Do bank resolution reforms reduce banks' equity capital implicit subsidy?

Abstract

This research test if international banks’ resolution reforms that change the main resolution from bailouts to bail-in reduce the implicit government subsidy to financial institutions captured by its stock abnormal returns. To solve the endogeneity issue related to the voluntary nature of the regulation we apply an instrumental variable approach based on the cumulative years of past banking crises. Our results support an effect of new bank resolutions on non-large banks that shows an increase of 4.12 percentage points in their abnormal return after the bail-in regulation. This effect is stronger for distressed banks and banks in fiscal deficit countries. But we do not find any effect on the abnormal returns of large and global systemic important banks. These results are a warning sign for a possible failure of bank resolution regulations in convincing investors that the resources used to save banks in a default event will come from the shareholders and debtholders, not from taxpayers.

JEL codes: G12, G15, G21, G28
Keywords: Bank Resolution Reforms, Implicit Subsidy, Too-Big-to-Fail, Cost of Equity.

1 Introduction

The turmoil caused by the failure of Silicon Valley Bank in March of 2023 has triggered a bank run from medium and small banks to large banks in the US. An article at the Wall Street Journal (Benoit et al., 2023) reports that US largest banks received an additional $120 billion in deposits in the days following SVB’s failure, whereas other banks have lost $108 billion in deposits in the period. These events have reignited the debate about the tools available by regulators to deal with distressed financial institutions. Indeed, a great deal of the bank regulations that were designed after the 2008 financial crisis aimed at reducing the need to expand the financial safety net and to inject taxpayer money into financial institutions in times of financial turmoil. If these regulations are credible, they reduce the ex-ante implicit subsidies enjoyed by Too-Big-to-Fail (TBTF) institutions.

This paper studies if banking regulations adopted by developed countries in the last decade have succeeded in mitigating the perception of implicit subsidy that reduces large banks' cost of funding and creates competitive distortions between TBTF banks and other institutions.

More specifically, we look at how the different levels of implementation of the FSB's (Financial Stability Board) recommendations across countries affect large banks' implicit subsidies. We focus on the bank resolution frameworks that attempt to change the bailout to bail-in expectations. Our main measure of implicit subsidy is based on Gandhi, Lustig, and Plazzi's (2020) metric, which uses the *abnormal equity returns* generated by the stocks of large banks in comparison to other banks.

Large banks and financial institutions show a lower cost of finance compared to other firms of the same size outside the financial sector (Ueda & Di Mauro, 2013; Acharya et al., 2016; Gandhi, Lustig, & Plazzi, 2020). This lower cost of finance is the result of a possible implicit subsidy: banks are exposed to the risk of bank runs during high marginal utility states of consumption and are more sensitive to variations in economic cycles. This greater risk, when priced, causes banks to have a higher cost of capital (Gandhi & Lustig, 2015). However, some banks are so large that their failure will impose a severe negative shock on households' and firms' well-being. Thus, there is an expectation that they will be saved by the government in the event of bankruptcy. If a bank is perceived as TBTF, its cost of capital will be lower in equilibrium than an exactly equal – but small – bank due to the government subsidy to the large bank's tail risk. The perceived expectation of a bailout of bank's debt could also be extended to its equity capital since a capital injection from the Government can ensure the bank's survival (Gandhi & Lustig, 2015).

On the other hand, bank bailouts deteriorate public finances and impose a high political cost by increasing popular dissatisfaction and polarization with the transfer of public resources to bailout the financial system (Mian, Sufi, & Trebbi, 2014). In addition, several papers point to the fact that banks' bailout increases moral hazard and reduce market discipline (see Berger & Roman (2020) for an updated review). Bailout expectations also distorts competition (Dam & Koetter, 2012), particularly when sovereigns are strong enough to be expected to inject large amounts into the financial system (Schiozer et al., 2018). As a result, since the global financial crisis (GFC), regulators have been working to reduce the perception that these banks will always be saved from bankruptcy. Banks' bail-ins rules aim to address those issues, by placing risks on the private sector, and minimizing costs to taxpayers, while also limiting the impact of bank failures on financial stability and the economy.

In summary, when the regulators spot that the bank is in financial distress conditions, they could require that the shareholders inject additional funds to ensure a healthy capital structure for the bank (See the Double Liability approach in Anderson, Barth, and Choi, 2018). When a bank approaches distress, equity holders may be wiped out, and subordinated, unsecured, and contingent convertible debt are (fully or partially) turned into equity capital to recapitalize the bank.

In our empirical exercises, we pay special attention to four of the most important bail-in frameworks applied after the GFC: the Orderly Liquidation Authority (OLA) provisions, contained in the Dodd-Frank Act in the US; the Bank Act from the United Kingdom; the Bank Recovery and Resolution Directive (BRRD) applied in several European Union countries and Canada's Bail-in resolution. To conduct our research, we used data from 1,752 banks from 19 countries. Our final sample comprises 14,986 bank-year observations. We explored the effect of bank resolution bail-in policies that occurred in 10 of the 19 countries of our sample.

We find that our metric used to capture the implicit subsidy (the abnormal equity returns, or *alphas*) increased after the passage of banking regulations in the countries that adopted the new policy. An increase in *alpha* means a reduction in implicit subsidies, as it indicates that investors charge a higher return to fund the bank. We measure the reform implementation using two variables: (*i*) a dummy variable for each country that implemented a bail-in policy during our sample period, and (*ii*) an index (*i.e.*, a granular measure) developed by the Financial Stability Board (FSB) (i.e., the Resolution Reform Index (RRI), that varies by country and year). Our results indicate that the alpha has increased by 4.6 percentage points for the banks after the bank resolution, possibly due to the reduction in the implicit subsidy. However, our findings reveal that only non-large banks were affected, while we found no evidence that large banks and GSIBs (Global Systemically Important Banks) were impacted by the resolution reforms. The non-large banks showed an increase of approximately 4 percentage points in their abnormal return after the bail-in regulation.

Next, we explore possible heterogeneities across banks and countries. Banks with higher default risk were more impacted by bail-in regulations. We believe this is because they are the most likely to be recapitalized via bail-in and whose shareholders would be more impacted given their higher probability of failure. These findings are robust to removing the periods when distressed stocks could be influenced by the state of the economy and drive our results, such as during bear markets and market rebounds (Eisdorfer & Misirli, 2016). In addition, we explored the country's constraints of bailing out banks using public resources. Extensive literature explores the countries' fiscal ability to perform bailouts (Acharya, Drechsler, & Schnabl, 2014, Leonello, 2018; Schiozer, Mourad, & Vilarins, 2018) and conclude that countries with weaker sovereign capacity (i.e., higher cost of issuing debt) would show a greater limitation in using funds for a bailout. Indeed, our results indicate that banks in countries with fiscal deficits are more impacted by bail-in regulations, possibly because of the budget constraint imposed on the home country, making bail-in resolutions more credible.

Moving on to our fourth set of empirical exercises, we aim to address the endogeneity issue prevalent in almost every research that explores voluntarily adopted policies. This pertains to the possibility of unobservable factors inherent in a country's financial system playing a significant role in the adoption of regulatory policies. Thus, if such factors are predictors of implicit subsidy and resolution adoption by regulators, a joint determination problem arises and creates a positive bias on our average effect estimations. To mitigate this issue, we employed an instrumental variable strategy using the cumulative years of past banking crises as the main instrument for the bank resolution policy. This instrument is a modified version of Beck, Radev, and Schnabel (2020). The results obtained using this approach confirm and strengthen our previous findings. Furthermore, we conducted several robustness tests to disentangle from possible confounding effects or measurement errors. These included: adjusting for the number of US banks, using the resolution reform index as the main treatment, and different bank size metrics.

Our results are different from the FSB reports. FSB reports point out that market discipline appears to have improved for GSIBs and that investors are at least partially pricing the risk of failure and a potential bail-in event (FSB, 2020). Our results are in line with the financial research that emphasizes that implicit government bailout guarantees continue to be priced around the world (Gandhi et al., 2020). In addition, confounders could bias the pre- and post-analysis, making it hard to establish a causal link between the adoption of the regulation and the reduction in the implicit subsidy due to banks' bailout expectations. Our research points out that while it may be true that non-large banks have seen an increase in their abnormal returns, we cannot indicate that large banks and GSIBs have been affected as desired by regulators.

Our research contributes to several streams of the literature. It is directly related to studies that deal with the pricing of the expected bailout (Gandhi & Lustig, 2015; Gandhi, Lustig, & Plazzi, 2020) and the change in bailout expectation to bail-in expectation due to bank resolutions (Acharya, Anginer, & Warburton (2016), and Schäfer, Schnabel, and Weder

(2017)). Our research also adds indirectly to the broader literature on the funding and liquidity implications of TBTF. Expected bailouts have been found to generate a deposit shift from unprotected to protected banks during financial turmoil (Oliveira et al., 2015), with implications on the loan supply to medium and small firms that generally cater from smaller banks (Schiozer and Oliveira, 2016). Since the implicit subsidy cannot be observed directly, the literature must expand to develop alternative ways to measure the effect of regulatory policies on it. Our research contributes to this literature by using a global sample, a novel G20's bank resolution reforms indicator of the FSB, and a more accessible implicit subsidy measurement.

Our results have implications for regulators and other policymakers. Because the adoption of bank resolution norms is voluntary, identifying its effect on the implicit subsidy of financial institutions and the possible risk pricing of its securities is critical to the public and technical debate. Our inferences also have implications for practitioners, since resolution norms potentially affect large banks' cost of capital, they may affect credit conditions for companies and individuals[1].

The paper proceeds as follows. Section 2 presents the institutional background. Section 3 shows the data and variables definition. Section 4 exposes out results, starting with the baseline model. Section 5 extends the baseline model in two directions: it explores the heterogeneity of banks' distance-to-default and the country's fiscal capacity to bailout banks. Section 6 shows the instrumental variable approach to deal with possible endogeneity. Section 7 shows the robustness checks and Section 8 concludes.

2 Institutional Background for Banks Bail-in Resolutions

Bail-in regimes make debtholders and shareholders, rather than taxpayers, bear the burden of recapitalizing distressed institutions. In a traditional bail-in resolution, the standard hierarchy sees equity investments classed as secondary to bonds when a bank is rescued: when a bank failure can affect the financial system, shareholders are eliminated (i.e., common equity instruments are the first ones to absorb losses) and subordinated creditors, senior unsecured debtholders, contingent convertible debtholders (i.e., CoCo Bonds) and other uninsured creditors have part of their debt turned into equity for the recapitalization (Berger & Roman,

[1] See Kovner & Van Tassel (2022), for an empirical application of bank cost of equity and loans growth.

2020) (e.g., the bail-in of Bank of Cyprus in 2013 converted approximately 47.5% of uninsured deposits into ordinary stocks[2]). From the regulators' perspective, bail-ins are expected to increase market discipline and efficiency in risk pricing.

Although we are dealing with bail-in using a broad definition, the bail-in resolution applied around the world has differences in its operationalization, and they are summarized as follows. In the US, the bail-in process is regulated by the Orderly Liquidation Authority (OLA) of 2010. If applied, the Federal Deposit Insurance Corporation Board (FDIC) orderly liquidates the top-tier parent company, while transferring solvent subsidiaries to a new bridge corporation. Losses are distributed among shareholders and unsecured creditors. The bridge company is capitalized by converting unsecured debt to equity and it can access financial markets for an additional capital injection. If this process does not ensure recapitalization, the OLA can use the Orderly Liquidation Fund to provide financing (Berger & Roman, 2020).

In Canada, the new bank bail-in regime has officially come into effect in September 2017. Like the other resolution process previously exposed, it the important financial institution is in default and reached a point of non-viability, the Canada Deposit Insurance Corporation (CDIC) is authorized to take temporary control or ownership of the Domestic Systemically Important Banks (DSIB). Any unsecured instrument with an initial term over 400 days is generally subject to the bail-in regime, with some exclusions like deposits, covered bonds, derivatives, structured notes, and certain liabilities (CDIC, 2023a).

Comparing to the OLA, the UK and European bail-in regimes still allow for a restructuring option or bailout under certain conditions (Philippon & Salord, 2017). The UK Bank Act of 2013 updated the bail-in rules that should be applied to the largest UK banks by the Bank of England as the regulatory authority. To be eligible for a bail-in resolution, the banks with balance sheet size greater than £15 billion–£25 billion. In a bail-in resolution in UK, existing shares are cancelled, diluted, or transferred, and unsecured creditor claims are written down to absorb losses. Creditor claims are then converted to equity to restore the bank's solvency.

Finally, in the European Union, the Bank Recovery and Resolution Directive (BRRD) was finalized on June 1, 2014, and became effective in January 2016. Its bail-in tool empowers

[2] Bank of Cyprus Archives. Recapitalization through Bail-in and Resolution Exit Bank of Cyprus Announcement. Available in https://www.bankofcyprus.com/en-GB/Start/News_Archive/Recapitalisation-through-Bail-in-and-Resolution-Exit-Bank-of-Cyprus-Announcement/

regulators to recapitalize by writing-off or converting liabilities to equity and requiring creditors to take losses according to risk hierarchy (Bank of England, 2018). However, contrary to the OLA, if resolution objectives are not met using those tools, both Bank of England and European Union can follow the BRRD and use public funds to stabilize the bank through temporary public ownership. The shareholders and creditors must bear losses equal to at least 8% of the bank's liabilities before the use of public funds. This is a last resort option in the case of a serious threat to financial stability or to protect public funds previously used to support a failed bank (Philippon & Salord, 2017).

In short, neither the US bail-in resolution nor the Canadian resolution explicitly express that they can use public funds. On the other hand, the European bank resolution show some flexibility for using public funds after shareholders and creditors suffer a loss expressed in the resolution. At this point, it is possible that the credibility of the rules is affected by the possibility of using public funds to save the banks.

3 Data

In this section, we will show the procedure for defining the sample and how to classify the bank size. Then, we present the research empirical design and the motive to use of instrumental variables approach.

3.1 Sample Selection and Bank Identification

We use eight main sources of data. The first is Thomson Reuters DataStream (TRD), from which we got a sample of financial institutions (FI) with available accounting and market information for the list of eligible countries defined below. Our data is in both annual and weekly frequency and ranges from 2001 to 2021. During this period, there was a gradual implementation of bank resolution rules in several countries starting in 2010. Therefore, to be included in the sample of annual data, the institution must pass the following filters based on Karolyi, Lee, and Van Dijk (2012). First, it must have valid (non-missing) annual observations for accounting and market variables: total assets, total liabilities, total debt, total equity, the market value of equity, return on assets, and return on equity. Next, we consider as valid observations those banks with total deposits, total loans, interest on loans, and debt expenses.

Then, except for total debt, all the previous variables must be greater than zero. Finally, we excluded observations that show the same values for total assets, total liabilities, total debt, net equity, and net income in the same country-year. Since it would be impossible for such a coincidence to occur, we believe that this is a valid procedure to exclude duplicate firms in our sample.

We define as banks, all institutions that are in Worldscope Industry Classification Benchmark (ICB) code 301010 (Banks) and 302020 (Investment Banks and Brokerage Services). This sector classification is defined by the main source of revenue of each firm. Gandhi et al. (2020) included other types of financial institutions that have experienced bailouts in the past, including non-life insurance, life insurance, and real estate investment services (See Gandhi et at., (2020), p. 4238 for a list of bailout events outside the banking industry). However, these institutions have characteristics and sources of revenue generation that differ from banks. An analysis including these institutions could bias the estimates due to measurement error since not all of them are subject to anti-bailout/bail-in policies.

We use the World Bank Databank to get financial development and macroeconomic level data. Since this dataset has gaps and unavailable data for several countries, we add another set of filters. First, we excluded those country-year-level observation that had no valid values of gross domestic product, gross domestic product growth, estimated unemployment, official inflation, and banking concentration.

The third database is the Global Crises Data maintained by the Behavioral Finance and Financial Stability Project (BFFS Project) at Harvard Business School. The data included the banking crises and other crises dates for over 70 countries from 1800 to 2016. Since the database is not complete, we decided to complete it by searching for banking crises that have happened in the countries in our sample. We found two potential banking crisis events: Italy and Greece. Italy faced a banking crisis between 2015 to 2018 that mainly impacted smaller banks and cooperatives. The government intervened by providing financial support to some banks but also liquidated some of them, further impacting the economy. Greece faced a banking crisis in 2015 caused by factors including sovereign debt, economic recession, and capital controls. The crisis resulted in a lack of liquidity in the banking sector, leading to government intervention through capital controls and financial support to banks, some of which were liquidated. Countries that are not in this crises database have been excluded from our sample.

Since the sample has variables that must be calculated using weekly returns, we need to apply filters to certify that the return data are appropriate for use in asset pricing models and for calculating risk variables. At the stock level, we perform the following filters. We remove all observations for firms whose name includes the words "fund," "mutual fund," "income," or "income fund" to eliminate data for mutual funds and other such investment services. We exclude all observations with missing values in the weekly returns. We exclude all observations with extreme returns followed by reversals: if a stock rose *R* above 22.5 in a week and fell -*R* below -22.5. This procedure was used by GLP (2020). We exclude penny stocks, classified as observations whose year-end closing price is less than a monetary unit. In each country, we exclude the very smallest firms by eliminating the bottom 1% by market capitalization. We remove all stocks with less than 52 weeks of valid observations (a full year). We exclude highly illiquid stocks. We define illiquidity as those stocks with more than 80% zero weekly returns.

We excluded each country-week that is not covered by the Global Factor Datatabe (Our fourth data source). This website provides return data for equity risk factors from around the world based on Jensen, Kelly, and Pedersen (2021). We used returns in daily frequency with capped value weighting. We excluded countries that are not part of the FSB because we must track the implementation of resolution reforms using the FSB's reform dashboard (Our fifth data source)

We also use some complementary data sources. The sixth database is the International Financial Statistics from the International Monetary Fund (IMF Data). In this database, we collect the official exchange rate of each country that covers the entire sample period. This was done to standardize the returns and accounting variables in local currency. We reinforce that in the first analysis, we use local currency returns, in line with other papers that address multifactor models in a cross-country sample (see Gandhi et al. (2020) and Jacobs (2016)). In addition, we collected the Market Yield on U.S. Treasury Securities to construct the proxy for the risk-free rate from the Federal Reserve Economic Data (FRED), our seventh data source.

After all the filters and sample definition, our eighth data source is the FSB, from which we collect the two variables that identify treatment (The bail-in resolution). Our variable comes from the "Table on implementation of reforms in priority areas by FSB jurisdictions" prepared by the FSB and made available on its website (fsb.org/). The second variable is the Resolution Reform Index (RRI). This variable is an index created by the FSB and available on its website (fsb.org/wp-content/uploads/RRI-2021.xlsx) The details of its construction are presented in the next section.

Table 1 shows the definition of the variables used in this paper and their respective data sources. Table 2 shows the total number of banks, investment banks, and brokerage services in our sample. Finally, Table 3 shows the descriptive statistics of our database. Panel A shows the statistics for the total sample, Panel B shows the subgroup of Non-Large Banks, Panel C shows the Large Banks. The G-SIBs are in Panel D, and the country-level variables are in Panel E. In our Appendix, Tables A.1 and A.2 show the detailed process to define the sample. In the end, our sample consists of 1,752 financial institutions and is distributed over 19 countries. 27 financial institutions are Global Systemic Important Banks (GSIBs). This sample generates a total of 14,986 observations (i.e., in our estimations using fixed effects, we dropped 185 singleton observations).

[Table 1 here]

[Table 2 here]

[Table 3 here]

3.2 Bail-in and Bank Resolution Variable

Our main treatment is the change in the bank resolution framework by the regulatory authorities of each country of our sample from bailout to bail-in. The bail-in variable takes the value of 1 when all three resolution powers for banks (transfer, bail-in, and temporary stay) and insurers (transfer, bridge, and run-off) are available in the country, and 0 otherwise. Table 4 shows when each country in our sample adopted such a policy. Our dummy variable was checked against the official regulation that generated it. In the US, we have the OLA preempted by the Dood-Frank act applied in 2010; in the UK we have the Bank Act of 2013; in Germany, Italy, the Netherlands, Spain, France, and Switzerland we have the BRRD applied in 2014-2015; in Canada, we have a Bail-in rule applied in 2017.

[Table 4 here]

Our second treatment variable is a Resolution Reform Index, RRI, by the FSB. Therefore, it is worth presenting the details of its construction. The index selects items that tend to have the most variability and least correlation across jurisdictions, and the relative weight of the items should reflect expert judgment about their importance to the success of resolution. The index is composed of three sub-indices. The first one covers resolution powers, recovery, and planning. It indicates whether the country has passed laws that allow for the full or partial resolution of banks (i.e., legal support must exist before banking regulations can be implemented). The second one includes operational policies and guidance of resolution regimes. The third one evaluates whether and to what extent authorities have powers to determine the bail-in of failing Systemic Important Banks, SIBs, by converting debt instruments, and if they impose requirements regarding banks' external loss-absorbing capacity.

It must be reinforced that the bank resolution index (RRI) captures the application of bank resolution incrementally. The sub-scores go up by 33 points, according to the following logic. Score 0, indicates that implementation has not occurred (i.e., draft regulation not published). A score up to 33, indicates that resolution is under development (i.e., draft regulation published or submitted to the legislative body, or rulemaking initiated under supervisory powers). A score of up to 67, indicates that partial implementation has occurred (i.e., final legislation published but not yet effective, partially adopted, or introduced only as a pilot). Finally, a Score of 100 indicates that full implementation has occurred (i.e., the final rule published and is effective for all relevant banks).

3.3 Bank Size Variable

The bail-in policy that is the focus of our study states that countries should develop resolution plans for Global Systemically Important Banks (GSIBs). In addition, similar rules should be applied to large domestic banks. Every year, GSIBS are intensified and exposed by the Bank for International Settlements, BIS, and the FSB. However, the identification of Domestic Systemically Important Banks (DSIBS) is up to the regulatory authorities in each country, and there is no single list of these institutions. Thus, one challenge of empirical research in banking is to define which banks are large and which are not G-SIBS. In this research, we created three groups of banks. First, we define GSIBS according to the annual BIS list. To allow for a before-and-after analysis of resolution standards, we take the first GSIBs list from 2010 and assume that all banks on the list must also be GSIBs in previous years.

Next, we define “Large banks” as the 5 largest banks in the country by total asset value. This definition is commonly used to calculate bank concentration (e.g., the World Bank uses this measure as its main bank concentration measure). The remaining banks in the sample are classified as “non-Large banks”. Finally, it is important to note that it would be inappropriate to call non-large banks small banks. We may have banks that are not in the top 5 in total assets but are still domestically important banks.

3.4 Estimating the Implicit Subsidy to Bank’s Cost of Equity Capital

In this section, we will expose the strategy for estimating the implicit subsidy to the Bank’s Cost of Equity Capital. Our implicit subsidy metric is heavily based on GLP20, but we have made some changes to gain granularity in the data and strengthen the statistical power of our subsequent tests. Thus, we decided to first explain the logic behind Gandhi, Lustig, and Plazzi's (2020) (GLP) methodology and then present our modifications.

Gandhi, Lustig, and Plazzi's (2020) metric of Implicit Subsidy is based on the asset pricing theory. Financial economics states that securities equally exposed to similar risk factors must have similar expected returns, all else being constant. If this relationship does not hold, it is possible that: (1) the model is incomplete as it does not consider all risk factors[3] or market frictions, or (2) there is a mispricing (and eventually arbitrage opportunities). If the government is expected to take part in the risks of financial institutions (FI), the cost of equity of large FI will be lower than the cost of equity of the small ones, controlling for the risk (Gandhi & Lustig, 2015).

According to Gandhi et al. (2020), the expected return of large banks can be explained by equity risk factors (e.g., market, size, value, and momentum) and by an unobservable factor that is uncorrelated with the conventional empirical ones. This unobservable factor will be captured

[3] This problem is kwon as the joint hypothesis. In the word of Eugene Fama, “The joint hypothesis problem says that you can’t test market efficiency without a model of market equilibrium. But the reverse is also true. You can’t test models of market equilibrium without market efficiency because most models of market equilibrium start with the presumption that markets are efficient […]. Tests of market efficiency are tests of some model of market equilibrium and vice versa. The two are joined at the hip.”
(Retrieved from https://www.minneapolisfed.org/article/2007/interview-with-eugene-fama).

by the intercept of a factor-based asset pricing regression if it is priced by equity investors[4], and it is a proxy for the government's implicit subsidy. Empirically, we regress the excess returns of a portfolio formed according to the size of the banks – i.e., Gandhi, Lustig, and Plazzi's (2020) use portfolios segmented by bank market value deciles, so they build 10 portfolios – on equity risk factors and capture the abnormal return, α, according to the asset pricing equation below.

$$[r_{it} - Rf_t] = \alpha + \beta_1 [Rm - Rf] + \beta_2 \, Size + \beta_3 \, Value + \beta_4 \, Prof + \beta_5 \, Inv + \beta_6 \, Mom + \epsilon_{it} \quad (1)$$

Where r is the monthly return of portfolio *i*, Rf is the risk-free rate, measured using the monthly return of a T-Bill, [Rm-Rf] is the equity risk premium, Size is the size factor, Value is the value factor, Prof is profitability factor, Inv is the investment factor, and Mom is the momentum factor. This factor regression can be called as an augmented Fama-French 5 Factor Model plus Momentum.

As shown by Gandhi, Lustig, and Plazzi's (2020) and Gandhi & Lustig (2015), portfolios composed of the largest (smallest) size deciles exhibit negative (positive) abnormal returns. This indicates that investors charge a lower (higher) return on average to fund larger (smaller) banks. We have made the following adaptations to the methodology outlined above: (i) we use weekly returns on individual stocks, as opposed to using monthly portfolio data. Despite criticism of using stock level data, we believe that the gain in observations outweighs the drawbacks of measurement errors; (ii) For each bank stock *i* in country *j*, we regress its excess returns against the six empirical risk factors exposed on the right-hand side of Equation 1. We run the regression in one-year windows (i.e., 52-week returns for each stock); (iii) Therefore, the alpha obtained at the end of each year for each stock represents the average abnormal return for that stock within the year. (iv) Finally, we multiply this weekly alpha by 52 weeks to obtain the annualized abnormal return, $\alpha \times 52$, our proxy for implicit guarantee. Table A.3 in our Internet Appendix exposes the results of the asset pricing model from Equation 1 for the entire sample and the entire sample period.

[4] In this model, the dependent variable is the returns above the risk-free rate and the dependent variables are the risk factors. The intercept will capture the average abnormal return that is not related to the common risk factors.

Our results show that the larger the size, the more negative is the average annualized abnormal return. Figure 1 shows average abnormal return by size group. Our plot shows that the average abnormal return of GSIBS, large banks and non-large banks is positive with few exceptions (e.g., Spain shows an average positive abnormal return for its GSIBs and non-large banks, and Canada, Brazil, Indonesia, and Mexico show a positive average abnormal return for their large banks). Figures 2, 3, and 4, show a heat map of average abnormal returns by country and year for GSIBs, Large banks with GSIBs and Non-Large banks, respectively. Overall, countries exhibit large variability in average abnormal returns and high volatility. Some countries show several gaps in the time series due to no valid observations after the sample definition filters or due to missing data for the empirical risk factors.

[Figure 1]

[Figure 2]

[Figure 3]

[Figure 4]

4 Main Empirical Results of Bail-in Resolution Effect

In this section, we seek to answer whether the implementation of the bank resolution reduced the implicit subsidy. In this sense, since the implicit subsidy is measured by the negative alpha, we tried to see if the alpha increased after the implementation of the bail-in reforms.

Figure 5 exposes the abnormal returns of GSIBs, large and non-large with GSIBs included divided by the pre- and post-bail-in resolution implementation. We use just the countries with bail-in resolution exposed in Table 4. From the right to the left, the non-Large banks showed a greater variation in abnormal returns variable. From approximately -2% to almost 2.25%, a rise of 4.25 percentage points. Next, the most surprising difference occurred at large banks and GSIBs. The large banks showed negative variation of approximately 3 percentage point, from -3% to -6%, approximately. The GSIBs showed a change of approximately 2.5 percentage points, from -2.5% to -5%.

[Figure 5]

The results of unconditional effect on pre- and post-bail-in resolutions on abnormal returns exposed at Figure 5 are not in line with what was expected by the regulators and policymakers since the resolutions were designed to increase the implicit subsidy. However, a simple pre- and post-analysis is inappropriate to catch the policy effect on the output. The next tests will explore the addition of controls for banks and country covariates, and fixed effects on banks and time to extract the bail-in resolution effect with greater precision. We first show an Ordinary Least Squares (OLS) estimation using Equation 2. This equation is the baseline model for our tests.

$$\alpha \times 52_{it} = \gamma_0 + \gamma_1 \text{BankResolution}_{jt} + \mathbf{b}' + \mathbf{J}' + \delta_i + \delta_t + \epsilon_{it}, \tag{2}$$

Where, for each bank *i*, on country *j*, and year *t*, $\alpha \times 52$ is the bank`s equity annualized abnormal return, our proxy for the implicit subsidy. BankResolution is one of our two measures of bank resolution: (i) a dummy variable that takes the value of 1 when the country *j* adopted a bail-in resolutions according to the FSB dashboard, Bail-in, or (ii) the annual change in the resolution reform index, developed by the FSB, ΔRRI. We exposed the results using the ΔRRI at the Robustness Section. **b** is a set of banking-level variables aimed to control for the bank's relative size, bank-level profitability, growth expectations, leverage risk, liquidity risk, and credit risk: the standardized total assets by GDP (TA/GDP), the return on equity (ROE), the book-to-market (B/M), the total debt to total assets (Debt/TA), the total deposits to total assets (Dep/TA) and the expected default frequency (EDF); **J** is a set of country-level variables to control for macroeconomic conditions and financial development factors: growth of Gross Domestic Product (ΔGDP), inflation, bank concentration (concent), bank crisis (bnkcrisis), and unemployment (unemp). We rely on Beck, Radev, and Schnabel (2020) and Gandhi, Lustig, and Plazzi (2020) as the main sources to define the appropriate control variables for our empirical model. δ_i and δ_t are bank- and time-fixed effects. The first fixed effect, δ_i, seeks to control for the fact that some banks have special status (e.g., public banks) or different levels of governance. The second fixed effect, δ_t, controls for any time-varying event that affect all banks.

Table 5 reports estimates from the regression models discussed above using OLS. In Column 1 we have the results using all banks of our sample. The results indicate that the average annualized abnormal return rose by 4.67 percentage points after the bail-in resolution implementation. In Columns 2, 3, 4 and 5 we can see that the effect varies with the size of the banks: non-large banks show the largest variation, with an effect of 4.12 percentage points in the period after the bail-in resolution. We can say that the effect obtained in Column 1 has derived of the non-large banks of our sample, since we cannot observe a significant effect for large banks and for the GSIBs.

[Table 5 here]

Other estimates show that by conditioning for time- and firm-fixed effects, and controlling for variables that capture macroeconomic factors, profitability, risks, and future growth expectations, we cannot say that the investor who prices bank risk has increased the premium for investing in large banks. We conjecture that this occurs for two reasons: first, it is possible that our sample is not large enough to allow the observation of the effect, given the high level of variability of the dependent variable. The next tests point out that this critic does not holds, since we observe significant effects when segmenting the sample by bank and country financial health. The second hypothesis is that the investor simply does not believe that these banks will not be saved (or partially helped) using public resources and will always have implicit guarantees. This would justify not changing the implicit subsidy. Those results are in line with the findings that regulatory change may not be enough to change investors' perceptions of these banks.

5 Distressed Banks and Country Fiscal Deficit

In this section, we explore two possible variables that are predicted to moderate the effect of banking regulations on investors' perception of implicit guarantees and, consequently, on their equity pricing.

First, we start from the literature that bank panic occurs due to a perceived deterioration in bank fundamentals (Allen & Gale, 1998) and that regulatory instrument such as insured deposits – as in Allen and Carletti (2010) – and the bail-out probability – as in Gandhi and

Lustig (2015) – can mitigate the risk of bank runs. Thus, if there is a perception that bank lenders no longer have an insurance guarantee, the premium of not having a bailout possibility must be higher for banks that are already in financial distress since they are most likely to fail.

To test this hypothesis, we adopt the empirical model of Equation 3, estimated by OLS.

$$\begin{aligned}\alpha \times 52_{it} = \; & \gamma_0 + \gamma_1 \text{BankResolution}_{jt} + \gamma_2 \text{Distressed} \\ & + \gamma_3 \text{BankResolution}_{jt} \times \text{Distressed} + \; \mathbf{b}' + \mathbf{J}' + \delta_i + \delta_t + \epsilon_{it}, \qquad (3)\end{aligned}$$

The variables exposed above have been previously mentioned, except for the Distressed variable: Distressed is a dummy variable that assumes value 1 (0) if bank *i* in year *t* and in country *j* shows values below (above or equal) the median of the Distance-To-Default variable (see Table 1 for variable definition), D2D. That is, if D2D is low (high), we have a bank with high (low) risk of default. We use the D2D instead of the Expected Default Frequency, EDF, because D2D has more variability, and it is not affected by normalization like EDF. In addition, since we are using the D2D in this equation, we decided to drop the EDF due to possible multicollinearity problems.

Except for the interaction term, all coefficients must be interpreted in relation to our base group: the non-distressed banks when there are no bank bail-in regulations. γ_1 captures the average effect of bank resolution for banks in a non-distressed situation. γ_2 captures the effect on the average alpha of distressed banks in countries without bail-in resolutions. γ_3 captures the difference in the effect of bail-in resolutions between distressed and non-distressed banks. If investors believe that passing a bank bail-in resolution reduces the probability of bailout and that this resolution is more plausible for distressed banks, we should observe a γ_3 > 0.

Second, we explore the country's financial conditions and its limited capacity to perform bank bailouts. When there is a financial deficit, the government is still able to finance a bailout either by issuing sovereign debt or by increasing its tax revenues. However, the cost of a bailout can be huge (i.e., according to Laeven and Valencia (2012), the median output loss of the past decade banking crises was about 25% of GDP) and it can increase sovereign credit risk imposing a high cost of financing for the countries (Acharya, Drechsler, & Schnabl, 2014).

We conjecture that the higher the country fiscal deficit, the higher the cost for the country to bailout the financial system. Thus, we believe that the credibility of a recure without using public resources (i.e., via bail-in) is higher in countries with larger fiscal deficits, making the bail-in resolution more credible. To test this hypothesis, we adopt the empirical model of Equation 4, estimated by OLS.

$$\alpha \times 52_{it} = \gamma_0 + \gamma_1 \text{BankResolution}_{jt} + \gamma_2 \text{Fiscal Deficit} + \gamma_3 \text{BankResolution}_{jt} \times \text{Fiscal Deficit} + \mathbf{b}' + \mathbf{J}' + \delta_i + \delta_t + \epsilon_{it}, \quad (4)$$

Again, the variables exposed above have been previously mentioned, except for the Fiscal Deficit variable. This variable is a dummy variable that assumes value 1 (0) if country *j* at year *t* shows a positive (negative) value on the OCED's government deficit variable, defined as the balance of income and expenditure of government, including capital income and capital expenditures. Negative values means that government has a surplus, and is providing financial resources to other sectors, while positive values means that government requires financial resources from other sectors.

Again, except for the interaction term, all coefficients must be interpreted in relation to our base group: the banks in a country without fiscal deficit when there are not bank bail-in regulations. The logic exposed in the Equation 3 is the same here. If investors believe that that passing a bank bail-in resolution reduces the probability of bailout and that this resolution is more plausible for countries in a fiscal deficit situation, we should observe a $\gamma_3 > 0$.

Table 6 shows the results of Equation 3. Column 1 provide evidence for the positive effect of bail-in resolution on distressed banks using all banks of our sample: bank resolutions increased abnormal returns by 3.9 percentage points on average for healthy banks. The difference in the effect of bail-in resolutions between distressed and non-distressed banks is 7.57 percentage points. Taking these results together, bank resolutions increased abnormal returns. by 3.3 percentage points for distressed banks (i.e., given by the sum of γ_1, γ_2 and γ_3, coefficients)

In the remaining columns, we segment the sample by bank size. All interactions terms are positives implying that the difference in the effect of bail-in resolutions between distressed and non-distressed banks is varies from 8.0 percentage points for non-large banks to 11.7 p.p. for GSIBs. When we interpret the results from the interactions terms against the base group our results show a limited economic effect: for non-large banks, the average abnormal return is 2.95 percentage points higher for distressed banks after the bail-in resolution compared to the base group. For large banks, the average abnormal return is just 1.45 percentage points lower for distressed banks with bail-in resolution compared to the base group. For GSIBs, the average abnormal return is 1.84 percentage points higher for distressed banks after the bail-in regulations compared to the base group (i.e., given by the sum of γ_1, γ_2 and γ_3, coefficients).

The negative coefficient of the Distress variable indicates that, outside of bank regulation, banks in financial distress show a negative average return compared to banks in good financial health. We understand that this negative average return is a product of the pricing of the implicit subsidy in countries without bail-in regulations. In addition, the existence of a positive abnormal return after regulation for distressed banks is an indication that these banks have lost the subsidy.

However, a alternative explanation for the Distress variable is that distressed banks exhibit negative returns due to the financial-distress puzzle. Financially distressed stocks severely underperform healthy stocks and impose a challenge to empirical asset pricing models (Campbell, Hilscher, and Szilagyi, 2008). Eisdorfer and Misirli (2016) show that the puzzle is conditional to the market conditions: distressed stocks do not underperform the healthy ones when the market is in distress, but distressed stocks show a high return when market rebounds.

This observation would be a concern for our results if the period of bank resolution reforms were positively correlated with market rebounds. In non-tabulated results, we perform two tests: first, we regress the market rebounds dummy against the bail-in dummy (i.e., a market rebounds are defined as a dummy that takes the value of 1 if there was a positive return on the MSCI portfolio of each country after a negative cumulative MSCI return in the past two years, as Eisdorfer and Misirli (2016). We got a coefficient of -0.088, which identifies that there is an 8.8 percentage points lower probability of a market rebound during the regulatory period. We then remove the market rebound periods and re-estimate Equation 3. When removing the market rebounds, our results remain qualitatively unchanged. Therefore, we assume that there is no effect of the financial-distress puzzle on our findings.

Table 7 shows the effect of bail-in resolutions on countries with high fiscal deficit. According to our results in Column 1, bail-in had no significant effect for countries that are not in fiscal deficit. Counterintuitively, countries that are in fiscal deficit but do not adopt bail-in rules present a lower average abnormal return (-3.98 percentage points) relative to countries in good conditions and without bail-in rules, indicating that even with fiscal deficit there is pricing of the implicit subsidy for those countries.

The difference in the effect of bail-in resolutions between banks in fiscal deficit countries to banks in fiscal surplus countries is 5.15 percentage points. Comparing to the base group, the average abnormal return is 2.02 percentage points higher in countries with fiscal deficit and with bail-in rules (given by the sum of γ_1, γ_2 and γ_3, coefficients). In the remaining columns, we segment the sample by bank size. Our results for the interaction continue to indicate that there is a positive effect for countries that adopted the bail-in measures and have fiscal deficit: for non-large banks, the average abnormal return is 0.62 percentage point higher in countries with fiscal deficit and with bail-in resolution compared to the base group. For large banks, the average abnormal return is 0.76 percentage points higher in countries with fiscal deficit and with bail-in resolution compared to the base group. Finally, for GSIBs, the average abnormal return is 2.14 percentage points higher in countries with fiscal deficit and with bail-in resolution compared to the base group.

In summary, our results indicate that the pricing of implicit subsidy after bail-in resolutions is conditional on banks being in financial distress and being in a country with a fiscal deficit. However, this result is not observed for all banks and is concentrated in non-large banks and week for large banks and GSIBs. The above findings are in line with a relatively new empirical literature on the interaction effects of implicit guarantees, bailouts, and country economic conditions (Leonello, 2018; Schiozer, Mourad, & Vilarins, 2018).

6 Endogeneity: instrumental variable approach

In this section, we show our instrumental variable strategy for dealing with our possible omitted variable problem and joint determination on the voluntary adoption of bank resolution and the fundamentals of financial system.

6.1 Instrument for Bank Resolution

We expect that switching from a bail-out-based bank resolution policy to a bail-in-based policy has effects on banks' implicit guarantees captured by its equity abnormal returns. However, the decision to implement such policies is voluntary. Thus, it is easy to think of a set of reasons why regulators in each market support bail-in resolutions. To take one example, the bank size and characteristics, the systemic importance of banks, government idiosyncrasies, and other unobservable factors may be part of the set of factors considered in the implementation of bail-in resolutions. Thus, if such set is positively correlated with the implicit guarantee, and positively related to the bail-in resolution, we will have a positive bias and overestimate the treatment effect of our policy.

To address this issue, we implemented an instrumental variables approach estimated using a two-stage least squares (2SLS). Our instrument is based on the logic of Beck, Radev, and Schnabel (2020): the use of the number of past crises as an instrument for implementing bail-in measures. The motivation of this instrument is that if bailouts have occurred in the past, the government is more likely to impose a comprehensive bank resolution regime, to avoid unpopular future bailouts.

We make a slightly important change in the calculation and its definition that makes it a stronger and more convincing instrument: unlike Beck, Radev, and Schnabel (2020) who used the cumulative number of past crises as an instrument (CNBC), we adopt the cumulative years of past banking crises (CYBC). This modification makes a big difference since we obtained a first stage that reinforces that our instrument is not weak. We add our explanation for the validity of the instrument: banking crises tend to have a strong impact on social well-being by inducing misery, unemployment, and financial losses. One of the mechanisms occurs due to the impact of banking crises on the firm's performance: reduced lending by banks harms both borrowing firms and the economy in their operating regions (Huber, 2018). This credit crunch has a severe effect on companies that are more dependent on bank financing. As a result, those companies show a higher negative return when financial crises occur (Chava & Purnanandam, 2011, Campello et al. 2010). Therefore, if the country has had prolonged banking crises in the past, we have a greater political cost for policies that do not aim to prevent new crises from occurring.

Our cumulative years of bank crises metric came from the BFFS Project. However, as the data ends in 2015 for most countries, we decided to search for banking crises, and we found two potential banking crisis events: Italy and Greece. Figure 6 shows the maximum number of years accumulated in banking crises. Within the countries covered by the BFFS Project, the USA is the country that showed a higher number of cumulative years of banking crises (CYBC), with 33 accumulated years of crises. Singapore shows the lowest number of cumulative banking crises.

[Figure 6]

Figures 7a and 7b show a comparison between our instrument, CYBC, and the instrument by Beck, Radev, and Schnabel (2020), CNBC. As can be seen, our instrument shows greater variation across countries compared to CNBC. The greater variation allows us to have greater heterogeneity in our instrument since some countries show a similar variation in the number of crises, but a high variation in the duration of the crises. For example, both Germany and Italy had crises in 2018. According to the CNBC metric, Germany would go from 5 to 6 accumulated crises, while Italy would go from 10 to 11 accumulated crises. Within the sample period, we would have a variation of only 1 year of crisis for each of the two countries. However, the German crisis lasted 3 years, while the Italian crisis lasted 9 years.

[Figure 7a]

[Figure 7b]

Finally, it seems obvious that the current crises may be related to unobservable variables, macroeconomic factors, financial development variables, and bank characteristics. However, we have no evidence that the cumulative years of past banking crises in each country affect the controls and the dependent variable at the current time. Therefore, we believe that the exclusion condition is not violated in our model.

6.2 Two-Stage Least Square

In this subsection, we provide evidence from a 2SLS regression model to mitigate endogeneity concerns due to the possible joint determination of the bail-in resolution and the bank- and country-level (unobservable) covariates. Equation 3 shows the first-stage equation of our 2SLS model.

$$\text{BankResolution}_{it} = \alpha_0 + \alpha_1 \text{CYBC}_{t-1} + \mathbf{b}' + \mathbf{J}' + \delta_i + \delta_t + \epsilon_{it}, \qquad (3)$$

Where, BankResolution is one of the bank resolution metrics presented earlier. CYBC is the cumulative years of banking crises. We decided to use the CYBC variable with one lag to avoid the mechanical correlation between it and the banking crisis dummy, which would violate our exclusion condition. Even so, there is suspicion that the number of past crises is a predictor of future crises, which would also affect our exclusion condition. The literature on forecasting financial crises can be divided into two strands. The first asserts that crises are unpredictable (Cole & Kehoe 2000). Another version states that financial crises are predicted by rapid expansions of credit accompanied by asset price booms (i.e., the Kindleberger-Minsky view of boom-bust credit cycles). Greenwood, Hanson, Shleifer, and Sørensen (2021) present empirical evidence for the second strand. In any case, according to both kinds of literature, the accumulated number of past crises is unrelated to the occurrence of a financial crisis today.

In the second stage, we estimate our new policy evaluation equation (Equation 4)

$$\alpha \times 52_{it} = \beta_0 + \beta_1 \mathrm{BankResolution}^*_{\mathrm{jt}} + \mathbf{b}' + \mathbf{J}' + \delta_i + \delta_t + \epsilon_{it}, \qquad (4)$$

Where $\mathrm{BankResolution}^*$ is the predicted value from the first-stage estimation. To account for the time-series correlation within firms, the standard errors are clustered by firm.

Table 8 reports the results from the first-stage estimation in Column 1. The coefficient of CYBC is both economically and statistically significant and suggests that the inclusion restriction holds. A yearly increase of cumulative years of banking crises rises the probability of a bail-in resolution implementation by 17.7%, approximately. In addition, the instrument easily passed the main test for weak instruments with an F-statistic above the rule-of-thumb threshold of 10 and the Stock-Yogo critical value of 16.38.

Column 2 to 5 reports the estimations for the second stage. Column 2 shows the results for all banks and Columns 3 to 5 shows the results for non-large banks, large banks and GSIBs, respectively. The estimated coefficient implies an increase of 6.46 percentage points of abnormal returns after the implementation of a bail-in resolution reform for all banks of our sample. As we can see in Column 2, this effect is lower for non-large banks since the abnormal return shows an increase of 5.1 percentage points after the bail-in reform. It is not possible to spot a significant effect for large banks and GSIBs.

The results exposed in Table 8 using the instrumental variable approach points to the same conclusion of our OLS results from Table 5: the effect of bail-in resolutions is concentrated at non-large banks, and it is not perceptible for large banks and GSIBs.

[Table 8 here]

7 Robustness

We carry out some additional tests to check the robustness of results for the bail-in resolution reforms against several changes in experiment design and specification.

7.1 Adjusting for US concentration

The United States is responsible for more than 70 percent of the number of banks in our sample. As a result, it is possible that out findings are driven entirely by the US banks and lack external validity. To account for this issue and attest that every country gets the same weight in our estimations, we follow Beck et al., (2020) and we weighed every observation by the inverse of the number of banks in each country per year. We believe this methodology is better than simply excluding US observations and losing a relevant amount of data.

Table 9 shows the results of Equation 2 estimated by OLS and weighted by the inverse of the number of banks in each country. The results show that the bail-in resolution increased abnormal returns for non-large banks by 2.94 percentage points. However, the results show a p-value of 13%, way above the standard threshold. In summary, these bank resolution effect on abnormal return is almost half of the ones exposed at our baseline model at Table 5.

In non-tabulated results, we perform the following additional tests: we repeat the baseline model excluding the US, and we re-estimate the 2SLS model excluding the US. Our results indicate that with US exclusion, the results are not significant. With the use of the IV technique, we obtained results consistent with those already presented in Table 8: the effect of the bail-in policy can only be seen in non-large banks.

[Table 9 here]

7.2 Alternative Bank Size Classification

In this section, we show the results using an alternative size definition based on Gandhi, Lustig, and Plazzi (2020). For each country and each year, we rank banks by total assets. We then use the percentiles 20', 40', 60', and 80' to form five groups. Banks with total assets below the 20' percentile were classified as small, and banks between the 20' and 40' were called mid-small. From the 40' to the 60' we have medium-sized banks. From the 60' to the 80', we have mid-large size banks. Finally, banks with total assets above the 80' percentile were classified as large-size banks. This definition will allow observing the heterogeneity of bank sizes with greater precision.

Table 10 shows the results of the OLS model applied for each subsample. According to the results, we can say that small banks (Column 1), mid-large banks (Column 4) and large banks (Column 5) show increase in their abnormal return by 6.2, 6.4, and 4.0 percentage points, respectively, after the bail-in resolution. However, the same effect cannot be seen in mid and mid-small banks. These results support the view that the effect of the new resolution is limited to the size of banks: there may be a specific size at which bank investors lose the expectation that the bail-in rule is feasible to implement. In addition, the Large group defined above is relatively bigger compared to the large group defined as the five largest banks of each country. This results together with the ones exposed so far, shows that the biggest effect is driven by small and medium-sized banks.

[Table 10]

7.3 Resolution Reform Index

In Table 11, we investigate the relationship between the change in the resolution reform index produced by the Financial Stability Board, FSB, and the abnormal equity returns. Similar to the tables presented before, Column 1, 2, 3, and 4 shows the results for the subsample of all banks, non-large banks, large banks, and GSIBs. Column 1 results imply that 1 unit change in ΔRRI is associated with a 0.14 percentage point increase in abnormal returns. These results must be interpreted according to the behavior of the RRI: the index does not change point-by-point but by jumps of 33 points. In this case, everything else constant, a 33-point increase in ΔRRI is associated with a change of 4.62 percentage points in abnormal return. From this point on, we will use this interpretation for all the ΔRRI results. Column 2 indicates that a change of 33 points in the ΔRRI is associated with a change of 5.44 percentage points in the abnormal return of non-large banks. On the other hand, it is not possible to state that there is a relationship between the ΔRRI and the abnormal return of large banks and GSIBs. Those results are similar to the ones exposed in Table 5 and supports our baseline results that non-large banks are the most affected by the bail-in resolution.

[Table 11 here]

8 Discursion and Conclusions

In this paper, we provide empirical evidence of the causal effect of new bail-in resolution frameworks on banks' implicit subsidy. As far as we know, this is the first paper to examine the effect of this bank resolution on abnormal returns as a proxy for implicit subsidy and the first to use an identification strategy that seeks to mitigate the endogeneity of the voluntary adoption of the resolution by regulators of each country.

Using a sample composed of banks of varying sizes spread across 19 countries, our results indicate that non-large banks were the most affected by bank resolutions. However, we have no evidence that the large banks and the globally systemically important banks (GSBIs) suffer any significant effect on their abnormal returns. However, not all banks and countries are treated equally: banks that are already in the higher financial distress and banks in fiscal deficit countries are the most affected by the new bank resolution. In this sense, investors may believe that only the distressed, non-large banks in fiscal deficit country can undergo a bail-in process and that the large ones and the GSIBs continue to enjoy an implicit subsidy if they fail.

These results are a warning sign for a possible failure of bank resolution regulations to convince investors that the resources that will be used to save the banks in a default event will come from the shareholders and debtholders and not from taxpayers. The consequences for not pricing adequately can generate excessive risk-taking both by large banks – given the existence of moral hazard – and by small banks – given the compression of their margins by the high competition from the large banks and subsidized banks.

This study shows a possible path that can be taken in the future. We have an understanding that bank resolutions via bail-in are similar across countries, but recent bank failure events have proven that there is a strong heterogeneity in the application of resolution across countries. For example, recent bank failure events on March, 2023, in the US and Switzerland point to the existence of fundamental differences in the frameworks: while in the US, all depositors of Silicon Valley Bank were guaranteed and subsequently declared bankrupt, the Swiss regulator decided to impose losses on contingent convertible debtholders of Credit Suisse before the bank's shareholders, which changes the hierarchical order of risks. The study of the effects of a loss of credibility or change in risk perception is an important avenue of research.

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Figures and Tables

Figures

Figure 1. Average Annualized Abnormal Return of banks' stocks by country

This figure shows the abnormal return for each country by bank size group. The abnormal returns were estimated using Equation 1 for each bank stock return at a weekly frequency.

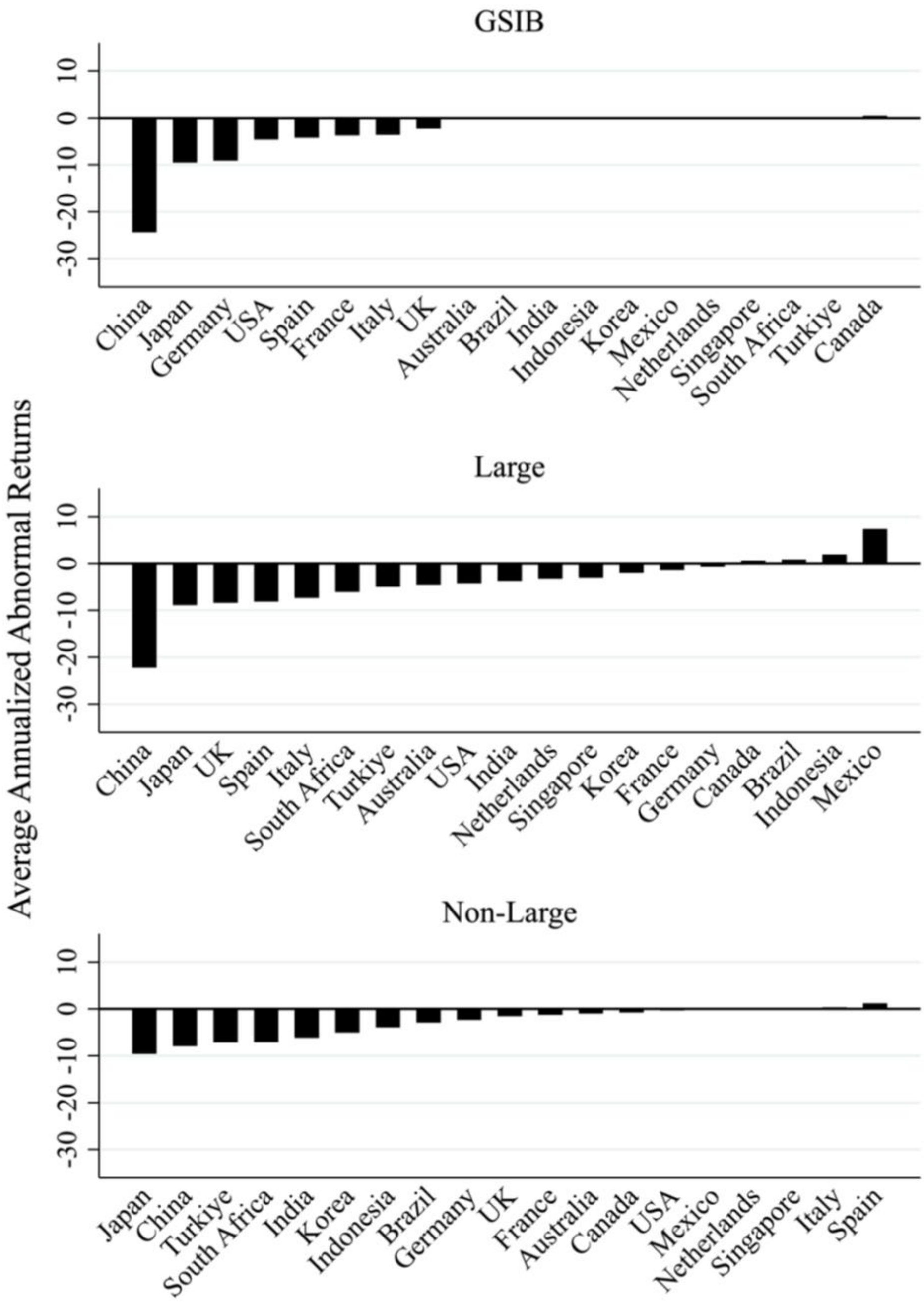


Figure 2. Average Alphas of GSIBs by country and year

This figure shows the average abnormal returns of GSIBs by country and by year. Values in red are below zero and represent an implicit subsidy and values in blue are above zero and represent a "taxation" to tail risk (Gandhi & Lustig, 2015). The dotted values represent the years after the application of the bank resolution.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
CAN	-2.7	-5.6	-6.1	2.2	12.7	3.2	-7.7	6.5	27.5	-10.7							0.9	-1.7	-15.6	5.6	-1.8
CHN								-59.2								-22.7				-2.9	
DEU	17.8	-0.4	-2.1	8.0	6.6	-14.1	-28.3	-31.2	0.6	-19.4	-44.3	-20.7	-35.0	1.3	-11.2	-45.0	-1.2	-14.6	-3.5	51.2	8.5
ESP	8.8	30.4	-19.8	-14.9	-1.8	-3.3	-14.9	1.9	5.3	-14.6	-23.6	-2.5	3.9	-4.7	-23.1	-6.7	-12.5	-13.1			
FRA	0.7	0.6	-4.6	11.5	3.4	-8.1	-21.1	-5.9	-16.1	-12.8	-14.5	-10.2	-9.8	-0.8	-0.5	-9.3	-0.2	-11.1	12.6	8.2	9.0
GBR	8.8	2.8	-13.1	-4.3	-5.0	-12.5	-3.2	-28.2	22.7	13.3	2.7	31.6	-9.0	-12.7	-28.4	-15.0	15.6	-6.4	2.4	-6.5	-8.5
ITA	-12.6	31.7	0.0	-23.8	19.2	-12.1	-7.3	-14.7	14.4	1.5	-17.7	14.5	-1.0	-5.6	-10.6	-23.4	-14.0				
JPN			-18.5	22.3	-2.2	-16.3	-27.9	-34.0	-33.1	-25.4	-0.7	10.1	-6.1	-17.2	2.4	-5.0	-8.4	-9.3		-6.4	-8.8
USA	13.6	22.1	-13.8	-7.4	3.3	-11.1	-1.2	-7.9	-26.0	-3.8	-29.0	-1.5	-18.9	-1.4	-8.1	-10.9	17.3	2.8	2.3	-14.2	-4.9

Low Alpha High Alpha Bail-in Resolution

Figure 3. Average Alphas of Large Banks with GSIBs by country and year

This figure shows the average abnormal returns of large banks by country and by year. Values in red are below zero and represent an implicit subsidy and values in blue are above zero and represent a "taxation" to tail risk (Gandhi & Lustig, 2015). The dotted values represent the years after the application of the bank resolution.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
AUS	-7.5	-12	12		-2.7	-7.4	1.5	-19	-3.9	3.9	6.7	-0.2	-1.5	-8.5	-7.7	-20	-11	-7.3	-20	14	-1.3
BRA							-2.7	-31	24	7.5	-10	8.7	9.7	3.6	-2.2	17	6	9.4	-13	-3.7	-19
CAN	-7.2	-2.9	9.7	-2.9	5.7	1.5	-14	1.7	30	0.1	2.4	-4	-2.6	2.2	-1.5	1.5	-1.9	-4.8	-14	11	0.4
CHN								-17								-12				-5.4	
DEU	3	4.4	-34	16	8.1	0.2	3.8	-15	15	-13	-20	-12	-6.4	6.4	-12	-35	25	-13	8.1	-3.2	14
ESP	-0.6	17	-0.9	-1.3	0.1	4.5	-16	-9.9	-17	-1.3	-21	-24	1.5	-3.1	-8	-12	-15	-12	-17	-5.3	-4.4
FRA	-1.3	14	5.5	-1.2	-1	1.8	-21	-16	-18	-2.9	-16	-7.2	7.3	1	-3.3	-8	4.5	-5.4	13	2	-5.5
GBR	3.8	-11	-19	-6.2	-2.1	-13	-21	-35	23	13	-1.2	30	3.8	-9.4	-17	-9.7	-3	-16	1.2	-0.2	2.3
IDN							-5.8	3.5	14	22		-12	-0.5	-0.4	6	-1.7			-2.2	-7.1	6.7
IND	1.7	16	-9.1	18	-14	-7.1	-35	23	-45	19	-5.4	10	-12	49	-29	-40	-9.6	10	18	-12	-24
ITA	-15	19	28	-6.1	9.8	-4.9	-6.9	-28	11	-9.4	-33	-3	5.1	-1.9	-7.4	-47	-9.9	-1.2	-2.6	-19	-7.9
JPN	-4.5	0.8	-17	23	-6.4	-17	-19	-36	-28	-22	-1.1	1.1	-8.6	-16	-2.7	-7	-5.7	-6.3		-5	-7.6
KOR					8					-11	-5.4	11	9.4	8.2	-1.6	6.2		-19	-28	-11	9.5
MEX						-11	39	16	14	23	-8.4	36	-2.3	8.1	-16	1.7	-16	1.9	-1.2	0.4	-6.1
NLD					2	6.9	12	-10	-29	-37	-17	-40	-5.8	8.7	1.5	-16	-0.3	-15	-11	33	-4.9
SGP	9.1	-21	-13	-14	-6.3	-14	-6.9	4.9	-0.4	3	-7.8	-11	-1.3	1.9	-9	1	-5.7	3.2	-11	8.9	6.7
TUR		-28	4.4	20			2	-16	-25	11	-10	-7.6	-8	-11	-20	-5.9	-14	10	9.5	-23	-13
USA	5.3	33	-7.3	-7.9	2.5	-17	-3.2	-2.9	-28	1	-29	1.8	-17	-2.2	-8.9	-8.7	15	1.5	5.3	-12	-10
ZAF	-60			17	-3.3	-3.1	-6.9	-29	-5.2	-2.6	-11	-15	-18	12	-9.1	21	-13	-5.2	-9.5	1.7	9.7

Figure 4. Average Alphas of Non-Large Banks by country and year

This figure shows the average abnormal returns of non-large banks by country and by year. Values in red are below zero and represent an implicit subsidy and values in blue are above zero and represent a "taxation" to tail risk (Gandhi & Lustig, 2015). The dotted values represent the years after the application of the bank resolution.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
AUS	13	2.2	12		7.6	-3.8	-6.7	-24	5.7	9.8	-4.8	-12	-3.1	-12	-10	-23				20	-7.4
BRA							13	-2.9	30	7.5	-17	-22	-9.4	-28	-6	3.8	-21	-14	26	-5.4	-17
CAN	1.5	-22	22	-3.7	12	1.4	-5.4	-14	12	-1.7	11	1.6	0.8	-6.8	-7.6	-5.7	-3.6	-9.8	11	-4	-3.5
CHN								-47								-1.1				-4.6	
DEU	-30	-2.7	36	20	-5.1	17	-16	-38	-0.3	-6.9	1.9	-12	5.3	-12	-19	2.1	-8.3	-17	16	5.7	7.9
ESP	4.8	13	24	21	-1	8.5	-20	-20	-7.5	-19	-16	6.4	49	15	1.2	10	4.5	3.7			
FRA	-16	11	29	-0.1	-14	-1.5	-12	-34	20	1.7	-17	1.7	31	-8	-16	1.3	12	14	9.8	-12	-0.4
GBR	34	11	5.7	-20	-6.7	-12	-15											-27	-6.7	-0.8	-0.9
IDN							-14	11	5.6	12		6.4	-12	-6.2	2.1	-3.1			-1.7	0.1	-38
IND	-4.7	5.9	2.9	19	-31	-5.2	4.6	15	-28	24	-4.1	16	-25	21	-24	-20	-22	5	-14	-25	-41
ITA	0.6	20	18	1.3	-0.8	-2	2	-22	9.9	-5.4	-15	-11	2.3	-12	1	-30	-10	-8.6	2	20	18
JPN	-3.9	4.6	-13	-7.2	-25	-15	8	-4.2	-9.5	-20	8	-14	-20	-4	0.5	-8.6	-15	-5.7		-23	-25
KOR					18					-16	-7.6	7.9	-31	-20	-3.5	0.3			-30	-5.1	5.6
TUR							6.1	-37	8	-31	-21	-2.9	1.4	-16	-15	-2.8	11	17	-14	-20	-25
USA	11	12	16	2	-3	-4.4	-18	-20	-27	1.5	-5.3	10	3.2	4.3	5.1	8	-1.2	4.4	0.5	-1.9	2.4
ZAF											-30	3	3.2		-17	2.7	7.6	-39	-8.3	-7.2	6.6

Figure 5. Average of Bank Level Annualized Abnormal Returns Pre- and Post-Bail-in Resolution

This chart shows the average abnormal returns for the periods before and after the bail-in resolution for countries that applied the resolution (i.e., USA, UK Italy, Spain, Switzerland, France, Germany, Netherlands, and Canada).

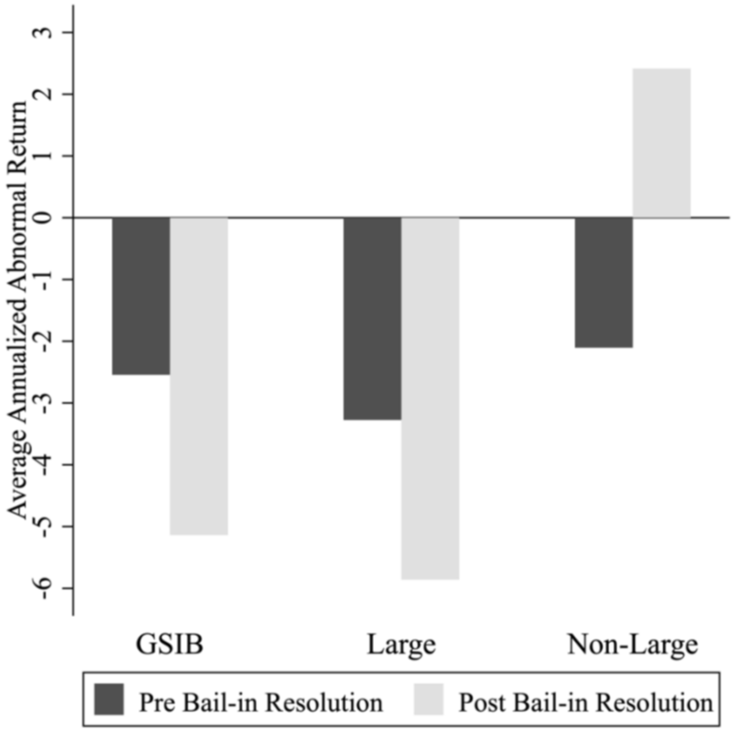


Figure 6. Maximum Cumulative years on Banking Crises (CYBC) by country

This figure shows the maximum number of years of cumulative banking crises in each country, CYBC.

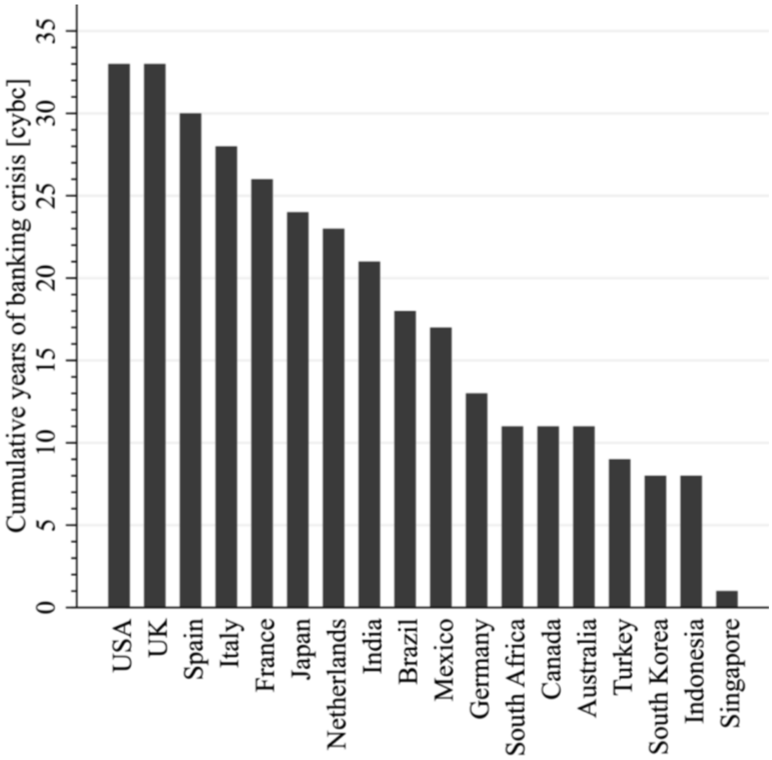


Figure 7a. Cumulative Years of banking crises (CYBC) and Cumulative Number of Banking Crises (CNBC) by country and year

This figure presents the Cumulative Years of Banking Crises (CYBC) – our instrumental variable – and the Cumulative Number of Banking Crises (CNBC) by country and year.

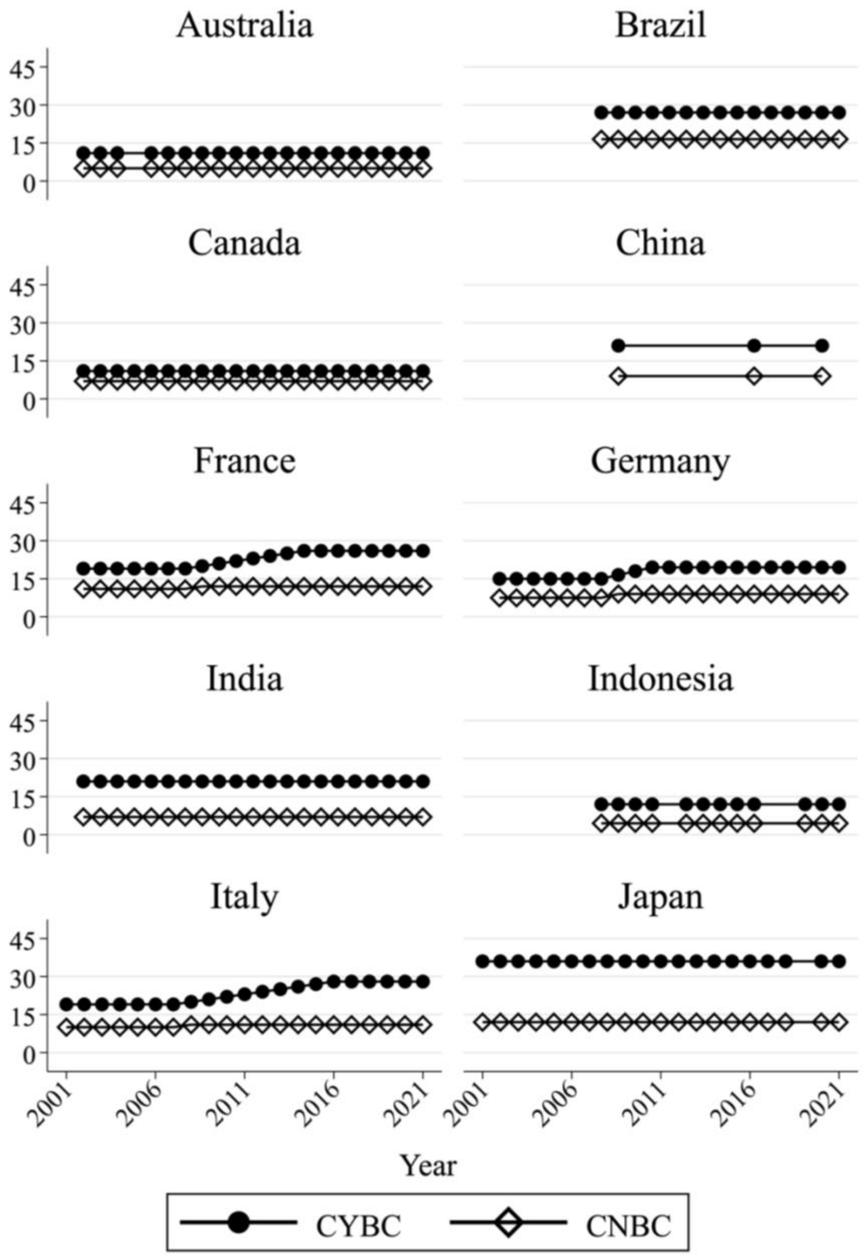
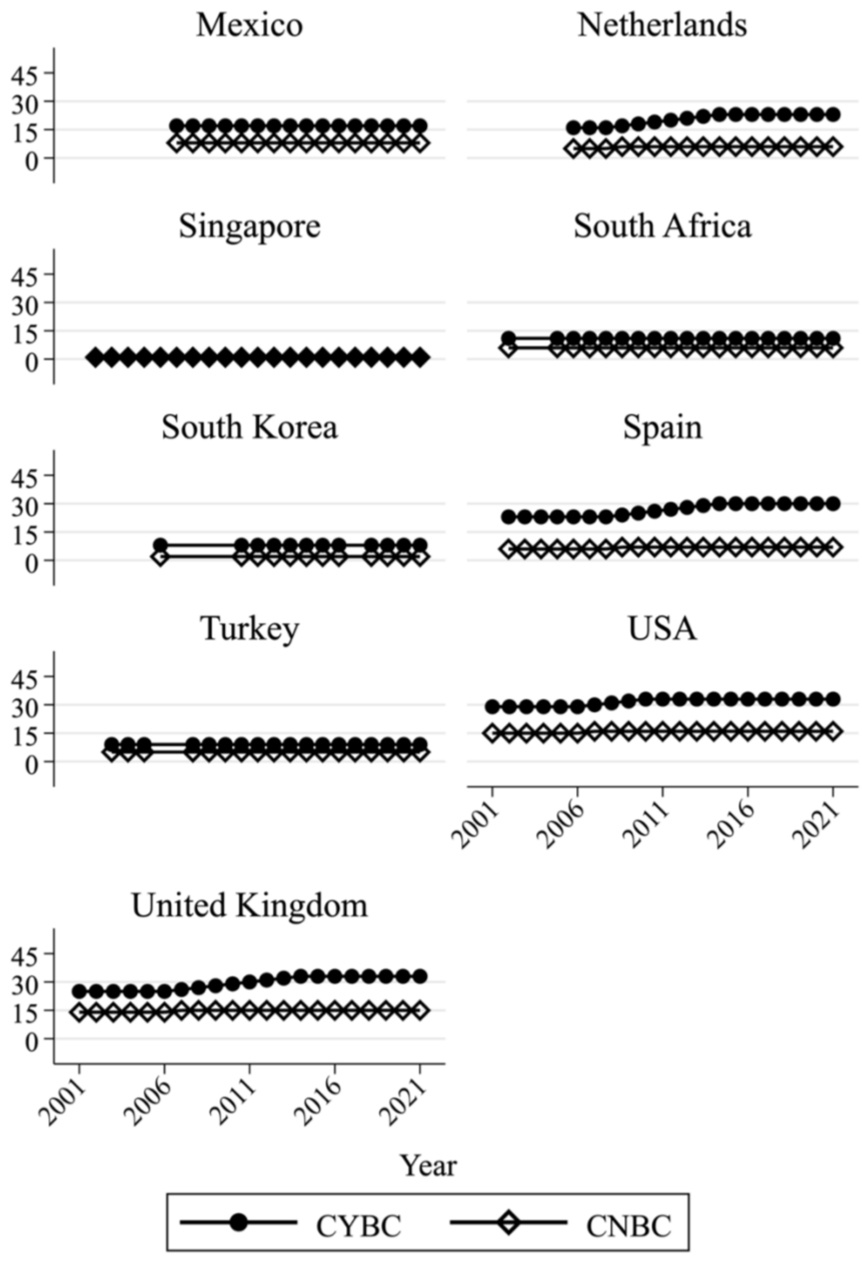


Figure 7b. Cumulative Years of banking crises (CYBC) and Cumulative Number of Banking Crises (CNBC) by country and year

This figure presents the Cumulative Years of Banking Crises (CYBC) – our instrumental variable – and the Cumulative Number of Banking Crises (CNBC) by country and year.



Tables

Table 1. Variable definitions and their sources

This table presents the definition of the variables used in this research and the source of the data.

Variables	Definition	**Source**
	Panel A: Firm level characteristic	
α×52	The annualized abnormal returns. It is calculates using Equation 1.	Author using data from DataStream
B/M	Book-to-Market.	Author using data from DataStream
Debt/TA	Total debt to total assets.	Author using data from DataStream
Dep/TA	Total deposits to total assets.	Author using data from DataStream
EDF	Expected Default Frequency based on the Merton model of distance to default following Brogaard, Dan & Ying (2017).	Author using data from Datastream
ROE	Return on Equity. Given by the net income in *t* divided by book value of equity *t*	Author using data from Datastream
TA/GDP	Standardized Total assets by country GDP.	Author using data from Datastream
	Panel B: Country Level	
Bail-in	Bail-in resolution, a country-level dummy variable that takes the value of 1 if the country implemented a bail-in resolution.	FSB
bnkcrisis	Banking crisis is a dummy variable that takes the value of 1 if the country is in a banking crisis.	BFFS Project
concetr	Bank Concentration (BC) is measure as the sum of assets of three largest commercial banks as a share of total commercial banking assets.	World Bank
CYBC	Cumulative Years on Banking Crises.	Author using data from BFFS Project
CNBC	Cumulative Number on Banking Crises.	Author using data from BFFS Project
Risk factors	It is a vector of equity risk factors. In this research, I will follow Gandhi et al., (2020) and use an enhanced six-factor model in local currency composed of the market factor (MKT), the size factor (SMB), the value factor (HML), profitability (Prof), Investments (Inv) and a momentum factor (Mom).	JKP's Global Factor Data
Exchange rate	It is the official exchange rate of each country.	IMF database
GDP growth	Growth of Gross Domestic Product in the last year.	World Bank
Inflation	It is the inflation measure by the consumer price index of each country.	World Bank
Mkt	It is the marker return proxy, measure as the monthly MSCI index return for each country measure in local currency.	DataStream
Risk Free rate	It is the risk-free rate proxy, measure as the yield to maturity of a 3-month US T-Bill in local currency. I will convert the Rf to local currency using the official exchange rate.	Federal Reserve Economic Data (FRED)
RRI	Resolution Reform Index, a country-level index of FSB Resolution reform implementation.	FSB
Unemp	Estimations of total labor for that does not have a job.	World Bank

Table 2. Number of Banks, IB and Brokerage Services by country

This table shows the number of unique financial institutions in each country and % is the percentage of financial institutions in each country relative to the total number of financial institutions in our sample. IB+BS is the abbreviation for investment banks and brokerage services. T0 is the first year that the country appears in our database. Countries with names shortened to fit the table: SA is South Africa, UK is United Kingdom and USA is United States of America.

Panel A. Number of Banks, IB and Brokerage Services by country

	All		Banks		IB + BS		
Country	N	%	N	%	N	%	T0
Australia	18	1.03	16	0.93	2	5.41	2001
Brazil	17	0.97	17	0.99			2007
Canada	11	0.63	10	0.58	1	2.7	2001
China	47	2.68	47	2.74			2008
France	28	1.6	26	1.52	2	5.41	2001
Germany	24	1.37	19	1.11	5	13.51	2001
India	49	2.8	49	2.86			2001
Indonesia	33	1.88	33	1.92			2007
Italy	43	2.45	37	2.16	6	16.22	2001
Japan	113	6.45	113	6.59			2001
Mexico	8	0.46	5	0.29	3	8.11	2006
Netherlands	7	0.4	5	0.29	2	5.41	2005
Singapore	3	0.17	3	0.17			2001
SA	12	0.68	10	0.58	2	5.41	2001
Korea	18	1.03	17	0.99	1	2.7	2005
Spain	19	1.08	19	1.11			2001
Turkey	15	0.86	15	0.87			2002
USA	1,264	72.15	1,254	73.12	10	27.03	2001
UK	23	1.31	20	1.17	3	8.11	2001
Total	1,752	100	1,715	100	37	100	

Panel B. Number of GSIBs by country

Country	N	%
Canada	2	7.41
China	3	11.11
France	3	11.11
Germany	2	7.41
Italy	1	3.70
Japan	3	11.11
Spain	2	7.41
USA	6	22.22
UK	5	18.52
Total	27	100

Table 3. Descriptive statistics for sample and subsamples

This table includes simple summary statistics for the sample of bank level variables (Panel A), the subsample of non-large banks (Panel B), the subsample of large banks (Panel C), the subsample of GSIBs (Panel D), and the summary statistics for country level variables (Panel E).

	Nobs	Mean	Min.	Max.	SD.
Panel A. Bank Level variables of all banks					
α×52	14,986	-1.793	-131.744	122.216	23.773
B/M	14,986	1.098	0.060	165.04	2.13
debt/ta	14,986	0.141	0.000	0.967	0.123
dep/ta	14,986	0.737	0.002	0.97	0.15
EDF	14,986	9.134	0.000	50.264	12.539
TA/GDP	14,986	-0.061	-0.093	1.874	0.131
ROE	14,986	7.465	-257.320	66.36	11.523
Panel B. Bank Level variables of Non-large banks					
α×52	13,596	-1.592	-131.744	122.216	24.025
B/M	13,596	1.067	0.060	10.722	0.789
debt/ta	13,596	0.132	0.000	0.967	0.119
dep/ta	13,596	0.755	0.002	0.97	0.134
EDF	13,596	8.662	0.000	48.562	12.287
TA/GDP	13,596	-0.089	-0.093	0.407	0.018
ROE	13,596	7.046	-257.320	66.36	11.55
Panel C. Bank Level variables of Large banks					
α×52	1,390	-3.763	-103.142	87.773	21.056
B/M	1,390	1.403	0.082	165.04	6.537
debt/ta	1,390	0.231	0.000	0.853	0.132
dep/ta	1,390	0.553	0.011	0.915	0.172
EDF	1,390	13.754	0.000	50.264	13.964
TA/GDP	1,390	0.213	-0.092	1.874	0.314
ROE	1,390	11.565	-94.780	56.9	10.399
Panel D. Bank Level variables of GSIB banks					
α×52	398	-4.982	-72.454	51.166	18.012
B/M	398	1.137	0.147	4.343	0.789
debt/ta	398	0.227	0.047	0.612	0.1
dep/ta	398	0.514	0.164	0.846	0.139
EDF	398	17.463	0.000	47.72	15.102
TA/GDP	398	0.366	-0.085	1.658	0.361
ROE	398	9.373	-43.140	54.37	9.668
Panel E. Country Level					
Bail-in	14986	0.329	0.000	1	.47
bnkcrisis	14986	0.183	0.000	1	.387
concentr	14986	38.439	23.123	100	13.076
CYBC	14986	27.562	1.000	33	6.59
GDP growth	14986	4.264	-9.838	46.445	3.994
inflation	14986	2.389	-1.353	44.964	1.99
RRI	14986	28.366	0.000	100	35.693
ΔRRI	13235	4.724	-16.500	95.062	11.194
unempl	14986	6.262	2.400	33.559	2.854

Table 4. Bail-in resolution by country

This table shows, for each country in our sample, the year of implementation of bank resolution reforms, its exact date, and the source of this information. **:** [a] Bail-in norm in Canada [link]. We use the year 2015 since the bail-in rule was not fully adopted in 2014. [b] In Europe, the Bank Recovery and Resolution Directive (BRRD) and the Single Resolution Mechanism (SRM) were finalized on June 1, 2014, and became effective in January 2016. [c] Bail-in norm in the UK [link]. [d] The Orderly Liquidation Authority (OLA) has created by Title II of the Dodd-Frank Act on Jul. 21, 2010.

FSB jurisdictions	Bail-in powers	Year of effectively implementation	Exact Date	Source
Argentina	No			FSB
Australia	No			FSB
Brazil	No			FSB
Canada	Yes	2017	June 1, 2016. [a]	FSB
China	No			FSB
France	Yes	2015	June 1, 2014. [b]	BRRD and FSB
Germany	Yes	2015	June 1, 2014. [b]	BRRD and FSB
Hong Kong	Yes	2016		FSB
India	No			FSB
Indonesia	No			FSB
Italy	Yes	2015	June 1, 2014. [b]	BRRD and FSB
Japan	No			FSB
Korea	No			FSB
Mexico	No			FSB
Netherlands	Yes	2015	June 1, 2014. [b]	BRRD and FSB
Saudi Arabia	No			FSB
Singapore	No			FSB
South Africa	No			FSB
Spain	Yes	2015	June 1, 2014. [b]	BRRD and FSB
Switzerland	Yes	2015	June 1, 2014. [b]	BRRD and FSB
Turkey	No			FSB
UK	Yes	2013	Dec. 18, 2013. [c]	The 2013 Bank Act and FSB
USA	Yes	2010	Jul. 21, 2010. [d]	OLA and FSB

Table 5. The effect of bail-in policy on implicit subsidy

This table shows the average change in abnormal returns associated with the implementation of the bail-in bank resolution reform (a dummy variable) as shown in the model presented in Equation 2. The regressions were estimated using OLS. Column 1 shows the results of running the regression using the entire sample. Column 2 shows the results for the sub-sample of non-large banks (defined as those that are not in the large bank group). Column 3 shows the results for the sub-sample of large banks (defined as the top 5 in each country). Column 4 presents the results of the GSIBs, defined by the list released by the BIS. Standard errors are in parentheses. All models were estimated using Bank-level and Country-level controls and Bank and Year Fixed Effects. All standard errors are clustered at the bank level. p-values: *10%; ** 5%; ***1%.

	(1)	(2)	(3)	(4)
Subsample	All	Non-Large	Large with GSIBs	G-SIBs
Model	OLS	OLS	OLS	OLS
Dependent Variable	$\alpha \times 52$	$\alpha \times 52$	$\alpha \times 52$	$\alpha \times 52$
Bail-in	4.672***	4.121***	1.185	0.767
	(1.054)	(1.382)	(2.617)	(4.749)
Bank controls	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Nobs	14,818	13,425	1,362	398
N of bank clusters	1,584	1,489	145	27
Adj. R^2	0.282	0.304	0.142	0.285

Table 6. The effect of bail-in policy on implicit subsidy of distressed banks

This table shows the average change in abnormal returns associated with the implementation of the bail-in bank resolution reform (a dummy variable) with a financial distress dummy interaction as shown in Equation 3. The regressions were estimated using OLS. Column 1 shows the results of running the regression using the entire sample. Column 2 shows the results for the sub-sample of non-large banks (defined as those that are not in the large bank group). Column 3 shows the results for the sub-sample of large banks (defined as the top 5 in each country). Column 4 presents the results of the GSIBs, defined by the list released by the BIS. Standard errors are in parentheses. All models were estimated using Bank-level and Country-level controls and Bank and Year Fixed Effects. All standard errors are clustered at the bank level. p-values: *10%; ** 5%; ***1%.

	(1)	(2)	(3)	(4)
Subsample	All	Non-Large	Large with GSIBs	G-SIBs
Model	OLS	OLS	OLS	OLS
Dependent Variable	$\alpha\times52$	$\alpha\times52$	$\alpha\times52$	$\alpha\times52$
Bail-in	3.900***	1.592	-3.101	-6.390
	(1.171)	(1.450)	(2.600)	(7.465)
Distress	-8.135***	-6.641***	-3.142*	-3.480
	(0.647)	(0.688)	(1.864)	(3.459)
Bail-in $\times$ Distress	7.538***	8.008***	4.785*	11.712*
	(0.835)	(0.880)	(2.596)	(5.836)
Bank controls	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Nobs	14,818	13,425	1,492	398
N of bank clusters	1,584	1,489	157	27
Adj. R^2	0.264	0.307	0.140	0.287

Table 7. The effect of bail-in policy on implicit subsidy of banks: exploring country fiscal deficit heterogeneity

This table shows the average change in abnormal returns associated with the implementation of the bail-in bank resolution reform (a dummy variable) with a fiscal deficit dummy interaction, as shown in Equation 4. The regressions were estimated using OLS. Column 1 shows the results of running the regression using the entire sample. Column 2 shows the results for the sub-sample of non-large banks (defined as those that are not in the large bank group). Column 3 shows the results for the sub-sample of large banks (defined as the top 5 in each country). Column 4 presents the results of the GSIBs, defined by the list released by the BIS. Standard errors are in parentheses. All models were estimated using Bank-level and Country-level controls and Bank and Year Fixed Effects. All standard errors are clustered at the bank level. p-values: *10%; ** 5%; ***1%.

	(1)	(2)	(3)	(4)
Subsample	All	Non-Large	Large with GSIBs	G-SIBs
Model	OLS	OLS	OLS	OLS
Dependent Variable	$\alpha\times52$	$\alpha\times52$	$\alpha\times52$	$\alpha\times52$
Bail-in	0.844	-1.257	1.428	-3.910
	(1.389)	(1.890)	(4.179)	(4.921)
Fiscal Deficit	-3.981***	-5.313***	0.959	0.298
	(0.884)	(1.118)	(1.515)	(2.710)
Bail-in × Fiscal Deficit	5.159***	7.190***	-1.626	5.760
	(1.587)	(2.153)	(4.225)	(5.143)
Bank controls	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Nobs	14,242	12,922	1,292	381
N of bank clusters	1,556	1,461	144	27
Adj. R^2	0.281	0.305	0.142	0.290

Table 8. The effect of bail-in policy on implicit subsidy: instrumental variable approach

This table shows the average change in abnormal returns associated with the implementation of the bail-in bank resolution reform (a dummy variable) using variation in the cumulative years of past banking crises as an instrument for the probability of implementation of bail-in resolution reform, as shown in Equation 4. The regressions were estimated using two-stage least squares (2SLS). Column 1 shows the results of running the first stage regression. Column 2 shows the results of the second stage regression using the entire sample. Column 3 shows the results for the sub-sample of non-large banks (defined as those that are not in the large bank group). Column 4 shows the results for the sub-sample of large banks (defined as the top 5 in each country). Column 5 presents the results of the GSIBs, defined by the list released by the BIS. Standard errors are in parentheses. All models were estimated using Bank-level and Country-level controls and Bank and Year Fixed Effects. All standard errors are clustered at the bank level. p-values: *10%; ** 5%; ***1%.

	(1)	(2)	(3)	(4)	(5)
Subsample	All	All	Non-Large	Large with GSIBs	G-SIBs
Model	1st Stage	2nd Stage	2nd Stage	2nd Stage	2nd Stage
Dependent Variable	Bail-in	$\alpha\times52$	$\alpha\times52$	$\alpha\times52$	$\alpha\times52$
Bail-in*		6.467***	5.115**	7.803	21.810
		(1.630)	(1.933)	(4.895)	(17.273)
$CYBC_{t-1}$	0.177***				
	(0.007)				
Bank controls	Yes	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
1st Stage F	516.89	516.89	425.31	436.13	18.98
Stock-Yogo critical values: 10%	16.38	16.38	16.38	16.38	16.38
Nobs	14,818	14,818	13,425	1,362	398
N of bank clusters	1,584	1,584	1,489	145	27
Adj. R^2	0.930	0.136	0.154	0.054	0.094

Table 9. The effect of bail-in policy on implicit subsidy: weighted observations

This table shows the average change in abnormal returns associated with the implementation of the bail-in bank resolution reform (a dummy variable) as shown in the model presented in Equation 2. The regressions were estimated using OLS and where weighted by the inverse number of banks in each contry-year. Column 1 shows the results of running the regression using the entire sample. Column 2 shows the results for the sub-sample of non-large banks (defined as those that are not in the large bank group). Column 3 shows the results for the sub-sample of large banks (defined as the top 5 in each country). Column 4 presents the results of the GSIBs, defined by the list released by the BIS. Standard errors are in parentheses. All models were estimated using Bank-level and Country-level controls and Bank and Year Fixed Effects. All standard errors are clustered at the bank level. p-values: *10%; ** 5%; ***1%.

	(1)	(2)	(3)	(4)
Subsample	All	Non-Large	Large with GSIBs	G-SIBs
Model	OLS	OLS	OLS	OLS
Dependent Variable	$\alpha \times 52$	$\alpha \times 52$	$\alpha \times 52$	$\alpha \times 52$
Bail-in	2.909	2.940	2.435	-6.113
	(1.842)	(2.031)	(3.079)	(7.201)
Bank controls	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Nobs	14,801	13,409	1,363	398
N of bank clusters	1,595	1,493	153	27
Adj. R^2	0.206	0.259	0.218	0.297

Table 10. The effect of bail-in policy on implicit subsidy: bank size classified by percentile of total assets

This table shows the average change in abnormal returns associated with the implementation of the bail-in bank resolution reform (a dummy variable). The bank size was defined by percentiles. The regressions were estimated using OLS. Column 1 shows the results of running the regression using the small banks (bellow percentile 20). Column 2 shows the results of running the regression using the mid-small banks (between percentile 20 to 40). Column 3 shows the results of running the regression using the mid banks (between percentile 40 to 60). Column 4 shows the results of running the regression using the mid-small banks (between percentile 60 to 80). Column 5 shows the results of running the regression using the mid-small banks (above percentile 80). Standard errors are in parentheses. All models were estimated using Bank-level and Country-level controls and Bank and Year Fixed Effects. All standard errors are clustered at the bank level. p-values: *10%; ** 5%; ***1%.

	(1)	(2)	(3)	(4)	(5)
Subsample	Small	Mid-Small	Mid	Mid-Large	Large
Model	OLS	OLS	OLS	OLS	OLS
Dependent Variable	$\alpha\times52$	$\alpha\times52$	$\alpha\times52$	$\alpha\times52$	$\alpha\times52$
Bail-in	6.271**	2.196	1.449	6.497***	4.004*
	(2.811)	(2.660)	(2.950)	(2.340)	(2.347)
Bank controls	Yes	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Nobs	2,984	2,883	2,888	2,917	2,758
N of bank clusters	561	504	488	418	284
Adj. R^2	0.308	0.343	0.325	0.330	0.357

Table 11. The effect of resolution reform index on implicit subsidy

This table shows the average change in abnormal returns associated with the change in the resolution reform index (ΔRRI). The regressions were estimated using OLS. Column 1 shows the results of running the regression using the entire sample. Column 2 shows the results for the sub-sample of non-large banks (defined as those that are not in the large bank group). Column 3 shows the results for the sub-sample of large banks (defined as the top 5 in each country). Column 4 presents the results of the GSIBs, defined by the list released by the BIS. Standard errors are in parentheses. All models were estimated using Bank-level and Country-level controls and Bank and Year Fixed Effects. All standard errors are clustered at the bank level. p-values: *10%; ** 5%; ***1%.

	(1)	(2)	(3)	(4)
Subsample	All	Non-Large	Large with GSIBs	G-SIBs
Model	OLS	OLS	OLS	OLS
Dependent Variable	$\alpha\times52$	$\alpha\times52$	$\alpha\times52$	$\alpha\times52$
ΔRRI	0.140***	0.165***	-0.054	-0.104
	(0.031)	(0.036)	(0.069)	(0.076)
Bank controls	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes
Portfolio FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Nobs	13,045	11,783	1,238	343
N of bank clusters	1,416	1,321	139	24
Adj. R^2	0.289	0.314	0.155	0.231

Internet Appendix

This Internet Appendix provides additional figures and tables supporting the main text.

Tables

Table A.1. Sample definition criteria for bank-level data in a yearly frequency

Steps/Filters	**Description**	**Total of N_ids and N_obs after the Step/Filter**	
		N_ids	***N_obs***
Raw data	This is the raw data after we dropped the firms without id information.	27,041	621,943
1. Valid accounting and market data	We dropped observations without total assets, total liabilities, total debt, book value of equity, market capitalization, return on assets and return on equity.	13,092	124,661
2. Valid account and market data for banks	We dropped observations without total deposits, total loans, net loans, interest on total loans, and interest expenses on debt.	3,081	28,640
3. Negative (or zero) accounting and bank specific data	We dropped observations with negative or zero values of total assets, total deposits, total loans,	2,957	27,121
4. Valid bank variables	We dropped observations with missing values of debt-to-assets, debt-to-firm value (using market and book values), deposits-to-assets, loans-to-deposits, cost of debt, and loans growth.	2,792	25,797
5. Valid ICB code for Banks and Investment Banks services	We dropped firms with ICB code different from 301010 or 302020.	2,692	25,091
6. Valid macroeconomic data	We dropped observations without GDP growth, Inflation, and Unemployment.	2,661	24,807
7. Valid financial development data	We dropped observations without bank concentration.	2,647	24,423
8 to 15. Stock level filters	Several stock level filters.	2,080	17,686
16. FSB jurisdictions	Keeping just the FSB jurisdictions.	1,828	15,643
17. Data for Banking Crises	Keeping the countries with valid banking crises observations.	1,790	15,261

18. Duplicates	We dropped observations with repeated values of total assets, total liabilities, total debt and net income for the same firm, in the same year.	1,752	14,986

Table A.2. Sample definition criteria for stock level data in weekly frequency

Steps/Filters	Description	Total of N_ids and N_obs after the Step/Filter	
		N_ids	***N_obs***
Raw data	This is the raw data in weekly frequency after we dropped the firms without id information.	2,423	1,099,230
8. Non-common equity	We dropped all firms whose name includes the words “fund”, “REITS”, "income", “trust”, “index”, “warrants”, “etf”, “receipt”, to eliminate data for mutual funds and other such investment services.	2,395	1,086,198
9. Missing returns observations	We dropped observations with missing returns data	2,394	1,085,684
10. Extreme returns and reversals	We dropped pairs of consecutive observations that have weekly equity returns that exceed 22.5% (90% per month), are of the exact same magnitude, but of opposite signs.	2,394	1,085,682
11. Penny Stocks	In each year, we dropped stocks whose price is less than one monetary unit at the end of the year.	2,358	1,065,222
12. Smallcaps Stocks	In each country, we dropped the very smallest firms by eliminating the bottom 1% by end of the year market capitalization.	2,329	1,053,336
13. Relevant number of observations	We dropped stocks with less than 52 weekly observations per year	2,134	946,972
14. High illiquid stock	We dropped stocks with more than 80% zero weekly per year	2,080	919,672
15. Transforming in annual data	We keep just the last week of the year	2,080	17,686

Table A.3 Asset Pricing Regression

This table shows the application of the 6-factor asset pricing model on the excess returns $r_{i,j,t} - Rf_{j,t}$ of banks measured on a weekly basis, as shown in the model presented in Equation 1. $r_{i,j,t}$ is the weekly return of each individual bank i, at country j in week t. $Rf_{j,t}$ is the weekly return of a T-Bill. All returns are at local currencies. Mkt minus Rf is the market risk factor, Size is the Size factor, Value it the Value factor, Prof is the profitability factor, Inv is the investment factor and Mon is the momentum factor. The regressions were estimated using OLS without fixed effects, as is common in asset pricing regressions. Column 1 shows the results of running the regression using the entire sample. Column 2 shows the results for the sub-sample of non-large banks (defined as those that are not in the large bank group). Column 3 shows the results for the sub-sample of large banks (defined as the top 5 in each country). Column 4 shows the results of the GSIBs, defined by the list released by the BIS. Standard errors are in parentheses. All standard errors are clustered at the bank level. p-values: *10%; ** 5%; ***1%.

	(1)	(2)	(3)	(4)
Subsample	All	Non-Large	Large without GSIBs	GSIB
Model	OLS	OLS	OLS	OLS
Dependent Variable	$r_{i,j,t} - Rf_{j,t}$	$r_{i,j,t} - Rf_{j,t}$	$r_{i,j,t} - Rf_{j,t}$	$r_{i,j,t} - Rf_{j,t}$
$\alpha \times 52$	-2.823***	-3.120***	-3.068**	-3.137***
	(0.766)	(0.988)	(1.196)	(0.965)
Mkt minus Rf	0.775***	0.633***	0.820***	0.971***
	(0.031)	(0.054)	(0.031)	(0.038)
Size	0.122*	0.442***	0.013	-0.229
	(0.062)	(0.082)	(0.055)	(0.143)
Value	0.408***	0.258***	0.480***	0.710***
	(0.080)	(0.079)	(0.084)	(0.094)
Prof	-0.377***	-0.241**	-0.362***	-0.788***
	(0.093)	(0.102)	(0.091)	(0.175)
Inv	0.024	-0.023	0.014	0.031
	(0.040)	(0.040)	(0.052)	(0.085)
Mom	-0.087**	0.015	-0.092*	-0.169***
	(0.043)	(0.043)	(0.050)	(0.042)
Nobs	38,324	13,416	17,576	8,320
Adj. R^2	0.554	0.500	0.586	0.661