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The Future of Bail-in for Banks: Resolving the Credit Suisse Dilemma*

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Abstract

The collapse of Credit Suisse highlights the limitations of bail-in mechanisms in preventing bailout. Regulatory authorities, faced with the decision of triggering bail-inable debt, may ultimately opt for alternative solutions, effectively sidestepping these mechanisms. This paper explores what we term the “Credit Suisse Dilemma”—a situation where bail-in bonds, designed to reduce government intervention during a banking crisis, can inadvertently increase the scale of such intervention if banks are bailed out without activating these bonds. We present a simple model illustrating this problem and discuss potential solutions, including a novel exchange mechanism whereby banks would replace bail-in bonds with higher levels of common equity at a pre-determined conversion ratio.

Keywords: Credit Suisse, bailout, bail-in, banking regulation, capital requirements.

JEL Classification: E44, G21, G28, G33.

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1 Introduction

The banking sector is no stranger to crises, and with each turmoil, there is a renewed search for effective solutions. One attempt to address the recurring issues in banking has been the implementation of contingent debt contracts, specifically bail-in instruments. These instruments are designed to absorb losses by converting into equity or being written down during periods of financial distress, allowing banks to be recapitalized or resolved without resorting to taxpayer-funded bailouts.

However, the recent collapse of Credit Suisse has cast renewed doubt on the practical effectiveness of these bail-in mechanisms. While the bank’s contingent convertible capital instruments, the so-called AT1 bonds, were wiped out,¹ a much larger amount of its bail-in bonds, totaling approximately 57 billion Swiss francs, were not activated. Instead, the Swiss regulatory authorities arranged an emergency takeover of Credit Suisse by UBS. This takeover was facilitated by governmental loss protection agreements and liquidity provision from the Swiss National Bank. As part of the deal, UBS continued to service Credit Suisse’s bail-in bonds, which carry relatively high interest payments.

These events reveal a critical dilemma: while bail-in bonds aim to reduce government intervention, they may unintentionally *increase* the scale of such intervention if regulators fear the repercussions of their activation. In the case of Credit Suisse, authorities faced a difficult decision: they could trigger the bank’s bail-in bonds, risking contagion effects that might destabilize financial markets, or assist in rescuing the bank, which could impose significant financial risk on taxpayers. Their decision not to declare the so-called point of non-viability (PONV), a legal requirement for triggering the bail-in bonds, reflects the complex trade-offs involved in dealing with systemic risk in the international banking sector.²

¹In a partial decision of October 2025, the Swiss Federal Administrative Court held that FINMA’s decree ordering the write-off of Credit Suisse’s AT1 instruments lacked a sufficient legal basis and therefore revoked the decree. The court has not yet ruled on possible remedies or compensation, and both FINMA and UBS have announced that they will appeal to the Swiss Federal Supreme Court. The final legal assessment of the AT1 write-down is thus still pending.

²The Swiss Financial Market Supervisory Authority briefly explained its decisions regarding the handling of the demise of Credit Suisse in a press briefing in April 2023 (FINMA, 2023). Besides concerns about contagion and systemic risks, this briefing also mentions serious doubt whether trust in the bank could be restored after a bail-in. The Expert Group on Banking Stability (2023) of the Swiss Finance Ministry issued a report on the issue later in 2023. In December 2024, the Parliamentary Investigation Committee (PUK, 2024) published a comprehensive report, offering deeper insights into the causes of Credit Suisse’s downfall and an extensive analysis of the authorities’ decision-making processes throughout the crisis.

Following the subsequent takeover by UBS, the interest payments on Credit Suisse’s bail-in bonds, which had not been converted to equity, had to continue. Since these bonds carry a risk premium over standard debt instruments, they increased the costs of the takeover for UBS. With the takeover being backed by governmental loss guarantees and a public liquidity backstop, this also raised the risk of eventually drawing upon taxpayer funds.

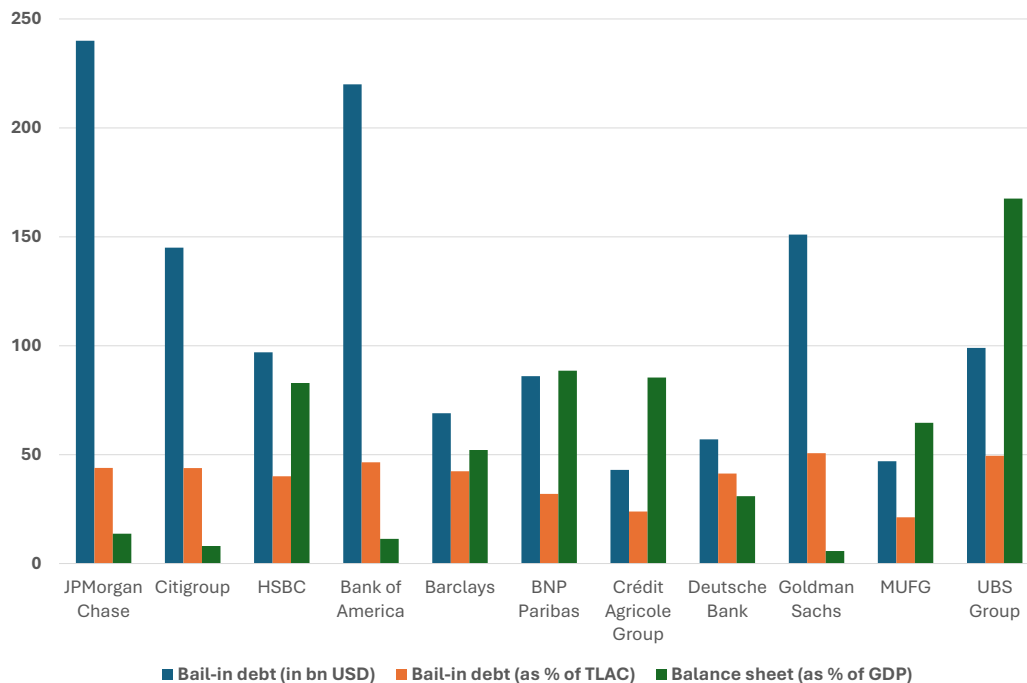
In this paper, we illustrate the dilemma of bail-in bonds within a simple model that captures the interaction between bail-in instruments and regulatory discretion regarding their activation. Our model analyzes how the issuance of bail-inable debt and the possibility of government intervention affect the (expected) tax burden of bank rescues. We show that while bail-in bonds *decrease* the expected tax burden by reducing the likelihood of a bailout *ex-ante*, they may *increase* the cost of intervention *ex-post* if banks are ultimately bailed out without converting these bonds into equity—an issue we term the “Credit Suisse Dilemma”, in light of recent events.

Our analysis provides important insights into the broader implications of bail-in instruments, particularly with regard to their effectiveness as a regulatory tool for preventing taxpayer-funded bailouts. By examining the problems and limitations of current bail-in frameworks, we also propose solutions to address this dilemma. Specifically, we suggest reforms to strengthen the credibility and effectiveness of bail-in mechanisms by establishing pre-defined action plans for central banks across relevant jurisdictions. Such plans would enable swift and coordinated responses, mitigating systemic risks and preventing contagion during the failure and bail-in resolution of globally systemically important banks (G-SIBs). Additionally, we propose a novel exchange mechanism through which banks would substitute bail-inable debt with higher levels of common equity at a pre-defined conversion ratio.

While our analysis is motivated by the Swiss experience, the insights and potential solutions we identify are broadly relevant across jurisdictions. The scale of bail-inable instruments issued by major international banks underscores this global dimension. Figure 1 presents the outstanding volumes of bail-in debt issued by a selection of G-SIBs. Taken together, the top 11 banks across buckets 2 to 4 of the Basel G-SIB framework (excluding Chinese institutions) account for approximately USD 1,250 billion in bail-in debt. These instruments, defined here as senior TLAC-eligible liabilities, constitute a substantial share of total loss-absorbing capacity (TLAC), averaging around 40% across the group. UBS is

particularly noteworthy due to the outsized scale of its balance sheet relative to the Swiss economy, with a balance sheet-to-GDP ratio of roughly 170%. The bank currently has about USD 99 billion in bail-in debt outstanding, including approximately USD 40 billion in legacy liabilities inherited from Credit Suisse that remain on its books.

Figure 1: Outstanding bail-in debt of G-SIBs (buckets 2–4, excl. China)



Source: Banks’ consolidated balance sheets and latest available TLAC/MREL disclosures as of 2024/25.

Note: “Bail-in debt” here excludes AT1 and Tier 2 capital instruments and refers, for each bank, to the stock of external TLAC-eligible senior unsecured long-term liabilities recognized at the level of the group’s resolution entity. For the US G-SIBs, this corresponds to external TLAC-eligible senior unsecured long-term debt issued by the holding company (JPMorgan Chase, Citigroup, Bank of America, Goldman Sachs). For the Euro-area and UK G-SIBs, it corresponds to subordinated or senior non-preferred TLAC/MREL-eligible liabilities issued by the respective resolution entity (Deutsche Bank, BNP Paribas, Crédit Agricole Group, Barclays, HSBC). For UBS, it corresponds to TLAC-eligible senior unsecured debt issued at group level. For Mitsubishi UFJ Financial Group (MUFG), it corresponds to external TLAC instruments issued directly by the bank and subordinated to excluded liabilities.

Model summary and detailed results. We set up a simple two-period model where banks act as intermediaries between investors and entrepreneurs, and are subject to macroeconomic risk that may lead to default. Banks start with a fixed amount of equity capital and acquire additional funding by issuing deposits and *bail-in bonds*—a form of contingent debt that

may be converted into equity in the event of bank failure. The issuance of bail-in bonds, mandated by regulation, aims to safeguard regular deposits during financial distress and minimize reliance on taxpayer-funded bank rescues.

However, when a negative shock threatens the banking sector, the regulatory authorities may choose to bypass the bail-in mechanism, opting instead to bail out the banks and protect the bail-in bond holders. Bailout is financed by taxing future generations, which distorts the true price of bail-inable debt by effectively offloading a portion of its risk onto future taxpayers, thus creating an implicit subsidy for banks today. In the baseline version of our model, we treat the uncertainty surrounding the activation of the bail-in mechanism as exogenous.³ Using a comparative statics analysis, we investigate how changes in the credibility of the bail-in regime affect the pricing of bail-in bonds, bank behavior, and the expected tax burden. We then extend the discussion to explore the underlying sources of this uncertainty and consider how regulatory reform may reduce it.

Crucially, bail-in bonds command a risk premium over standard debt instruments, reflecting their designed purpose to absorb losses in times of financial distress. However, if a bank is ultimately bailed out without converting these bonds to equity, the cost of the bailout—and thus the taxpayer burden—rises, owing to the higher interest costs associated with these bonds. This situation creates a seeming paradox: the very instrument intended to shield taxpayers during banking crises may, under certain circumstances, actually increase their financial burden. This outcome raises questions about whether capital regulations should encourage or even mandate the issuance of bail-inable debt.

Our model shows that while bail-in regulations can prove counterproductive ex-post, they consistently reduce the *ex-ante* expected tax burden related to government-sponsored bank rescues. This result is not immediately obvious. Consider a scenario where the credibility of the bail-in mechanism is weak. In such a setting, a full government bailout remains the most likely outcome in the event of a severe shock. If one has to assume that bail-inable debt will not be activated during such episodes, its issuance may seem misguided: rather than shielding taxpayers, it could simply increase the ultimate fiscal costs of intervention.

³For cases such as that of Credit Suisse, based in the small, open economy of Switzerland, treating the probability of bail-in activation as at least partially exogenous appears especially plausible: while the legal authority to activate the bank's bail-in bonds rested with the Swiss authorities, the decision not to do so was heavily influenced by external factors, including international market conditions and pressure from foreign jurisdictions, most notably the United States (see Federal Council, 2024; PUK, 2024).

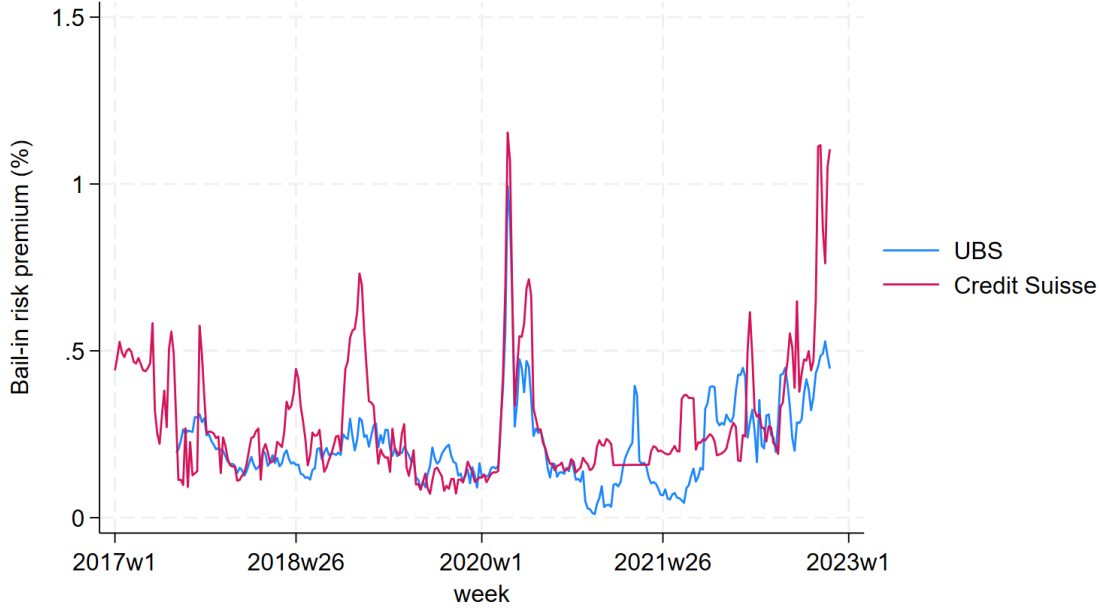
Yet this intuition overlooks a basic but important logic: if bail-in credibility is weak, then the associated risk premium on bail-inable debt must also be small. Moreover, even when bail-in activation is rather unlikely, the mere presence of bail-inable instruments still introduces a non-zero probability that private bondholders, not taxpayers, will absorb losses in a crisis. Crucially, our model shows that, in expectation, this prospect of private loss absorption always outweighs the additional fiscal cost incurred when bail-in is not activated. In this sense, the case for bail-in regulation remains fundamentally valid, even in environments where credibility is weak, and despite the recent shortcomings this regulation displayed in the case of Credit Suisse.

Empirical evidence suggests that weak bail-in credibility is not merely hypothetical. Lewrick et al. (2019) estimate the average spread between bail-inable bonds and otherwise comparable non-bail-inable bonds for G-SIBs over the period 2016–2018 and find only modest differences. Building on their approach, Figure 2 presents updated estimates of the bail-in risk premium for Credit Suisse and UBS from 2017 up to the months preceding the collapse of Credit Suisse in March 2023. While the spreads respond visibly to episodes of heightened failure risk, they remain contained throughout the sample. Most strikingly, Credit Suisse’s bail-in premium barely exceeded 100 basis points even in the immediate run-up to its failure. These muted reactions suggest that market participants assigned a rather low (though non-zero) probability to actual bail-in activation. Our model reflects this same logic: when investors anticipate that bail-in is unlikely to be enforced, they demand only a modest risk premium, keeping funding costs close to those of traditional debt.

We further examine potential approaches to enhance the resolvability of global systemically important banks without relying on government support, and to address the current issues surrounding bail-inable debt. Our analysis suggests that adopting a stronger, more credible commitment to bail-in processes can reduce the expected taxpayer burden from bailouts. However, investors anticipating a lower likelihood of bailout will demand a higher risk premium on bail-in bonds, thereby increasing the cost of bailouts in the rare extreme cases where they remain necessary. In this sense, enhancing, but not fully guaranteeing, the credibility of the bail-in process may have even amplified the very dilemma that materialized in the case of Credit Suisse.

Furthermore, we find that the way in which bail-in credibility is achieved matters. An

Figure 2: Estimated bail-in risk premia for Credit Suisse and UBS



Source: Lewrick et al. (2019), updated figure provided by the authors (personal communication, November 2025).

Note: For the estimation of the bail-in risk premium (BIRP), bail-in bonds are matched with otherwise comparable non-bail-in bonds issued by the same banking group and denominated in the same currency, with a difference in remaining maturity of no more than 12 months. The BIRP for each bond pair is then calculated as the difference between the option-adjusted spread (OAS) of the bail-in bond and that of its matched non-bail-in counterpart. If multiple matches exist, the BIRP is averaged across matches.

effective bail-in framework must establish credibility by addressing the underlying risks associated with bail-ins, such as contagion risk, operational challenges, legal complexities, and political uncertainties. Mitigating these risks will require a concerted effort to enhance international collaboration, in particular among supervisory authorities and central banks. Approaches that only address the symptoms of these issues, such as implementing more rigid bail-in trigger rules based on pre-defined indices or events, are insufficient and may even backfire.

Additionally, we consider stronger common equity requirements as a viable alternative to current bail-in regulations. While banks often argue that raising additional equity capital is significantly more costly than issuing bail-inable debt, our findings suggest that at least part of the reason for this discrepancy is that the risks associated with bail-in instruments

are partially externalized onto society rather than fully borne by investors. A numerical example of our model illustrates that the rate on bail-in bonds can be heavily influenced by the perceived probability that a bail-in will not be triggered in a crisis (leading to a bailout instead).

Relatedly, as parts of the literature suggest, concerns over potential negative impacts of higher capital requirements on bank lending and real investment may be overstated. While increased requirements could exert short-term pressure on lending, this literature argues that, given a sufficiently long transition period, these adverse effects are likely to be modest and could even turn positive in the long term.

Moreover, our model indicates that lower bank lending and investment are not inherently detrimental. Projects whose viability hinges on artificially low credit rates—stemming from banks’ artificially low funding costs due to the externalization of project failure and default risks onto society—may, in fact, be socially undesirable. In such cases, if higher capital requirements prevent these projects from being funded, this may represent a beneficial reallocation of resources away from activities that rely on implicit subsidies.

A straightforward replacement of bail-inable debt with common equity would undoubtedly strengthen the resilience of the banking sector and reduce the (expected) fiscal burden during crises. However, such a reform would face significant hurdles. In addition to concerns about (short-term) lending constraints, there are legitimate concerns about the potential impact on international competitiveness, particularly if such measures were enacted unilaterally at the national level.

To navigate these challenges, we propose a pragmatic and balanced approach: a novel exchange mechanism under which banks would gradually substitute a portion of their bail-in bonds with increased levels of common equity, according to a pre-defined conversion ratio. Since equity capital automatically absorbs losses, providing a more robust buffer than bail-in bonds, this conversion ratio could be set below 1. To illustrate the mechanics and potential implementation of such a mechanism, we use the example of Swiss capital requirements for UBS, the sole remaining G-SIB in Switzerland.

We also examine different design options for implementing this exchange mechanism. One option would be to make participation voluntary, providing banks with flexibility in adoption, while the other is to establish it as a mandatory measure. Our analysis suggests that if

participation were voluntary, banks might only opt in if the mechanism allows them to offload more risk onto society. Therefore, to strengthen the banking sector’s resilience, namely by making it is less reliant on government-backed bailouts and reducing the financial burden on taxpayers, mandatory participation would likely be necessary. Furthermore, setting an appropriate conversion ratio is essential, and this ratio should be calibrated carefully, taking into account also the credibility and effectiveness of the existing bail-in processes.

Related Literature. The idea of contingent debt is not new (e.g., Hellwig, 1998; Gersbach, 2023b). It gained particular attention, however, only after the financial crisis of 2007/08. (Implicit) government subsidies to banks considered too big to fail have proven costly (Ueda and di Mauro, 2013; Santos, 2014), and, as a consequence, regulators and researchers alike called for stronger capital requirements, credible frameworks for bank resolution, and a shift from government bailouts to investor bail-in (Coffee, 2011; Bolton and Oehmke, 2019; Freixas and Rochet, 2023; Admati and Hellwig, 2024; Colliard and Gromb, 2024). At the center of attention for contingent debt instruments are bail-in bonds and so-called “CoCo bonds”, which can be written down or converted into equity if pre-specified trigger events occur.⁴ For an overview on contingent convertible debt instruments, see Zhou et al. (2012), Avdjiev et al. (2013), and Calomiris and Herring (2013).

Bail-in instruments and CoCo bonds can vary in their design, particularly regarding the terms of conversion and the triggers for conversion. Automatically triggered bonds, which activate when specific indicators cross a pre-determined threshold, enhance the credibility of the conversion process by reducing the uncertainty associated with discretionary decision-making. These indicators can be tied to book value ratios, such as equity to total assets, or to market prices, such as credit default swap spreads.⁵

Since book values are influenced by accounting procedures and may lag behind current events or be subject to window dressing, most of the literature has focused on market-based triggers. However, these are also not without problems, as they can potentially open the door

⁴“Bail-in bonds” and “CoCo bonds” both are contingent debt instruments, but they have distinct roles and mechanisms. CoCo (contingent convertible) bonds are part of banks’ AT1 capital and are supposed to be triggered already well before failure, thereby providing recapitalization to banks in distress. In contrast, bail-in bonds are activated only once a bank is deemed non-viable, with the primary purpose of protecting taxpayers by absorbing losses during the resolution process. For a recent discussion advocating for stronger, more credible AT1 regulation to support the recovery of troubled banks, see Perotti and Martino (2024).

⁵Some have also advocated for using systemic indicators, so that the triggers for bail-in depend on whether there is broader financial distress in the economy (Squam Lake Working Group, 2009; McDonald, 2013).

to stock price manipulation and market instability (Sundaresan and Wang, 2015; Glasserman and Nouri, 2016).⁶ In the case of Credit Suisse, the activation of its bail-in bonds depended on the discretionary decision of regulatory authorities to declare or not declare the PONV.

Various papers have studied the potential effects of transitioning from a bailout to a bail-in regime on market discipline and default costs (Toader, 2015; Vallée, 2019; Lindstrom and Osborne, 2020; Leanza et al., 2021; Berger et al., 2022; Giuliana, 2022). While there is general consensus that moving towards bail-in procedures is beneficial overall, this body of work also emphasizes that the specific design and the credibility of the employed instruments matter.

In particular, the literature on CoCo debt highlights how key design parameters—such as the conversion mechanism (equity conversion vs. principal write-down), trigger types, and trigger levels—can significantly affect banks’ behavior and risk-taking incentives (Hilscher and Raviv, 2014; Albul et al., 2015; Berg and Kaserer, 2015; Chan and van Wijnbergen, 2017; Chen et al., 2017; Martynova and Perotti, 2018; Avdjiev et al., 2020; Fatouh et al., 2022). For a comprehensive overview, see Flannery (2014, 2017).

To distinguish our contribution from this literature, it is important to note that bail-in bonds, unlike CoCos, are only activated upon outright bank failure, i.e., when equity holders have already been fully wiped out (see footnote 4). Consequently, concerns central to the CoCo literature—such as opportunistic debt restructuring or dilution-related shareholder incentives—do not arise in our setting. Nonetheless, we identify a related yet distinct channel of inefficiency: when the pricing of bail-inable debt is distorted by implicit government guarantees, banks may engage in inefficient investment behavior, allocating capital even to projects that are ex-ante unproductive.

Unlike in the CoCo context, our analysis would remain fundamentally unchanged, and our core results continue to hold under the alternative assumption that bail-in activation entails a principal write-down rather than a conversion to equity. In this case, rather than bondholders assuming ownership, a designated resolution authority would oversee the orderly wind-down of the bank. The pricing of bail-in bonds remains unaffected, as investors, regardless of the resolution mechanism, ultimately receive the residual value of the failing bank after all other

⁶The cited authors argue that market-based triggers may come with a multiple-equilibria problem, where stock prices are not uniquely determined. Alternative settings that avoid this issue are proposed by Calomiris and Herring (2013) and Pennacchi and Tchisty (2019a, b).

debt obligations have been met.

A broader and still unresolved question remains whether the issuance of bail-in instruments can serve as an effective alternative to higher levels of common equity. Some argue in favor of this view (Calomiris and Herring, 2013; Hilscher and Raviv, 2014), while others remain skeptical, emphasizing the robustness and simplicity of equity capital (Admati et al., 2014; Chan and van Wijnbergen, 2017; Admati and Hellwig, 2024). Our findings support a nuanced perspective: for bail-inable debt to function as an efficient complement to equity capital, its credibility and operational feasibility must be ensured. In the absence of such assurances, the case for strengthening equity-based capital requirements becomes significantly more convincing.

Outline. The paper is organized as follows: Section 2 introduces a simple framework in which we lay out the fundamental dilemma regarding the issuance of bail-inable debt and the regulatory authorities' decision on whether or not to activate it. Section 3 solves for equilibrium. Section 4 examines the (expected) fiscal burden of bank rescues and explores the policy motivations for bailouts, even under a bail-in regime. Section 5 discusses potential ways to address the problems associated with bail-in instruments. Section 6 concludes. Technical proofs are relegated to the appendix.

2 The Model

We consider a two-period model ($t = 1, 2$) with a single homogeneous good. Banks compete for funds by issuing deposits and bail-in bonds, and act as financial intermediaries.

2.1 Technologies

The model comprises a risk-free asset and a risky investment project. The risk-free asset is in infinite supply and yields a constant (gross) return $1 + r_s$ ($r_s \geq 0$) in period 2 for each unit of the good invested in period 1, i.e., $1 + r_s$ is the productivity of the underlying technology. A risky investment project requires an investment in the amount of $w + I$ in $t = 1$ and returns output y in $t = 2$, where

$$y = q \cdot (w + I), \tag{1}$$

with q being an aggregate shock:

$$q = \begin{cases} q^h \text{ (high)} & \text{with probability } p, \\ q^l \text{ (low)} & \text{with probability } 1 - p, \end{cases} \quad (2)$$

where $q^l < q^h$. We denote the average shock by q^m :

$$q^m = pq^h + (1 - p)q^l \quad (3)$$

and we assume $q^m > 1 + r_s$, i.e., the average return of the investment project exceeds the return on risk-free assets. While all agents will have access to the risk-free asset, only entrepreneurs can carry out investment projects.

2.2 Agents

There is one generation of agents living for two periods. The generation consists of a continuum of agents with mass L . There are four classes of agents: A mass L_E of agents are entrepreneurs, a mass L_B of agents are bankers, a mass L_I of agents are (sophisticated) investors, and a mass L_C of agents are (ordinary) consumers. It holds that $L = L_E + L_B + L_I + L_C$.

Entrepreneurs. Entrepreneurs are risk-neutral and consume only in $t = 2$. Each entrepreneur starts with an endowment w in $t = 1$ and has access to a single investment project. Since an entrepreneur starts only with funds w , s/he has to acquire an amount I to realize the project. Entrepreneurs can acquire funds only by taking a loan through an intermediating bank, meaning they cannot finance their project by issuing equity or issuing debt directly to households.⁷ Alternatively, the entrepreneur can invest his/her endowment in the safe asset. If an entrepreneur cannot repay the loan, the output $q(w + I)$ is seized by the bank.⁸

Banks. Bankers are risk-neutral and consume only in $t = 2$. Each banker has initial

⁷There are various reasons why banks play a crucial role in channeling funds to investment projects (Diamond, 1984; Hellwig, 1998; Gersbach and Uhlig, 2006). A prominent explanation is the need for sophisticated monitoring technologies to overcome pledgeability constraints—technologies typically available only to banks.

⁸For simplicity, we ignore liquidation costs, but this is not essential to the model.

endowment e_1 and sets up a bank. Thus, there is a continuum of banks with mass L_B and each bank has equity capital in the amount e_1 . Aggregate bank equity in $t = 1$ is denoted by $E_1 (= L_B e_1)$. We assume that aggregate bank equity is insufficient to finance all entrepreneurs: $E_1 < IL_E$.

Banks acquire debt funding by issuing deposits or bail-in bonds, which offer fixed interest rates of r^d and r^b , respectively. The total volumes of deposits and bail-in bonds within the banking sector are denoted by D and B , respectively. A bank can allocate its funds by either granting loans to entrepreneurs at rate r^c or by investing in safe assets. We denote the total amount of loans to entrepreneurs as C and the aggregate investment in safe assets as A .

Investors. Investors are risk-neutral and consume only in $t = 2$. Each investor has initial endowment w and can invest in safe assets, bank deposits, or bail-in bonds. If investors are indifferent between these options, we use the tie-breaking rule that they invest in bail-in bonds first and hold the rest of their endowment as deposits.

Consumers. Consumers are risk-averse and consume in both periods. Each consumer has initial endowment w . Consumers have utility functions defined over consumption in the two periods, with β ($0 < \beta < 1$) denoting the discount factor. The utility functions satisfy standard assumptions. Consumers can save through bank deposits or by investing in safe assets. If they are indifferent between the two, we use the tie-breaking rule that they invest in deposits. Since consumers can transfer wealth between the two periods at the riskless rate r_s , the solution of a consumer's intertemporal consumption problem generates a continuous saving function $s\{r_s\}$. We assume that $s\{r_s\}$ is increasing in r_s .

2.3 Regulation and bail-in mechanism

Regulatory authority. Banking regulation requires banks to hold some fraction of their loans as common equity capital and a fraction α of their loans as bail-in bonds.⁹ To focus on the issue of bail-inable debt, assume for now that the banks' amount of equity capital E_1 is fixed and meets the regulatory capital requirement. The aggregate bail-in requirement is $B \geq \alpha C$. If all entrepreneurs are funded, the aggregate loan volume C is equal to IL_E .

⁹Relating to real-world capital requirements, this implies that we assume safe assets to carry a risk weight equal to zero, and we abstract from a leverage constraint.

Since bail-in bonds are a more costly source of funding to the banks than deposits, they will aim to meet this condition with equality.

We further assume that there is uncertainty regarding the reaction of banking authorities if a bank is about to fail, i.e., bail-in is not always triggered. More precisely, we assume that failing banks, along with their bail-in bond holders, are bailed out with exogenous probability $p_R \in (0, 1)$, meaning that bail-in occurs only with probability $1 - p_R$.¹⁰

Bailout and bail-in procedures. The interest rate r^b on bail-in bonds is realized only if the bank does not encounter any financial trouble or if it is subsequently bailed out. If the bank fails and is not bailed out, its bail-in bonds are converted into equity.¹¹ A bank is considered to be failing if in $t = 2$ the returns on its portfolio of loans and risk-free assets are insufficient to repay depositors at rate r^d and investors in bail-in bonds at rate r^b . In this case, the initial bank owners realize a return of -1 on their endowment.

If the bank is bailed out, depositors and investors in bail-in bonds receive their promised rates. The bailout is financed by taxation of a future generation. If the bank is not bailed out, all bail-in bonds are converted into equity, and the bondholders become the new owners of the bank, receiving shares proportional to the number of bail-in bonds they owned.

Further assumptions. To streamline the analysis and avoid fringe cases, we impose the following baseline conditions. First, we assume $wL_I > \alpha IL_E$, i.e., investors have enough funds to acquire bail-in bonds in the amount that banks are mandated to issue if all entrepreneurs are financed. Additionally, we assume $L_C s(r_s) + wL_I + E_1 \geq IL_E$, i.e., there are enough savings in the economy to fund all entrepreneurial investment projects.

Later in the text, we will also introduce a set of assumptions that constrains the magnitude of the macroeconomic shock. Specifically, Assumption 1 will ensure that the shock is substantial enough to stress the banking sector. Assumption 2, on the other hand, will limit the shock from becoming “excessively large” (or equivalently, ensures that bail-in regulations are “sufficiently robust”). This guarantees that, in the event of a bail-in, banks will always be able to fulfill their obligations to depositors at the promised rate r^d , without requiring additional public support or intervention.¹²

¹⁰See Section 4.4 for further context on how this assumption can be rationalized.

¹¹As discussed in the Introduction, our analysis remains robust under the alternative assumption that bail-in activation entails a principal write-down rather than a conversion to equity.

¹²We address the scenario in which a bail-in proves insufficient to cover depositor claims in Section 5.3. In

3 Equilibrium

Definition 1 (Definition of equilibrium)

A competitive symmetric equilibrium is a tuple $\{B, D, A, C, r^d, r^b, r^c\}$ such that the following conditions hold:

- (i) entrepreneurs maximize expected profits;
- (ii) banks meet the regulatory bail-in requirement, i.e., $\alpha C = B$;
- (iii) the banks' aggregate investment/savings balance is given by $D + B = L_I w + L_C s(r_s)$;
- (iv) the banks' aggregate balance sheet identity is given by $E_1 + D + B = A + I L_E$;
- (v) banks make zero profits;
- (vi) investors and consumers optimally choose their portfolio of risk-free assets, deposits, and bail-in bonds.

Condition (i) determines the amount of bank loans C to the entrepreneurs. If r^c meets the entrepreneurs' participation constraint, which we will show is the case in equilibrium, all investment projects are financed and $C = I L_E$. Conditions (ii)-(iv) determine B , D and A . Since the banking sector is competitive, banks earn an expected return on equity equal to the risk-free rate, as stated by Condition (v). Condition (vi) implies that, in (interior) equilibrium, investors and consumers are indifferent between risk-free assets, deposits, and bail-in bonds. Since depositors are always made whole, an immediate result is $r^d = r_s$. We next determine r^b and r^c according to Conditions (v) and (vi).

Entrepreneurs' problem. Entrepreneurs apply for loans as long as realizing the investment project yields higher profits than an investment in safe assets:

$$p[q^h(w + I) - I(1 + r^c)] + (1 - p) \max\{q^l(w + I) - I(1 + r^c), 0\} \geq (1 + r_s)w. \quad (4)$$

We assume that the aggregate shock is severe enough to cause trouble in the bad state of the world, i.e., we stipulate

such cases, taxpayer funds are used to cover the shortfall and make depositors whole. More generally, this implies that deposits in our framework are effectively risk-free (as, e.g., in Martynova and Perotti, 2018).

Assumption 1

$$q^l(w + I) < \left(I - \frac{E_1}{L_E}\right)(1 + r_s). \quad (5)$$

Assumption 1 implies $q^l(w + I) < I(1 + r_s)$. Given that $r^c \geq r_s$, entrepreneurs default in the bad state of the world. Consequently, we can write the participation Constraint (4) as

$$\begin{aligned} pq^h(w + I) - pI(1 + r^c) &\geq (1 + r_s)w, \\ 1 + r^c &\leq q^h \frac{w + I}{I} - (1 + r_s) \frac{w}{pI}, \end{aligned} \quad (6)$$

i.e., entrepreneurs apply for loans as long as the loan rate r^c is not too high. Thus, if r^c meets Condition (6), each entrepreneur borrows I and realizes the investment project. For what follows, assume that Condition (6) holds. We will show later that in equilibrium this is indeed the case.

Banks' problem. Since bank deposits are safe, they yield the same rate of return as the safe asset: $r^d = r_s$. Since the risk-neutral investors have access to safe assets, deposits, and bail-in bonds, the expected returns on these assets have to equalize in an (interior) equilibrium. Thus, the expected return on bail-in bonds $\bar{r}^b$ has to equal r_s . Assume for now that banks finance all entrepreneurs, i.e., $C = IL_E$. This will indeed be the case if the loan rate r^c is such that the entrepreneurs' participation Constraint (6) holds and the expected aggregate profits of banks granting loans are at least equal to $E_1(1 + r_s)$.

Banks maximize the initial equity holders' expected returns on equity. Since initial equity is fixed, this is equivalent to maximizing the initial equity holders' expected profits Π^e . We denote the initial equity holders' profits in the bad state and in the good state by Π^l and Π^h , respectively. Since, by Assumption 1, entrepreneurs default in the bad state of the world, we obtain

$$\Pi^l = \max\{0, q^l(w + I)L_E + (1 + r_s)A - (1 + r_s)D - (1 + r^b)B\}, \quad (7)$$

where $A = D + B + E_1 - IL_E$ and $B = \alpha IL_E$.

Since it must be $r^b \geq r_s$, Assumption 1 implies that also the banks are failing in the bad state of the world. Thus, $\Pi^l = 0$. We note that the initial equity holders of the bank

always realize a return on equity of -1 in the bad state, regardless of whether the bank is ultimately bailed out or not.

In the good state of the world, entrepreneurs fully repay their loans. Thus, banks do not default and we obtain

$$\Pi^h = (1 + r^c)IL_E + (1 + r_s)A - (1 + r_s)D - (1 + r^b)B. \quad (8)$$

It follows that the banks' expected profits are given by

$$\Pi^e = p[(1 + r^c)IL_E + (1 + r_s)A - (1 + r_s)D - (1 + r^b)B]. \quad (9)$$

Since the banking sector is competitive, equilibrium requires $\Pi^e = (1 + r_s)E_1$.

Return on bail-in bonds. We next solve for the promised rate on bail-in bonds r^b . Investors' expected return on bail-in bonds $\bar{r}^b$ is given by

$$\bar{r}^b = pr^b + (1 - p) [p_R r^b + (1 - p_R) r^{bi}], \quad (10)$$

where r^{bi} denotes the return on bail-in bonds if they are converted into equity (i.e., **bailed in**). The return r^{bi} is given by

$$\begin{aligned} r^{bi} &= \frac{q^l(w + I)L_E + (1 + r_s)A - (1 + r^d)D}{B} - 1 \\ &= \frac{q^l(w + I)L_E + (1 + r_s)[E_1 - (1 - \alpha)IL_E]}{\alpha IL_E} - 1, \end{aligned} \quad (11)$$

where the second line uses $r^d = r_s$, $A = D + B + E_1 - IL_E$ and $B = \alpha IL_E$. We stipulate

Assumption 2

$$q^l(w + I) \geq (1 + r_s) \left[(1 - \alpha)I - \frac{E_1}{L_E} \right], \quad (12)$$

i.e., the aggregate shock is not extreme, allowing the banks to always repay their depositors after converting all bail-in bonds into equity. Consequently, deposits are safe even for $p_R < 1$. Assumption 2 also implies that the investors' rate of return on bail-in bonds, in the event of conversion into equity, is greater than (or at least equal to) minus one.

We note that Assumptions 1 and 2 jointly ensure that the macro shock is neither neg-

ligibly small—in which case there are no default-related problems at all—, nor extremely large—in which case banks would default on their debt even after converting the bail-in bonds to equity.

Equilibrium requires $\bar{r}^b = r_s$. By Equations (10) and (11), we obtain

$$pr^b + (1-p)p_R r^b + (1-p)(1-p_R) \left[\frac{q^l(w + I)L_E + (1 + r_s)[E_1 - (1 - \alpha)IL_E]}{\alpha IL_E} - 1 \right] = r_s. \quad (13)$$

Equation (13) uniquely pins down the equilibrium rate r^b . Furthermore, we can state

Lemma 1

Let $p_R \in (0, 1)$ and Assumptions 1–2 hold. Then,

- (i) $r^{bi} < r_s, \quad \frac{dr^{bi}}{d\alpha} > 0;$
- (ii) $r^b > r_s, \quad \frac{dr^b}{d\alpha} < 0, \quad \frac{dr^b}{dp_R} < 0.$

The proof is in the appendix. The realized return r^{bi} on bail-in bonds following conversion increases in α ; that is, it rises with the aggregate amount of bail-in bonds issued by the banking sector. At first glance, this may seem counterintuitive: a larger volume of bail-in bonds means the residual value of the bank must be divided among more bondholders, diluting individual claims. However, as established by the lemma, this dilution effect is outweighed by the fact that a higher share of bail-in bonds in the capital structure leads to a greater residual value upon conversion. This is because a higher reliance on bail-inable debt, rather than deposits, reduces the bank's post-conversion repayment obligations, thereby increasing the value recoverable by the bondholders.

Given that the return on bail-in bonds in the event of conversion is necessarily below the return on safe assets r_s , it follows that the realized return r^b on bail-in bonds in normal times—or in the case of a bailout—must exceed r_s . Otherwise, these instruments would not be attractive to investors.

Finally, the equilibrium return r^b on bail-in bonds is decreasing in both the aggregate volume of bail-inable debt (governed by α) and the bailout probability p_R . The first effect follows directly from the requirement that investors earn an expected return equal to the risk-free rate. If a higher α raises the realized return r^{bi} in the event of conversion, then the compensating return r^b that investors require in non-conversion states declines. Similarly, a

higher bailout probability p_R lowers the effective risk of holding bail-in bonds by reducing the likelihood of conversion. As a result, investors demand a lower premium, and the equilibrium return r^b correspondingly falls.

Implicit state guarantees and banks' funding costs. The fact that banks have to pay lower interest rates on their bail-in bonds when the probability of a government bailout is high highlights how (implicit) state guarantees reduce banks' cost of capital by shifting default risk onto society. Within our simple model, we can easily quantify this effect: for every percentage point increase in the likelihood of a government-sponsored rescue during a crisis, banks' funding costs decrease by dr^b/dp_R units per bail-in bond issued. Specifically, the presence of such guarantees decreases banks' costs by a total amount $[r^b(p_R) - r^b(0)]B$, where $r^b(p_R)$ denotes r^b as a function of p_R . This illustrates the direct financial benefit banks derive from implicit government support in times of financial distress.

Equilibrium solutions. It remains to determine the equilibrium values for the rest of our variables and to verify whether the entrepreneurs' inventive Constraint (6) holds. The following proposition summarizes our results:

Proposition 1

Let Assumptions 1–2 hold. Given bail-in regulation α ,

- (i) *the equilibrium is uniquely determined, with r^b being pinned down by Equation (13), r^c pinned down by $\Pi^e = (1 + r_s)E_1$ with Π^e according to Equation (9), $B = \alpha IL_E$, $D = L_I w - B + L_C s(r_s)$, and $A = D + B + E_1 - IL_E$.*
- (ii) *the entrepreneurs' participation Constraint (6) holds.*

The first part of the proposition immediately follows from the text. The proof for the second part is in the appendix. From this proof also follows

Corollary 1

Let Assumptions 1–2 hold. Then,

- (i) $\frac{dr^c}{dp_R} < 0$;
- (ii) $\frac{d(r^b - r_s)B}{d\alpha} = 0$, $\frac{dr^c}{d\alpha} = 0$.

Along the lines of Modigliani-Miller, the corollary states that the total premium payments on bail-in bonds, and hence banks' overall funding costs, are independent of the regulatory parameter α and thus independent of the aggregate amount of bail-in bonds issued by the banks. The intuition is straightforward: increasing the volume of bail-in bonds raises costs at the extensive margin (as B increases), but simultaneously lowers costs at the intensive margin (as r^b declines; see Lemma 1). In equilibrium, these two effects exactly offset one another.

Since banks operate in a competitive market and earn zero profits in equilibrium, it follows directly that the lending rate r^c is also independent of α .

By contrast, an increase in the probability of a bailout lowers the banks' funding costs by reducing the required return on bail-inable debt, r^b . Given the zero-profit condition, this decline in r^b translates into a lower loan rate r^c . In other words, the higher the anticipated likelihood of government intervention, the lower the cost of credit in the economy.

Optimal bail-in regulation. If regulation mandates banks to hold just enough bail-in bonds—in addition to their fixed amount of equity—to ensure that deposits are safe even in the absence of a bailout, it sets α such that Assumption 2 holds with equality. In this case, $r^{bi} = -1$. Setting a regulatory α beyond this point is inconsequential for the banks and the entrepreneurs (see Corollary 1), nor does it affect the investors' expected returns since $\bar{r}^b = r_s$. As we will show in the next section, it does not affect the (expected) tax burden from bailout either.

4 Bailout: Fiscal Burden and Policy Motives

4.1 Tax burden in the event of a bailout

We next examine the tax burden caused by a government bailout. Consider the case where the bad state of the world is realized, entrepreneurs default, and banks are bailed out by the government. The amount required to bail out the banks including their bail-in bond holders is given by

$$N = D(1 + r_s) + B(1 + r^b) - L_E q^l(w + I) - A(1 + r_s), \quad (14)$$

which is positive under Assumption 1. In equilibrium, $D - A = IL_E - E_1 - B$, so we obtain

$$\begin{aligned} N &= (D - A)(1 + r_s) + B(1 + r^b) - L_E q^l(w + I) \\ &= L_E \left(\left(I - \frac{E_1}{L_E} \right) (1 + r_s) - q^l(w + I) \right) + B(r^b - r_s). \end{aligned} \quad (15)$$

The initial bankers' equity E_1 is wiped out.

Using the relation $B = \alpha L_E$ and Equation (11), we can also express the tax burden as $N = B(r^b - r^{bi})$. This expression highlights that the tax burden arises because regulatory authorities choose not to impose losses on bail-in bond holders by converting their bonds into equity. Such a conversion would avert the need for a bailout by reducing bail-in bond holders' returns from r^b to r^{bi} . However, by choosing to shield bail-in bond holders from these losses, the authorities effectively shift the burden of these losses onto taxpayers.

In the hypothetical case that banks would not have to issue bail-in bonds, their aggregate balance sheet identity would be given by

$$IL_E + A = D' + E_1, \quad (16)$$

where D' denotes the amount of deposits. We note that $D' = D + B$. In the bad state, the amount required to bail out the banking sector would then be given by

$$\begin{aligned} N' &= D'(1 + r_s) - A(1 + r_s) - q^l L_E(w + I) \\ &= L_E \left(\left(I - \frac{E_1}{L_E} \right) (1 + r_s) - q^l(w + I) \right). \end{aligned} \quad (17)$$

Comparing the tax burdens N and N' in the event of a bailout, we obtain

$$N - N' = B(r^b - r_s), \quad (18)$$

which is positive since $r^b > r_s$, for $p_R < 1$. Thus, the issuance of bail-in bonds leads to a higher tax burden if the bad state materializes and the bail-in bond holders are not actually bailed in but the bank is bailed out instead.

4.2 Expected tax burden

We next show that from an *ex-ante* perspective, bail-in bonds are still beneficial since they *reduce* the expected tax burden.

When banks issue bail-in bonds, the expected tax burden from governmental interventions is given by

$$\begin{aligned}\mathbb{E}(N) &= (1-p)p_R N \\ &= (1-p)p_R [(IL_E - E_1)(1+r_s) - L_E q^l(w+I) + B(r^b - r_s)],\end{aligned}\quad (19)$$

where we note that bailout happens if the bad state of the world materializes *and* bail-in bond holders are not actually bailed in.

If banks would issue uncontingent debt contracts only, the expected tax burden would be given by

$$\begin{aligned}\mathbb{E}(N') &= (1-p)N' \\ &= (1-p)[(IL_E - E_1)(1+r_s) - L_E q^l(w+I)],\end{aligned}\quad (20)$$

where we note that now the banks would always have to be bailed out in the bad state of the world.

Comparing the expected tax burden in both cases, we obtain

$$\mathbb{E}(N - N') = (1-p)\{p_R B(r^b - r_s) - (1-p_R)[(IL_E - E_1)(1+r_s) - L_E q^l(w+I)]\}. \quad (21)$$

We immediately see that, for a bailout probability of $p_R = 0$, Assumption 1 ensures that Expression (21) is negative, meaning the expected tax burden is lower when banks issue bail-inable debt. At the opposite extreme, for $p_R = 1$, one might initially expect the expression to be positive, suggesting that the sign of Expression (21) could vary with the bailout probability. However, this is not the case: when $p_R = 1$, we have $r^b = r_s$, which renders Expression (21) exactly zero. In fact, we can show that Expression (21) is negative for all $p_R < 1$, and thus state

Theorem 1 (Bail-in bonds and tax burden)

The issuance of bail-in bonds reduces the expected tax burden ex-ante but increases the tax

burden ex-post in the event of a bailout.

The proof is in the appendix. Theorem 1 supports the basic rationale for regulatory bail-in regimes by showing that, in expectation, such regimes are beneficial—even if individual cases, like that of Credit Suisse, might seem to suggest otherwise. The reason is that while the issuance of bail-in bonds makes bailout more costly, it also decreases the probability that bailout is necessary in the first place; and this latter effect always dominates the former.

Following up on these findings, we can state

Corollary 2

Let Assumptions 1–2 hold. Then,

- (i) $\frac{dN}{dp_R} = \frac{d(N-N')}{dp_R} < 0$, $\frac{d\mathbb{E}(N)}{dp_R} = \frac{d\mathbb{E}(N-N')}{dp_R} > 0$;
- (ii) $\frac{dN}{d\alpha} = \frac{d(N-N')}{d\alpha} = \frac{d\mathbb{E}(N)}{d\alpha} = \frac{d\mathbb{E}(N-N')}{d\alpha} = 0$.

The proof is in the appendix. Intuitively, a lower bailout probability p_R implies higher realized costs N in the event a bailout does occur. This is because a lower p_R increases the risk premium required by investors, thereby raising the interest rate r^b on bail-in bonds. If these bonds are ultimately bailed out, the higher interest payments result in greater fiscal costs for the public sector.

However, when considering the *ex-ante* expected bailout costs, the relationship reverses. While a lower p_R indeed increases the cost *conditional* on a bailout, it simultaneously reduces the *likelihood* of such an event. The corollary establishes that this latter effect dominates: strengthening the credibility and commitment to bail-in, by reducing p_R , unambiguously lowers the *expected* fiscal cost of bank resolutions. This finding lends support to policies that enhance regulatory commitment to the bail-in regime.¹³

Turning to the role of the regulatory parameter α , which governs the required volume of bail-inable debt, we find two opposing effects on the (expected) tax burden. As established already in the discussion of Corollary 1, increasing α raises the extensive margin of potential costs by expanding the volume of bail-in bonds but lowers the intensive margin by reducing the equilibrium interest rate r^b . According to the second part of the corollary, these two effects exactly cancel out in equilibrium.

¹³For a more nuanced evaluation of this result, see Section 4.4.

Consequently, the aggregate volume of bail-inable debt has no impact on the overall cost of a bailout. Bailing out a larger quantity of bail-in bonds is no more expensive than bailing out a smaller one, as the required risk premium adjusts accordingly. This also implies that, once α reaches the threshold at which Assumption 2 binds with equality, any further increase in bail-in requirements has no effect on the expected fiscal burden from bank rescues during a crisis.

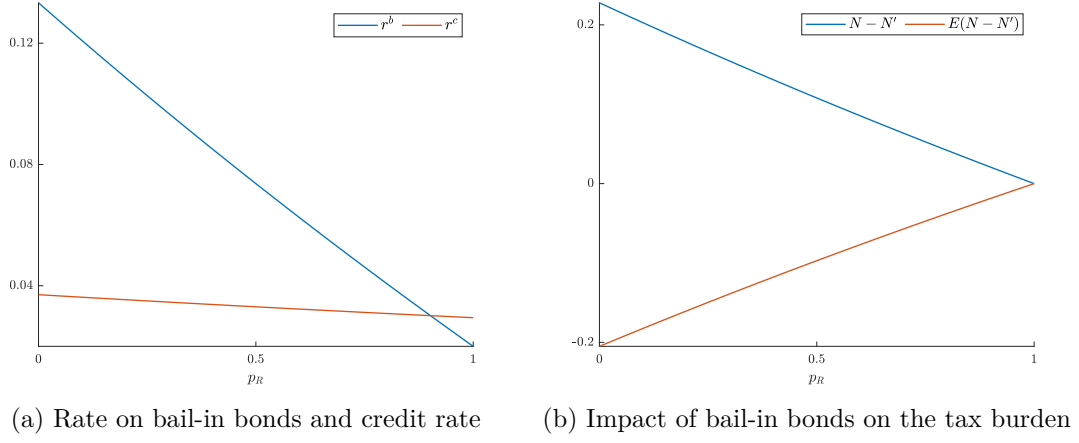
Welfare criterion. In what follows, we implicitly adopt the view that reducing the expected tax burden associated with bank rescues, by eliminating implicit government subsidies, is welfare improving. This criterion may not be immediately self-evident: investors, banks and entrepreneurs are risk-neutral, and while implicit subsidies distort the pricing of bail-in bonds, we have shown that they do not necessarily affect aggregate investment levels or the likelihood of bank default.

Nonetheless, (constrained) minimization of the expected fiscal burden from bailouts aligns with ex-ante welfare optimality for several reasons. First, although the main economic agents in our model are risk-neutral, consumers, who ultimately bear the tax burden, are risk-averse. Reducing their exposure to uncertain future taxation is therefore welfare improving. Second, taxation is typically associated with dead-weight losses and administrative costs, making its reduction a legitimate objective from an efficiency perspective. Third, relaxing our baseline assumptions—for instance, by introducing unproductive investment opportunities—reveals that the externalization of risk onto taxpayers can incentivize excessive lending and inefficient capital allocation (see Section 5.3.) Fourth, although not explicitly modeled, redistribution from ordinary taxpayers to banks and corporations is clearly undesirable from the standpoint of fairness and inequality.

4.3 Numerical example

To illustrate our model, we provide a simple numerical example. Let $w = 1$, $e = 0.5$ and $L = 100$, with $L_E = 20$, $L_B = 5$, $L_I = 15$ and $L_C = 60$. Consumers' utility function and discount factor are such that $s(r_s) = 0.3$. It follows that total bank equity is given by $E_1 = 2.5$, and $E_1/C = 0.08$. For the returns, assume $r_s = 0.02$, $q^l = 0.52$, $q^h = 1.5$, and $p = 0.9$. For regulation, assume that α is set such that Assumption 2 holds with equality,

Figure 3: Equilibrium rates and (expected) tax burden as a function of p_R



which yields $\alpha = 0.07$ and $r^{bi} = -1$. For the investment projects, assume $I = 1.5$.

Assumptions. We first verify whether this example meets our assumptions. Clearly, $q^m = 1.4 > 1.02 = 1 + r_s$. Investors have enough funds to buy the bail-in bonds: $wL_I = 15 > 2.01 = B$. Total savings in the economy exceed entrepreneurs' needs: $L_C s(r_s) + wL_I + E_1 = 35.5 > 30 = IL_E$. The shock is not too small, so that Assumption 1 is met: $q^l(w + I) = 1.3 < 1.4 = (I - E_1/L_E)(1 + r_s)$.

Equilibrium. In equilibrium, we obtain $D = 31$ and $A = 5.5$. The rate on bail-in bonds r^b and the credit rate r^c depend on the bailout probability p_R , as illustrated in Figure 3a. The credit rate is maximum for $p_R = 0$ and, in this case, equals about 0.04. One can immediately verify that the entrepreneurs' participation Constraint (6) is met for all $p_R \in (0, 1)$.

Tax burden. Figure 3b plots the differences in the (expected) tax burden when banks issue bail-in bonds compared to when they do not. Along the lines of Theorem 1, we observe $\mathbb{E}(N) - \mathbb{E}(N') < 0$, but $N - N' > 0$. For a bailout probability $p_R = 1$, bail-in bonds earn the risk-free rate of return, so their effect on the difference in the (expected) tax burden is zero. As established in Corollary 2, we also observe that a higher probability for bail-in, i.e., a lower p_R , decreases the ex-ante expected tax burden but increases that burden in the event of a bailout, thereby illustrating the fundamental dilemma of bail-in instruments.

4.4 Bailout decision

Having illustrated the fundamental dilemma of bail-inable debt, we will turn to potential approaches for mitigating it in the following section. First, however, it is essential to understand *why* a bailout may still occur, even within a bail-in regime.

In our model, the probability of a bailout, denoted by p_R , is treated as an exogenous parameter. We intentionally abstracted from modeling its determinants in detail, focusing instead on the consequences of bail-in uncertainty for debt pricing, bank incentives and the distribution of crisis-related costs. In this section, we aim to unpack the underlying sources of that uncertainty and provide a rationale for treating it as exogenous within the context of our framework.

Consider the moment when a bank is on the brink of collapse and regulatory authorities must choose between activating the bail-in mechanism or pursuing a bailout. At this critical juncture, we can distinguish two broad categories of motivations that may lead to the decision to bail out rather than bail in. Under the first category, the decision to bail out is driven by a pragmatic assessment of the situation: given the specific circumstances, a bailout is viewed as the lesser evil. Under the second category, bailout is chosen despite being the inferior option from a social welfare perspective, perhaps due to short-term political incentives, regulatory capture, or pressure from foreign governments or powerful stakeholders.

Bailout as the least bad option. As mentioned in the introduction, bailout may be preferable to bail-in if the risks associated with bail-in are excessive. These risks include operational challenges and legal risks and complexities (see, e.g., Hadjiemmanuil, 2024), location risk, potential financial losses, and coordination problems across international jurisdictions, as well as the critically important issue of contagion risks. The legal risks became particularly evident after the Swiss Federal Administrative Court’s October 2025 ruling, which held that FINMA’s decree ordering the wipeout of Credit Suisse’s AT1 bonds lacked a sufficient legal basis and revoked it, subject to appeal. The systemic effects and contagion risks linked to bail-in mechanisms have been studied, for example, by Hüser et al. (2018). For a broader review of the literature on contagion in financial networks, see Glasserman and Young (2016).

Gersbach (2023a) identifies the specific pitfalls of bail-in bonds, in particular their conta-

gion risks, in the context of the Credit Suisse collapse. In short, contagion could have taken place through three primary channels. First, institutional holders of bail-in bonds, such as pension funds and other banks, might face significant financial distress if these bonds were converted to equity. The tradability of bail-in bonds on secondary markets exacerbates this uncertainty, as neither the issuing bank nor regulatory authorities can precisely identify the current bondholders.

Second, a bail-in for a globally systemically important bank like Credit Suisse has never occurred before. This lack of precedent means that if such a bail-in were to take place, it could prompt investors to reassess the risk associated with bail-in bonds. Consequently, investors might demand higher risk premia, thereby increasing banks' funding costs. Lastly, a major bank failure could trigger widespread market fear and uncertainty, leading to further instability and upheavals in the financial sector.

Within the framework of our model, such a contagion scenario can be captured as follows: after a negative shock hits the economy, with probability p_R the global financial system turns out fragile and vulnerable to contagion. If, as suggested by the literature, a bail-in at a major international bank could exacerbate this fragility, and if resulting contagion would entail prohibitively high costs, then a bailout emerges as the socially optimal policy response.

In this scenario, the uncertainty surrounding the bailout decision remains exogenous, as the fragility of the global financial system in response to a bail-in is taken as given. One may challenge this assumption, arguing that such fragility could be anticipated and mitigated through effective regulatory measures and coordinated pre-crisis planning across jurisdictions, reducing the need for bailout as an optimal response. Still, from the perspective of a small country like Switzerland, whose banking sector constitutes only a minor share of the global system, it is arguably reasonable to treat systemic fragility as at least partially exogenous.

That said, this does not preclude a discussion of how and to what effect the credibility and effectiveness of the bail-in mechanism could be improved. Should the international community succeed in implementing enhanced cooperation and coordinated reforms (such as those outlined in Section 5.2), our framework is well suited for a comparative statics analysis of their implications for bank behavior, the pricing of bail-in bonds and the expected fiscal burden of bank resolutions.

Inefficient bailout. Aside from justified concerns related to bail-in, regulatory authorities may also opt for a bailout although it is inefficient. Possible reasons for such decision-making are external pressures, agency problems, or political economy distortions.

This scenario, too, can be captured within the logic of our model. Suppose that, in times of banking sector distress, bail-in bondholders—typically large institutional investors such as pension funds or insurance companies—begin lobbying policymakers to avert a bail-in. With probability p_R , this lobbying effort succeeds. In this case, the private interests of influential actors may override the broader public interest, resulting in a bailout that is socially inefficient and ultimately shifts the financial burden onto taxpayers.

Since our focus lies on the functioning of the bail-in mechanism and the implications of the uncertainty that surrounds it, rather than on the intricacies of political games or optimal contract design, it seems justifiable to treat bailout uncertainty as exogenous in this context as well. Nonetheless, recognizing the potential for politically motivated bailouts offers an important complementary perspective to the economic analysis developed above.

Impact on our model. For the majority of the findings derived from our model, the specific motivation underlying the bailout probability p_R is irrelevant.

The key exception is Corollary 2(*i*), which implicitly assumes that a decrease in p_R does not generate situations with bail-in instead of bailout although bail-in comes with additional risks. Relating to our explanation above, this requires that a decrease in p_R and thus a higher likelihood for bail-in, either stems from a reduction of distortions in political decision-making or reflects an actual decrease in the underlying risks associated with bail-in. This insight is also important for the question of how to address the issues associated with bail-inable debt, which we discuss next.

5 Alleviating the Credit Suisse Dilemma

The preceding analysis has laid out both the inherent dilemma of bail-inable debt and the policy considerations that may still warrant bailouts. We now shift from diagnosis to remedy by examining potential policy measures aimed at strengthening the resilience of the banking system and reducing the fiscal costs associated with bank rescues.

We examine three fundamental options: (1) Abolishing bail-in requirements; (2) Making

bail-in processes more credible; and (3) Replacing bail-in rules with stricter common equity requirements.

5.1 Option (1): Abolishing bail-in requirements

Unsurprisingly, our analysis shows that this option is largely undesirable. While getting rid of bail-in instruments may preserve taxpayers from bearing additional costs if banks are bailed out in a crisis and bail-in bonds are not converted into equity, it would increase the ex-ante expected tax burden from government interventions during banking crises (see Theorem 1). Thus, simply removing bail-in requirements without providing an alternative would lead to higher average bank resolution costs for the public sector.

5.2 Option (2): More credible bail-in processes

Strengthening the credibility of bail-in has the potential to significantly reduce the expected taxpayer burden from bank rescues, as indicated by Corollary 2(*i*) and Figure 3b. However, several important issues must be considered. First, as investors perceive a reduced likelihood of bailout, they will demand a higher premium on bail-in bonds. This, in turn, increases the cost of bailouts in the rare extreme cases when they still occur, exacerbating the underlying dilemma of bail-inable debt by making these interventions even more expensive. In this regard, we note that it is impossible to commit fully to a bail-in strategy: during periods of extreme stress, the political authorities can always find justifications to override these mechanisms.

Additionally, the approach taken to establish bail-in credibility plays an important role. For instance, attempts to solely limit regulatory discretion, e.g. by implementing mechanical bail-in trigger rules, based on pre-defined indices or events, can be a double-edged sword. While such rules may help prevent socially inefficient decisions against bail-ins—often driven by political economy issues such as lobbying from special interest groups—an inflexible commitment to these triggers could have unintended consequences, potentially activating bail-ins even in circumstances that could lead to financial contagion and systemic crisis.

A truly credible and effective bail-in framework must therefore address the underlying risks associated with bail-ins. As discussed earlier, these risks include contagion and systemic

effects, operational challenges, legal risks and complexities, and significant difficulties in coordinating and cooperating across jurisdictions. In addition to reforms at the national level, mitigating these risks requires a concerted effort to enhance international collaboration. An assessment of potential measures to support this goal is provided in the Swiss Federal Council’s (2024) report on banking stability. Building on these measures, we further propose the establishment of pre-planned central bank coordination mechanisms.

Pre-planned coordination of central bank actions. We suggest that coordinated efforts among supervisory authorities be complemented by pre-planned alignment of central bank actions across relevant jurisdictions. Specifically, in the event of a bail-in at a major international bank, the central banks of the affected currency regions should be prepared to respond swiftly and collaboratively to mitigate systemic risks and prevent contagion. One effective measure could be to ensure that emergency liquidity assistance (ELA) is available to both banks and nonbank financial institutions (NBFIs) that are impacted by the bail-in.

A way to implement this ELA framework could be for central banks to classify the affected bail-in instruments as eligible collateral in repo transactions or within discount window operations. If central banks prefer to limit discount window access to banks and not extend it to NBFIs, they could instead incentivize banks to intermediate central bank liquidity to NBFIs. Such an approach could entail providing ELA against affected bail-in instruments without imposing the typical interest rate penalty associated with ELA, thus making it accessible without punitive costs.

More broadly, the ELA framework must be designed to avoid adverse signaling effects. If market participants perceive the use of ELA as an indicator of severe distress, affected institutions may refrain from accessing it even when liquidity support is necessary—undermining the very objective of the facility. To address this, central banks should consider pre-announcing standardized conditions for ELA use in systemic scenarios, thereby normalizing its role as a stabilizing instrument rather than a last-resort signal of failure.

If carefully implemented and credibly communicated, the described measures could substantially mitigate the risk that a bail-in at a major international bank sets off a domino effect and triggers a broader financial crisis. Absent such provisions, financial institutions with direct or indirect exposure to bailed-in instruments may face sudden liquidity shortfalls, prompting fire sales of assets and an increased risk of runs. Through proactive coordination,

central banks can play a pivotal role in maintaining financial stability in the wake of a bail-in. Such preparedness would not only mitigate systemic risk but also enhance the credibility and effectiveness of the bail-in resolution framework.

5.3 Option (3): Substituting bail-in bonds for equity capital

Requiring banks to partially replace bail-in bonds with higher levels of common equity appears to be one of the most direct and effective strategies to bolster the resilience of the banking system. This approach becomes especially relevant if meaningful reforms of the bail-in framework, as discussed above, prove unachievable.¹⁴ Common equity offers the significant advantage of automatically absorbing losses, thus largely avoiding the uncertainties, risks and coordination requirements associated with bail-in processes.

A substantial body of research has stressed that capital requirements increase the resilience of both individual financial institutions and the banking system as a whole, while helping to smooth out credit cycles (Gersbach and Rochet, 2017). However, there is also evidence to suggest that increased capital requirements could constrain credit supply and capital formation, at least in the short-term (e.g., Fraise et al., 2019). Additionally, such measures could incentivize regulatory arbitrage, both across countries and between traditional banks and NBFIs.¹⁵

The banking industry frequently emphasizes these concerns, arguing that acquiring additional equity capital is significantly more costly and difficult than issuing bail-inable debt. However, our findings indicate that this cost discrepancy could be at least partly due to the fact that bail-in instruments are underpriced. Investors factor in the possibility of government bailouts, which distorts the true cost of bail-inable debt. For our numerical example, Figure 3a suggests that bail-in bonds are indeed a relatively inexpensive source of funding when investors believe there is a low probability they will be triggered in a crisis: the rate r^b on bail-in bonds is just 4% when the bailout probability p_R is 80%. However, if investors assume these bonds will be triggered during a crisis, the cost of bail-inable debt increases significantly: $r^b = 12\%$ when p_R drops to 20%. Therefore, bail-inable debt may only appear

¹⁴The necessary coordination and cooperation across jurisdictions would likely require countries to relinquish some of their sovereign crisis-management powers to either a supranational authority or another jurisdiction.

¹⁵See Ongena and Nistor (2024) for a recent review of the empirical literature.

cheap because part of the associated risk is effectively offloaded onto society.

This view is shared by a range of scholars who offer further arguments in favor of stronger capital regulation (e.g., Admati et al., 2014; Thakor, 2018; Bahaj and Malherbe, 2020; De Nicoló et al., 2021; Admati and Hellwig, 2024). They contend that, with a sufficiently long transition period, the costs of tightening capital regulation would be manageable at current equity levels. Moreover, such measures would ultimately yield substantial long-term social benefits by reducing the banking sector’s vulnerability to crises and enhancing overall stability. A review of the literature by the Basel Committee on Banking Supervision (2019) largely concurs, concluding that the optimal level of capital requirements is “likely either similar or higher than was originally estimated by the Basel Committee” (p. 1).

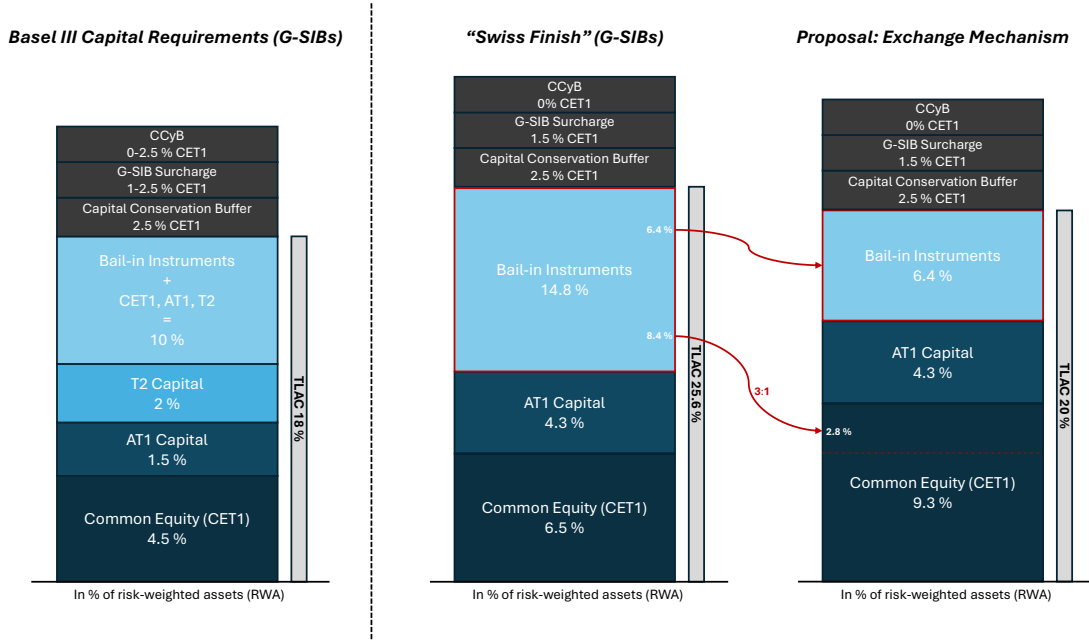
Exchange mechanism. If bail-in mechanisms fail to work as intended and meaningful reform is unlikely, while higher equity capital requirements could significantly strengthen the banking system, it is reasonable to consider substituting one for the other. However, a complete replacement of bail-in bonds with common equity may be overly drastic, likely to encounter fierce opposition, and raises legitimate concerns about potential negative side effects. To address these challenges, we propose a novel exchange mechanism as a balanced alternative.

Under this approach, banks would substitute bail-in bonds for higher common equity levels based on a pre-determined exchange ratio. Given that common equity serves as a more robust buffer than bail-inable debt, banks could be allowed to replace bail-in bonds with equity at a ratio below one—for instance, 1/2 or 1/3 units of additional equity for every unit reduction in bail-in bonds.

Figure 4 illustrates this idea in the context of a G-SIB in Switzerland, where UBS remains the sole G-SIB. As shown in the figure, Switzerland’s current national bank capital requirements, known as the “Swiss Finish”, are stricter than those mandated under Basel III. This provides regulatory leeway to allow banks to substitute bail-in bonds for common equity at a ratio below one. The figure demonstrates that, for example, introducing a 3:1 exchange mechanism could increase banks’ equity capital by 2.8% through a 8.4% reduction in bail-in bonds, while still exceeding Basel III’s total loss absorbing capital (TLAC) requirements by 2%.¹⁶

¹⁶We note that any unilateral changes to national banking regulations must carefully consider their poten-

Figure 4: Proposal for an exchange mechanism between bail-in bonds and common equity



Note: We report the base CET1 requirement for a G-SIB under the "Swiss Finish" as 6.5%. This differs from the 10.5% (formerly 10%) reported by the Swiss banking regulator FINMA because their figure already includes both the 2.5% capital conservation buffer and 1.5% (formerly 1%) G-SIB surcharge. To ensure comparability with Basel III's capital requirements, we address these components separately.

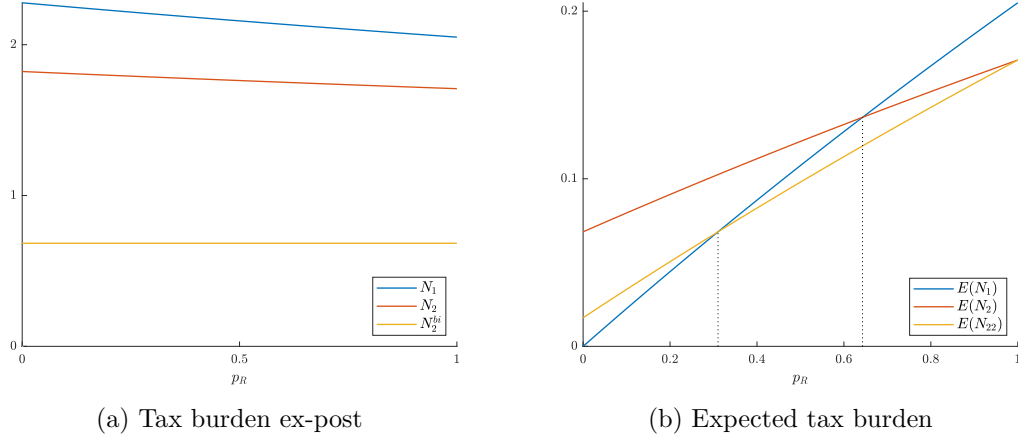
Note: The base CET1 figure of 6.5% in the "Swiss Finish" includes the Swiss sectoral countercyclical capital buffer (SCCyB), but excludes any bank-specific Pillar 2 surcharges.

Note: FINMA sets the TLAC requirement for a Swiss G-SIB as 29.6% (formerly 28.6%), which includes the capital conservation buffer and the G-SIB surcharge. For consistency with Basel III's TLAC framework, which sets a minimum of 18% but excludes such buffers, we also exclude them from our TLAC calculation to maintain comparability between the two approaches.

Effect on the tax burden. We now evaluate this proposal using our simple model. Suppose that any equity capital in addition to the banks' initial amount E_1 is provided by the (sophisticated) investors. Indexing our variables before and after the introduction of the exchange mechanism by $\tau \in \{1, 2\}$, investors become invested in bank equity in the amount $E_2 - E_1$, in bail-in bonds in the amount B_2 and, together with consumers, in deposits in the amount $D_2 = L_I w - B_2 - (E_2 - E_1) + L_C s$. Investing in bank equity capital is incentive-compatible for the investors, as they are risk-neutral and the equilibrium expected return on bank equity equals the returns on bail-in bonds, deposits, and safe assets.

tial impact on regulatory arbitrage and banks' competitiveness in the international arena. If a single country independently tightens its regulatory requirements, it may lose its position as a host for major international banks.

Figure 5: Impact of the exchange mechanism on the tax burden as a function of p_R



As an example, assume banks replace half of their initial bail-in bonds with equity capital at a 3:1 ratio. Maintaining the parameter values from the numerical example in Section 4.3, we obtain $B_1 = 2.01$, $B_2 = 1.005$ and $E_1 = 2.5$, $E_2 = 2.835$. Figure 5 plots the (expected) tax burden before and after banks use the exchange mechanism, as a function of the bailout probability p_R .

As expected, Figure 5a shows that the tax burden in the event of a bailout decreases: $N_2 < N_1$. However, because the total amount of loss absorbing capital (equity + bail-in bonds) is reduced, leaving it insufficient to cover all losses in the bad state of the world, some additional taxpayer funds are now required to bail out the depositors even in the event of a bail-in: $N_2^{bi} > N_1^{bi} = 0$. The overall effect on the expected tax burden depends on the level of p_R , as illustrated in Figure 5b. For higher values of p_R , the first effect dominates, leading to $\mathbb{E}(N_2) < \mathbb{E}(N_1)$; for lower values of p_R , the second effect becomes more significant, and $\mathbb{E}(N_2) > \mathbb{E}(N_1)$.¹⁷

These findings suggest that substituting bail-in bonds for equity capital at a ratio significantly below 1 benefits taxpayers only when bail-in credibility is low—an assumption that arguably aligns with current real-world conditions. The most promising approach to reducing the public burden of bank rescues, however, is to pair the introduction of an exchange

¹⁷We will later provide a formal expression for the threshold conversion ratio (as a function of p_R), which separates conversion ratios into those below the threshold—where the expected tax burden decreases relative to the baseline—and those above it—where the expected tax burden increases. Notably, the exchange mechanism always reduces the variability of the realized tax burden across the possible states of the world.

mechanism with a focus on enhancing bail-in credibility, as discussed in Option (2).

By strengthening the credibility and effectiveness of the bail-in process (reflected by a reduction in the value of p_R), the expected tax burden decreases along the $\mathbb{E}(N_1)$ -curve in Figure 5b. Introducing an exchange mechanism provides additional advantages if the conversion rate is appropriately calibrated. This is exemplified by the expected tax burden $\mathbb{E}(N_{22})$, which results if banks substitute 1/4 of their bail-in bonds for equity at a 3:2 conversion rate. For instance, if p_R can be reduced from 0.8 to 0.4, the immediate effect is a lowered expected tax burden along the $\mathbb{E}(N_1)$ -curve. By subsequently implementing the 3:2 exchange mechanism, we transition to the $\mathbb{E}(N_{22})$ -curve, further decreasing the expected tax burden.¹⁸

Voluntary vs. mandatory exchange mechanism. An open question remains as to whether banks could be offered such an exchange mechanism on a voluntary basis or whether it should be mandatory. To address this question within our model, we examine the incentives banks face when considering replacing a fraction μ of their initial bail-in bonds B_1 with equity capital, at a pre-determined conversion ratio of $x : 1$ ($x > 1$).

If participation in the mechanism is voluntary, the decision to engage, and to what extent, rests with the initial equity holders of the bank, who will weigh the expected returns on equity under both the status quo and after participation in the exchange mechanism. Assuming Assumption 2 holds with equality prior to the introduction of the exchange mechanism, it follows directly that, with the exchange mechanism in place, the bad-state returns on both bail-in bonds and bank equity remain equal to -1 .

When deciding whether to utilize the exchange mechanism, banks take the interest rates r^c , r^b as given and evaluate their equity returns r_τ^e in the good state of the world, given by

$$r_\tau^e = \frac{(1 + r^c)IL_E + (1 + r_s)(A - D_\tau) - (1 + r^b)B_\tau}{E_\tau} - 1, \quad (22)$$

with

$$B_2 = (1 - \mu)B_1, \quad E_2 = E_1 + \frac{1}{x}\mu B_1, \quad D_2 = D_1 - (E_2 - E_1) + (B_1 - B_2), \quad (23)$$

¹⁸One could further argue that partially replacing bail-inable debt with common equity may indirectly strengthen the credibility of the remaining bail-in instruments. In that sense, our results on the benefits of the proposed exchange mechanism may in fact represent a conservative estimate.

where we can use aggregate variables to characterize an individual bank's decision-making problem since all banks are symmetric. We obtain

Proposition 2

Banks are incentivized to use the exchange mechanism between bail-in bonds and equity capital only if it enables them to offload more risk onto society:

$$r_2^e > r_1^e \iff \mathbb{E}(N_2) > \mathbb{E}(N_1).$$

The proof is in the appendix. Proposition 2 states that allowing voluntary access to the exchange mechanism cannot reduce the expected tax burden; if anything, it may increase it. Relating to Figure 5b, banks are incentivized to use the mechanism only when p_R falls within the range where $\mathbb{E}(N_2) > \mathbb{E}(N_1)$ (or $\mathbb{E}(N_{22}) > \mathbb{E}(N_1)$, depending on the conversion ratio x).

Intuitively, banks prefer to replace bail-in bonds with common equity only when the bailout probability is low; in such cases, bail-in bonds are costly because little of their risk is offloaded onto society. Conversely, when the bailout probability is high, resulting in lower rates on bail-in bonds, banks have little incentive to replace them with costly equity capital. These findings indicate that to effectively reduce the expected tax burden from government-backed bank rescues, the exchange mechanism would need to be mandatory.¹⁹

Conversion threshold. Drawing on the proof of Proposition 2, we can also derive the threshold value $\tilde{x}$ for the conversion ratio x , below which the introduction of the exchange mechanism guarantees a reduction in the expected fiscal burden from bank rescues:

Corollary 3

The exchange mechanism reduces the expected tax burden, i.e., $\mathbb{E}(N_2) < \mathbb{E}(N_1)$, iff:

$$x < \tilde{x}, \quad \text{where} \quad \tilde{x} := 1 + \frac{p_R}{p(1 - p_R)}. \quad (24)$$

¹⁹Beyond the scope of our simple model, banks could also have additional incentives to participate in a voluntary exchange mechanism, even when the perceived bailout probability p_R is relatively high. These incentives might include reputational advantages or signaling motives, which could help distinguish them from other banks. If these factors are significant, it could be practical to initially implement the exchange mechanism on a voluntary basis to observe its adaption and effectiveness before considering a mandatory approach.

By contrast, an exchange mechanism with $x > \tilde{x}$ would prove counterproductive, as it would lead to an increase in the expected tax burden.

Notably, the threshold value $\tilde{x}$ is independent of both μ and the absolute volume of bail-in bonds. It increases with the bailout probability p_R , which is consistent with the earlier intuition: allowing banks to substantially reduce bail-in debt in exchange for only modest increases in equity is only advantageous when the credibility of bail-in is low. This again highlights the interdependence between the two key policy levers discussed—enhancing bail-in credibility and substituting bail-in bonds with equity.

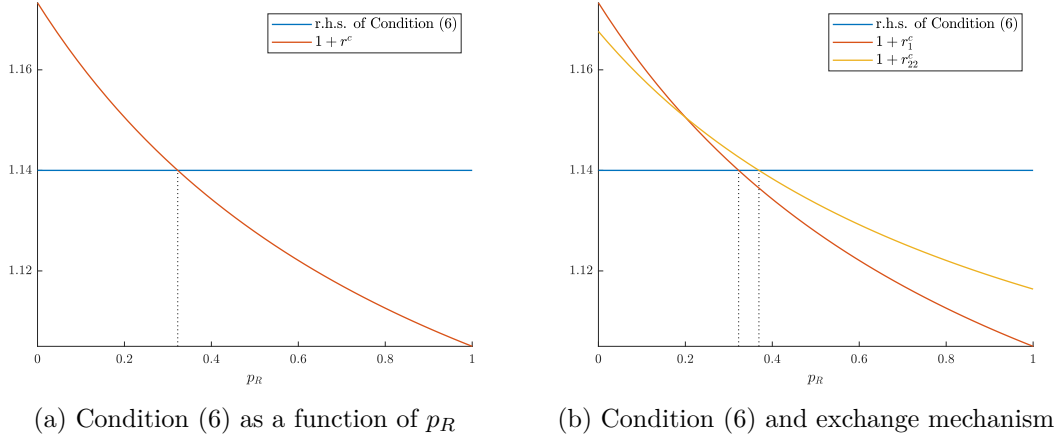
Impact on lending and investment. Requiring banks to participate in the exchange mechanism, when they would opt against it voluntarily, increases banks' funding costs. Strengthening bail-in credibility has a similar effect. For intermediation to remain profitable for banks, the equilibrium loan rate r^c must rise. Potentially, this increase could invalidate the entrepreneurs' participation Constraint (6), leading to a collapse in real investment.

Our findings alleviate this concern. As shown in the proof of Proposition 1, the entrepreneurs' participation constraint always holds. This includes the case of $p_R = 0$, where banks' funding costs, and consequently the credit rate, are at their maximum, due to the absence of implicit government subsidies. However, this result depends crucially on the productivity assumption for the entrepreneurs' investment projects, specifically $q^m > 1 + r_s$. If this condition is violated, an increase in r^c from either heightened bail-in credibility or a mandatory exchange mechanism could indeed reduce real investment, as illustrated in the following example.

Unproductive investments. Consider the same parameter values as in the numerical example of Section 4.3, except that now $p = 0.5$. Under these conditions, $q^m = 1.01 < 1.02 = 1 + r_s$, meaning that the entrepreneurs' investment projects are unproductive on average. Figure 6a plots the entrepreneurs' participation Constraint (6) as a function of the bailout probability p_R . The participation constraint holds for high levels of p_R but is violated at lower values.

This suggests that strengthening the credibility of the bail-in process, which results in higher bank funding costs and a higher credit rate r^c , may lead to a collapse in entrepreneurial investment. Similarly, Figure 6b illustrates that introducing a mandatory exchange mech-

Figure 6: Entrepreneurs' participation constraint for $q^m < 1 + r_s$



anism could further undermine the entrepreneurs' participation constraint. In this specific example, such a mechanism would invalidate the constraint for p_R values around 0.35.

It is crucial to recognize that entrepreneurs opting out of financing these projects is ultimately beneficial, because projects for which $q^m < 1 + r_s$ are socially inefficient. Despite low average productivity, entrepreneurs may initially be inclined to pursue these projects due to limited liability protection and artificially low credit rates, which banks are able to offer because implicit state guarantees allow them to shift part of the financing risks onto the public. Consequently, any decline in real investment resulting from credit rates that more accurately reflect the underlying risks promotes a more efficient allocation of capital, thereby enhancing economic efficiency.

Heterogeneous investment projects. We further emphasize that if there is heterogeneity among entrepreneurs, with some able to access “good” projects and others “bad” projects, credit rates that fully internalize project risks would naturally eliminate only the inefficient projects while preserving the viable ones. As a result, we would observe a decline solely in *inefficient* real investment, while productive projects would continue to receive financing.

Taken together, these insights suggest that replacing (unreliable) bail-in arrangements with higher levels of common equity could yield twofold benefits: it would not only reduce the expected fiscal cost of bank failures, but also mitigate distortions that encourage the financing of projects with negative expected net present value.

This result echoes concerns from the CoCo literature, where the issuance of CoCo debt may induce excessive risk-taking by banks, since, depending on their design, CoCo activation can benefit bank owners (i.e., shareholders) through a write-down of liabilities when distress occurs (see Hilscher and Raviv, 2014; Berg and Kaserer, 2015; Fatouh et al., 2022). Our mechanism differs, however: bail-in merely reallocates losses at default between creditors and taxpayers, with shareholders being fully wiped out in any case. In our setting, inefficiency arises not from distorted shareholder incentives, but from the mispricing of bail-in bonds caused by implicit government guarantees.

6 Conclusion

We explore the implications of bail-in bonds, particularly in light of the Credit Suisse collapse. Our analysis reveals a fundamental dilemma: while bail-in bonds aim to reduce the tax burden associated with bank rescues by imposing losses on bond holders instead of taxpayers, they can unintentionally *increase* the costs of a bailout if one ultimately occurs.

Our findings show that, despite these drawbacks, bail-in bonds *reduce* the *ex-ante* expected tax burden of government-sponsored bank bailouts. This reduction arises because bail-in instruments decrease the probability of a bailout being necessary, and this effect dominates the higher ex-post costs should a bailout still be required. Thus, our model affirms the fundamental rationale for implementing bail-in regulation as a tool for protecting taxpayers' money, despite the limitations revealed in the specific case of Credit Suisse.

We contribute to the ongoing debate on how to address the issues associated with bail-inable debt in two main ways. First, we show how enhancing the credibility of bail-in mechanisms can reduce the expected tax burden, and we outline possible steps to build this credibility. Second, we propose a novel regulatory exchange mechanism whereby banks would gradually substitute bail-in bonds with higher levels of common equity, at a pre-determined conversion ratio. Since common equity automatically absorbs losses, this shift could mitigate the adverse effects of regulatory discretion regarding government bailouts in a banking crisis. In particular, it would reduce distortions in banks' funding costs caused by implicit government subsidies on bail-in bonds, thereby eliminating incentives to finance even ex-ante inefficient investment projects.

Several extensions to our current analysis could provide further insight. For instance, endogenizing the authorities' bailout decision would allow us to shift the perspective from a small open economy like Switzerland to a major global financial player such as the United States. Introducing market power for banks and allowing them to issue outside equity could yield a richer assessment of the proposed exchange mechanism. Finally, incorporating investor risk-aversion and introducing a third state of the world, where a moderate negative shock could be absorbed solely by the banks' equity capital, could yield additional insights into the optimal design of regulatory bail-in mechanisms.

A Proofs

Proof of Lemma 1

We first show $r^{bi} < r_s$. By Equation (11),

$$\begin{aligned} \frac{q^l(w + I)L_E + (1 + r_s)[E_1 - (1 - \alpha)IL_E]}{\alpha IL_E} &< 1 + r_s; \\ q^l(w + I) &< (1 + r_s) \left(\alpha I - \frac{E_1}{L_E} \right) + (1 + r_s)(1 - \alpha)I; \\ q^l(w + I) &< (1 + r_s) \left(I - \frac{E_1}{L_E} \right), \end{aligned}$$

which holds by Assumption 1.

Next, we show that $dr^{bi}/d\alpha > 0$. By Equation (11),

$$\begin{aligned} \frac{dr^{bi}}{d\alpha} &= \frac{(1 + r_s)IL_E}{\alpha IL_E} - \frac{q^l(w + I)L_E + (1 + r_s)[E_1 - (1 - \alpha)IL_E]}{(\alpha IL_E)^2} IL_E > 0; \\ (1 + r_s)(\alpha IL_E - E_1) - [q^l(w + I)L_E - (1 + r_s)(1 - \alpha)IL_E] &> 0; \\ (1 + r_s)IL_E - (1 + r_s)E_1 - q^l(w + I)L_E &> 0. \end{aligned} \quad (\text{A.1})$$

Making use of Assumption 1, a sufficient condition for Condition (A.1) is

$$(1 + r_s)IL_E - (1 + r_s)E_1 - \left(I - \frac{E_1}{L_E} \right) (1 + r_s)L_E \geq 0,$$

which holds since the l.h.s. equals zero. Since $r^{bi} < r_s$, it is clear from Equation (10) that for all $p_R < 1$, r^b must be greater than r_s . It is also obvious that r^b is strictly decreasing in p_R , with $r^b = r_s$ for $p_R = 1$. From $dr^{bi}/d\alpha > 0$ follows $dr^b/d\alpha < 0$. $\square$

Proof of Proposition 1 and Corollary 1

We show that the entrepreneurs' participation Constraint (6) holds at the equilibrium loan rate r^c . For the proof, we first determine the values of p_R and α for which the equilibrium loan rate r^c is maximum. Then we show that, at these values, r^c meets Condition (6). It follows that r^c meets Condition (6) for all values of p_R and α .

Part 1. We first rewrite the equilibrium condition that determines r^c , that is, $\Pi^e = (1 + r_s)E_1$

with Π^e given by Equation (9). We obtain

$$\begin{aligned}(1 + r^c)IL_E + (1 + r_s)A - (1 + r_s)D - (1 + r^b)B &= \frac{E_1(1 + r_s)}{p}; \\ (1 + r^c)IL_E + (1 + r_s)(E_1 - IL_E) - (r^b - r_s)B &= \frac{E_1(1 + r_s)}{p}.\end{aligned}\tag{A.2}$$

Since r^b is decreasing in p_R , Equation (A.2) immediately implies that r^c is also decreasing in p_R . We next verify how r^c reacts to changes in α . Since $B = \alpha IL_E$, we obtain

$$\frac{d(r^b - r_s)B}{d\alpha} = (r^b - r_s)IL_E + \alpha IL_E \frac{dr^b}{d\alpha}.\tag{A.3}$$

We define $k := \frac{(1-p)(1-p_R)}{p+(1-p)p_R}$ and rewrite the equilibrium condition $\bar{r}^b = r_s$, with $\bar{r}^b$ given by Equation (10), as

$$(r^b - r_s) + k(r^{bi} - r_s) = 0.\tag{A.4}$$

Using Equation (A.4), we obtain

$$\begin{aligned}\frac{dr^b}{d\alpha} &= -k \frac{dr^{bi}}{d\alpha} \\ &= -k \left(\frac{(1 + r_s)IL_E}{\alpha IL_E} - \frac{q^l(w + I)L_E + (1 + r_s)[E_1 - (1 - \alpha)IL_E]}{\alpha^2 IL_E} \right) \\ &= -\frac{k}{\alpha} \left(1 + r_s - \frac{q^l(w + I)L_E + (1 + r_s)[E_1 - (1 - \alpha)IL_E]}{\alpha IL_E} \right) \\ &= -\frac{k}{\alpha} (1 + r_s - 1 - r^{bi}) \\ &= \frac{r_s - r^b}{\alpha}.\end{aligned}\tag{A.5}$$

Substituting Expression (A.5) into Expression (A.3) yields

$$\frac{d(r^b - r_s)B}{d\alpha} = 0$$

and thus, by Equation (A.2), $dr^c/d\alpha = 0$.

Part 2. We next fix p_R and α such that the corresponding equilibrium loan rate is maximum. From Part 1, this obtains for $p_R = 0$ and is independent of the choice for α , which we can

thus set arbitrarily. For convenience, let α be given by

$$\alpha = 1 - \frac{E_1}{IL_E} - \frac{q^l(w+I)}{(1+r_s)I}, \quad (\text{A.6})$$

i.e., Assumption 2 holds with equality. It follows that $r^{bi} = -1$, which, in turn, implies $p(1+r^b) = 1+r_s$. Denote by $\hat{r}^c$ the loan rate that applies for $p_R = 0$ and α according to Equation (A.6). From Equation (A.2) it then follows that $\hat{r}^c$ is given by

$$\begin{aligned} (1+\hat{r}^c)IL_E + (1+r_s)(A-D) - \frac{1+r_s}{p}B &= \frac{E_1(1+r_s)}{p}; \\ (1+\hat{r}^c)IL_E + (1+r_s)\left(B+E_1-IL_E-\frac{B}{p}\right) &= \frac{E_1(1+r_s)}{p}; \\ 1+\hat{r}^c &= (1+r_s)\left(1+\frac{1-p}{p}\frac{B+E_1}{IL_E}\right), \end{aligned} \quad (\text{A.7})$$

where $B = \alpha IL_E$ and α is determined by Equation (A.6). Substituting Expression (A.6) into Equation (A.7) yields

$$1+\hat{r}^c = (1+r_s)\left(1+\frac{1-p}{p}\left(1-\frac{q^l(w+I)}{(1+r_s)I}\right)\right).$$

Finally, we can show that $\hat{r}^c$ meets Condition (6):

$$\begin{aligned} (1+r_s)\left(1+\frac{1-p}{p}\left(1-\frac{q^l(w+I)}{(1+r_s)I}\right)\right) &\leq q^h\frac{w+I}{I} - (1+r_s)\frac{w}{pI}; \\ \frac{1+r_s}{p}\frac{I+w}{I} &\leq \frac{w+I}{I}\left(\frac{1-p}{p}q^l + q^h\right); \\ 1+r_s &\leq (1-p)q^l + pq^h, \end{aligned}$$

which holds because we assume $q^m > 1+r_s$. Since Condition (6) holds for $\hat{r}^c$, it holds for all loan rates that can obtain in equilibrium. $\square$

Proof of Theorem 1

First, note that from Equations (11) and (13), r^b is given by

$$r^b = \frac{r_s - (1-p)(1-p_R)r^{bi}}{p + (1-p)p_R} \quad (\text{A.8})$$

and it follows that

$$r^b - r_s = \frac{(1-p)(1-p_R)}{p + (1-p)p_R}(r_s - r^{bi}). \quad (\text{A.9})$$

We define

$$\zeta := \frac{p_R(1-p)}{p + (1-p)p_R} \quad (\text{A.10})$$

and proceed to show that $\mathbb{E}(N - N')$ is always negative. By Equations (21) and (A.9)–(A.10),

$$\begin{aligned} \frac{\mathbb{E}(N - N')}{(1-p)(1-p_R)} &= \frac{p_R B(r^b - r_s)}{1 - p_R} - [(IL_E - E_1)(1 + r_s) - L_E q^l(w + I)] \\ &= \zeta B(r_s - r^{bi}) - [(IL_E - E_1)(1 + r_s) - L_E q^l(w + I)]. \end{aligned}$$

With $B = \alpha IL_E$ and Equation (11) follows

$$\begin{aligned} \frac{\mathbb{E}(N - N')}{(1-p)(1-p_R)} &= \zeta \alpha IL_E (1 + r_s) - \zeta [q^l(w + I)L_E + (1 + r_s)(E_1 - (1 - \alpha)IL_E)] - \\ &\quad - [(IL_E - E_1)(1 + r_s) - L_E q^l(w + I)] \\ &= (\zeta - 1) [(IL_E - E_1)(1 + r_s) - L_E q^l(w + I)]. \end{aligned}$$

This expression is negative, since $\zeta \in (0, 1)$ and $[\cdot] > 0$ by Assumption 1. $\square$

Proof of Corollary 2

The second part of the corollary follows immediately from Corollary 1. It remains to prove the first part. The first inequality immediately results from $dr^b/dp_R < 0$ by Lemma 1. We now prove the second inequality. To do so, we first derive dr^b/dp_R . Using Equation (A.8),

$$\begin{aligned} \frac{dr^b}{dp_R} &= -\frac{r_s - (1-p)(1-p_R)r^{bi}}{(p + (1-p)p_R)^2}(1-p) + \frac{(1-p)r^{bi}}{p + (1-p)p_R} \\ &= \frac{1-p}{(p + (1-p)p_R)^2} [(p + (1-p)p_R)r^{bi} - r_s + (1-p)(1-p_R)r^{bi}] \\ &= \frac{1-p}{(p + (1-p)p_R)^2} (r^{bi} - r_s). \end{aligned} \quad (\text{A.11})$$

By Equations (19), (A.9) and (A.11), we obtain

$$\begin{aligned} \frac{d\mathbb{E}(N)}{dp_R} &= (1-p) \left[(IL_E - E_1)(1 + r_s) - L_E q^l(w + I) + B(r^b - r_s) + p_R B \frac{dr^b}{dp_R} \right] > 0; \\ &\quad (IL_E - E_1)(1 + r_s) - L_E q^l(w + I) + B \frac{(1-p)(1-p_R)}{p + (1-p)p_R} (r_s - r^{bi}) - \end{aligned}$$

$$\begin{aligned}
& -B \frac{p_R(1-p)}{(p+(1-p)p_R)^2} (r_s - r^{bi}) > 0; \\
& (IL_E - E_1)(1+r_s) - L_E q^l(w+I) + \\
& + B(r_s - r^{bi}) \underbrace{\frac{1-p}{p+(1-p)p_R} \left(1 - p_R - \frac{p_R}{p+(1-p)p_R} \right)}_{=: \phi} > 0; \\
& (IL_E - E_1)(1+r_s) - L_E q^l(w+I) + \\
& + [(1+r_s)B - (1+r_s)[E_1 - (1-\alpha)IL_E] - L_E q^l(w+I)] \phi > 0; \\
& [(IL_E - E_1)(1+r_s) - L_E q^l(w+I)] (1+\phi) > 0,
\end{aligned} \tag{A.12}$$

where the last step makes use of $B = \alpha IL_E - E_1$. The first factor on the l.h.s. of Condition (A.12) is positive by Assumption 1. The second factor is positive since

$$\begin{aligned}
& 1 + \phi > 0; \\
& \frac{1-p}{p+(1-p)p_R} \left(1 - p_R - \frac{p_R}{p+(1-p)p_R} + \frac{p+(1-p)p_R}{1-p} \right) > 0; \\
& \frac{1-p}{p+(1-p)p_R} \left(1 + \frac{p}{1-p} - \frac{p_R}{p+(1-p)p_R} \right) > 0; \\
& \frac{1-p}{p+(1-p)p_R} \left(\frac{1}{1-p} - \frac{p_R}{p+(1-p)p_R} \right) > 0; \\
& \frac{1-p}{p+(1-p)p_R} \left(\frac{p}{(1-p)(p+(1-p)p_R)} \right) > 0,
\end{aligned}$$

which clearly holds for $p \in (0, 1)$. It follows that $d\mathbb{E}(N)/dp_R > 0$. Since, by Equation (20), $\mathbb{E}(N')$ is independent of p_R , we obtain $d\mathbb{E}(N - N')/dp_R = d\mathbb{E}(N)/dp_R$. $\square$

Proof of Proposition 2

To prove the proposition, we first derive the conditions for $r_2^e > r_1^e$ and $\mathbb{E}(N_2) < \mathbb{E}(N_1)$. Then we show that they are mutually exclusive.

From Equations (22) and (23), we obtain $r_2^e \geq r_1^e$ iff

$$\begin{aligned}
& [(1+r^c)IL_E + (1+r_s)(A - D_1) - (1+r^b)B_1] \left(E_1 + \frac{1}{x}\mu B_1 \right) \leq \\
& \leq \left[(1+r^c)IL_E + (1+r_s) \left(A - D_1 - \left(1 - \frac{1}{x} \right) \mu B_1 \right) - (1+r^b)(1-\mu)B_1 \right] E_1;
\end{aligned}$$

$$\begin{aligned}
& E_1 \left[(1+r_s) \left(1 - \frac{1}{x} \right) \mu B_1 - (1+r^b) \mu B_1 \right] + \\
& + [(1+r^c)IL_E + (1+r_s)(A-D_1) - (1+r^b)B_1] \frac{1}{x} \mu B_1 \leq 0; \\
& E_1 \left[(1+r_s) \left(1 - \frac{1}{x} \right) - (1+r^b) \right] + \\
& + [(1+r^c)IL_E + (1+r_s)(A-D_1) - (1+r^b)B_1] \frac{1}{x} \leq 0; \\
& (1+r_s) \left(1 - \frac{1}{x} \right) - (1+r^b) + \frac{1+r_s}{px} \leq 0.
\end{aligned} \tag{A.13}$$

The last step follows from $\Pi^e = (1+r_s)E_1$. Using $r^{bi} = -1$ and $\bar{r}^b = r_s$, Condition (A.13) is met with equality for

$$p_R = \frac{px - p^2(x-1) - p}{(1-p)(1+p(x-1))} =: \tilde{p}_R. \tag{A.14}$$

We proceed to compare the expected tax burdens and obtain $\mathbb{E}(N_2) \leq \mathbb{E}(N_1)$ iff

$$\begin{aligned}
& p_R [(D_2 - A)(1+r_s) + B_2(1+r^b) - L_E q^l(w+I)] + (1-p_R) [(D_2 - A_2)(1+r_s) - \\
& - L_E q^l(w+I)] - p_R [(D_1 - A)(1+r_s) + B_1(1+r^b) - L_E q^l(w+I)] \leq 0; \\
& p_R(B_2 - B_1)(1+r^b) + L_E q^l(p_R - 1) + A(1+r_s)(p_R - 1) + (D_2 - p_R D_1)(1+r_s) \leq 0; \\
& -p_R(1+r^b)\mu B_1 - (1-p_R) [L_E q^l(w+I) + (A-D_1)(1+r_s)] + (1+r_s) \left(1 - \frac{1}{x} \right) \mu B_1 \leq 0; \\
& (1+r_s) \left(1 - \frac{1}{x} \right) - p_R(1+r^b) \leq 0.
\end{aligned} \tag{A.15}$$

The last step follows from the fact that Assumption 2 initially holds with equality. Using $r^{bi} = -1$ and $\bar{r}^b = r_s$, Condition (A.15) is met with equality for

$$p_R = \frac{px - p}{1 + p(x-1)} =: \hat{p}_R. \tag{A.16}$$

Comparing Equations (A.14) and (A.16) shows that $\tilde{p}_R = \hat{p}_R$. Since $x > 1$, we further obtain $\hat{p}_R \in (0, 1)$. As a sidenote, $\hat{p}_R$ is independent of μ and B_1 .

Finally, we show that $r_2^e > r_1^e$ if and only if $p_R < \hat{p}_R$, while $\mathbb{E}(N_2) < \mathbb{E}(N_1)$ if and only if $p_R > \hat{p}_R$. To do so, note that $dr^b/dp_R < 0$ by Lemma 1, and

$$\frac{dp_R(1+r^b)}{dp_R} = \frac{1+r_s}{p + (1-p)p_R} \left(1 - \frac{p_R(1-p)}{p + p_R(1-p)} \right) > 0.$$

Using $x > 1$, it follows that the l.h.s. of Condition (A.13) is smaller than zero for $p_R = 0$ and monotonically increasing in p_R . Conversely, the l.h.s. of Condition (A.15) is greater than zero for $p_R = 0$ and monotonically decreasing in p_R . It follows that $r_2^e > r_1^e$ if and only if $\mathbb{E}(N_2) > \mathbb{E}(N_1)$. $\square$

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