context, showing that while interventions can curb banking-sector risk, they may also carry enduring fiscal consequences through reduced public services provision.

Keywords: Capital requirements, Liquidity Coinsurance, Moral hazard.

JEL classification: G21; G28

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1 Introduction

The intricate relationship between banks and governments has been a central topic of academic debate, particularly intensified by the recurrent financial crises that have marked the global economy. Central to this discussion is the fundamental dilemma over the desirability and consequences of government bailouts of distressed financial institutions. This debate is situated at the intersection of the prevailing need to preserve the stability of the financial system and the latent risk of inducing excessive risk-taking behavior by banks, a phenomenon well known as the moral hazard problem. The tension inherent in this dilemma has generated a vast and rich theoretical and empirical literature that seeks to understand the dynamic effects and possible solutions to this complex challenge (see for example, Allen et al. 2015 for an excellent review).

The theoretical literature also explores the conditions under which bailouts may be more or less likely and their implications. For example, the too-big-to-fail theory suggests that large, systemically interconnected financial institutions are more likely to be bailed out due to the potentially devastating macroeconomic costs of their failure. This implicit expectation of bailout may further exacerbate moral hazard problems, as these institutions may feel even more protected by taking risks and may themselves be interested in increasing their interconnectedness to increase the likelihood of being bailed out (Roncoroni et al. 2021, Sim, 2022, Altinoglu and Stiglitz, 2023). Additionally, a vast amount of empirical research has been devoted to analyzing the concrete effects of public interventions in the banking sector (Calomiris et al. 2005, Detragiache and Ho, 2010 or Calderon and Schaeck, 2016). The global financial crisis of 2007-2008 provided a natural laboratory to examine the consequences of bank rescue programs implemented by various countries. The accumulated evidence suggests that, in the short term, bailouts can indeed have stabilizing effects by restoring confidence in the financial system and preventing a severe credit crunch (Laeven and Valencia, 2013). However, this same evidence also supports the theoretical concern about moral hazard. Acharya et al. (2016), for example, find that banks that received bailouts during the crisis tended to take more risk in subsequent periods, suggesting that government intervention may have reinforced excessive risk-taking behaviors. Other empirical studies have focused on the reaction of financial markets to signals of possible bailouts. Dam and Koetter (2012) show that markets adjust their expectations about bank credit risk as a function of the perceived likelihood of government intervention. In particular, they find that banks considered more likely to be bailed out experience a decrease in their funding costs, which could be interpreted as a partial internalization of the implicit insurance provided by the government. Similarly, Gropp et al. (2014) find that banks with a higher bailout expectation tend to hold lower capital levels and build riskier asset portfolios, again supporting the moral hazard hypothesis induced by bailout expectations. In addition to analyzing the direct effects of bailouts, empirical research has also examined the consequences of different types of interventions and the conditions under which they are more or less effective. Some studies have compared the outcomes of capital injections, asset guarantees and debt relief schemes, seeking to identify the policies that achieve stabilization with the lowest fiscal cost and the least negative impact on bank incentives (Furceri and Zdzienicka 2012, Bova et al. 2016, Borio et al. 2020). A crucial aspect that emerges from the literature on the bailout dilemma is the inherent difficulty in generating a credible commitment by governments not to intervene in future crises. While a government may announce its intention not to bail out failing banks, in the heat of a systemic crisis, the pressures to intervene and avoid catastrophic economic consequences can become overwhelming. This lack of credibility in the no-bailout commitment can undermine efforts to mitigate moral hazard ex ante. In response to this challenge, a significant part of the literature has focused on exploring regulatory and institutional design mechanisms that seek to align bank incentives with financial stability and limit the need for discretionary bailouts. Among the solutions proposed are the establishment of automatic bank resolution rules that define in advance the procedures to be followed in the event of a financial institution's failure, reducing discretion and uncertainty (Bolton and Oehmke 2019, Leanza et al. 2021). Another key proposal is the implementation of countercyclical capital buffers, which would force banks to accumulate capital in good economic times in order to absorb losses during recessions, strengthening their resilience. Also, the idea of ex ante insurance, financed by the banking industry itself, has been explored as an alternative to taxpayer-funded bailouts (Mayes 2005, Binder and Hadjiemmanuil, 2025). More recent studies have begun to explore the complex interaction between fiscal and financial policy in the context of bank bailouts. Farhi and Tirole (2012) analyze how fiscal constraints may condition the credibility of the no bailout commitment, arguing that limited fiscal space may make the no bailout pledge less credible in case all banks are exposed to similar risk. Moreover, these authors suggest that increasing international financial integration further complicates this trade-off by introducing new sources of risk and making it more difficult to coordinate resolution policies at the global level.

Our paper is the first to combine a dynamic banking economy and a government providing public services. This environment allows us to study the trade-off between a more stable banking system but with a lower provision of public goods and services versus an economy more prone to crises but with higher provision of public services in a banking economy exposed to moral hazard.

The remainder of this paper is organized as follows. Section 2 presents the basic features of the model. Section 3 examines competitive equilibria without intervention. Section 4 presents a liquidity requirements, while government intervention in the form of injection of public goods is presented in section 4. Section 5 contains the equilibrium when failures are allowed. Finally, the concluding remarks are summarized in Section 6.

2 The Model

The model is based on Hellman et al. (2000) and Hasman and Samartín (2024). We consider a bank operating for M periods, where each period is divided into two half periods. In each period, there is a continuum of ex-ante identical agents that deposit their endowment at the bank. These depositors have the standard Diamond-Dybvig preferences. Individuals can be of type-1 (impatient) with probability γ^s and need to withdraw after half a period, or they can be of type-2 (patient) with probability 1-γ^s and maintain their money for the whole period. The probability γ^s is also the fraction of impatient consumers in the population and γ^s can take two values γ^H and γ^L, with $\gamma^H > \gamma^L$ and equal probabilities. The average fraction of impatient consumers is $\gamma = \frac{\gamma^H + \gamma^L}{2}$. We assume that depositors have D units to invest.[1]

In each period, the bank offers an interest rate r_i on its deposits. We also assume the existence of deposit insurance and so the amount of funds deposited depends only on the interest rate offered. The bank competes with other banks that offer an interest rate r_{-i} on their deposits. The total amount of bank's deposits is affected by both the interest rate the bank offers and the interest rate offered by its competitors (an increase in the bank's interest rate results in an increase in deposits while an increase in the competitor's rate leads to a decrease in deposits).

The bank is affected by moral hazard due to the fact that it makes decisions on asset allocation after it has already acquired funds. In particular, it must choose between two projects: Project I, a safe investment that has a guaranteed return of R, and Project II, a risky investment (gambling asset) that has a probability p of yielding a return of R^H and a probability $(1-p)$ of yielding a return of R^L (which is assumed to be zero). While the gambling investment has a lower expected return compared to the safe investment ($pR^H + (1-p)R^L < R$), it has the potential for a higher return if successful ($R^H > R$). We assume $\delta R \geq 1$ $(0 < \delta < 1)$, that is, the safe project has a positive net present value. Additionally, there is a third option, a storage asset, that allows to transfer funds between half periods.

Finally, there is a government that raises T taxes each period so as to provide public services, as for instance education, health, social security, national security, recreation activities, etc. These taxes can be alternatively used to provide some safety net to the banking system at a cost of consuming less public goods. Public services provide θT at the end of each period, where θ is a measure of the efficiency of the government in the provision of public services.

3 Competitive Equilibria Without Intervention

We describe the equilibrium of the economy in the initial case of no intervention. We assume that idiosyncratic liquidity shocks are extreme. This assumption implies that holding reserves, or investing γ^H) to pay impatient depositors, is not optimal.[2]

If banks do not hold enough liquidity to pay impatient depositors when the bank faces

[1] To simplify the analysis, we assume that type-1 depositors that withdraw after half a period will just recover their initial funds.

[2] A proof is provided in Appendix A.

the high liquidity shock, then the bank will fail with probability 1/2 (since there will not be enough funds to pay impatient depositors the promised amount). We calculate the expected profits of a bank over time, assuming two possible investment options. If the bank chooses the safe investment, the per period profit is: $\pi_P^{NI}(r_i, r_{-i}) = b_P^{NI}(r_i)D(r_i, r_{-i})$, where $b_P^{NI}(r_i) = \frac{1}{2}[R(1 - T - \gamma^L) - (1 - \gamma^L)r_i]$. As banks have $(1 - T - \gamma^L)$ units to invest, the profits for the bank are the return from the safe asset, net of depositors'payment. Conversely, the profit from investing in the gambling asset is $\pi_G^{NI}(r_i, r_{-i}) = b_G^{NI}(r_i)D(r_i, r_{-i})$, where $b_G^{NI}(r_i) = \frac{1}{2}p[R^H(1 - T - \gamma^L) - (1 - \gamma^L)r_i]$.

Banks aim to maximize their expected future profits. This is represented by the equation $V = \sum_{t=0}^{M} \delta^t \pi^t$. We examine the limit as $M \longrightarrow \infty$. Banks will choose strategies corresponding to an infinitely repeated static Nash equilibrium.

The sequence of events is as follows: First, banks set the interest rate for deposits. Next, depositors decide which bank to deposit their money in. Finally, banks choose a project to invest in and the returns are received. The investment process involves two steps: funding from depositors and selecting the project in which to invest.

We first focus on the project selection step, assuming that banks have $(1-T-\gamma^L)D(r_i, r_{-i})$ units to invest.

The expected discounted profits from investing in the safe asset are: $V_P^{NI}(r_i, r_{-i}) = \sum_{t=0}^{\infty} \delta^t \pi_P^t = \pi_P^{NI}(r_i, r_{-i})/(1 - \delta)$, while the expected discounted profits from investing in the gambling asset are: $V_G^{NI}(r_i, r_{-i}) = \sum_{t=0}^{\infty} \delta^t \pi_G^t = \pi_G^{NI}(r_i, r_{-i})/(1 - p\delta)$. Banks will choose to invest in the safe asset if $V_P^{NI}(r_i, r_{-i}) \geq V_G^{NI}(r_i, r_{-i})$ and will invest in the risky asset otherwise. From the above condition, we derive the threshold rate for the bank to opt for the safe asset investment:

$$r^\star = \frac{1 - T - \gamma_L}{(1 - p)(1 - \gamma_L)}[(1 - \delta p)R - pR^H(1 - \delta)] \tag{1}$$

that is, for $r \leq r^\star$ the bank will invest in the safe asset.

Given the project selection step, we next consider deposit funding. If a bank tries to invest in the safe asset, it will choose r_P=$arg\ max_r\{V_P(r_i, r_{-i})\}$, that is, $max_r\{\pi_P^{NI}(r_i, r_{-i})/(1 - \delta)\}$. For a symmetric equilibrium (i.e., $r_{-i} = r_P$), making use of the first order condition $(\partial V_P^{NI}/\partial r_i = 0)$ we have that $b_P^{NI}(r_P) = D(r_P, r_P)/(\partial D(r_P, r_P)/\partial r_i)$ that implicitly determines r_P^{NI}. Given that $\varepsilon = (\partial D/\partial r_i)(r/D)$ we can derive the equilibrium interest rate as:

$$r_P^{NI} = \frac{[R(1 - T - \gamma^L)]\varepsilon}{(1 - \gamma^L)(1 + \varepsilon)} \tag{2}$$

The bank will invest in the safe asset whenever $r_P^{NI} \leq r^\star$, and will invest in the gambling asset otherwise. From this condition, we can determine a threshold ε above which banks will have an incentive to gamble. This result is summarized as follows:

Lemma 1 *When markets are sufficiently competitive (i.e $\varepsilon > \widehat{\varepsilon}$), the only equilibrium in-*

volves banks investing in the gambling asset, where

$$\varepsilon^{\star} = \frac{r^{\star}(1-\gamma^L)}{R(1-T-\gamma^L) - r^{\star}(1-\gamma^L)} \tag{3}$$

We assume from now on that markets are sufficiently competitive and so banks will have incentives to gamble. Additionally, we assume the cost of insurance is high enough and so intervention is justified. In the next sections we examine different regulation policies to avoid moral hazard and failure in the banking system.

4 Competitive Equilibria With Liquidity Requirements

In order to avoid banks' failures, we now describe the equilibrium of the economy when banks are obliged to maintain γ^H in storage, as a liquidity requirement. Additionally, we will show how moral hazard can be prevented by requiring a sufficiently high level of taxes.

In this case, if the bank chooses the safe investment, the per period profit is: $\pi_P^L(r_i, r_{-i}) = b_P^L(r_i)D(r_i, r_{-i})$, where $b_P^L(r_i) = R(1-T-\gamma^H) + \frac{1}{2}(\gamma^H - \gamma^L) - (1-\gamma)r_i$. Again, as banks have $1-T-\gamma^H$ units to invest, the profits for bank are the return from the safe asset, net of depositors'payment. Note that in each half period, with probability one half, the bank may end up receiving the low liquidity shock, and in this case it can transfer the excess resources $(\gamma^H - \gamma^L)$ to the next half period. Conversely, the profit from investing in the gambling asset is $\pi_G^L(r_i, r_{-i}) = b_G^L(r_i)D(r_i, r_{-i})$, where $b_G^L(r_i) = p[R^H(1-T-\gamma^H) + \frac{1}{2}(\gamma^H - \gamma^L) - (1-\gamma)r_i]$.

As in the previous section, the expected discounted profits from investing in the safe asset are: $V_P^L(r_i, r_{-i}) = \sum_{t=0}^{\infty} \delta^t \pi_P^L = \pi_P^L(r_i, r_{-i})/(1-\delta)$, while the expected discounted profits from investing in the gambling asset are: $V_G^L(r_i, r_{-i}) = \sum_{t=0}^{\infty} \delta^t \pi_G^L = \pi_G^L(r_i, r_{-i})/(1-p\delta)$. Banks will choose to invest in the safe asset if $V_P^L(r_i, r_{-i}) \geq V_G^L(r_i, r_{-i})$. From this condition, we can derive the threshold rate for the bank to choose to invest in the safe asset:

$$\widehat{r} = \frac{(1-T-\gamma^H)}{(1-\gamma)(1-p)}[(1-\delta p)R - pR^H(1-\delta)] + \frac{1}{2}\frac{(\gamma^H - \gamma^L)}{(1-\gamma)} \tag{4}$$

where, for $r \leq \widehat{r}$ the bank will invest in the safe asset; otherwise it will invest in the gambling asset in this case.

Given the project selection step, we next consider the deposit funding. If a bank tries to invest in the safe asset, it will choose $r_P = arg\ max_r\{V_P(r_i, r_{-i})\}$, that is, $max_r\{\pi_P^L(r_i, r_{-i})/(1-\delta)\}$. Following the same argument as in the previous section, we can derive the equilibrium interest rate as follows:

$$r_P^L = \frac{[R(1-T-\gamma^H) + \frac{1}{2}(\gamma^H - \gamma^L)]\varepsilon}{(1-\gamma)(1+\varepsilon)} \tag{5}$$

The bank will invest in the safe asset whenever $r_P^L \leq \widehat{r}$, which implies that

$$\varepsilon \leq \widehat{\varepsilon} = \frac{\widehat{r}(1-\gamma)}{R(1-T-\gamma^H) + \frac{1}{2}(\gamma^H - \gamma^{L)}) - \widehat{r}(1-\gamma)} \tag{6}$$

As in the previous section, when markets are sufficiently competitive, the only equilibrium involves gambling. In order to avoid it, the government can apply a level of taxes, that prevents moral hazard. This result is summarized in the following lemma:

Lemma 2 *Moral hazard can be prevented if the government applies a sufficiently high level of taxes T, given by:*

$$\widehat{T} = \frac{(1-\gamma^H)(\frac{R\epsilon}{1+\epsilon} - \frac{A}{1-p}) - \frac{\gamma^H - \gamma^L}{2}\frac{1}{1+\epsilon}}{\frac{R\epsilon}{1+\epsilon} - \frac{A}{1-p}} \tag{7}$$

where A is

$$A = (1-\delta p)R - pR^H(1-\delta) \tag{8}$$

Proof: The level of taxes is obtained from the condition $r_P^L \leq \widehat{r}$. Substituting by its values we have:

$$\frac{[R(1-T-\gamma^H) + \frac{1}{2}(\gamma^H - \gamma^L)]\varepsilon}{(1-\gamma)(1+\varepsilon)} \leq \frac{(1-T-\gamma^H)}{(1-\gamma)(1-p)}A + \frac{1}{2}\frac{(\gamma^H - \gamma^L)}{(1-\gamma)} \tag{9}$$

and solving for T we obtain:

$$T \geq \frac{(1-\gamma^H)(\frac{R\epsilon}{1+\epsilon} - \frac{A}{1-p}) - \frac{\gamma^H - \gamma^L}{2}\frac{1}{1+\epsilon}}{\frac{R\epsilon}{1+\epsilon} - \frac{A}{1-p}} \tag{10}$$

Q.E.D

The intuition for this result is that requiring a sufficiently high level of taxes, there are less resources invested long term and moral hazard is reduced.

Finally, we can define a welfare function in this case as follows:

$$W^L = \frac{(1-\gamma)r_P^L}{1-\delta}\lambda + V_P^L(1-\lambda) + \theta\frac{T}{1-\delta} \tag{11}$$

5 Competitive Equilibria With Public Intervention

We now describe the equilibrium of the economy when the reserve requirement is no longer imposed but instead the government can inject public funds in order to cope with the high liquidity shock. In this scenario the bank will always invest γ_L in storage but knows that will be rescued by the government when the high shock is realized. If the bank chooses the safe investment, its profit per period would be given by: $\pi_P^I(r_i, r_{-i}) = b_P^I(r_i)D(r_i, r_{-i})$, where $b_P^I(r_i) = R(1-T-\gamma_L) - (1-\gamma)r_i$, that is, the benefit per unit of deposit net of costs.

Conversely, the profit from investing in the gambling asset is $\pi_G^I(r_i, r_{-i}) = b_G^I(r_i)D(r_i, r_{-i})$, where $b_G^I(r_i) = p[R^H(1-T-\gamma_L) - (1-\gamma)r_i]$. In this case, with probability p, the project is successful, depositors are paid and the bank receives the difference. With probability $1-p$, the bank is bankrupt and the banker loses the charter.

As in the previous sections, the expected discounted profits from investing in the safe asset are: $V_P^I(r_i, r_{-i}) = \sum_{t=0}^{\infty} \delta^t \pi_P^t = \pi_P^I(r_i, r_{-i})/(1-\delta)$, while the expected discounted profits from investing in the gambling asset are: $V_G^I(r_i, r_{-i}) = \sum_{t=0}^{\infty} \delta^t \pi_G^t = \pi_G^I(r_i, r_{-i})/(1-p\delta)$. Banks will choose to invest in the safe asset if $V_P^I(r_i, r_{-i}) \geq V_G^I(r_i, r_{-i})$ and will invest in the risky asset otherwise. From the above condition, we derive the threshold rate for the bank to opt for the safe asset investment:

$$\widehat{\widehat{r}} = \frac{1-T-\gamma_L}{(1-p)(1-\gamma)}[(1-\delta p)R - pR^H(1-\delta)] \tag{12}$$

that is, for $r \leq \widehat{\widehat{r}}$ the bank will invest in the safe asset.

Given the project selection step, we next consider the deposit funding. If a bank tries to invest in the safe asset, it will choose r_P=$arg\ max_r\{V_P(r_i, r_{-i})\}$, that is, $max_r\{\pi_P^I(r_i, r_{-i})/(1-\delta)\}$. We can derive the equilibrium interest rate, as in the previous cases, as follows:

$$r_P^I = \frac{R(1-T-\gamma^L)\varepsilon}{(1-\gamma)(1+\varepsilon)} \tag{13}$$

The bank will invest in the safe asset whenever $r_P^I \leq \widehat{\widehat{r}}$, which implies that

$$\varepsilon \leq \widehat{\widehat{\varepsilon}} = \frac{\widehat{\widehat{r}}(1-\gamma)}{R(1-T-\gamma^L) - \widehat{\widehat{r}}(1-\gamma)} \tag{14}$$

As in the previous sections, if markets are sufficiently competitive, the only equilibrium involves gambling. In fact, it can be shown that $\widehat{\widehat{\varepsilon}} < \widehat{\varepsilon}$, and therefore the level of taxes does not prevent gambling in this framework. This result shows that when banks know ex ante that they will be bailed out, their level of risk increases, which is consistent with the empirical evidence. In this case the government could apply an interest rate ceiling $\widehat{\widehat{r}}$. This result is summarized in the following proposition.

Proposition 3 *In the economy with public intervention, taxes cannot prevent moral hazard problems, and instead the government could apply an interest rate ceiling* $\widehat{\widehat{r}}$.

Proof: See Appendix B.

The welfare function in this case will be:

$$W^I = \frac{(1-\gamma)\widehat{\widehat{r}}}{1-\delta}\lambda + V_P^I(1-\lambda) + \theta\frac{(T-\frac{1}{2}B)}{1-\delta} \tag{15}$$

Note that in the case of intervention, each period the government injects funds $\gamma^H - \gamma^L = B$ with probability $\frac{1}{2}$ and so the amount consumed of the public good is reduced.

6 Welfare Comparisons: A Numerical Example

In this section we carry out a welfare analysis by comparing the welfare functions in different scenarios: liquidity requirements, public intervention via bailouts and finally, no intervention or letting the system fail.

First, it can be shown that in the case of no intervention, the level of taxes is not enough to prevent moral hazard ($\varepsilon^\star < \widehat{\varepsilon}$). As in the previous section the government could apply an interest rate ceiling $r^\star$, as given by equation (1). This result is summarized in the following proposition.

Proposition 4 *In the economy without intervention, taxes cannot prevent moral hazard problems, and instead the government could apply an interest rate ceiling* $r^\star$.

Proof: See Appendix C.

The welfare function is as follows:

$$W^{NI} = \frac{0.5(1-\gamma^L)r^\star}{1-\delta}\lambda + V_P(1-\lambda) + \theta\frac{T}{1-\delta} \tag{16}$$

First, we can argue that intervention in the form of bailouts is preferred to a liquidity requirement, that is, $W^I \geq W^L$, if and only if $\lambda \geq \widehat{\lambda}$, where

$$\widehat{\lambda} = \frac{b_P^L - b_P^I + 0.5B\theta}{(1-\gamma)(\widehat{\widehat{r}} - \widehat{r}) + b_P^L - b_P^I} \tag{17}$$

Second, intervention is preferred to letting the system fail or no intervention, that is $W^I \geq W^{NI}$, if and only if $\lambda \geq \widehat{\widehat{\lambda}}$, where

$$\widehat{\widehat{\lambda}} = \frac{b_P^I - b_P^{NI} - 0.5B\theta}{(1-\gamma^L)0.5r^\star - (1-\gamma)\widehat{\widehat{r}} + b_P^I - b_P^{NI}} \tag{18}$$

Finally, we can compare the case of liquidity requirements versus no intervention. In this case we have that $W^L \geq W^{NI}$, if $\lambda \geq \lambda$, where

$$\lambda^\star = \frac{b_P^L - b_P^{NI}}{(1-\gamma_L)0.5r^\star - (1-\gamma)\widehat{r} + b_P^L - b_P^{NI}} \tag{19}$$

Figure 1 displays the preferred regions for different values of θ and λ: θ, represented on the horizontal axis, shows agents' preferences for consuming public goods. Higher values of θ indicate a stronger preference for allocating resources towards public goods and services (e.g., infrastructure, education, healthcare, environment). This implies a potentially lower willingness to divert funds towards private sector bailouts. λ, represented on the vertical axis, indicates the weight that depositors have on the social welfare function. Higher values of λ indicate that the government places a greater emphasis on protecting the interests and well-being of depositors when making decisions related to the banking system. This could stem from concerns about financial stability, social equity, or the potential for widespread hardship if depositors lose their savings.

The colored regions represent the better policy outcome based on a social welfare function that balances the preference for public goods (θ) and the weight given to depositors (λ), in the context of some level of banking system distress (which is now an implicit background factor influencing the trade-off). Let us re-examine the components of the graph with this new lens: the orange solid line represents $\widehat{\lambda}$, as given by equation (17). This line shows a threshold for the weight on depositors (λ) above which intervention becomes more appealing than a liquidity requirement, given the agents' preferences for public goods (θ). If depositors highly value public goods (high θ), the government will only intervene to protect depositors if their weight in the social welfare function is also sufficiently high (λ). The slope suggests that as the preference for public goods increases, a greater weight on depositors is needed to justify intervention. The gray dashed line represents $\widehat{\widehat{\lambda}}$, as given by equation (18). This line shows another threshold related to the weight on depositors, above which intervention dominates over letting the system fail or no intervention. Below this line, the preference for public goods becomes a stronger consideration, and a greater weight on depositors is needed to justify intervention. Finally, the black thick line represents $\lambda^{\star}$, as given by equation (19). This horizontal line represents a critical threshold for the weight on depositors (λ). Above this line, the government places a high enough value on depositors' well-being to apply a liquidity requirement, and below the line failures are allowed.

Given the above thresholds we can determine three different dominance regions: the red shaded region, where the model suggests that allowing bank failures, or no intervention, is better. This occurs when agents have a strong preference for public goods (high θ) and the government places a relatively low weight on the well-being of depositors (low λ). In this scenario, the cost of intervention (in terms of diverted resources from public goods) outweighs the concern for depositors. The blue shaded region, where the model suggests that a liquidity requirement is better. Here, the government assigns a moderate weight on depositors and agents have a moderate preference for public goods. The level of banking distress (implicit) might not be severe enough to clearly tip the balance towards intervention, given these preferences. Finally, the green shaded region, where the model suggests that government intervention is better. This happens when the government places a high weight on the well-being of depositors (high λ), even if their preference for public goods is also significant (intermediate θ). The need to protect depositors outweighs the desire to allocate all resources to public goods.

We can observe there is an unique value of θ for which the three level curves coincide. This result is summarized in the following proposition:

Proposition 5 *There is an unique value of θ where the three level curves coincide, given by*

$$\theta^{crit} = \frac{-LD + JX}{(X + D)0.5B} \tag{20}$$

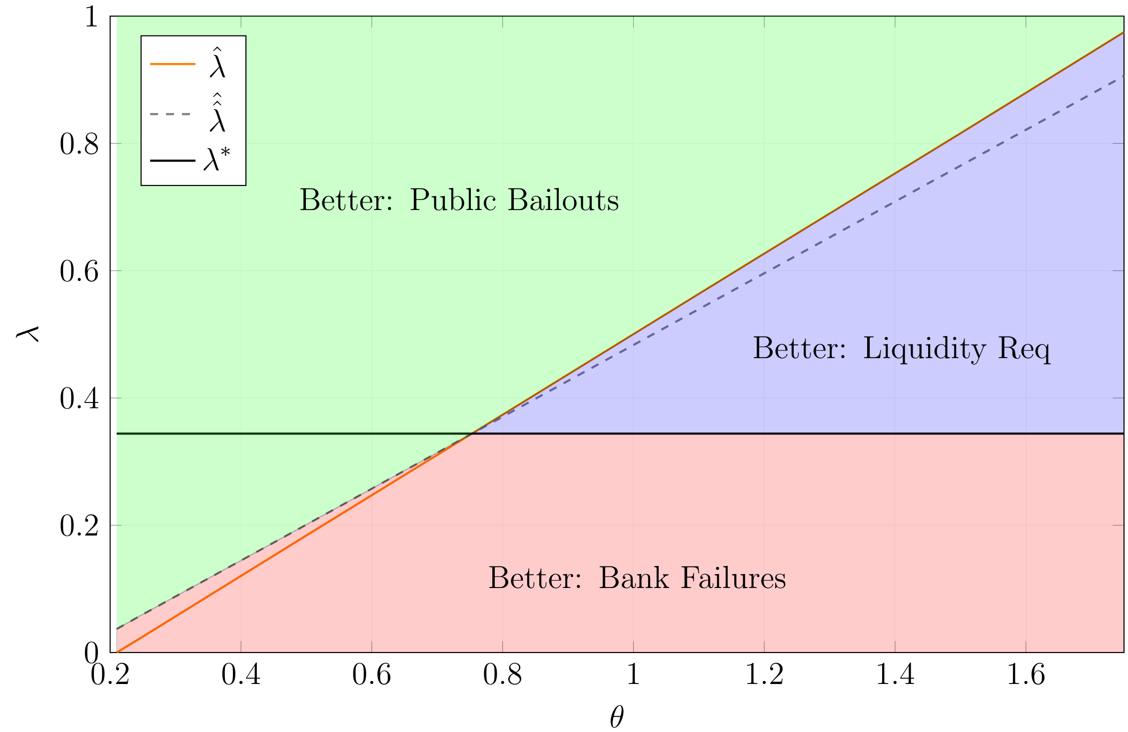

Figure 1: Combined decision regions

where $D = b_P^{NI} - b_P^*$, $X = \frac{(1-\gamma_L)r^\star}{2} - (1-\gamma)\widehat{r}$, $F = b_P^{NI} - b_P^I$, $J = b_P^I - b_P^*$, $K = (1-\gamma)(\widehat{\widehat{r}} - \widehat{r})$ *and* $L = \frac{(1-\gamma_L)r^*}{2} - (1-\gamma)\widehat{\widehat{r}}$.

Additionally if $X + D < 0$*, the slopes are such that* $\widehat{\lambda} > \widehat{\widehat{\lambda}} > \lambda^\star$.

Proof: See Appendix D.

Finally, we present a numerical example. The parameters used in this example are summarized in table 1 and satisfy all the assumptions of the model.

p	R^H	R	T	λ	θ	ε	γ	γ^H	γ^L	$\widehat{\lambda}$	$\widehat{\widehat{\lambda}}$	$\lambda^\star$
0.60	2.20	1.50	0.20	0.25	0.60	20	0.28	0.37	0.20	0.25	0.19	0.04

Table 1: Parameters

For these parameters, $\widehat{r} = 0.83$, $\widehat{\widehat{r}} = 1.33$ and $r^\star = 1.04$. The value of $\theta^{crit} = 0.29$. The preferred option is public intervention.

6.1 Policy Discussion

Finally, we can discuss what types of governments might operate in each area under these new definitions:

Red Shaded Region. Austerity-Focused Governments: A government with a primary focus on fiscal discipline and maximizing resources for public services might be very hesitant to use public funds for bank bailouts if the weight on depositors is low in their social calculus. Governments Prioritizing Public Goods Above All Else: A government with a strong ideological commitment to public goods provision might view private sector financial issues as secondary to their core mission, especially if the political power of depositors is limited. Governments with Weak Depositor Protection Mechanisms: A government that has not established strong deposit insurance schemes or regulatory frameworks to protect depositors might be more eager to accept bank failures.

Blue Shaded Region. Balanced Priority Governments: A government that seeks a balance between investing in public goods and ensuring some level of financial stability for depositors might choose non-intervention when the implicit banking distress is not extreme and both θ and λ are at moderate levels. Governments Relying on Private Sector Solutions: A government that believes the financial sector should primarily handle its own problems might only intervene in systemic crises where the weight on depositors becomes very high. Governments with Moderate Political Pressure from Depositors: If depositors don't wield significant political influence, the government might be more inclined to prioritize public goods in less severe situations.

Green Shaded Region. Populist or Socially Conscious Governments: A government highly responsive to the concerns of ordinary citizens, including depositors, and potentially less focused on strict fiscal austerity, might prioritize intervention when the weight on depositors is high. Governments with Strong Labor or Middle-Class Support: These governments often prioritize the financial security of a broad base of citizens, including depositors. Governments Recognizing Systemic Risk and Depositor Impact: Even a government with a preference for public goods might intervene if a potential bank failure is seen as having widespread and severe consequences for depositors and the overall economy, thus indirectly impacting the potential benefits of public goods provision. Governments with Strong Deposit Insurance Schemes: The existence of a robust deposit insurance system (which increases the implicit weight on depositors' well-being) might make intervention a more palatable option when distress occurs.

7 Concluding Remarks

This paper analyzes the dynamic interaction between a government that provides public goods and a banking sector that transforms liquid assets into long-term investment projects. In particular, we show how deposit insurance can create incentives for banks to engage in excessive risk-taking. In addition, banks are subject to liquidity risk. To address these issues, we evaluate a range of regulatory policies aimed at mitigating financial risk, while recognizing the trade-off in terms of reduced public goods provision.

Our analysis identifies distinct regions of optimal policy based on the interplay between individuals' preferences for public goods and the relative weight of depositors in a social welfare function. When individuals place a low value on public goods, government intervention in the form of ex-post bailouts is more likely to be optimal. However, as government efficiency in providing public goods increases, optimal intervention requires a stronger weight for depositors—leading to more active regulation. When both government efficiency and the weight on depositors are high, liquidity requirements emerge as the preferred policy tool. Conversely, when depositors carry less weight in the welfare function—reflecting a more market-oriented policy stance—non-intervention becomes optimal, even at the risk of more frequent banking crises.

This is the first study to examine the role of government in a banking economy from a long-term perspective. Our findings underscore that government intervention can carry persistent costs in the form of reduced public good provision. Future research could build on this framework by incorporating financial contagion or by studying how different market structures in the banking sector interact with government policy over time.

Appendix A

If banks do not hold enough liquidity to pay impatient depositors when the bank faces the high liquidity shock, then the bank will fail with probability 1/2 (since there will not be enough funds to pay impatient depositors the promised amount). Consequently, the per period profit of a bank that chooses the safe investment would be: π_P^I (r$_i$, r$_{-i}$) = b_P^I (r$_i$)D(r$_i$, r$_{-i}$), where $b_P^I(\mathrm{r}_i) = \frac{1}{2}[R(1-T-\gamma^L)-(1-\gamma^L)r_i]$.

If the bank chooses to keep enough funds to pay depositors in case of a high liquidity shock, then $b_P^I(\mathrm{r}_i) = R(1-T-\gamma^H)+\frac{1}{2}(\gamma^H-\gamma^L)-(1-\gamma)r_i$. Note that in this case with probability 1/2 the bank receives the low liquidity shock and can transfer resources to the next period. We need to show that:

$$R(1-T-\gamma^H)+\frac{1}{2}(\gamma^H-\gamma^L)-(1-\gamma)r_i \leq \frac{1}{2}[R(1-T-\gamma^L)-(1-\gamma^L)r_i] \qquad (21)$$

or that keeping enough reserves to avoid a bankruptcy is worse than risking a bankruptcy but investing more in the long-term project. This is the same as:

$$R(1-T-\gamma^H)-\frac{1}{2}R(1-T-\gamma^L)+\frac{1}{2}(\gamma^H-\gamma^L) \leq (1-\gamma)r_i-\frac{1}{2}(1-\gamma^L)r_i \qquad (22)$$

Note that since $\gamma = \frac{\gamma^H+\gamma^L}{2}$, we have that:

$$R\left(\frac{1-T+\gamma^L}{2}\right)+\frac{1}{2}\gamma^H+\frac{1}{2}\gamma^H r_i \leq R\gamma^H+\frac{1}{2}\gamma^L+\frac{1}{2}r_i \qquad (23)$$

which can be expressed as

$$[R(1-T)-r_i]+(R-1)\gamma^L \leq [2R-(r_i+1)]\gamma^H \qquad (24)$$

or

$$[R-r_i]+(R-1)\gamma^L \leq [(R-r_i)+(R-1)]\gamma^H+TR \qquad (25)$$

which can be simplified as

$$(R-r_i)(1-\gamma^H) \leq (R-1)(\gamma^H-\gamma^L)+TR \qquad (26)$$

Q.E.D

Appendix B

We want to show that $\widehat{\varepsilon}$ given by equation (6) is greater than $\widehat{\widehat{\varepsilon}}$ given by equation (14), that is:

$$\frac{\widehat{r}(1-\gamma)}{R(1-T-\gamma^H)+\frac{1}{2}(\gamma^H-\gamma^{L)}-\widehat{r}(1-\gamma)} > \frac{\widehat{\widehat{r}}(1-\gamma)}{R(1-T-\gamma^L)-\widehat{\widehat{r}}(1-\gamma)} \tag{27}$$

or,

$$\widehat{r}[R(1-T-\gamma^L)] > \widehat{\widehat{r}}[R(1-T-\gamma^H)+\frac{1}{2}(\gamma^H-\gamma^{L)}] \tag{28}$$

we replace $\widehat{r}$ as given by equation (4) and $\widehat{\widehat{r}}$ by equation (12):

$$\left[\frac{1-T-\gamma^H}{(1-\gamma)(1-p)}A+\frac{1}{2}\frac{B}{1-\gamma}\right]R(1-T-\gamma^L) > \frac{1-T-\gamma^L}{(1-\gamma)(1-p)}A\left[R(1-T-\gamma^H)+\frac{B}{2}\right] \tag{29}$$

where $B=(\gamma^H-\gamma^{L)})$ and $A=(1-\delta p)R-pR^H(1-\delta)$

After some simplifications we obtain:

$$(1-p)R > X \tag{30}$$

or $R^H > R$, which is satisfied by assumption.

Q.E.D

Appendix C

We want to show that $\widehat{\varepsilon}$ given by equation (6) is greater than $\varepsilon^\star$ given by equation (3), that is:

$$\frac{\widehat{r}(1-\gamma)}{R(1-T-\gamma^H)+\frac{1}{2}(\gamma^H-\gamma^{L)}-\widehat{r}(1-\gamma)} > \frac{r^\star(1-\gamma^L)}{R(1-T-\gamma^L)-r^\star(1-\gamma^L)} \tag{31}$$

or,

$$\widehat{r}(1-\gamma)[R(1-T-\gamma^L)] > r^\star(1-\gamma^L)[R(1-T-\gamma^H)+\frac{1}{2}(\gamma^H-\gamma^{L)}] \tag{32}$$

we replace $\widehat{r}$ as given by equation (4) and $r^\star$ by equation (1):

$$\left[\frac{1-T-\gamma^H}{(1-p)}A+\frac{B}{2}\right]R(1-T-\gamma^L) > \frac{1-T-\gamma_L}{(1-p)}A\left[R(1-T-\gamma^H)+\frac{B}{2}\right] \tag{33}$$

where $B=(\gamma^H-\gamma^{L)})$ and $A=(1-\delta p)R-pR^H(1-\delta)$

After some simplifications we obtain:

$$(1-p)R > X \tag{34}$$

or $R^H > R$, which is satisfied by assumption.

Appendix D

We want to show that there is an unique value of θ for the three level curves: $\widehat{\lambda}$, $\widehat{\widehat{\lambda}}$ and $\lambda^{\star}$. Let us define:

$$D = b_P^L - b_P^{NI} \tag{35}$$

$$X = \frac{(1-\gamma_L)r^*}{2} - (1-\gamma)\widehat{r} \tag{36}$$

$$F = b_P^{NI} - b_P^I \tag{37}$$

$$J = b_P^I - b_P^* \tag{38}$$

$$K = (1-\gamma)(\widehat{\widehat{r}} - \widehat{r}) \tag{39}$$

and

$$L = \frac{(1-\gamma_L)r^*}{2} - (1-\gamma)\widehat{\widehat{r}} \tag{40}$$

We can rewrite

$$\widehat{\lambda} = \frac{b_P^{NI} - b_P^I + 0.5B\theta}{(1-\gamma)(\widehat{\widehat{r}} - \widehat{r}) + b_P^{NI} - b_P^I} = \frac{F + 0.5B\theta}{K + F} \tag{41}$$

similarly

$$\widehat{\widehat{\lambda}} = \frac{b_P^I - b_P^F - 0.5B\theta}{(1-\gamma^L)0.5r^{\star} - (1-\gamma)\widehat{\widehat{r}} + b_P^I - b_P^F} = \frac{J - 0.5B\theta}{L + J} \tag{42}$$

and finally

$$\lambda^{\star} = \frac{b_P^{NI} - b_P^F}{(1-\gamma_L)0.5r^{\star} - (1-\gamma)\widehat{r} + b_P^{NI} - b_P^F} = \frac{D}{X + K} \tag{43}$$

By comparing $\widehat{\widehat{\lambda}}$ and λ^*, we can easily get a value of θ such that $\widehat{\widehat{\lambda}} = \lambda^*$:

$$\theta_1 = \frac{-LD + JX}{(X + D)0.5B} \tag{44}$$

We can also compare $\widehat{\lambda}$ and $\widehat{\widehat{\lambda}}$ and find a value of θ such that $\widehat{\lambda} = \widehat{\widehat{\lambda}}$:

$$\theta_2 = \frac{KJ - LF}{0.5B(J + L + K + F)} \tag{45}$$

We can show that there is an unique value of θ for the three threshold values of λ, that is $\theta_1 = \theta_2 = \theta$, that is:

$$\theta_1 = \frac{-LD + JX}{(X + D)0.5B} = \theta_2 = \frac{KJ - LF}{0.5B(J + L + K + F)} \tag{46}$$

By operating in the above expression we obtain

$$(JX - DK + XF)(L + J) = L(DL + DJ) \tag{47}$$

or

$$(JX - DK + XF)(L + J) = LD(L + J) \tag{48}$$

We can cancel $(L + J)$ on both sides:

$$(JX - DK + XF) = LD \tag{49}$$

that can also be expressed as:

$$X(J + F) = D(L + K) \tag{50}$$

By replacing $J + F$ by their values we can see that it is equal to D:

$$(J + F) = b_P^I - b_P^* + b_P^{NI} - b_P^I = D \tag{51}$$

Similarly, $L + K$ is equal to X:

$$L + K = \frac{(1 - \gamma_L)r^*}{2} - (1 - \gamma)\widehat{r} + (1 - \gamma)(\widehat{\widehat{r}} - \widehat{r}) = X \tag{52}$$

which implies that $\theta^\star = \theta_1 = \frac{-LD+JX}{(X+D)0.5B} = \theta_2 = \frac{KJ-LF}{0.5B(J+L+K+F)}$

Finally, by comparing the slopes of the three level curves we can show that $\widehat{\lambda} > \widehat{\widehat{\lambda}} > \lambda^\star$:

$$\frac{0.5B}{K + F} > \frac{-0.5B}{L + J} > 0 \tag{53}$$

or

$$L + J < -K - F \tag{54}$$

Making use of the fact that $L + K$ is equal to X and $J + F = D$

$$X + D < 0 \tag{55}$$

Q.E.D

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