NBER WORKING PAPER SERIES

PERMANENT CAPITAL LOSSES AFTER BANKING CRISES

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Working Paper 34288
http://www.nber.org/papers/w34288

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
September 2025

The authors would like to thank Markus Brunnermeier, Andrew Karolyi, Arvind Krishnamurthy, Ross Levine, Stephan Luck, Yueran Ma, Alberto Martin, Andrew Metrick, Alan Moreira, Tyler Muir, Karsten Müller, Aleksandra Rzeznik, Paul Schmelzing, Emil Verner, Wei Xiong, and seminar participants at the Bank for International Settlements, Bank of England, BI Norwegian Business School, Cheung Kong Graduate School of Business, Cornell University, Federal Reserve Bank of Boston, Federal Reserve Bank of Chicago, Federal Reserve Bank of New York, Goethe University, Kedge Business School, Princeton University, Skema Business School, Universitat Pompeu Fabra, University of Toronto, Washington University in St. Louis, the American Finance Association conference, ASU Sonoran Winter Finance Conference, Barcelona GSE Summer Forum, CEPR/Study Center Gerzensee European Summer Symposium in Financial Markets, European Finance Association conference, MoFiR Workshop on Banking, NBER Summer Institute (Risks of Financial Institutions), and Yale Program on Financial Stability conference for their comments and feedback. We thank Sophia Alden, Niklas Grimm, Andrea Pop Catalisan, and Chiara Vergeat for excellent research assistance. Matthew Baron acknowledges funding from the Cornell Center for Social Sciences, the Institute for New Economic Thinking, and an OFR-NSF grant administered through the NBER. A previous version of the paper circulated under the title "Investing in Crises". The views expressed herein are those of the authors and do not necessarily reflect the views of the European Central Bank, Eurosystem, or National Bureau of Economic Research.

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NBER Working Paper No. 34288
September 2025
JEL No. G01, G21

ABSTRACT

We study the mechanisms driving bank losses across historical banking crises in 46 economies and the effectiveness of policy interventions in restoring bank capitalization. We find that bank stocks experience large, permanent declines at the onset of crises. These losses predict commensurate long-term declines in banks' earnings and dividends, rather than elevated future equity returns. Bank losses are primarily driven by write-downs of nonperforming assets, not asset sales during panics. Forceful liquidity-based interventions during crises predict only small, temporary increases in bank market value. Overall, these results suggest that bank losses during crises are not primarily due to temporary price dislocations. Early liquidity interventions can avert banking crises, but only under specific conditions. Once large bank equity declines have occurred, policy responses have historically failed to prevent persistent undercapitalization in the banking sector.

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I. Introduction

Banking crises have been a recurrent feature of financial systems, often resulting in significant economic disruptions. A key issue for macroeconomic modeling of banking crises and the design of effective policy interventions is understanding the nature of bank losses. By depleting bank capital, bank losses can impair banks' capacity to intermediate funds from savers to firms and households. They can also cause widespread bank failures and capital market disruptions and necessitate policy interventions entailing high fiscal costs. Given the economic importance of bank losses, this paper empirically investigates the key mechanisms driving bank losses across the history of banking crises in 46 economies since 1870, along with the role of government interventions in restoring bank capitalization.

An important divide across theoretical models—critical for correctly diagnosing underlying causes and mechanisms—is whether bank losses during banking crises are primarily temporary or permanent. Several prominent classes of models posit that losses incurred by financial intermediaries are primarily *temporary*, as crises are times when assets held by financial intermediaries trade at sharp discounts. This may be due either to binding borrowing constraints faced by financial intermediaries (e.g., Gertler and Kiyotaki 2010, Gertler and Karadi 2011, He and Krishnamurthy 2012) or to temporary illiquidity (driven by depositor fragility or information frictions, e.g., Allen and Gale 1998, Gorton and Huang 2004, Bolton, Santos, and Scheinkman 2011, Dang, Gorton, and Holmström 2020, Gertler, Kiyotaki, and Prestipino 2020, Amador and Bianchi 2024). These mechanisms lead to sharp but reversible declines in the value of assets held by financial intermediaries due to temporary price dislocations and high discount rates. Provided that central banks quickly offer liquidity support before substantial asset liquidations occur, the value of bank assets—and therefore of bank equity—recovers as discount rates normalize and liquidity returns to the market.

A second view is that banking crises primarily give rise to *permanent* bank losses. If liquidity interventions are insufficient, banks may be forced into fire sales, liquidating assets at depressed prices to meet liquidity demands or regulatory capital requirements (e.g., Diamond and Dybvig 1983, Shleifer and Vishny 1997, 2011). Alternatively, permanent losses could be due to deterioration in banks' asset quality. This deterioration could stem either from poor lending practices prior to the crisis (Kaminsky and Reinhart 1999, Calomiris and Mason 2003, Dell'Ariccia

and Marquez 2006, Schularick and Taylor 2012, Gennaioli and Shleifer 2018, Correia, Luck, and Verner 2025) or from persistent real effects of liquidity shocks or of tightened borrowing constraints, including borrower defaults and macroeconomic deterioration that affect future loan repayments and collateral values (Bernanke 1983). In both cases, the rise in nonperforming assets and borrower defaults lead to significant asset impairments and write-downs at banks, permanently lowering banks' equity and earnings and leading to severe consequences for the real economy (e.g., Kiyotaki and Moore 1997, Holmström and Tirole 1997, Kashyap and Stein 2000, Peek and Rosengren 2000, Caballero, Hoshi, and Kashyap 2008, Huber 2018). In contrast to the *temporary-loss* view, which suggests that central banks can substantially reverse banking sector losses through ample liquidity provision, bank losses in this view persist even after funding and market liquidity are restored. In the absence of timely bank recapitalizations and loan restructurings, nonperforming asset problems can become entrenched, leading to persistent banking sector undercapitalization.

While these two views are not mutually exclusive and may both be empirically relevant, they imply different testable predictions for the market dynamics of bank equity during banking crises and the role of policy interventions in restoring bank capitalization. Conceptually, in this paper, we view the market value of bank equity as primarily representing the value of a leveraged portfolio of bank assets, as priced by equity markets. According to the *temporary-loss view*, the decline in market valuations of bank equity would be temporary, driven by high discount rates of bank assets during crises. As a result, the returns of bank equity following banking crises would be elevated, especially when central banks intervene with extensive liquidity support to stop the panic. On the other hand, in the *permanent-loss view*, the market valuation of bank equity would experience a permanent, earnings-driven shock around the onset of banking crises and would not realize elevated returns thereafter. Bank equity would improve little after liquidity-based interventions if bank losses are primarily due to fundamental asset weaknesses. Absent forceful government recapitalizations, banks would experience low long-run capitalizations.

To empirically distinguish these views, we construct several new historical datasets on stock returns, bank losses, and banking crisis interventions across 46 economies since 1870. The first dataset builds on Baron, Verner, and Xiong (2021, henceforth "BVX"). It comprises country-level total return indexes of bank and nonfinancial equities spanning 46 economies, available at both monthly and yearly frequencies from 1870 onward. The second dataset contains the equity

returns, balance sheet quantities, net income, and equity issuance around each banking crisis at the *individual bank level* for the ten largest banks in each of the 17 economies covered in Jordà, Schularick, and Taylor (2017, henceforth "JST"). The third dataset contains comprehensive new data on government interventions during banking crises. This dataset extends the work of Laeven and Valencia (2020) and Metrick and Schmelzing (2024), documenting the monthly starting dates of liquidity-based interventions around each crisis and providing detailed information on historical government recapitalization programs, with statistics on their size, timing, and breadth. Equipped with these historical datasets, we address the following three research questions.

1. Are banking crises permanent or temporary shocks to bank value?

We begin by examining the evolution of equity returns of banks and nonfinancial firms following large market-value bank equity losses. To do so, we refine BVX's definition of a "bank equity crisis" to construct a purely data-driven, real-time indicator that captures banking-crisis-like episodes marked by large declines in the aggregate market value of bank equity. (We subsequently consider other types of banking crises, along with averted crises, later in the paper, but we start with these crises precisely to understand times of large bank losses.) Using this definition, we find that both bank and nonfinancial equity values fall sharply in the year of the bank equity crisis, resulting in average abnormal returns of -68 and -36 log-points (or -49% and -30% in arithmetic abnormal returns), respectively. Over the subsequent five years, bank equity does not exhibit elevated returns, instead performing similarly to the country's unconditional average. We show that the initial decline in bank equity at the onset of a bank equity crisis is largely earnings driven, as the market price decline mirrors a commensurate drop in banks' long-term future earnings and dividends. Taken together, these results suggest that large bank equity declines primarily reflect permanent and earnings-driven losses for the banking sector. In contrast, nonfinancial firms' equity values do exhibit elevated returns after banking crises, with prices and dividends recovering to pre-crisis levels within five years, suggesting nonfinancial equity dynamics are mainly discount-rate driven.

Zooming in on the monthly frequency, we observe that bank stocks do feature some short-term recoveries from their troughs, consistent with the temporary-loss view. However, even with perfect market timing, the magnitude of the bounce-back from trough to peak averages only about 30% of the initial decline in bank equity. Furthermore, this bounce-back partially reverses on average after twelve months, so that the cumulative average return over a five-year horizon is not

elevated relative to the unconditional average. Thus, while bank equity dynamics exhibit some recovery at shorter horizons, the longer-term evidence points mainly to large permanent losses.

2. What accounts for the permanent losses to bank value during bank equity crises?

Across historical crises, we find that deterioration in asset quality best explains banks' permanent losses, though losses from asset sales during panics can be substantial for banks with large securities portfolios. Several analyses support this conclusion.

First, we compare banks' realized accounting losses with their market equity losses following crisis onset. If banks were forced by funding pressure to liquidate substantial assets at depressed values, we would expect to observe large immediate realized losses during banking panics. Instead, we find that realized book losses in the first year of crisis onset, when all banking panics occur, account for about 30% of banks' market-value losses. The majority of realized book losses occur years later, consistent with the slow accounting recognition of impaired assets, even though equity markets recognize most losses in the initial year of the crisis.

Furthermore, we find that most realized accounting losses take the form of write-downs—recognized valuation losses on assets that remain on the balance sheet. To see this, we decompose banks' net income into write-downs, gains and losses from securities trading and asset sales, and other components. Eventual write-downs tend to account for most of the market-value equity declines observed during historical crises. Gains and losses from securities trading and asset sales contribute little on average. An exception is for banks with large securities holdings, in which case a significant share of realized losses is immediate and takes the form of trading losses.

Finally, at the country level, we find that bank equity crises with larger bank market equity declines tend to exhibit a higher share of nonperforming loans following the crisis, reinforcing the permanent-loss view that bank losses largely stem from the deterioration in the quality of assets remaining on banks' balance sheets.

3. To what extent do policy interventions restore bank capitalization?

We start by analyzing two key types of *liquidity-based interventions*: extraordinary central bank liquidity support and the announcement of blanket liability guarantees. We find that for bank equity crises, these liquidity-based interventions are not followed by large or sustained increases in bank value. This result is inconsistent with the view that forceful liquidity interventions can accomplish the same result as direct recapitalizations (Gertler and Karadi 2011).

We next examine the role of equity issuance as a more direct tool for restoring the banking sector's capitalization. To establish a baseline, we find that, absent new equity issuance, bank capitalization remains permanently lower in the five years following crises, inconsistent with the notion that banks can self-recapitalize through high profitability following crises (Gertler and Kiyotaki 2015). While bank recapitalizations, whether government- or privately led, can restore capitalization, they tend historically to be limited in scope. We find that most government recapitalization programs are small relative to estimated bank losses, narrowly targeted to a small number of banks, and implemented with significant delay.

Other types of banking crises

Overall, our results indicate that once a bank equity crisis is reached (as defined by real-time indicators observable to policymakers), bank equity does not earn high future returns, the banking sector sees a persistent rise in nonperforming loans and asset write-downs, and liquidity-based interventions are not sufficient to restore bank capitalization. But do these dynamics hold in other types of banking crises, such as bank-run events without large bank equity declines? Furthermore, under what circumstances can banking panics evolve into large bank equity declines, and vice versa? Can different types of banking crises be averted in the first place through early and decisive liquidity interventions?

To answer these questions, we first contrast bank equity crises to banking panics without large bank equity declines, which we call "panic-only crises". We find that panic-only crises evolve very differently. They are associated with bank equity returns that recover within a few years, strong positive responses to liquidity-based interventions, and quick macroeconomic recoveries. These results suggest different underlying mechanisms and sensitivities to policy interventions, which can be distinguished in real time.

One may wonder if this result implies that most bank equity crises in our sample could have been prevented by early liquidity interventions. Our answer is generally no. We find that bank equity crises are not usually the result of failed liquidity interventions. In most cases, the bank equity decline strictly precedes the banking panic, suggesting that fundamental weaknesses in the banking system are already present at the early stages of the crisis and not the result of preceding banking panics. There are only a few examples of the converse: liquidity events

followed by bank equity declines—what we call "mismanaged banking panics," with the U.S. Great Depression being one prominent case. We show that liquidity interventions can be effective at preventing panics from escalating, though mainly when implemented *before* a large decline in bank equity values. In contrast, when significant bank equity losses are already present at the time of intervention, these crises—whether or not they include a subsequent panic—tend to be more difficult to resolve, typically followed by permanent bank losses, rising nonperforming loans, and prolonged undercapitalization of the banking system.

Related literature

Our results contribute to understanding the dynamics of banking crises, opening avenues for further theoretical work. The most parsimonious interpretation of our findings is that banking crises involving large losses are best explained as permanent deteriorations in bank value. While bank runs may result, the transient feedback loops between bank value and funding liquidity are short-lived and usually modest compared to the long-run decline in bank value. Furthermore, bank losses persist after funding liquidity is restored. Models relying primarily on temporary price dislocations thus provide an incomplete picture of how most banking crises evolve and how policy interventions can help restore bank capitalization.

Our findings build on a literature showing that banking crisis recessions tend to be unusually deep and persistent compared to non-banking-crisis recessions (Cerra and Saxena 2008, Reinhart and Rogoff 2009, Huber 2018, BVX 2021), largely due to balance sheet problems in the household and banking sectors (Mian and Sufi 2014, JST 2011, 2015). Our results are consistent with a literature stressing the role of fundamental losses as the root cause of banking crises (Kaminsky and Reinhart 1999, Calomiris and Mason 2003, Correia, Luck, and Verner 2025) and research documenting the prolonged process of resolving bad loans in the banking sector (Kane 1989, Hoshi and Kashyap 2004). Such losses are often related to a credit boom-gone-bust (Schularick and Taylor 2012) and triggered by a sudden shift in investor beliefs (Gennaioli and Shleifer 2018). A key contribution of our paper relative to this prior literature is analyzing the interplay between interventions and crises, both in terms of crises prevention and resolution.

Our evidence on the deterioration in asset quality driving permanent bank losses also speaks to the literature on "zombification" of banks, which argues that simply providing a liquidity backstop to a banking sector saddled with bad loans may exacerbate the underlying asset-quality problem by distorting incentives to restructure loans and recapitalize banks (Peek and Rosengren 2005, Caballero, Hoshi and Kashyap 2008, Acharya, Crosignani, Eisert, and Steffen 2022, Becker and Ivashina 2022). We contribute to this literature by showing that the long-lasting nature of banking crises is partly attributable to the failure to address bank solvency problems directly.

A related literature has shown that banking crises are predictable, with rapid growth in credit and asset prices predicting financial fragility and crisis severity (Schularick and Taylor 2012, Baron and Xiong 2017, Mian, Sufi, and Verner 2017, Greenwood, Hanson, Shleifer and Sørensen 2022, Krishnamurthy and Muir 2024). We contribute to this literature by focusing on the evolution of bank distress after the crisis starts and analyzing the nature of losses incurred.

Our results also contribute to a substantial body of evidence that discount rates rise around banking crises for a variety of asset classes (Gorton and Metrick 2012, He and Krishnamurthy 2013, Muir 2017, Krishnamurthy and Muir 2024). For example, Muir (2017) shows that banking crises are associated with wider credit spreads and higher dividend yields on broad equity indices, consistent with a high price of risk. Our findings for nonfinancial firms are consistent with this interpretation, as their stock prices recover over the five years following a crisis. However, we show that bank stocks, in contrast, do not earn elevated realized returns, supporting the view that bank losses are largely permanent and earnings driven.

II. Historical data and banking crisis dates

In this section, we describe the construction of several interconnected datasets covering stock returns and banking crisis interventions across 46 economies over the period 1870-2019. We build on the country-level panel of bank and nonfinancial equity index total returns from BVX, which we use to define the starting years of "bank equity crises" in each country. We then compile a bank-level database containing the equity total returns of the ten largest banks in each country around each historical bank equity crisis, along with data on each bank's annual balance sheet quantities, components of net income, and equity issuance. Finally, we construct two datasets on policy interventions around bank equity crises.

A. Annual equity index returns at the country level

We use BVX's annual country-level dataset, spanning 46 economies from 1870 to 2016. The panel consists of three types of variables: bank equity index total returns, nonfinancial equity index total returns, and other variables (e.g., short-term government interest rates, inflation rates).

Unless otherwise specified, equity returns of the bank and nonfinancial equity indexes for each country are expressed as annual log excess total returns in local currency units (LCU) as of December 31. The excess total return is defined as the price return plus the dividend return of the index minus the short-term government interest rate. For historical periods in which the short-term interest rate is unavailable, we use real total returns (price return plus dividend return minus the inflation rate) in place of excess total returns. As we show in Section III, the main results of the paper are essentially unchanged when using real total returns instead of excess total returns.[1]

B. Banking crisis dates

We next construct a list of the starting years of a systematic set of banking crises.[2] As Romer and Romer (2017) and BVX highlight, this task is inherently challenging. Most existing chronologies of banking crises follow a subjective, "know it when you see it" approach of selecting episodes that feature bank runs, bank failures, and large-scale government interventions from historical narrative accounts. Consequently, these chronologies may contain a look-ahead bias, in which events that deteriorated over time are more likely to be labeled as banking crises, while those that quickly improved are retrospectively deemed too mild to be considered crises (Romer and Romer 2017). This bias could affect our equity predictability regressions in Section III.

[1] To make the aggregate bank equity index consistent with the returns of the individual bank data described in subsection III.D, we build a new aggregate bank equity index for each country using the individual bank data around ±5-year windows of each bank equity crisis since 1870. This new index is a market-capitalization-weighted annual total return index of the ten largest banks within each country. We then update the original bank equity index from BVX with this new bank equity index, which we use for all subsequent analysis. The main results of the paper are robust to either version of the bank equity index. The correlation between the original bank index returns and the newly constructed index is 0.98. The main advantage of substituting in this new bank equity index built from the micro-data is that it correctly incorporates the returns of failed banks (by permanently setting their share prices to zero or to the shareholders' actual terminal payoffs), of acquired banks, and of banks undergoing other types of transactions.

[2] Throughout the paper, we always identify a "crisis" as a *country and year pair*, e.g., "Germany 1931". Thus, the "U.S. 2008" and "France 2008" are considered different "crises" in our sample. We stress that this terminology does not imply that such events across countries are economically unrelated.

To overcome this challenge, we date the start of a "bank equity crisis" using a refinement of BVX's definition, creating a purely data-driven, real-time indicator that captures banking crises with large declines in the market value of bank equity. BVX defines a "bank equity crisis" as an episode characterized by large bank equity index losses and widespread bank failures within a country. BVX shows that this definition is macroeconomically relevant (as these criteria forecast future output declines and credit crunches) and theoretically motivated (as bank equity is a key state variable in macro-finance and banking models). Their definition is also agnostic as to whether crises result more from solvency or liquidity difficulties, as both can lead to bank equity losses.

We modify BVX's definition to ensure that our indicator relies on simple, accessible, and objective public information that market participants could observe and act on in real time. For the remainder of the paper, we define the starting year of a "bank equity crisis" as the first year when the following two criteria are jointly met:

1. A greater than 30% annual decline in the bank equity index (computed using excess total returns, in any year within the past five years)
2. The failure of a top-20 bank (ranked by total assets within each country)[3]

The first criterion identifies large declines in the market capitalization of the banking sector. The second criterion refines the set of all bank equity declines, as some declines may result from broad-based stock market crashes without other symptoms typically associated with banking crises. Nevertheless, the main results of the paper are robust to running the analysis on the events that meet only the first criterion (see Figure A.7). Implementing the second criterion requires us to systematically identify the names and asset sizes of the twenty largest depository institutions around each 30% bank equity decline. This is feasible due to the comprehensive database created

[3] In practice, we implement these two criteria sequentially. In a first step, we use the panel of bank equity returns (specifically, annual excess total returns with a December 31 year-end) to select all country-year observations in which there is an annual return of less than -30%. All such bank equity declines are reported in Table A.2. In a second step, we screen for the failure of a top-20 depository institution within a 0-to-+5-year window around each bank equity decline. (The top 20 banks are ranked by asset size within each country five years prior to each failure event, since a bank can rapidly decrease in asset size upon encountering distress.) The crisis start is defined as the latest year satisfying both criteria. Note that this is a real-time definition that does not require any future information.

by Baron, Schularick, and Zimmermann (2024, henceforth BSZ).[4] The definition of a bank failure within these top-20 banks is also from BSZ.[5]

Table A.1 lists the resulting 76 bank equity crises. Table A.1 shows that, except in two cases, all our bank equity crises are also BVX bank equity crises (using their definition).

It is important to note that our definition of bank equity crises, by design, only selects a subset of all potential bank distress events. However, our criteria provide a *real-time* diagnostic tool for policymakers and macroeconomists to identify, investigate the underlying mechanisms of, and design policy interventions for a well-defined and macroeconomically consequential class of banking crises. Our definition covers nearly all episodes that are typically labeled as "systemic crises" (e.g., by Reinhart and Rogoff (2009)), including the 2007-08 banking crises and the Great Depression banking crises across many countries. In Section III, we show that our main results are robust to different crisis definitions and dates, such as Reinhart and Rogoff (2009), JST (2017), and Laeven and Valencia (2020) banking crises and 30% year-over-year declines in bank equity using either annual or monthly data.[6]

By construction, our crisis definition excludes certain events, such as the 1998 LTCM crisis or bank-run episodes without large bank equity declines. Section VI compares bank equity crises to these other types of banking crises and to averted crises. Other crises tend to exhibit more transitory bank equity dynamics, with bank equity responding more readily to liquidity

[4] The BSZ database includes the identities and annual balance sheets of all banks (defined as all depository institutions) in 17 economies since 1870, ensuring coverage of all banks within the top 20 in each country. For 30% bank equity declines outside of these 17 economies, we compile lists of the top 20 banks by assets using extensive historical research documented in each case. Bank balance sheets of the largest depository institutions were observable to market participants in all 17 countries, even as far back as 1870 (BSZ 2024). Annual bank balance sheets were published for each country in government statistics released to the public and investor manuals, which is how they were collected by BSZ. Thus, the identities and sizes of the twenty largest banks were known to market participants.

[5] BSZ identify individual bank failures in their dataset using a broad definition of failure, which includes outright failures (i.e., liquidations following suspensions of payments, judicial bankruptcies, or resolutions by a government agency), as well as nationalizations and government-arranged mergers of banks on the verge of failure. Additionally, we classify a bank as failing if its stock total return is less than -80% in a single year. This definition accounts for government guarantees to creditors and other policy interventions during crises, which can make outright bank failures rare in some periods even for banks that are highly insolvent.

[6] The robustness of the main results to narrative-based definitions of banking crises (e.g., Reinhart and Rogoff (2009), JST (2017), and Laeven and Valencia (2020)) helps alleviate the potential concern that the differential response of bank versus nonfinancial equities may be partly mechanical, driven by the fact that bank equity crises are identified based on large bank stock declines.

interventions. Section VI also examines how different crisis types are interrelated, highlighting how one type can evolve into another depending on the nature and timing of interventions.

C. Monthly equity index returns around bank equity crises

We use monthly bank equity index returns and nonfinancial equity index returns from BVX. All series are expressed as log excess total returns, measured at month-end. We use these data for analyzing the higher-frequency response of equity prices to the onset of the crisis (in Section III) and to liquidity-based policy interventions (in Section V).

D. Individual bank stock returns and balance sheet characteristics around bank equity crises

A significant contribution of this paper is the construction of a new *individual*-bank-level dataset around each historical crisis—specifically, an annual panel of the ten largest banks within each country in a ±5-year window around each bank equity crisis. This dataset contains the following variables: bank-level equity total returns and dividends (for publicly traded banks), balance sheet quantities (assets, loans, book value of common equity), shares outstanding of common equity, net income and its components, and equity issuance. We describe the construction of each variable below.[7]

The development of this dataset was a multi-year effort, involving the discovery and compilation of a large number of historical sources from archives worldwide. Due to the substantial resources required for this effort, this dataset is limited to the 17 economies covered in JST. Historical sources for each country are listed in the appendix, and specific sources for each bank and variable are documented in detail in the individual data files for each crisis here.

The variables used in this dataset, all reported at the bank-year level (as of December 31), are as follows. Further details on their construction are provided in the appendix.

- *Equity total returns* are calculated for each stock based on the year-end price, $P_{i,b,t}$, and yearly dividend, $D_{i,b,t}$, for country *i*, bank *b*, and year *t*. All quantities are carefully adjusted

[7] The top ten banks in each country are ranked by total assets five years before the start of each bank equity crisis, to hold the sample composition constant throughout the five-year window around each bank equity crisis.

for stock splits and other effective dilutions (e.g., stock dividends, rights issuances). Returns are all expressed as log excess total returns.

- *Balance sheet quantities* (assets, loans, book value of common equity) are taken from BSZ and cleaned to produce consistent series for each bank around each crisis. Annual growth rates are then computed as real log changes.
- *Shares outstanding* of common equity, $Shares_{i,b,t}$, are recorded and used to compute equity capitalization (= $P_{i,b,t}$ * $Shares_{i,b,t}$) and equity issuance (as explained below).
- *Net income* is recorded for each bank and year and then divided into three components: (1) losses from write-downs, (2) gains or losses from securities trading and asset sales, and (3) a residual category, which comprises all other revenues and expenses (e.g., net interest income, fee-based income, operating costs, and extraordinary revenue and expense items). "Write-downs" are defined as revaluations of assets that *remain on the balance sheet* and reflect expected future reductions in cash flows (e.g., possible or actual loan losses, provisions against future credit losses, additions to loan loss reserves, write-downs of fixed assets, goodwill impairments). In contrast, the second category, which we refer to as "trading income" for short, includes realized gains and losses from securities trading and all asset sales (including sales of real estate, loans, and subsidiary divisions of the bank).
- *Issuance of common equity* is calculated following Stephens and Weisbach (1998) and Baron (2020). The approach uses the change in common shares outstanding and accounts for whether the equity issuance is an open-market sale (using the market price) or a rights issuance (using the offering price, with adjustments to capture the effective dilution). Equity issuance data are also obtained from the "cash flow from financing activity: equity issuance" line in banks' cash flow statements, when available (typically only for a subset of banks after 1990). Full methodological details are provided in the appendix.

E. Policy interventions

Monthly dates of liquidity-based interventions and recapitalizations.

We build a database of the monthly starting dates of policy interventions for all bank equity crises in our sample. We record three types of policy interventions: 1) extraordinary central bank

liquidity support to the banking system, 2) announcements of blanket guarantees of banking system liabilities, and 3) government recapitalizations. We refer to the first two types of policy interventions collectively as "liquidity-based interventions." This database expands upon Laeven and Valencia (2020) and Metrick and Schmelzing (2024): our contribution is systematically listing the starting *months* of these interventions, extracted from textual excerpts within these databases and also from other historical sources. The starting month is assessed based on our best interpretation of the narrative evidence for each historical banking crisis.[8]

We define these three types of policy interventions following Laeven and Valencia (2020). "Extraordinary central bank liquidity support" occurs when central bank liquidity provision first exceeds 5% of total banking sector liabilities. "Bank liability blanket guarantees" occur when the government announces explicit protection of nearly all bank liabilities of the entire banking sector. (As in Laeven and Valencia (2020), actions that only raise deposit insurance coverage do not qualify.) "Government recapitalizations" occur when a government fund is created to purchase newly issued common or preferred bank equity, and the fund then recapitalizes three or more banks. (Capital requirements, prompt corrective action, and other policies that compel banks to raise new equity do not qualify.) We note that these three types of policy interventions are only a subset of all possible policy interventions. Our database should not be seen as a comprehensive set of all possible responses to banking crises.

Appendix Section 1 presents a brief overview of the history of bank recapitalizations and liquidity-based interventions summarized from the narrative and quantitative data in our interventions database. The database, which can be found here, also contains extensive historical documentation about the nature and implementation of each type of intervention for each individual crisis. Figure A.1 plots a timeline of liquidity-based interventions and recapitalizations (or "no intervention" of these types) across the history of bank equity crises in our sample. Figure A.1 shows that these types of government interventions have become more frequent over time. Recapitalizations, for the most part, are a relatively recent phenomenon.

Detailed database of government recapitalization programs

[8] Table A.1 lists the starting months of policy interventions for each bank equity crisis. Table A.3 provides descriptive statistics on the frequency of each intervention type and the time between banking crisis onset and interventions.

To investigate recapitalization programs across historical bank equity crises, we build a detailed database on the size, timing, and breadth of government-led recapitalization programs. Given the extensive historical research needed for each individual case, we restrict ourselves to the 17 economies from JST. We defer a detailed discussion of this database to Section V.

F. Summary statistics

Table 1 reports summary statistics for the country-year panel (Panel A) and the individual bank-year panel (Panel B). Panel A shows summary statistics for the index returns of bank stocks and nonfinancial stocks across 46 economies since 1870, expressed as either real total returns or excess total returns, along with the dividend yields and real dividend growth of bank stocks and nonfinancial stocks. Panel A also includes the real earnings growth, real market capitalization growth, and real book equity growth of banks; these metrics are aggregated from the individual bank data and are thus only available for the 17 JST economies in a ±5-year window around bank equity crises. Panel B reports similar statistics for individual banks in ±5-year windows around bank equity crises over the period 1870-2019 for the ten largest banks within each country.

III. Banking crises as permanent shocks to bank value

A. Returns analysis

Using the panel of yearly stock returns, we first analyze the equity returns of publicly traded banks and nonfinancial corporations around bank equity crises across 46 economies from 1870 to 2019. Figure 1 plots the buy-and-hold abnormal returns around the start of bank equity crises for the bank and nonfinancial equity indexes, estimated using the following equation:

$$r_{i,t-k,t+h} = \alpha_i + \beta^h BankingCrisis_{i,t} + \varepsilon_{i,t+h} \quad (1)$$

The dependent variable, $r_{i,t-k,t+h}$, is the cumulative log excess total returns from year *t-k* to *t+h*, for either banks or nonfinancials in LCU. $BankingCrisis_{i,t}$ equals 1 if country *i* enters a crisis in year *t*, and α_i denotes country fixed effects. Since the fixed effects subtract the country average returns, the estimated coefficient β^h captures the "abnormal" returns of the equity index for a given horizon h, where we define abnormal returns as the log excess total returns of either the bank or nonfinancial index *minus the country average* of the same index. In Figure 1, we set

k = 1, so that all cumulative returns are relative to the year *t-1* before the crisis. The estimated coefficients β^h for $h \in [-5,5]$ are then plotted, where h measures the years relative to crisis onset. The figure also includes 95% confidence intervals based on Driscoll-Kraay standard errors.

The coefficients plotted in Figure 1 thus represent cumulative buy-and-hold abnormal returns, relative to the year before the crisis. Figure 1 shows that both bank equity (blue) and nonfinancial equity (orange) sharply decline at the start of the bank equity crisis (i.e., from year *t-1* to *t*), resulting in average abnormal returns of -68 and -36 log-points (or -49% and -30% in arithmetic abnormal returns), respectively.

Do stocks recover to their pre-crisis level after this initial crash or earn elevated returns going forward relative to the country average? In Figure 1, since abnormal returns measure the returns relative to the country average, a flat segment parallel to the horizontal axis (represented by the dashed horizontal line) would correspond to cumulative returns that equal the country's average, while an upward- or downward-sloping segment would correspond to returns that overperform or underperform the average.

Figure 1 shows that for banks, cumulative equity returns after the start of the crisis (i.e., relative to year *t*) are not elevated above their country average (i.e., above the dashed horizontal line). The coefficient estimates in Table 2 measure the cumulative abnormal returns relative to year *t* (using Equation (1) with k = 0) and show no significantly elevated returns for bank stocks (Panels A and C). In fact, the point estimates are consistently negative for horizons of one to five years, and significantly so in years 3 and 4 after the start of the banking crisis.

In contrast, cumulative returns for nonfinancial firms after the start of the crisis tend to be significantly above their country average. Coefficients in Table 2 for nonfinancials' cumulative abnormal equity returns (Panel B and D) are uniformly positive and tend to increase with the horizon. After five years, the cumulative returns for nonfinancials are significantly elevated by roughly 30 log-points (or 35% in arithmetic returns) relative to the unconditional average. Related, Figure 1 shows that nonfinancials' equity returns to its pre-crisis trend by year *t+5*.

The collapse of bank stocks around banking crises has ramifications for the broader economy. The cumulative returns for nonfinancials following banking crises are substantially lower in countries with lower cumulative returns for banks, as demonstrated by Figure A.2 and

Table A.4. This suggests that permanent shocks to bank values are associated with slower recoveries of the broader corporate sector.

We conclude that bank stocks experience a large and permanent drop in abnormal returns in the year of the crisis (from year *t-1* to *t*), followed by future cumulative abnormal returns that are either close to zero (statistically insignificant for years *t+1*, *t+2*, and *t+5*) or significantly negative (for years *t+3* and *t+4*). Either way, these results are inconsistent with theoretical models of banking crises that predict elevated returns in times of financial stress. Furthermore, bank equity does not recover to its pre-crisis level: Figure 1 shows that the decline in bank equity is permanent. In contrast, the decline in nonfinancial equity is mostly transitory, with nonfinancial equities earning above-average returns after crises.

The results remain robust across various specifications. Figure A.3 shows the results using abnormal real returns instead of abnormal excess returns. Figure A.4 and Table A.5 report the results for a broad market equity index (containing both financial and nonfinancial firms). Figure A.5 compares advanced versus emerging economies; compares periods before versus after 1945; and excludes the Global Financial Crisis (GFC). Figure A.6 considers alternative methods for computing abnormal return: subtracting country-specific average returns computed in expanding windows from 1870 to year *t-5*, subtracting country-specific average returns computed in rolling windows from year *t-15* to *t-5*, or not subtracting anything (i.e., no country fixed effects). Figure A.7 replicates the analysis using episodes of 30% annual declines in bank equity, rather than focusing solely on bank equity crises. (These episodes—of which bank equity crises are a subset—are listed in Table A.2.) Figure A.8 replicates the analysis using various alternative banking crisis definitions: the monthly start dates of BVX crises, Laeven and Valencia (2020) crises, year-over-year 30% annual bank equity declines, and the annual start dates of JST (2017) and Reinhart and Rogoff (2009) crises. Figure A.9 extends the horizon to ten years before and after each banking crisis. Figure A.10 excludes the banking crisis episodes for which data are unavailable for the full ±5-year window, demonstrating that the results in Figure 2 are not driven by shifts in the composition of episodes. Figure A.11 rebuilds the bank indexes for the 17 JST economies using the individual-bank data but excluding banks that fail or exit during crises, demonstrating that the performance of the bank equity index is not driven by banks that fail but by the performance the

surviving banks. Figure A.12 shows that the results are robust to deliberately timing crises late.[9] The results of all the above analyses are similar to our main results.

We also perform several robustness exercises that analyze returns after controlling for risk, factor returns, and the momentum effect. Figure A.13 controls for factor returns (market, value, size, momentum, and global equity market factors of Karolyi and Wu (2021)). Table A.6 and A.7 controls for time-series momentum. Table A.8 further analyzes risk-adjusted returns by building trading strategies around bank equity crises and computing a variety of performance metrics of these strategies that control for risk and factor portfolio returns. These analyses strengthen our main conclusions by showing that bank returns after the start of banking crises are even lower than those in our main analyses after accounting for higher levels of measured risk.

B. Bounce-backs at short horizons

This section examines monthly bank equity returns around the onset of bank equity crises. At this higher frequency, we observe that bank equity returns often do modestly rebound from their troughs, with the rebound typically occurring around the end of the banking panic phase of the crisis. However, the magnitude of this rebound is small relative to the initial decline and tends to reverse at longer horizons. As such, bank return dynamics are consistent with the temporary-loss view, but only at shorter horizons. The evidence at longer horizons indicates permanent losses.

We first present in Figure A.15 selected cases to illustrate the full range of return dynamics, which can be obscured when averaging across crises. Each plot shows cumulative bank equity returns relative to the pre-crisis bank equity index peak. The returns shown are regular excess returns, *not* abnormal excess returns. We highlight key events with vertical lines: the start of the

[9] The potential concern is that if one marks the crisis too early, the subsequent low cumulative returns might be driven by the tail end of the initial crash. This is not the case for several reasons. First, the analysis in Figure A.12 shows that the main results are robust to deliberately marking the crisis six or twelve months late. Second, as Figure 1 shows, the low average future returns are mainly driven by underperformance in years two and three after the crisis onset, not in year one. Third, our definition of a bank equity crisis already tends to select the crisis slightly *later* than BVX crises: on average 0.6 years later and in only one case (out of 76) before BVX crises. Furthermore, in all but four cases, our definition selects the crisis after the start of the panic phase. For example, all GFC crises are dated as of December 2008 or later (several months after the panic triggered by Lehman Brothers's collapse), and all Great Depression crises are dated as of December 1931 or later (after the start of the nationwide U.S. banking panic in fall 1931 and the European panics in summer-fall 1931).

panic (red solid line), the panic end (green solid line), liquidity-based interventions (light blue dashed line), and government recapitalizations (orange dashed line).

Figure A.15 reveals a bounce-back in bank equity returns that begins around the month when the banking panic ends and policy interventions occur. However, in the eight selected cases in Panels A and B, the bounce-back is small compared to the initial crisis drop, and the bounce-back reverses at longer horizons ranging from one to seven years. Even in the largest bounce-back (Germany 2008), the recovery is only 40% of the initial decline and reverses within three years. Bank equity does not return to its pre-crisis level. Thus, while bank equity dynamics are consistent with the temporary-loss view at shorter horizons, the evidence at longer horizons points to permanent losses.

We next examine these dynamics systematically across all bank equity crises relative to each crisis trough. Figure 2 plots the average cumulative returns for bank and nonfinancial equities relative to the trough for the bank index using monthly data. More specifically, to create this figure, for each crisis, we identify the trough in the bank log excess total returns index, then compute cumulative log excess total returns for banks and nonfinancials relative to that point within a ±5-year window; we then average these returns across crises. The figure shows that even relative to the lowest point in each crisis, the rebound in bank equity returns is modest. The magnitude of the bounce-back from trough to peak averages only about 30% of the initial decline in bank equity. Gains taper off and partially reverse after approximately one year.

This analysis purposely assumes retrospective knowledge of the crisis trough, which is not available to investors in real time. However, the purpose of this analysis is to demonstrate that even with perfect timing, the rebound in bank equity returns remains modest relative to the initial crisis decline. These returns thus represent an *upper bound* on what a long-only buy-and-hold bank equity investor could obtain. It should be noted that the above results primarily hold for bank equity (blue); in contrast, nonfinancial equity (orange) recovers to nearly 80% its pre-crisis peak, though only after five years.

C. Dividends and earnings around banking crises

The temporary-loss view predicts that bank stocks experience a large but mostly temporary drop in value. We have shown that bank equities do not earn elevated returns or recover in the five

years after a crisis, thus interpreting the initial shock to bank equity as permanent. We next show that the sharp decline in bank equity returns at the crisis onset predicts declines in future bank dividends and earnings (i.e., net income). We thus interpret the bank equity declines around crises as due to an earnings effect, rather than a discount-rate effect. In other words, bank equity falls permanently because bank dividends and earnings also decline permanently.

Figure 3 plots the real dividend-per-share index and real earnings-per-share index for the bank and nonfinancial equity indexes, averaged across bank equity crises, along with the interquartile range across crises. To construct Figure 3, we compute market-capitalization-weighted indexes of the real dividends index or the real earnings index, denoted $D_{i,t+h}$, in the $h \in [-5,5]$ window around all banking crises, where t is the starting year of a banking crisis. We normalize $D_{i,t+h}$ by its value $D_{i,t-1}$ in the year before the start of the crisis and then compute the average and interquartile range of $D_{i,t+h}/D_{i,t-1}$ at each horizon $h \in [-5,5]$ across crises. As a result, Figure 3 plots the average level of real dividends per share (Panel A) or earnings per share (Panel B) relative to the year before the crisis.

Figure 3 shows that both banks and nonfinancial firms significantly cut their dividends and report lower earnings following a crisis. For banks, dividends and earnings remain well below their long-term average five years post-crisis, while for nonfinancial firms, they rebound, though only slowly through year *t+5*.[10] While bank dividend cuts around the onset of the crisis may be partly driven by government mandates, the fact that both dividends and earnings are persistently low five years out suggests that this cannot fully account for our results.

We then analyze whether the initial declines in bank equity at the crisis onset capture long-term decreases in banks' dividends and earnings. Table 3 presents results from panel regressions of long-term changes in dividends and earnings after a bank equity crisis on bank excess returns in the crisis year. Panel A reports regression estimates at the country level using Equation (2a), while Panel B reports regression estimates at the individual bank level (for the ten largest banks by assets in each country around each bank equity crisis) using Equation (2b):

[10] Data on banking sector earnings per share (EPS) for Panel B is calculated by aggregating the bank-level data for the ten largest banks into a market capitalization-weighted country-level index for banks' EPS (analogous to how the dividend indexes were created by BVX). Since this data was aggregated from the bank-level data, it only covers 17 economies since 1870. For nonfinancial firms, comprehensive data on their aggregate earnings since 1870 is unavailable across all these countries and hence not plotted.

$$\Delta y_{i,t-1,t+5} = \alpha_i + \beta r_{i,t-1,t} + \varepsilon_{i,t} \quad (2a)$$

$$\Delta y_{i,b,t-1,t+5} = \alpha_b + \beta r_{i,b,t-1,t} + \varepsilon_{i,b,t} \quad (2b)$$

The dependent variables used in different specifications are the changes in real earnings and real dividends from one year before a banking crisis starts to five years after, using the country index (Equation (2a)) or bank-level data (Equation (2b)). The independent variable is the bank log excess total return in the crisis year using either the country index or bank-level data. The regressions are estimated conditional on a bank equity crisis.[11]

We observe coefficients at both the country and bank levels that are statistically significant and roughly in the range of 1 to 2, suggesting an approximately commensurate relationship between the initial stock decline and subsequent decreases in dividends and earnings. Panel A shows that banking crises with larger initial bank equity declines at onset have larger long-run declines in aggregate bank real earnings and real dividends. Panel B shows that in the cross-section of individual banks, those with larger initial equity declines experience larger long-run declines in real earnings and real dividends. These bank-level results hold with crisis fixed effects (even-numbered columns in Panel B), meaning that within a crisis, banks with relatively worse returns also have relatively worse dividends and earnings.[12]

Overall, the evidence indicates that the market decline in bank equity at the crisis onset predicts a roughly commensurate long-run decline in banks' dividends and earnings, both at the country and individual-bank level. This earnings-driven effect is inconsistent with the temporary-loss view, which predicts that much of the decline in bank equity should be discount-rate driven.

D. Heterogeneity across banks

Are all banks similarly hit in crises, or are losses concentrated in specific institutions? To answer this question, we analyze the heterogeneity in bank-level outcomes. We show that most

[11] Note that the dependent and independent variables in these regressions have overlapping horizons by design. This is because we are asking whether the bank equity decline in year *t* reflects dividends and earnings declines both in year *t* and in future years through *t+5*, given that stock prices should reflect both contemporaneous and future changes in these variables. Thus, these regression estimates should be thought of as capturing correlations, not predictions.

[12] Baron and Xiong (2017) show that equity investors do *not* tend to anticipate future bank distress in the years *before* the crisis onset. In other words, the bank equity crash at the crisis onset comes as a large and sudden surprise to equity investors. However, once this crash occurs, market prices at this point roughly (though not always perfectly, see subsection III.E) anticipate future declines in banks' dividends and earnings.

crises are driven by losses concentrated in a few institutions that are persistently and severely distressed. These institutions have predictable future negative returns, large lending contractions, persistently lower capitalizations (as measured both by book and market values), and large accounting losses (especially in the form of write-downs); these bank-level outcomes are predictable in the year of the crisis onset with five-year-ahead prediction horizons.

We implement this analysis by exploiting banks' market-to-book (M/B) ratios. As Begenau et al. (2024) shows for U.S. banks around the 2008 crisis, and as we show here for an international sample of banks across historical crises, the M/B ratio of banks is a highly informative variable that captures the cross-section of bank distress during crises. We start by sorting the largest ten banks by country into five bins based on their M/B ratio in the year of banking crisis onset. The five bins consist of M/B ratios of: 0 to 0.2, 0.2 to 0.4, 0.4 to 0.6, 0.6 to 0.8, and >0.8. We call banks with the lowest M/B ratios the most distressed banks, and those with the highest M/B ratios the least distressed or the healthiest. As Figure A.18 shows, before bank equity crises, banks in all these bins have similar average M/B ratios around 1.2, which then fall sharply around the start of crises. Figure A.16 traces the evolution of the M/B ratio over the five years after crisis onset and finds that M/B is persistently low. This is because market values (M) permanently crash at the crisis onset, as previously shown in this section, while book values (B) are sticky, reflecting slow write-downs of book value, as we will see in Section IV.

Figure A.16 panels B-D plot the dynamics of several outcome variables (future excess bank returns, real credit growth, and net income) over a future five-year horizon after the onset of crises and finds that the most distressed banks, as measured by M/B in the year of the crisis onset, have persistently worse outcomes. Figure A.17 plots the distribution of these outcome variables five years after crisis onset across banks and finds negative skewness (even after including a crisis episode fixed effect), demonstrating that large losses and severe outcomes are concentrated in a few institutions in the left tail.

To analyze these patterns more formally, we estimate the following specification at the individual bank level:

$$\Delta y_{i,b,t,t+5} = \alpha_i + \sum_k \beta_k \, M/B(lower_k, upper_k)_{i,b,t} + \varepsilon_{i,t} \quad (3)$$

The equation is estimated on bank-year observations corresponding to the onset year (denoted year *t*) of bank equity crises and for the largest ten banks within each country, with individual banks

indexed by b. The dependent variable $\Delta y_{i,b,t,t+5}$ is the five-year-ahead change in a bank-level outcome measured from the onset year of each bank equity crisis. The regressions include country fixed effects α_i and a set of M/B bin indicators, $M/B(lower_k, upper_k)_{i,b,t}$, which equal one if a bank's market-to-book ratio in the crisis onset year falls within a given range.

Table A.10 reports the results. Banks with low M/B at the crisis onset have lower future excess total returns (column 1), lower real credit growth (column 2), lower real book equity growth (column 3), lower net income (column 4), and greater losses due to write-downs (column 5) over the next five years, relative to banks with high M/B. The estimated coefficients are monotonic across M/B bins: the most distressed banks, with M/B ratios below 0.2, show the largest declines over the subsequent five years, while the healthiest banks, with M/B ratios above 0.8, perform substantially better. The differences are large in magnitude. For example, the most distressed banks see reduced credit growth by 26 percentages points and reduced income-to-book-equity by 87 percentages points (both cumulative over five years), relative to the healthiest banks. Overall, these results suggest that the negative aggregate outcomes after banking crises are driven by losses concentrated in a few institutions that are persistently and severely distressed.

E. Heterogeneity in outcomes across bank equity crises

We next discuss the heterogeneity in outcomes across bank equity crises. We show that higher post-crisis returns are more likely when policy support is strong and early. Crises preceded by credit booms are associated with worsening outcomes in the years following the crisis onset.

We begin by quantifying the variation in outcomes across crises. Some of this heterogeneity is already evident in Figure A.15, which plots the monthly cumulative returns around twelve selected crises. Panels A and B highlight crises that are most representative of the broader sample—episodes with weak long-run returns following the crises. These include Germany, the Netherlands, Switzerland, and the U.K. during the Global Financial Crisis, as well as France in 1931, the U.S. in 1931, Japan in 1997, and Thailand in 1997. In these cases, the ten-year cumulative excess returns are near zero or negative. Nevertheless, there are exceptions. Panel C shows recoveries in Sweden in 1991, the U.S. in 2008, and other episodes where long-term returns were strong. However, such outcomes are relatively uncommon in the historical record.

The high returns of bank stocks in the U.S. after 2008 should be seen as an exception rather than the rule.

Figure A.18 systematically explores heterogeneity across bank equity crises, plotting the median and interquartile range of the cumulative abnormal excess returns across crises. Figure A.18 shows that the interquartile range for bank equity lies entirely below the horizontal axis, suggesting that at least 75% of crises do not see recoveries in bank equity.[13]

Which factors predict high returns after crises? In Table A.13, we regress future bank equity returns on a set of variables that may influence post-crisis outcomes. The dependent variable is the log excess total returns of the bank equity index (Panel A) or cumulative real GDP growth (Panel B) from year *t+1* to *t+5* (relative to the start of the bank equity crisis in year *t*). The sample includes 75 bank equity crises with available post-crisis return data to *t+5*. All regressors are modified to reflect only information known by the end of year *t+1*, as to avoid any look-ahead bias. Table A.13 shows that accommodative monetary policy and fiscal policy, quick write-downs (relative to market-value losses), and quick banking sector recapitalizations—all before or at year *t+1*—predict higher future bank returns.[14] These results are also visualized in Figure A.19, which splits the sample of bank equity crises by these predictor variables.

Table A.13 also shows that the long-run underperformance of banks is more pronounced when a crisis is preceded by a credit boom. To see the impact of credit booms, Figure A.20 and Table A.14 replicate the main analysis from Figure 1, splitting banking crises into those that are preceded by a credit boom and those that are not. A preceding credit boom is defined as an above-median change in the credit-to-GDP ratio, measured over the pre-crisis trough to peak. When a credit boom precedes a crisis, we observe an *additional* 60 log-point abnormal decline (or -45 percentage points in arithmetic abnormal returns) in bank equity excess total returns occurring in year *t+3* after the crisis onset persisting through year *t+5*. In contrast, crises not preceded by credit booms earn returns similar to the country's unconditional average return. This result supports the

[13] In a related analysis, Table A.12 compares the 1870-1945 and 1946-2019 periods, as well as advanced economies and developing economies. It examines differences in bank-level outcomes, policy interventions, and other observables between these subsamples. One key result from this table is that bounce-backs and recoveries in bank equity returns are similarly uncommon across all subsamples.

[14] Magnitudes are economically significant. For example, a one-percentage-point reduction in monetary policy rates, one-percentage-point increase in primary deficits of fiscal policy, hundred-percentage-point increase in write-downs to market-value losses by year *t+1*, and banking sector recapitalization before year *t+1* (indicator variable) predict higher cumulative bank returns of 14.0, 18.7, 50.2, and 23.7 percentage points, respectively, over the next four years.

hypothesis that bank equity underperformance after crises could be driven by unexpected future deterioration in asset quality from a credit boom-gone-bust. Nevertheless, all crises result in permanent losses in the banking sector.[15]

IV. Deterioration in asset quality as a key mechanism explaining bank losses

We have shown that the market value of bank equity declines permanently at the onset of banking crises and that this decline predicts future deterioration in banks' dividends and earnings, consistent with the permanent-loss view of banking crises. In this section, we examine banks' accounting losses to understand the drivers of these permanent equity declines. We present evidence that losses are mostly explained by asset write-downs, rather than by asset sales during panics. However, losses from asset sales can be substantial for banks with large securities portfolios.

A. Decomposition of banks' accounting losses during bank equity crises

The permanent-loss view encompasses two mechanisms that can explain banks' long-run equity losses during banking crises. The first emphasizes fire sales, which are an important aspect of banking crises; see Shleifer and Vishny (2011) for a comprehensive review. During fire sales, banks may be forced to liquidate assets, usually securities, at values substantially below their long-run fundamental values, imposing large immediate accounting losses on the sector (Shleifer and Vishny 1997, 2011, Diamond and Rajan 2011, Gorton and Metrick 2012).

The second mechanism holds that permanent declines in banks' market values reflect a deterioration in asset quality (e.g., Calomiris and Mason 2003, Correia, Luck, and Verner 2025). In this case, bank losses arise from permanent shocks to the value of bank assets, with banks being slow to recognize accounting losses on impaired assets, even though equity markets price them in around the onset of the crisis. The literature has shown that nonperforming loans (NPLs) are a

[15] Figure A.21 shows that housing returns are persistently negative in the five years after banking crises and do not recover to pre-crisis levels. To the extent that credit booms and busts are often driven by real estate (Jordà, Schularick, and Taylor 2015) and that banks in many historical banking crises have large real estate exposures, the slow and persistent decline in real estate prices after crises may be one factor helping to explain our results of why bank returns underperform in the aftermath of credit-boom-driven crises (i.e., bank equity investors at the start of the crisis might not fully anticipate the depth or persistence of the future real estate decline).

common aspect of systemic banking crises (e.g., Laeven and Valencia 2013, Ari et al. 2021) and tend to result from poor lending standards during boom periods (e.g., Kaminsky and Reinhart 1999, Dell'Ariccia and Marquez 2006, Schularick and Taylor 2012). Alternatively, they could arise from persistent real effects of liquidity shocks or of tightened borrowing constraints, including borrower defaults and macroeconomic deterioration that affect future loan repayments and collateral values (Bernanke 1983). Discretion in accounting rules for loan loss provisioning encourages a delay in the recognition of loan losses (Laeven and Majnoni 2003, Bushman and Williams 2012, Laeven and Huizinga 2019). Additionally, poorly designed capital regulation and inefficient restructuring regimes can encourage risky banks to "evergreen" bad loans, which can lead to further deterioration in loan quality and distortive effects on the real economy (e.g., Peek and Rosengren 2005, Caballero, Hoshi and Kashyap 2008, Acharya et al. 2022).

These mechanisms can be complementary. Indeed, fire sales and deteriorations in asset quality can reinforce each other, especially in highly leveraged institutions such as banks, resulting in downward asset price spirals (Brunnermeier 2009, Shleifer and Vishny 2011). Moreover, write-downs could result from fire sales in the broader economy (e.g., of real estate projects or corporate assets) affecting the collateral values underlying banks' assets, leading to adverse feedback effects on the net worth of banks (Kiyotaki and Moore 1997).

In this section, we show that most bank losses during bank equity crises stem from write-downs of assets that remain on banks' balance sheets. These losses are slowly recognized by banks after the crisis onset but account for nearly all the market-value decline in bank equity by year five. This pattern supports the interpretation that losses arise primarily from deteriorating asset quality, not from fire sales. However, when banks hold a larger fraction of their assets in tradable securities, realized accounting losses are more immediate, and a larger fraction of total losses are attributable to trading losses rather than write-downs.[16]

Our analysis proceeds in two parts. First, we compare the realized accounting losses of banks with their market equity losses following the onset of banking crises. Trading losses must be recognized in the year they occur, because securities trades and asset sales are realized events

[16] Other potential sources for the permanent loss in banks' market value after crises, which we do not analyze in this paper, include: reduced future profitability due to regulatory and supervisory limits on risk-taking, increased regulatory costs, reduced reputational value, and decreased fee-based income from financial services.

that immediately affect the balance sheet.[17] If funding pressures forced banks to liquidate assets at substantially-below-fundamental values, we would observe large immediate accounting losses during banking panics and a strong correlation between book losses and declines in market value. We do not observe this pattern for the average bank. Instead, realized book losses in the first year of crisis onset, when all banking panics occur, account for only about 30% of the total market-value decline. Most realized book losses are recorded years later.

Second, we decompose banks' book net income to assess whether market-value equity declines after banking crises are driven by write-downs or by trading losses and asset sales. This breakdown allows us to distinguish recognized valuation losses on assets that remain on the balance sheet from realized losses due to securities trading and asset sales. We find that most realized losses are reported in the form of eventual write-downs. Total losses from securities trading or assets sales account for only a small share of cumulative bank losses.

These results can be seen in Figure 4, which compares banks' market-value losses to their cumulative "abnormal" book income in the years following bank equity crises. The sample consists of the ten largest banks per country across 17 advanced economies around bank equity crises from 1870 to 2019, and quantities are normalized by banks' aggregate book equity from the year before the crisis. "Abnormal" income is defined as yearly net income minus its average value from year *t-4* to *t-1*, which serves as a benchmark to capture changes from pre-crisis levels. Results from Figure 4 are also reported in tabular form in Table 4.

Figure 4 reveals that the market-value losses (black solid line) mostly all occur during the first year of a banking crisis. This is consistent with the permanent decline in bank equity returns documented earlier. However, realized book losses (black dashed line) are relatively small over the first two years. Cumulative book losses are about 13% and 21% of pre-crisis book equity on

[17] Unlike for loan-loss recognition, there is little possibility of earning smoothing or accounting discretion when it comes to securities trading or asset sales. To see the logic of this, note that an asset sale is a realized transaction and involves a reduction in securities or loans on the balance sheet and an increase in cash (or other assets). For example, if $50 M in securities were sold for $40 M in cash, the balance sheet would see a reduction in $50 M in securities, an increase in $40 M in cash, and a $10 M equity loss that would be passed through to the income statement, in order for the balance sheet and income statement to reconcile. Concealing or delaying recognition of a trading loss or asset sale thus requires falsification of the balance sheet of confirmable items such as cash and securities. This is certainly possible—one can point to historical examples of accounting fraud during banking crises—but taking such steps goes beyond standard earnings smoothing or accounting discretion.

To address potential concerns about the accuracy of historical accounting data, we replicate the main results on the post-1945 subsample (see Figure A.22) featuring stronger government bank supervision and independent external audits conducted under well-defined accounting rules in all 17 countries. We find similar results for this subsample.

average by the end of years *t* and *t+1*, respectively, while market losses account for roughly 40%.[18] Market losses plateau by the end of year *t*, while book losses slowly increase over five years. By year five, book losses amount to roughly 35% of pre-crisis book equity and 100% of market losses.

Figure 4 and Table 4 then break down banks' book income into its components, which are also computed as cumulative abnormal values relative to their average pre-crisis values (from year *t-4* to *t-1*) for each bank. These components of income are: a) write-downs and b) all other book income (in Panel A), and a) write-downs, b) trading income, and c) all other book income (in Panel B). "Write-downs" are defined as revaluations of assets that remain on the balance sheet and correspond to expected future reductions in cash flows (e.g., revaluation of assets, possible or actual loan losses and impairments, provisions against future credit losses), while "trading income" broadly encompasses realized gains and losses from securities trading and dispositions of all assets, not just of securities.[19]

Figure 4 shows that most of the market-value equity declines can be accounted for by eventual write-downs. In Panels A and B, write-downs (solid blue line) closely track cumulative book losses (dashed black line), demonstrating that, on net, write-downs fully account for nearly all book losses and, by *t+5*, all market-value losses. In contrast, losses from securities trading and asset sales (solid red line, Panel B) account for a small portion of total book or market-value losses.

However, not all banks fare equally. Panels C and D of Figure 4 and Table 4 show that banks with higher securities holdings experience larger immediate accounting losses. Specifically, banks in the top quartile in terms of the ratio of securities to assets experience an immediate decline in book values in the first year of the crisis that is driven to a large extent by a decline in trading income (solid red line, panel D) and represents a large fraction of the deterioration in market values (solid black line, panel D). In contrast, banks that are in the bottom quartile of securities-to-assets

[18] Note that magnitudes between Figure 4 and Figure 1 differ slightly due to different country samples (46 countries vs. 17 JST countries) and different normalizations by year *t-1* (book equity vs. market equity). Also, note that in Figure 4, Panel A and Panel B have different sample sizes due to data availability and therefore show similar but not identical results for market-value losses, total book losses, and write-downs. Panel A is based on 37 crisis episodes for which we have the breakdown of net income into write-downs and other income, while Panel B is based on 21 crisis episodes for which we have the breakdown of net income into the three categories.

[19] In the case of bank failures, unless the financial statements after failure explicitly categorize losses into other categories, asset losses are assumed to be all "trading losses", under the maximal assumption that bank failures result in disorderly liquidations. We even allow total losses to exceed book equity in the case of bank failure, if book assets fall below liabilities and lead to losses absorbed by creditors or the government. By making these assumptions for bank failures, we are likely over-estimating banks' aggregate "trading losses".

(and mostly hold loans) experience a less immediate decline in book values (dashed black line, panel C) that is mostly driven by write-downs (solid blue line, panel C) rather than by trading income (solid red line, panel C). The six bank equity crises in our sample that rank highest in terms of their securities-to-assets ratio (weighted across banks) all take place during the 2007-2008 crisis episode, when fire sales of securitized assets were significant (Gorton and Metrick 2012).[20] These results are consistent with the interpretation that banks' tradable securities are particularly vulnerable to fire sales (Brunnermeier and Pedersen 2009, Shleifer and Vishny 2011).

As robustness analyses, Figure A.22 replicates Figure 4 and Table 4 but for three subperiods, 1870-1945, 1946-2005, and 2006-2019, and finds that similar results hold on all three subperiods. While the relative contribution of write-downs to total losses is greatest in the 1946-2005 period, write-downs still account for most of total losses in the 1870-1945 period, demonstrating that the nature of losses in bank equity crises was not substantially different in this period before widespread deposit insurance and modern policy interventions.[21] Figure A.23 and Table A.15 report distributions of income components (write-downs, trading losses, net interest margin, and other), showcasing heterogeneity at both bank and crisis level. For most bank equity crises, write-downs tend to account for a large share of the total losses by year five after the crisis, though not all crises fit this pattern.

Taken together, these results indicate that permanent losses of banks during bank equity crises can mostly be explained by eventual write-downs, although losses from asset sales can be substantial for banks that hold a large fraction of their assets in tradable securities.[22]

B. Evidence on nonperforming loans at the country level

Write-downs reflect valuation losses on assets that remain on banks' balance sheets, primarily capturing nonperforming loans and increased provisions for expected credit losses.

[20] These countries are Belgium, France, Germany, Switzerland, the U.K., and the U.S.

[21] See Figure A.24 for two examples of historical balance sheets and income statements during the Great Depression, those of Continental Illinois, a U.S. bank, covering the period 1934-36 and of Deutsche Bank, a German bank, covering the period 1932-34, showing the prominence of write-downs.

[22] One caveat is that our analysis only examines the ten largest banks in each country. In some countries and periods, smaller banks might have less stable funding and be more prone to asset sales in crises. In addition, non-banks, especially broker-dealers, securities firms, and hedge funds, might be more prone to asset sales in crises, given their larger holdings of securities and less stable non-deposit funding.

Another way to show that most bank losses are linked to deteriorating credit quality is to zoom out to the aggregate level and examine the relationship between bank equity declines and peak nonperforming loan (NPL) rates across crises.

Figure 5 plots cumulative bank equity total returns against peak NPL rates across crises. The x-axis measures peak NPL rates between year *t* and *t+5* relative to the start of the bank equity crisis, with data from Ari, Chen, and Ratnovski (2021). This measure uses information not available at time *t*, which is necessary because banks tend to be slow to recognize nonperforming loans. The y-axis plots the unlevered cumulative log excess total return of the bank equity index (from year *t-1* to *t+5*). We use unlevered bank returns to capture the implied market value of *asset* losses, permitting direct comparison to NPL rates. We unlever returns by dividing them by the country's aggregate banking sector book leverage.[23] We limit the sample to JST countries for which we have data on nonperforming loans. Figure 5 shows that more negative unlevered bank returns are associated with higher NPL rates after banking crises. This negative relationship is statistically significant, as shown in Table A.16. We also report the goodness-of-fit, measured using the adjusted R^2 statistic, below the scatterplot in Figure 5. For our full sample of crises for which the NPL data is available, the adjusted R^2 is 0.233. However, this relatively low value is driven by two outliers where bank stocks have highly positive returns, the U.S. in 1990 and Sweden in 1991. Excluding these two observations, the adjusted R^2 is 0.533. Since measurement standards may be different across periods, Table A.16 also reports the results for the 2008-2010 crisis episodes only. The relationship in this subsample is stronger with an adjusted R^2 of 0.606.

The association we observe for banks is not merely that crises with higher NPL rates have broadly worse equity returns. Figure A.25 shows no association between nonfinancial equity returns and NPL rates. We conclude that at the country level, the poor returns of bank stocks following crises are well explained by asset quality deterioration in banks' loan portfolios.

V. Policy interventions and bank capitalization

In this section, we show that policy interventions have generally not been successful in restoring bank capitalization after bank equity crises. Conditional on a bank equity crisis, liquidity-

[23] Figure A.25 plots analogous results for *levered* (i.e., unadjusted) bank excess total returns, showing similar adjusted R^2 estimates to those in Figure 5.

based interventions do not predict an increase in bank market value beyond a transient bump, while bank recapitalizations have historically been small and delayed, contributing to persistent banking sector undercapitalization.

A. Bank equity after liquidity-based interventions

The temporary-loss view suggests that central banks and governments can restore market confidence and funding stability of the financial system by acting as lenders of last resort. These interventions aim to ease market illiquidity, reduce borrowing constraints, and prevent fire sale pricing. As a result, according to these theories, extraordinary central bank liquidity support and blanket liability guarantees (unless completely anticipated by the market) should lead to sharp rebounds in the market valuations or implied valuations of assets held by banks, and, therefore, to large and permanent increases in bank equity values.

Empirically, however, we do not find evidence that liquidity-based interventions implemented in response to bank equity crises lead to large or permanent increases in bank value. We focus on two types of interventions: extraordinary central bank liquidity support and the announcement of blanket guarantees on bank liabilities, using the first such event in each crisis. Neither intervention type is followed by a strong or lasting rebound in bank equity prices.[24]

Figure 6 plots cumulative abnormal monthly returns around the start of liquidity-based interventions implemented after the onset of bank equity crises, using a methodology similar to Figure 1 but applied to monthly returns and intervention dates. Figure 6 shows that for banks (blue), these interventions do not predict large or permanent increases in bank value. In the short-run (within two months following intervention), returns continue to decline, possibly reflecting the time needed for interventions to scale and convince markets of policy commitment. Bank equities then rise by about 20%, but this gain is short-lived. Returns reverse between months 12 and 36, and bank equity values remain low thereafter. This pattern suggests that while liquidity interventions may temporarily lead asset prices to rebound by restoring market liquidity, easing borrowing constraints, and reducing the risk of run-driven failures, bank equity valuations are dominated in the long run by the eventual recognition of larger permanent asset losses.

[24] Figure A.26 analyzes these two types of liquidity interventions separately and shows similar results.

This finding is inconsistent with the temporary-loss view, which attributes banking crises primarily to runs, binding borrowing constraints, or market illiquidity. Such theories predict that interventions from a lender of last resort would lead to a rapid restoration of bank value by restoring market liquidity and removing the fear of run-driven bank failures or inefficient asset liquidations (Gertler and Kiyotaki 2015, Dang, Gorton, and Holmström 2020, Gertler, Kiyotaki, and Prestipino 2020, Amador and Bianchi 2024). While some models (Gertler and Karadi 2011, Brunnermeier and Sannikov 2016) suggest an equivalence between liquidity interventions and equity injections, our evidence suggests that liquidity-based interventions do not fully restore bank capitalization after the onset of bank equity crises.

In interpreting these results, we caution that liquidity interventions are not randomly assigned and that deeper or more rapid crises are the ones in which liquidity interventions are likely stronger. As a result of this endogeneity issue, our analysis does not allow us to infer the counterfactual evolution of bank equity in the absence of these interventions. Instead, we simply conclude that the dynamics of bank equity after liquidity interventions are inconsistent with the equilibrium dynamics predicted by the models above.

B. Government recapitalizations tend to be small, delayed, and narrow

Motivated by the permanent decline in bank equity valuations during crises, we investigate the extent to which new equity issuance contributes to the recovery of bank market capitalization.

To do so, we distinguish between government recapitalizations—bank equity issuance financed with public funds—and private recapitalizations, which include all other bank equity issuance not funded by the government. (Bank equity issuance prompted by capital requirements or prompt corrective action, but executed without taxpayer support, are included in the second category.) Summing these two categories produces total bank equity issuance.

Figure 7 compares bank equity issuance to market-value losses following the onset of bank equity crises. Panel A plots cumulative equity issuance, with total issuance (blue) and government-funded issuance (green). As in Figure 4, we benchmark these against banks' aggregate market-value losses (black), with losses plotted as positive values for comparability. This analysis comprises the ten largest banks by country across 17 economies over the period 1870-2019, with all values normalized by pre-crisis aggregate book equity. Panel A shows that new equity issuance is modest relative to losses. Total bank equity issuance is only a fraction of both the level of pre-crisis book equity and of the realized value of bank losses in crises. Government recapitalization programs account for about a fourth of total bank equity issuance.

Panel B plots the cumulative log change in the real aggregate market capitalization of banks, measured relative to the year before each crisis. Market capitalization is the sum of the market values of the ten largest banks in each country and is averaged across bank equity crises. The figure shows that banks' market capitalization is persistently lower after crises. This reflects both sustained declines in equity prices (as shown in Section II) and the modest scale of new equity issuance documented in this section.

To isolate the role of issuance, Panel B includes a dashed line showing a counterfactual calculation assuming no new equity is issued after the crisis onset. The gap between the solid and dashed lines thus represents the contribution of equity issuance to market capitalization. This contribution is small relative to the overall decline, suggesting that new issuance only partially offsets the loss. These results are inconsistent with models (e.g., Gertler, Kiyotaki, and Queralto 2012) in which outside equity slowly but eventually flows into the banking sector, due to high returns to scarce intermediary capital, helping to restore the banking sector's net wealth.[25]

We next study government recapitalization programs in more detail to understand why they have historically been insufficient in restoring the capitalization of the aggregate banking sector. We build a comprehensive database documenting all government recapitalization programs across

[25] As with liquidity-based interventions, we caution that bank recapitalizations, whether government directed or bank initiated, are not randomly assigned and that more severe crises may necessitate larger or more rapid recapitalizations. As a result, our analysis does not allow us to infer the counterfactual evolution of bank capitalization, since bank market valuations may have continued to deteriorate or rebound in the absence of recapitalizations, given that the macroeconomic environment likely would be different. Our results also do not allow us to infer the optimal amount of new bank capital needed, and banks' pre-crisis capitalization should not be seen as the desired target. Instead, we interpret our results as simply measuring the recapitalizations relative to losses and as demonstrating inconsistency with models that predict that bank capitalization mean-reverts, either through high internal returns or by attracting higher levels of outside equity after banking crises.

17 economies since 1870. For the purposes of this database, a "government recapitalization" occurs when a government fund is created to purchase newly issued common or preferred equity in three or more banks. This database is the first of its type and allows one to see the full range of government recapitalization programs throughout history. Based mostly on new archival research that builds on the databases of Laeven and Valencia (2020) and Metrick and Schmelzing (2024), we focus on collecting detailed statistics on three key dimensions—the size, timing, and breadth—of all historical government recapitalization programs. Given the extensive historical research needed for each recapitalization, we restrict our sample to 17 JST economies over 1870-2019.

Table 5 presents this database, with summary statistics for each variable (mean, standard deviation, and percentiles) at the bottom of each panel. Panel A reports variables related to the *size* of government recapitalizations, while Panel B reports variables related to their *speed* (Columns 3-6) and *breadth* (Columns 7-10). Our main conclusion from this analysis is that government capitalization programs have historically tended to be small, delayed, and narrow.

Regarding the *size* of recapitalizations, Panel A reports on the legislative allocation (column 3) and the amount actually used to purchase newly issued common or preferred equity in banks (column 4). Column 6 normalizes the latter by banking sector total equity in the year before the crisis onset (from column 5). Column 7 reports total bank equity issuance across the largest ten banks in the country from year t to $t+5$ around the crisis (regardless of whether there was a government recapitalization), normalized by book equity in year $t-1$. Column 8 only includes the bank equity issuance during years that coincided with a government recapitalization program. Column 10 normalizes the total bank equity issuance by the market value of bank equity losses (column 9). Histograms of the distribution of these variables across bank equity crises are plotted in Figure A.27. Our main conclusion is that the size of government recapitalizations tends to be small relative to both pre-crisis book equity and to the realized value of bank losses in crises. Table 5 reports that on average government recapitalizations amounted to 24% of book equity (column 7) and 43% of losses (column 10). There is wide variation, with some programs being substantially larger (like Sweden's 1993 recapitalization).

Regarding the *speed* of recapitalizations, Panel B reports the delay between the start of the banking panic and the first recapitalization program (columns 5 and 6), along with whether and when additional second or third rounds of recapitalization programs were instituted (column 4). Regarding the *breadth* of recapitalizations, Panel B classifies recapitalizations as broad or narrow.

Broad recapitalizations are defined as those that include a large number of banks, both healthy and distressed, whereas narrow recapitalizations target a small number of distressed banks. To capture breadth, Panel B reports the number of banks recapitalized (column 8), the percent of the ten largest banks in each country that were recapitalized (column 9), and an estimate of the percent of the entire banking system (weighted by assets) that was recapitalized (column 10).

We classify 65% of recapitalizations as narrow. Across crises, the median number of banks recapitalized is five. While the Troubled Asset Relief Program (TARP) in the U.S. after the 2008 financial crisis was unique in recapitalizing over 700 banks (broad) and was implemented about one month following the banking panic that started with the collapse of Lehman Brothers (timely), this is often not the case elsewhere. An example of extreme delay is the Japanese banking crisis of the 1990s. The crisis started with the real estate collapse in 1990, followed by prominent bank failures starting in 1994, and a major banking panic in the fall of 1997. The Japanese government implemented a recapitalization program only in March 1999, with a second program following in 2003. Two examples of narrow recapitalization programs are in Germany and Italy in 2008. Germany's SoFFin program only recapitalized five banks (out of hundreds in Germany), with major banks such as Deutsche Bank declining to participate in the government recapitalization program. Italy likewise only recapitalized four medium-sized banks, with nearly all major banks including UniCredit and Intesa Sanpaolo declining the government recapitalization program. [26]

VI. Comparison to other types of banking crises

Overall, our results indicate that once a bank equity crisis is reached—based on real-time indicators that a policymaker can observe—bank equity does not earn high future returns, the banking sector sees a sharp and persistent rise in nonperforming loans and asset write-downs, and liquidity-based interventions are not sufficient to restore bank capitalization. But do these

[26] In Appendix Section 2, we draw upon the narrative and quantitative information in our historical interventions database, along with prior research, to examine why liquidity interventions tend to be frequently and promptly implemented, while government recapitalizations tend to be relatively less common and delayed. We discuss various institutional constraints and political factors that likely drive this pattern.

dynamics hold for other types of banking crises, such as bank-run events without large bank equity declines? Furthermore, under what circumstances can bank-run events turn into large bank equity declines, or vice versa? And can different types of banking crises be averted in the first place by early decisive liquidity interventions? We analyze these issues in this section.

A. Comparison to "panic-only" banking crises

We start by contrasting bank equity crises to banking panics without large bank equity declines, which we call "panic-only crises", following BVX's distinction between bank equity crises and panic crises.[27] Consistent with the view that panic-only crises capture liquidity-driven events, we find that panic-only crises evolve differently, with high future bank equity returns, large positive responses to liquidity interventions, and smaller macroeconomic output losses. These results suggest that the dynamics of panic-only crises tend to be more consistent with the temporary-loss view.

Table A.17 lists the full sample of various types of banking crises. Panic-only crises (N = 85) are reported in column 8 as sustained panics that are not bank equity crises. Examples include the U.S. Panic of 1907, the U.K.'s "small bank" crisis of 1991, and Norway's 2008 liquidity crisis.

Panic-only crises tend to involve only temporary losses, in sharp contrast to bank equity crises. Figure A.28, Panel A, shows that panic-only crises feature significant negative returns in the year of crisis onset, followed by elevated bank equity returns that bring valuations back to pre-crisis levels by year five. In contrast, Panel B (a replication of Figure 1) shows that bank equity crises are associated with permanently lower bank returns, with no recovery to pre-crisis levels. Furthermore, panic-only crises are followed by only a small, temporary reduction in bank dividends (Panel C), in contrast to the large and permanent reduction in bank equity crises (Panel D, replication of Figure 3).

Panic-only crises also exhibit large positive responses to liquidity interventions. Figure A.29 shows that bank equity prices fully rebound in the month of extensive central bank liquidity

[27] Most banking crises analyzed by BVX are both types. Of the crises of just one type, BVX focus on banking crises without panics (also called "quiet banking crises"). Here, we analyze panic-only crises.

support or blanket liability guarantees (Panel A). In contrast, bank equity crises show only a modest initial response, followed by a long-term reversal (Panel B, a replication of Figure 6).[28]

Panic-only crises also tend to be less macroeconomically severe. Figure A.30 shows that they are followed by relatively shallow declines in real GDP (Panel A) and modest contractions in bank credit (Panel B). In contrast, bank equity crises are associated with larger and more persistent declines in both output and credit.

We also compare bank equity crises to other types of crises. Figure A.32 and Figure A.33 compare bank equity crises (Panels A and B) to other types of crises: nonfinancial equity crashes (Panel C), currency crises (Panel D), real consumption drops (Panel E), and real GDP drops (panel F). Definitions of these other types of crises are provided in the figures. Unlike bank equity crises, these other events are followed by elevated returns for both bank and nonfinancial equities and only temporary or no reductions in dividends, suggesting that different mechanisms drive post-crisis return dynamics for these other events.

B. Can early liquidity interventions avert banking crises?

We have shown that once a bank equity crisis occurs, bank losses tend to be permanent, the banking sector sees a persistent rise in nonperforming loans and asset write-downs, and liquidity-based interventions are insufficient to restore bank capitalization. However, one may wonder if early liquidity interventions can avert different types of banking crises in the first place.

For liquidity disturbances in which a prior bank equity decline *has not already occurred*, the answer is often yes. We show that in these cases, early liquidity interventions have historically tended to contain liquidity shocks and prevent future bank equity declines, successfully averting crises. We then explore the specific conditions under which early liquidity interventions are most likely to succeed.

[28] Figure A.31 analyzes cross-predictability across countries and shows a consistent result. This analysis asks, if some countries experienced bank equity crises in, e.g., 2008, what happened in other countries without bank equity crises? The intuition is that these other countries (e.g., those in East Asia or Latin America) were hit by a liquidity shock but did not see a 30% decline in bank equity (presumably because their banking sectors were not heavily exposed to U.S. mortgage-backed securities or the U.S.-European housing boom/bust). Figure A.31 shows that while countries with bank equity crises suffer a permanent drop in bank equity, the non-crisis countries see a quick bounce-back in their bank equity prices at the same time, consistent with the temporary-loss view.

By contrast, we argue that most *bank equity crises* could not have been prevented by early liquidity interventions. Building on a result in BVX, we show that in most cases, bank equity declines at the onset of crises strictly preceded the emergence of banking panics. As a result, these bank equity crises could not have been prevented by early liquidity interventions during a panic phase—because no such panic had yet occurred. This timing suggests that most historical bank equity crises were not liquidity crises that later evolved into solvency crises. Rather, they reflected underlying weaknesses in the banking system that were already present at the onset of the crisis.

To demonstrate these results, we first illustrate the timing relationship between banking panics, 30% bank equity declines, and liquidity interventions in Figure A.34. The figure presents a tree diagram that maps all the paths taken by different types of historical banking crises, based on the sample of events in Table A.17. The diagram first categorizes episodes by whether the panic occurs strictly before the bank equity decline (bottom tree) or the bank equity decline occurs first (bottom tree).[29] It then traces how each crisis evolves, conditional on policy interventions, toward one of three outcomes: a bank equity crisis, a panic-only crisis, or an averted crisis. We define an "averted crisis" as an incipient liquidity shock to the banking sector that fully recedes within two months without any bank failures or 30% bank equity declines (as documented in the spreadsheet accompanying Table A.17).

Figure A.34 shows that when a prior bank equity decline has not occurred (top tree), early liquidity interventions are relatively common and often successfully avert crises. Of the 183 total episodes of incipient liquidity shocks in this group, 126 receive early liquidity interventions, of which 92 are classified as averted, representing about 50% of the original 183 episodes.[30]

Bank equity crises behave differently. In most cases, the bank equity decline comes first, and early liquidity interventions are less successful. Of the 76 bank equity crises in our sample, 57 of these cases (or 75%) appear in the bottom tree, where the equity decline precedes the panic. This evidence indicates that most bank equity crises arise because of early solvency problems in

[29] In cases without a 30% bank equity decline, we assume the panic—or incipient panic—occurs first. Conversely, in cases without a banking panic, we assume the 30% equity decline occurs first.

[30] Note that all averted crises are in the top tree: they all start out as liquidity crises without 30% bank equity declines, and all feature early liquidity interventions. This is an empirical finding, not a mechanical consequence of our definitions. Specifically, there are no cases in the lower tree in which both no banking panic materialized and bank equity prices quickly bounced back.

the banking sector, reflected in an initial crash in bank equity prices, which often later morphs into a banking panic.[31]

Only in a minority of bank equity crises (19 cases, or 25%) did the panic occur first or concurrently with the bank equity decline. We call these cases "mismanaged banking panics" (outcome #2 in Figure A.34). The U.S. during the Great Depression is a prominent example. "Mismanaged banking panics" occurred mostly between 1870 and 1945, often in countries on the Gold Standard when central banks had limited flexibility to act as lenders of last resort. In our interpretation, the relative rarity of "mismanaged banking panics", especially in more recent times, reflects the historical effectiveness of liquidity interventions, which have frequently succeeded in containing incipient liquidity shocks before they escalate.

We next analyze the conditions under which early, decisive liquidity interventions can avert crises. Specifically, we ask whether certain crisis characteristics predict which events become "averted" crises, using the definition introduced above. We estimate a probit regression on the full sample of events from Table A.17, where the dependent variable is an indicator for "averted" crises. The predictor variables are: *Small BE Decline*, an indicator variable for whether the bank equity decline preceding the incipient panic is less than 30%; *Early Liq. Interv.,* an indicator variable for whether liquidity interventions occurred within one month of the panic (based on the two types of liquidity interventions analyzed in Section V); *War*, an indicator variable for whether the incipient panic occurred at the outbreak of a war; and *Single Bank,* an indicator variable for whether the incipient panic was focused around a single institution.

Table A.18 Panel A shows that these four variables strongly predict whether an incipient liquidity shock is averted (as opposed to becoming a true banking panic or a bank equity crisis). The two best predictor variables are *Small BE Decline* and *Early Liq. Interv.* In fact, both indicators are essentially necessary conditions for an averted panic: with one exception, all averted panics occur when the bank equity decline is small in magnitude, and all averted panics follow early liquidity intervention. The other two variables, *War* and *Single Bank,* are likewise associated with a higher probability of the incipient panic being successfully averted. Averted crises are thus much

[31] Bank equity crises are not always followed by a panic, as Figure A.34 shows. In these cases, the panic is suppressed by the liquidity interventions, though large bank equity losses remain. These "quiet banking crises," as described by BVX, are still macroeconomically severe. BVX shows that such episodes feature large output gaps, credit contractions, bank failures, and other signs of banking sector distress, even in the absence of bank runs.

more likely when the liquidity event is due to the outbreak of a war or when the run is initially limited to problems at a single bank.[32]

Overall, we conclude that incipient crises can be averted with liquidity interventions only when a steep bank equity decline has not yet occurred. Incipient crises are also more likely to be averted in special circumstances, such as after the outbreak of a war or when the liquidity problems initially involve a run only on a single bank. In contrast, once a large bank equity decline has taken place, crises become more difficult to resolve. Whether or not they are followed by a panic, these episodes typically involve permanent bank losses, a persistent rise in nonperforming loans, and long-lasting banking sector undercapitalization.

VII. Conclusions

We have shown that bank equity prices tend to exhibit a permanent decline during bank equity crises, which predicts long-run deterioration in banks' dividends and earnings rather than elevated future bank equity returns. Evidence from accounting data suggests that banks' permanent losses during crises are mainly due to asset write-downs, not asset sales during panics. Bank capital remains depleted many years after bank equity crises, even in countries with large-scale liquidity injections by the government or central bank. These findings imply that liquidity-based policies alone are not always sufficient to resolve banking crises and that recapitalization policies are likely needed to restore the banking sector to long-term health. However, government recapitalizations historically have often been insufficient to offset banking sector losses, resulting in persistently low levels of market capitalization relative to pre-crisis levels.

[32] One can go beyond the functional form imposed by the probit regression and make even better predictions based on simple rules using these four predictor variables. In Panel B, one can predict averted panics based on whether *Small BE Decline* and *Early Liq. Interv.* are both equal to one. This predicts whether the crisis is averted with a perfect true-positive rate of 91 / 92 = 99% and with a low false-positive rate of 35 / 148 = 24%. *Small BE Decline* and *Early Liq. Interv.* are thus essentially necessary conditions for the crisis to be averted. In Panel C, one can add a third condition to predict whether the crisis is averted, whether either *War* or *Single Bank* equals one. In this case the true-positive rate is lower at 46 / 92 = 50%, but the false-positive rate is minimal at 5/148 = 3%. This suggests that nearly all liquidity crises due to the outbreak of wars or due to single bank runs are averted. We interpret *War* or *Single Bank* as being essentially sufficient conditions for an averted crisis.

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Figure 1: Cumulative abnormal equity returns around bank equity crises

This figure plots the cumulative abnormal returns around bank equity crises for the bank and nonfinancials equity indexes, normalized to zero in year $t-1$, where t is the year of the bank equity crisis. Abnormal returns are defined as the log excess total returns of the equity index for a given horizon around the crisis minus the country average of the same index, and are estimated using Equation (1) with $k = 1$. 95% confidence intervals (CI) are computed using Driscoll-Kraay standard errors. The dashed black lines represent zero abnormal return starting from year t for banks and nonfinancials, separately. Cumulative abnormal returns above those lines indicate positive abnormal returns following the crisis, and vice versa.

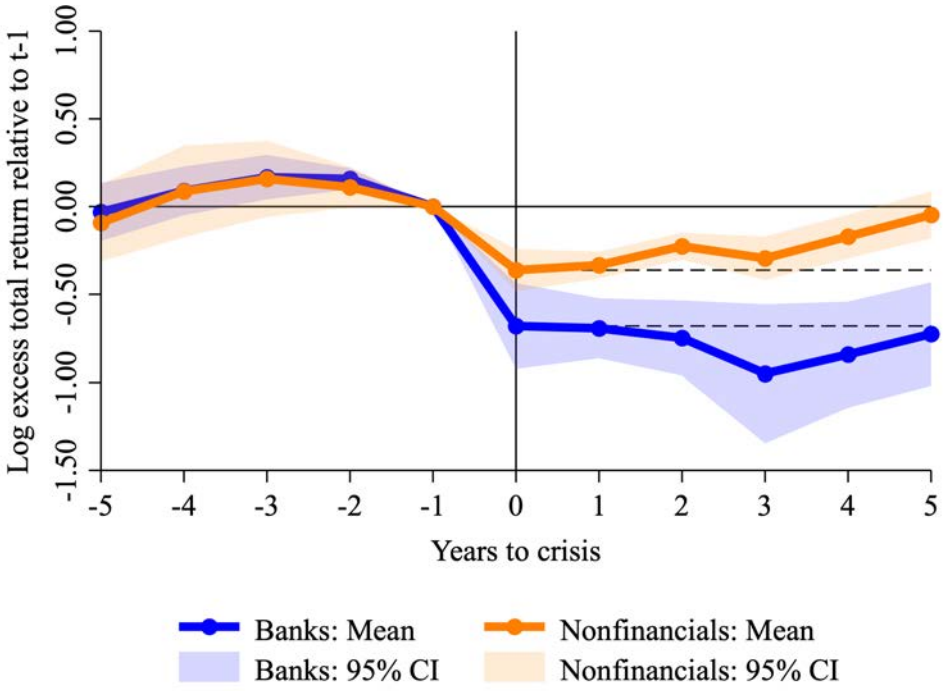


Figure 2: Equity returns assuming perfect timing of troughs around bank equity crises

This figure plots the cumulative abnormal returns around bank equity crises for the bank and nonfinancials equity indexes, normalized to zero in the month of the trough of the bank equity returns index. The trough is identified by looking within a $t-6$ to $t+18$ month window around the bank equity crisis start (or using the panic start month when bank equity returns do not have a trough in this window). The cumulative abnormal returns are computed by demeaning monthly log excess total returns for each month $h \in [-60, 60]$ around the troughs using the unconditional country average (for banks and nonfinancials, respectively) to produce abnormal returns, and then cumulating over time. The result is then normalized to zero in the month of the trough for each individual bank equity crisis. The mean and interquartile range are then computed across bank equity crises and plotted in this figure.

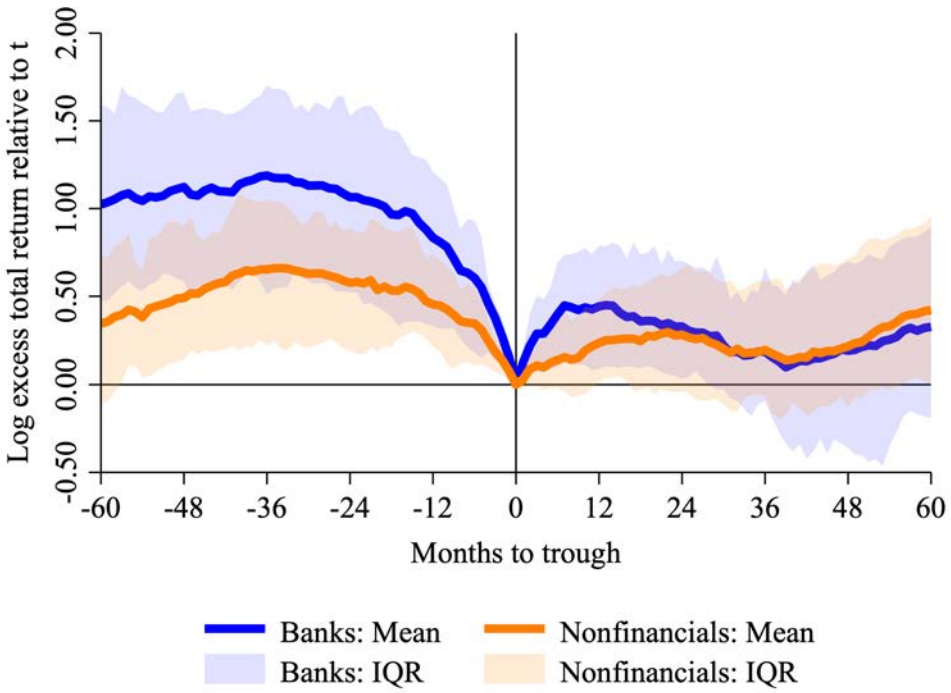
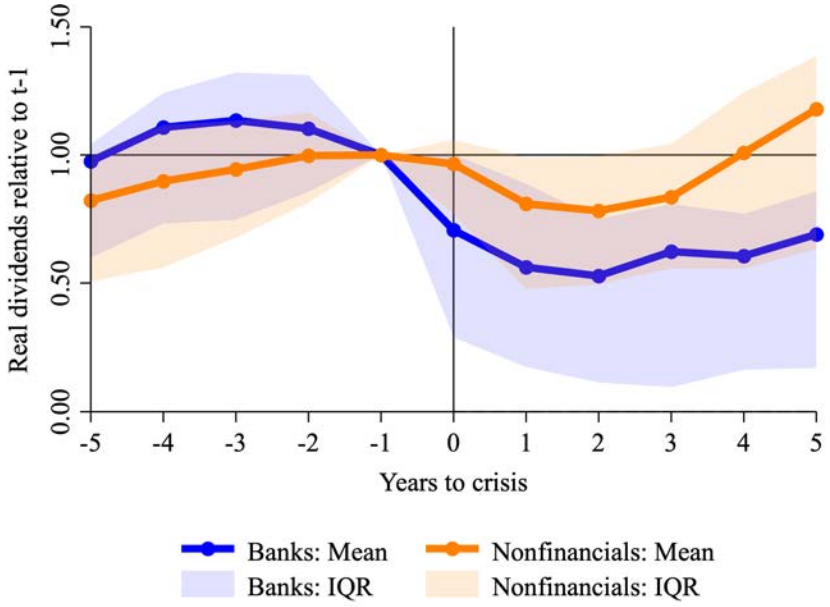


Figure 3: Dividends and earnings around bank equity crises

This figure plots the real dividends per share index for bank and nonfinancial equity, as well as the real earnings per share index for bank equity, averaged across bank equity crises. To construct this figure, we compute two market-capitalization-weighted indexes corresponding to the per-share real dividends index and the per-share real earnings index, denoted $D_{i,t+h}$, in the window of $h \in [-5, 5]$ years around all bank equity crises, where t is the starting year of a crisis. We normalize $D_{i,t+h}$ by its value $D_{i,t-1}$ in the year before the start of the crisis and then compute the average and interquartile range across crises of $D_{i,t+h}/D_{i,t-1}$ at each horizon $h \in [-5, 5]$. As a result, this figure plots the average level of annual real dividends (Panel A) or annual earnings (Panel B) relative to the year before the crisis, per a given share purchased in the year before the crisis. In Panel A, we drop three crises where the dividend index takes on extreme values (Mexico 1931, India 1993, and Venezuela 2009). In Panel B, to avoid normalizing earnings by negative or very small values in year $t-1$, we normalize by the last positive value before the crisis (instead of the $t-1$ value) in three cases: Norway 1988, USA 1990, and Denmark 1992. We do not plot the real earnings index for nonfinancials in Panel B because the requisite data are not available.

(A) Real dividends



(B) Real earnings

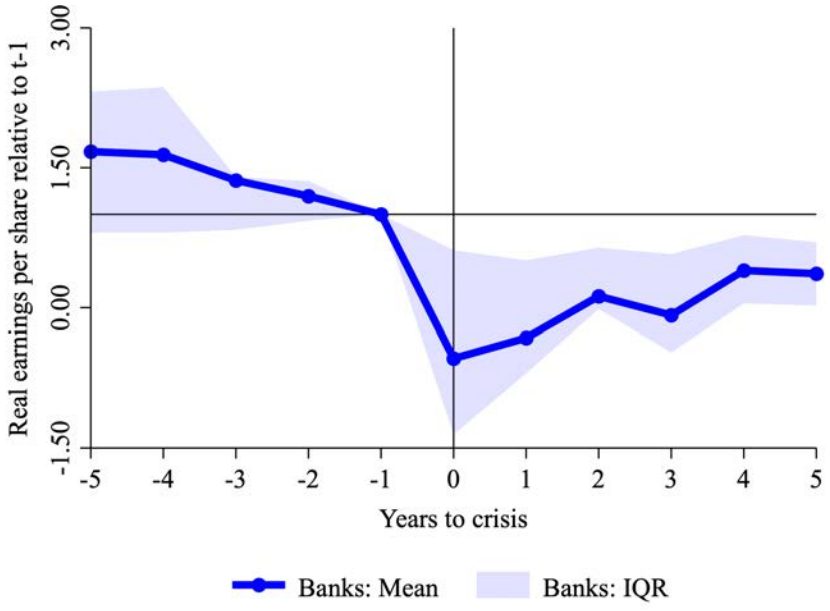
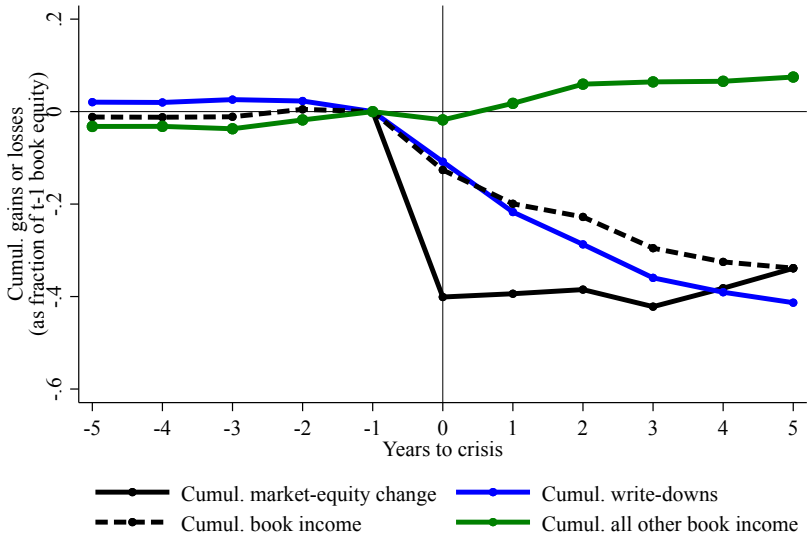


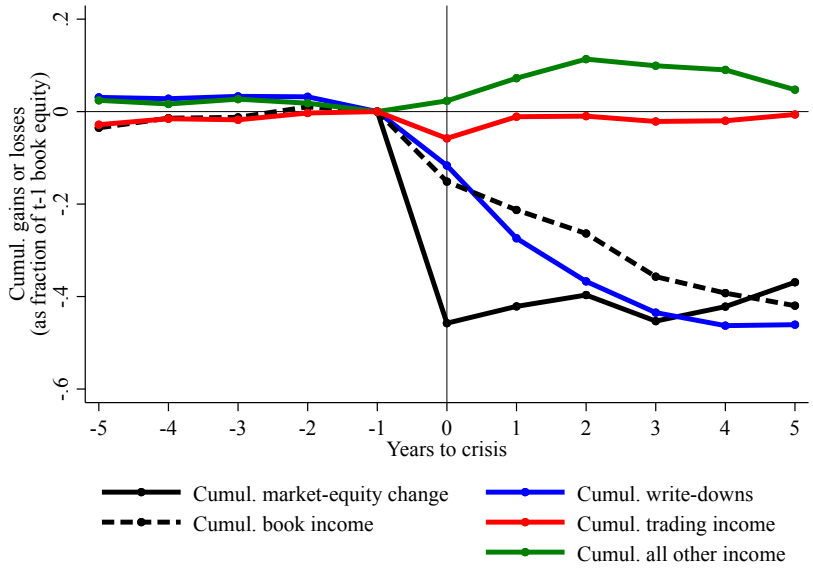
Figure 4: Banks' book income decomposed into write-downs and other income categories

This figure plots banks' cumulative abnormal book income (black dashed line) in the years following bank equity crises. "Abnormal" is defined for each bank as its yearly net income minus its average pre-crisis value (from year $t-4$ to $t-1$). Banks' abnormal book income is then aggregated over the ten largest banks within each country, normalized by these banks' aggregate book equity from the year before the crisis (year $t-1$), and then cumulated forward from year $t-5$ and averaged across crises in the 17 advanced economies over the period 1870-2019; this cumulative index is then recentered up or down, so that its value is zero in year $t-1$, in order to present cumulative book gains or losses relative to $t-1$. The plot next compares banks' book income to their cumulative market-equity gains and losses (black solid line), calculated relative to year $t-1$, normalized by banks' aggregate book equity in year $t-1$, and then averaged across crises in the 17 advanced economies over the period 1870-2019. Banks' book income then is decomposed into income categories, which are also computed as cumulative abnormal values relative to their average pre-crisis values for each bank. Panel A decomposes banks' net income into write-downs (blue line) versus all other book income (green line), while Panel B decomposes banks' net income into write-downs (blue line), trading income (red line), and all other book income (green line). These components of net income are defined in the main text. Panel A is based on 37 crisis episodes for which we have the breakdown of net income into write-downs and other income, while Panel B is based on 21 crisis episodes for which we have the breakdown of net income into the three categories described above. Panels C and D are similar to Panel B but only include banks for which the securities-to-assets ratio in year $t-1$ is in the bottom or top quartile (among all banks across all crises), respectively.

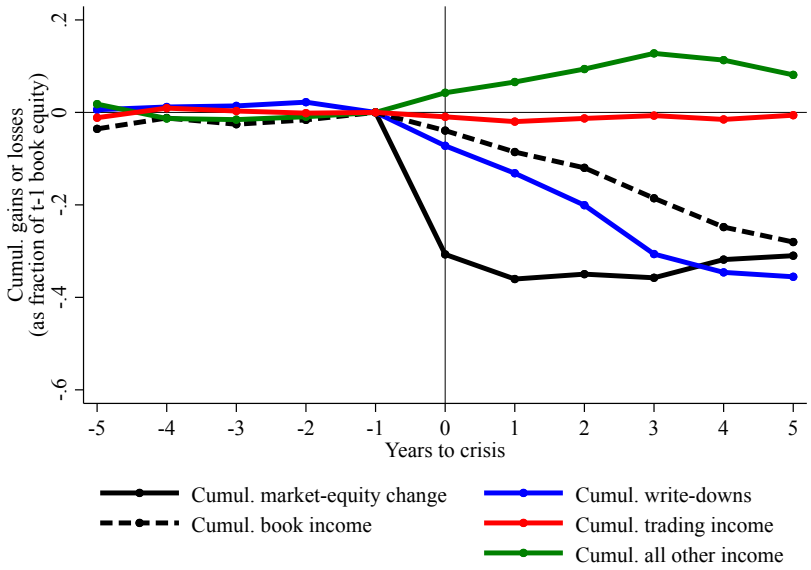
(A) Income decomposed into write-downs and all other income



(B) Income decomposed into three categories



(C) Banks in bottom quartile of (securities/assets)



(D) Banks in top quartile of (securities/assets)

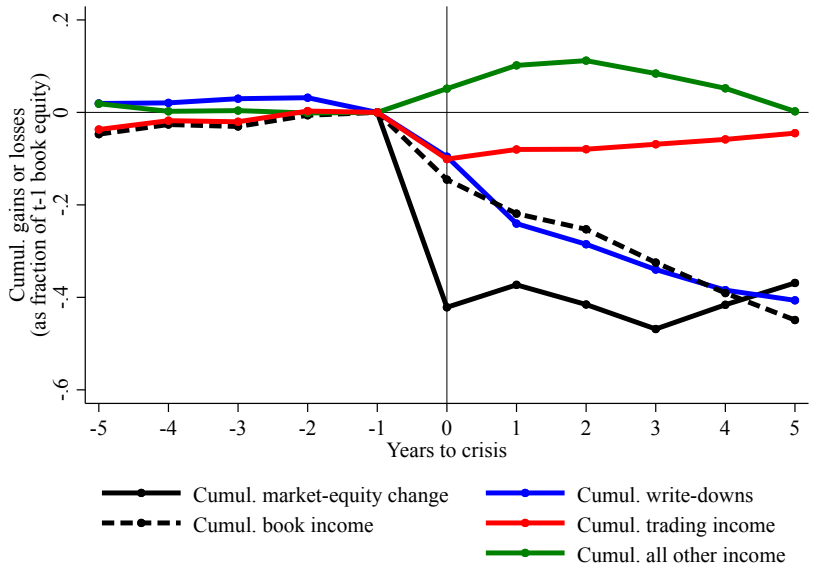
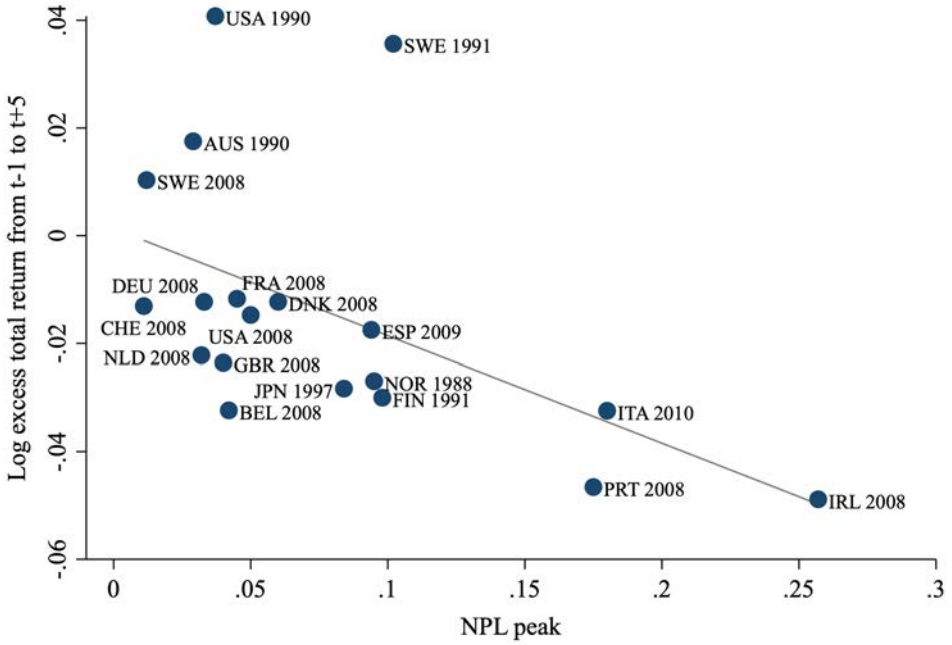


Figure 5: To what extent can NPL rates account for banks' market-equity losses?

This figure plots the unlevered cumulative log excess total return of the bank equity index (from $t-1$ to $t+5$) against the peak non-performing loans (NPL) rate (maximum value from t to $t+5$), where the start of a bank equity crisis occurs at time t. Each observation corresponds to a bank equity crisis. The sample of crises consists of all available crises in advanced economies for which the NPL data are available. A line of best fit, estimated using ordinary least squares, is plotted, and the corresponding adjusted R^2 statistics are reported below the plot. Figure A.25 plots analogous results for levered bank and nonfinancial index returns.



Adj. R^2 = 0.233; Adj. R^2 (w/o USA 1990 and SWE 1991) = 0.533

Figure 6: Cumulative abnormal equity returns around liquidity-based interventions

This figure plots the cumulative abnormal log excess total returns of the bank and nonfinancials equity indexes at monthly frequency relative to month t, where month t corresponds to the implementation of extraordinary central bank liquidity support or the announcement of blanket guarantees of banking sector liabilities, whichever comes first. 95% confidence intervals (CIs) are computed using Driscoll-Kraay standard errors. Figure A.26 plots the same figure for extraordinary central bank liquidity support or bank liability blanket guarantees separately.

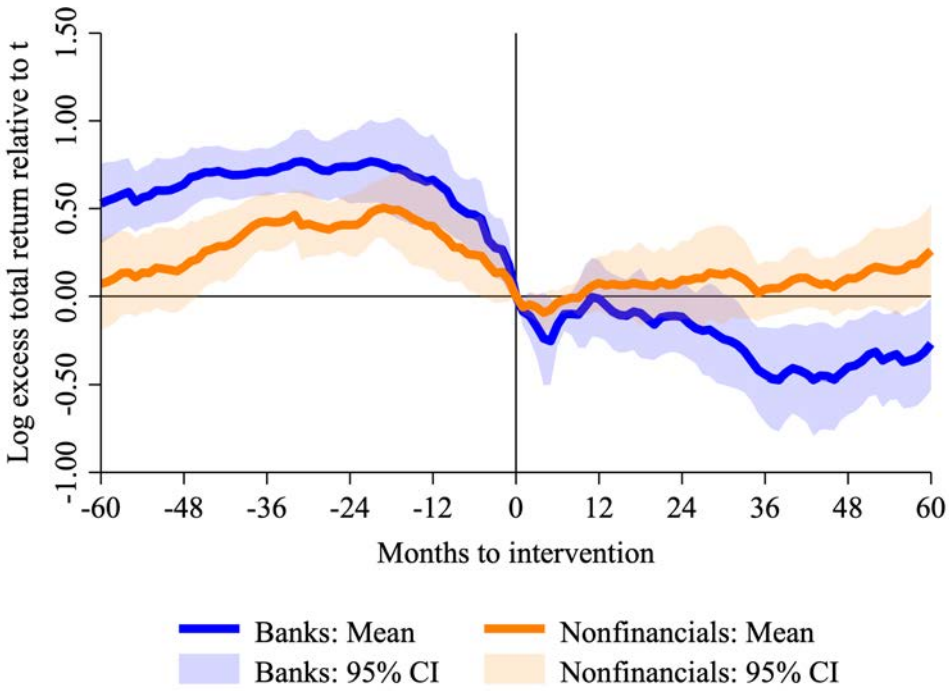
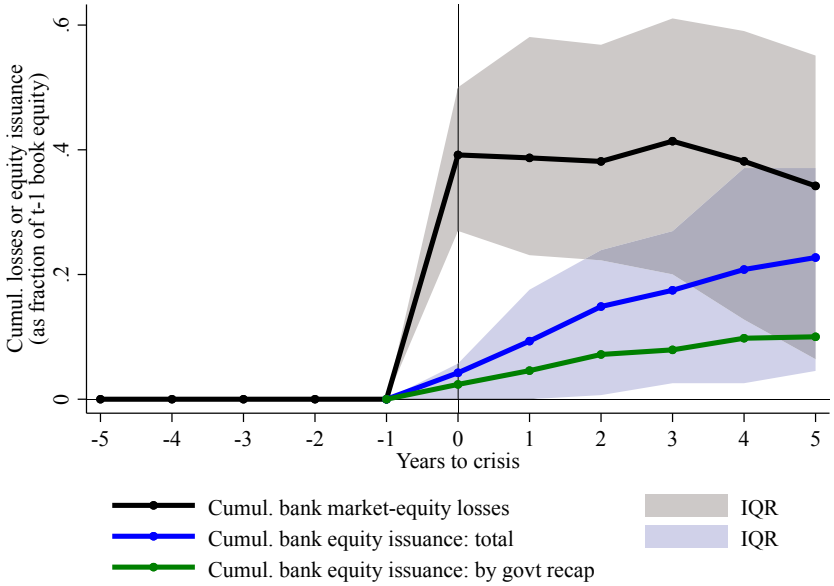


Figure 7: Banks' equity issuance relative to their market-equity losses

Panel A plots cumulative bank equity issuance and banks' market-equity losses after the start of bank equity crises, computed for the ten largest banks within each country and averaged across bank equity crises. Bank equity issuance is plotted using two measures: total common equity issued (blue line) and equity issued during a government recapitalization program (green line). Cumulative bank market-equity losses are also plotted (black line). Market-equity losses are computed as the cumulative declines in individual banks' excess total returns relative to the year prior to the bank equity crisis. All three variables are first normalized within each bank equity crisis by banks' book equity in the year before the crisis (year $t-1$), then averaged across bank equity crises. Variables are only calculated after the start of bank equity crises ($t \geq 0$) and set to zero before to highlight recapitalizations after crises begin. The solid lines plot averages across bank equity crises, while the shaded areas depict interquartile ranges (IQR). Panel B plots banks' log real market capitalization in year $t+h$ ($h \in [-5, 5]$) relative to year $t-1$, averaged across bank equity crises, where t is the year of the crisis. Market capitalization is aggregated across the sample of the ten largest banks within each country. The dashed line plots estimated market capitalization assuming equity issuance is zero from t onwards.

(A) Equity issuance relative to market-equity losses



(B) Bank market capitalization is persistently low even after equity issuance

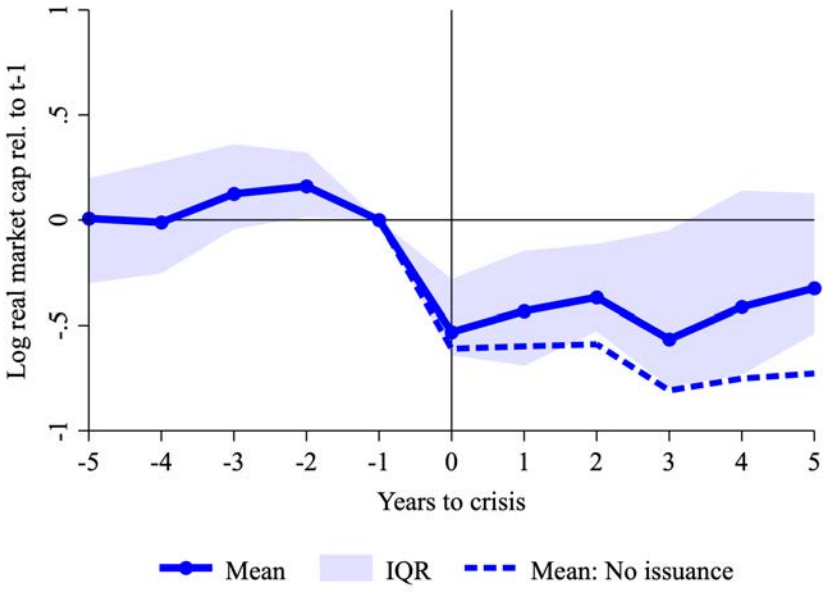


Table 1: Summary statistics

Summary statistics are reported for the country-year data (Panel A) and the individual bank-year data (Panel B). Panel A reports summary statistics for the index returns of bank stocks and nonfinancial stocks, across 46 economies over the period 1870-2019, either as real total returns or excess total returns. Dividend yields and real dividend growth of bank stocks and nonfinancial stocks are also reported. Real earnings growth is only available for bank stocks. Real market capitalization growth and book equity growth of banks is aggregated up from the individual bank data and is thus only available for a smaller sample of 17 economies in ±5-year windows around bank equity crises. Panel B reports bank-level summary statistics for the ten largest banks within each country (determined by asset rank five years before the start of each bank equity crisis) and within ±5-year windows around bank equity crises over the period 1870-2019. All returns and growth rates in both panels are in log units.

Panel A: Country-level data

	Mean	SD	p5	p25	p50	p75	p95	N
Real total return, banks	0.040	0.318	-0.407	-0.074	0.057	0.175	0.457	3,956
Excess total return, banks	0.022	0.318	-0.430	-0.090	0.037	0.158	0.448	3,956
Real total return, nonfin.	0.040	0.306	-0.430	-0.092	0.043	0.185	0.484	3,876
Excess total return, nonfin.	0.024	0.306	-0.440	-0.105	0.028	0.168	0.461	3,876
Dividend yield, banks	0.048	0.030	0.004	0.030	0.046	0.061	0.100	3,599
Dividend yield, nonfinancials	0.041	0.023	0.011	0.026	0.038	0.052	0.082	2,865
Real dividend growth, banks	-0.013	0.775	-0.761	-0.153	0.007	0.164	0.677	3,430
Real dividend growth, nonfin.	0.019	0.295	-0.461	-0.103	0.020	0.140	0.500	2,697
Real earnings growth, banks	0.044	0.761	-0.699	-0.055	0.053	0.175	0.812	1,893
Real mkt cap growth, banks	0.004	0.408	-0.597	-0.182	0.043	0.211	0.540	496
Real book eq. growth, banks	0.030	0.195	-0.223	-0.033	0.031	0.105	0.285	452

Panel B: Individual bank data
(Ten largest banks within each country, 17 JST economies, ±5-years around bank equity crises)

	Mean	SD	p5	p25	p50	p75	p95	N
Excess total return	-0.084	0.683	-0.822	-0.190	0.020	0.189	0.481	3,287
Dividend yield	0.043	0.036	0.000	0.021	0.041	0.058	0.098	3,456
Dividends/book equity	0.052	0.040	0.000	0.021	0.049	0.074	0.121	3,090
Real market cap growth	-0.012	0.418	-0.697	-0.181	0.014	0.209	0.575	3,159
Real book equity growth	0.030	0.187	-0.251	-0.026	0.027	0.098	0.314	3,673
Market-to-book ratio	1.102	0.581	0.306	0.695	1.009	1.410	2.288	3,165
Real asset growth	0.029	0.142	-0.188	-0.040	0.026	0.102	0.257	3,816
Real loan growth	0.025	0.165	-0.233	-0.049	0.023	0.107	0.276	3,816
Net income/book equity	0.073	0.182	-0.185	0.015	0.074	0.142	0.315	3,049
Equity issuance/book equity	0.059	0.171	-0.013	0.000	0.000	0.026	0.372	3,270

Table 2: Cumulative abnormal equity returns after bank equity crises

This table reports regression coefficients estimated using Equation (1) with $k = 0$, which capture cumulative equity returns after the start of the crisis (i.e., relative to year t). Results corresponding to log excess total returns are reported in Panel A (for bank equity) and Panel B (for nonfinancials equity), while those for log real total returns are reported in Panel C and Panel D. Driscoll-Kraay standard errors are reported in parentheses. *, **, *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Excess returns, banks

	Dependent variable: $r^B_{i,t,t+h}$				
	$h = 1$	$h = 2$	$h = 3$	$h = 4$	$h = 5$
BankEqCrisis$_{i,t}$	-0.009	-0.064	-0.262***	-0.156**	-0.040
	(0.070)	(0.055)	(0.089)	(0.065)	(0.077)
Constant	0.024***	0.050***	0.080***	0.104***	0.125***
	(0.008)	(0.014)	(0.020)	(0.025)	(0.030)
Within-R^2	0.000	0.000	0.004	0.001	0.000
N observations	3,835	3,717	3,600	3,484	3,370
N bank equity crises	75	75	71	71	71

Panel B: Excess returns, nonfinancials

	Dependent variable: $r^N_{i,t,t+h}$				
	$h = 1$	$h = 2$	$h = 3$	$h = 4$	$h = 5$
BankEqCrisis$_{i,t}$	0.031	0.138**	0.069	0.191***	0.313***
	(0.052)	(0.056)	(0.047)	(0.069)	(0.081)
Constant	0.026***	0.054***	0.088***	0.118***	0.145***
	(0.008)	(0.014)	(0.022)	(0.028)	(0.033)
Within-R^2	0.000	0.002	0.000	0.003	0.007
N observations	3,395	3,301	3,206	3,111	3,017
N bank equity crises	68	68	68	68	68

Panel C: Real returns, banks

	Dependent variable: $r^B_{i,t,t+h}$				
	$h = 1$	$h = 2$	$h = 3$	$h = 4$	$h = 5$
BankEqCrisis$_{i,t}$	0.014	-0.031	-0.240**	-0.137*	-0.018
	(0.066)	(0.046)	(0.109)	(0.079)	(0.086)
Constant	0.041***	0.086***	0.135***	0.177***	0.217***
	(0.008)	(0.014)	(0.020)	(0.026)	(0.032)
Within-R^2	0.000	0.000	0.003	0.001	0.000
N observations	3,835	3,717	3,600	3,484	3,370
N bank equity crises	75	75	71	71	71

Panel D: Real returns, nonfinancials

	Dependent variable: $r^N_{i,t,t+h}$				
	$h=1$	$h=2$	$h=3$	$h=4$	$h=5$
BankEqCrisis$_{i,t}$	0.046	0.155***	0.080	0.198***	0.321***
	(0.044)	(0.052)	(0.057)	(0.073)	(0.080)
Constant	0.042***	0.088***	0.139***	0.187***	0.231***
	(0.009)	(0.017)	(0.026)	(0.035)	(0.043)
Within-R^2	0.001	0.003	0.001	0.003	0.007
N observations	3,395	3,301	3,206	3,111	3,017
N bank equity crises	68	68	68	68	68

Table 3: Initial bank equity declines capture long-run declines in banks' dividends and earnings

Panel A reports coefficients from Equation (2a), estimated at the country-year level, conditional on the start of a bank equity crisis in country i in year t. For Panel A, the independent variable $r_{i,t-1,t}$ is the past one-year log excess total return of the bank index from $t-1$ to t in country i and bank equity crisis in year t. The dependent variable $y_{i,t-1,t+5}$ is the cumulative log-change between $t-1$ and $t+5$ of the aggregate real earnings index or real dividends index of the banking sector in country i. In Panel A, Huber-White standard errors are reported in parentheses. Panel B estimates Equation (2b) at the individual bank level (with each individual bank indexed by b), conditional on the start of a bank equity crisis in country i in year t. The variable $r_{i,b,t-1,t}$ is the past-year bank log excess total return, and outcome variables $y_{i,b,t-1,t+5}$ are defined analogously as in Panel A but at the individual bank level for the ten largest banks within each country around each bank equity crisis. In Panel B, standard errors clustered by crisis episode are reported in parentheses. *, **, *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Dividends and earnings at the country aggregate level

	Dependent variable: Log-change in outcome variable through $t+5$	
	Real earnings per share	Real dividends per share
$r_{i,t-1,t}$	1.704***	2.334***
	(0.417)	(0.549)
Constant	0.033	0.445
	(0.386)	(0.396)
Adjusted R^2	0.186	0.184
N	37	67

Panel B: Dividends and earnings at the bank level

	Dependent variable: Log-change in outcome variable through $t+5$			
	Real earnings per share		Real dividends per share	
$r_{i,b,t-1,t}$	1.011***	0.825***	1.469***	1.381***
	(0.231)	(0.235)	(0.224)	(0.310)
Constant	-0.068	-0.171	-0.086	-0.135
	(0.231)	(0.131)	(0.198)	(0.170)
Crisis FEs	No	Yes	No	Yes
Adjusted R^2	0.11	0.42	0.29	0.59
N	168	168	204	204

Table 4: Banks' book income decomposed into write-downs and other income categories

This table reports the estimates plotted in Figure 4, documenting banks' cumulative market-equity change (row 1) and cumulative abnormal book income (row 2) in the years following bank equity crises. "Abnormal" is defined for each bank as its yearly net income in year $t+h$ minus its average pre-crisis value (from year $t-4$ to $t-1$). Banks' cumulative abnormal market-equity change and cumulative abnormal book income are then aggregated over the ten largest banks within each country, normalized by these banks' aggregate book equity from the year before the crisis, and then averaged across crises in 17 economies over the period 1870-2019. Panel A decomposes banks' net income into write-downs (row 3) versus all other book income (row 4), while Panel B decomposes banks' net income into write-downs (row 3), trading income (row 4), and all other book income (row 5). These components of net income are all computed as cumulative abnormal values relative to their average pre-crisis values for each bank. Panel C corresponds to Figure 4 Panels C and D and reports various ratios, splitting banks by whether their securities-to-assets ratios in year $t-1$ are in the bottom or top quartile (among all banks across all crises), with differences between these two groups tested in the row labeled "Difference". Standard errors are reported in parentheses. *, **, *** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Net income decomposed into write-downs and all other income

	Years after crisis					
	h = 0	h = 1	h = 2	h = 3	h = 4	h = 5
Cumul. bank market-equity (ME) change	-0.400***	-0.393***	-0.384***	-0.421***	-0.381***	-0.338***
	(0.033)	(0.036)	(0.036)	(0.041)	(0.042)	(0.042)
Cumul. book income	-0.126***	-0.199***	-0.227***	-0.295***	-0.325***	-0.338***
	(0.027)	(0.036)	(0.042)	(0.053)	(0.062)	(0.076)
Cumul. write-downs	-0.108***	-0.217***	-0.287***	-0.359***	-0.390***	-0.413***
	(0.020)	(0.034)	(0.044)	(0.051)	(0.055)	(0.059)
Cumul. all other book income	-0.017	0.018	0.059	0.064	0.066	0.075
	(0.025)	(0.037)	(0.051)	(0.058)	(0.067)	(0.078)
Cumul. book income / cumul. ME change	31.5%	50.6%	59.1%	70.1%	85.3%	100.0%
Cumul. write-downs / cumul. ME change	27.0%	55.2%	74.7%	85.3%	102.4%	122.2%
Cumul. write-downs / cumul. book income	85.7%	109.0%	126.4%	121.7%	120.0%	122.2%

Panel B: Net income decomposed into three categories

	Years after crisis					
	h = 0	h = 1	h = 2	h = 3	h = 4	h = 5
Cumul. bank market-equity (ME) change	-0.457***	-0.421***	-0.396***	-0.453***	-0.421***	-0.369***
	(0.051)	(0.055)	(0.054)	(0.062)	(0.063)	(0.066)
Cumul. book income	-0.151***	-0.212***	-0.263***	-0.356***	-0.392***	-0.419***
	(0.024)	(0.051)	(0.069)	(0.076)	(0.083)	(0.091)
Cumul. write-downs	-0.116***	-0.273***	-0.367***	-0.434***	-0.462***	-0.460***
	(0.024)	(0.051)	(0.069)	(0.076)	(0.083)	(0.091)
Cumul. trading income	-0.057*	-0.011	-0.009	-0.021	-0.019	-0.006
	(0.033)	(0.058)	(0.061)	(0.068)	(0.075)	(0.088)
Cumul. all other book income	0.023	0.072	0.113*	0.099	0.090	0.047
	(0.037)	(0.051)	(0.063)	(0.096)	(0.100)	(0.100)
Cumul. book income / cumul. ME change	33.0%	50.4%	66.4%	78.6%	93.1%	113.6%
Cumul. write-downs / cumul. ME change	25.4%	64.8%	92.7%	95.8%	109.7%	124.7%
Cumul. write-downs / cumul. book income	76.8%	128.8%	139.5%	121.9%	117.9%	109.8%
Cumul. trading income / cumul. book income	37.7%	5.2%	3.4%	5.9%	4.8%	1.4%

Panel C: Top and bottom quartile banks by (securities/assets)

	Quartile by	Years after crisis					
	(securities/assets)	h = 0	h = 1	h = 2	h = 3	h = 4	h = 5
Cumul. book income / cumul. ME change	Bottom	12.7%	23.6%	34.1%	51.8%	78.0%	90.6%
	Top	34.4%	58.6%	60.7%	69.2%	93.8%	122.0%
	Difference	21.7%***	35.0%***	26.6%***	17.4%	15.8%	31.4%*
Cumul. write-downs / cumul. book income	Bottom	184.6%	154.1%	168.1%	165.4%	139.1%	126.8%
	Top	65.5%	110.1%	113.1%	104.6%	98.5%	90.4%
	Difference	-119.1%***	-44.0%**	-55.0%***	-60.8%***	-40.7%**	-36.4%**
Cumul. trading income / cumul. book income	Bottom	23.1%	22.4%	10.9%	3.2%	6.0%	2.1%
	Top	69.0%	36.7%	31.3%	21.0%	14.9%	9.8%
	Difference	45.9%**	14.3%	20.4%	17.7%	8.8%	7.7%

Table 5: Government recapitalization programs during bank equity crises

The table reports selected characteristics of government recapitalization programs across bank equity crises in 17 economies since 1870. (Blank rows correspond to the bank equity crises without a government recapitalization program). Panel A reports variables related to the size of government recapitalizations. Variables under the header "From other historical sources" are from historical sources beyond the bank-level dataset of the top-10 banks, and they report upon the size of the recapitalization program: the legislative allocation (column 3) and the amount actually used to purchase newly issued common or preferred equity in banks (column 4). Column 6 normalizes the latter by banking sector total equity in year before the bank equity crisis (from column 5). In Panel A, variables under the header "From bank-level data (top-10 banks only)" come from the individual-bank data of the top-10 banks within each country: Column 7 reports total bank equity issuance across all top-10 banks in each country from year t to year $t+5$ around the crisis (normalized by book equity in the year $t-1$ before the bank equity crisis) regardless of whether there was a government recapitalization, whereas column 8 only includes the bank equity issuance during years which coincided with government recapitalization programs. Column 10 normalizes the total bank equity issuance by the market-value of bank equity losses (column 9). Panel B reports variables related to the speed of government recapitalizations (Columns 3-6) or the breadth of recapitalizations (Columns 7-10), which are defined in the main text.

Panel A: Size of government recapitalizations

			From other historical sources				From bank-level data (top-10 banks only)			
Crisis	Recap	First recap	Size (legislative allocation)	Size (used)	Bank sector equity$_{t-1}$	Col (4) / Col (5)	Total eq issuance / book eq	Govt recap / book eq	Bank eq decline / book eq	Col (7) / Col (9)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Australia 1893							21%		-65%	
Australia 1990							57%		-14%	
Belgium 1931							1%		-39%	
Belgium 2008	Yes	10/2008	N/A	13.5 B EUR	50.6 B EUR	26.7%	36%	36%	-91%	39%
Denmark 1992							5%		-8%	
Denmark 2008	Yes	1/2009	100 B DKK	46 B DKK	243.4 B DKK	18.9%	26%	24%	-54%	45%
Finland 1921							2%		-27%	
Finland 1991	Yes	3/1992	8 B FIM	7.9 B FIM	33.7 B FIM	23.4%	21%	21%	-50%	42%
France 1882							0%		-38%	
France 1931							7%		-47%	
France 1994	Yes	5/1994	N/A	8.4 B FRF	802.8 B FRF	1.0%	23%	3%	-12%	26%
France 2008	Yes	12/2008	N/A	21 B EUR	271.3 B EUR	7.7%	26%	22%	-61%	36%
Germany 1931	Yes	2/1932	N/A	400 M DEM	4.8 B DEM	8.3%	35%	35%	-59%	59%
Germany 2008	Yes	12/2008	100 B EUR	29.4 B EUR	352.0 B EUR	8.4%	47%	18%	-67%	27%
Italy 1889							13%		-74%	
Italy 1921							39%		-26%	
Italy 2010	Yes	6/2009	20 B EUR	6.2 B EUR	208.5 B EUR	3.0%	24%	0%	-82%	0%
Japan 1907										
Japan 1927							9%		-28%	
Japan 1997	Yes	3/1999	12.4 T JPY	9.3 T JPY	29.0 T JPY	32.1%	54%	43.2%	-62%	70%
Netherlands 1921							0%		-44%	
Netherlands 1931							3%		-36%	
Netherlands 2008	Yes	10/2008	N/A	21 B EUR	110.8 B EUR	19.0%	19%	11%	-78%	15%
Norway 1921							3%		-44%	
Norway 1988	Yes	10/1991	5 B NOK	16.2 B NOK	23.6 B NOK	68.6%	61%	38%	-54%	70%
Portugal 1925							24%		-8%	
Portugal 1931							10%		-16%	
Portugal 2008	Yes	6/2012	12 B EUR	17.7 B EUR	27.3 B EUR	64.8%	54%	21%	-87%	24%
Spain 1977							12%		-41%	
Spain 2009	Yes	3/2010	N/A	54.4 B EUR	180.6 B EUR	30.1%	50%	26%	-58%	46%
Sweden 1922							1%		-42%	
Sweden 1932							0%		-3%	
Sweden 1991	Yes	5/1993	N/A	41.3 B SEK	56.9 B SEK	72.6%	72%	57%	-60%	96%
Sweden 2008							19%		-3%	
Switzerland 1931							0%		-75%	
Switzerland 2008							47%		-66%	
UK 1973							12%		-28%	
UK 2008	Yes	10/2008	N/A	116 B GBP	250.7 B GBP	46.3%	77%	62%	-73%	86%
USA 1931	Yes	6/1934	N/A	897 M USD	7,950 M USD	11.3%	3%	3%	-51%	6%
USA 1990							25%		-6%	
USA 2008	Yes	10/2008	700 B USD	205 B USD	852 B USD	24.1%	28%	22%	-47%	46%
MEAN	43%					27%	24%	26%	-46%	43%
SD	50%					23%	22%	18%	25%	27%
Min	0					1%	0%	0%	-91%	0%
25th	0					8%	4%	18%	-63%	26%
50th	0					23%	21%	22%	-47%	42%
75th	1					32%	37%	36%	-28%	59%
Max	1					73%	77%	62%	-3%	96%
N	40					17	40	17	40	17

Panel B: Speed and breadth of government recapitalizations

			Timing of recapitalization program				Breadth of recapitalization program			
Crisis	Recap	Panic starts	First recap	Additional recaps)	Delay (mos. from panic)	Delay (mos. from bank eq decline)	Only most distressed banks?	Num banks	% of top-10 banks recapped	% of banking system recapped (by assets)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Australia 1893		4/1893								
Australia 1990		3/1990								
Belgium 1931		5/1931								
Belgium 2008	Yes	9/2008	10/2008	12/2012	1	9	Yes	3	30%	77%
Denmark 1992		no panic								
Denmark 2008	Yes	9/2008	1/2009	-	4	12	No	43	100%	>95%
Finland 1921		no panic								
Finland 1991	Yes	9/1991	3/1992	-	6	28	No	83	100%	>95%
France 1882		1/1882								
France 1931		10/1930								
France 1994	Yes	no panic	5/1994	2/1995	2	-8	Yes	2	20%	14%
France 2008	Yes	9/2008	12/2008	-	3	11	No	7	70%	83%
Germany 1931	Yes	4/1931	2/1932	-	10	18	Yes	3	43%	19%
Germany 2008	Yes	9/2008	12/2008	-	3	11	Yes	5	38%	30%
Italy 1889		11/1893								
Italy 1921		11/1921								
Italy 2010	Yes	9/2008	6/2009	12/2012	9	23	Yes	4	13%	6%
Japan 1907		2/1907								
Japan 1927		2/1922								
Japan 1997	Yes	11/1997	3/1999	6/2003	16	108	No	18	78%	56%
Netherlands 1921		no panic								
Netherlands 1931		no panic								
Netherlands 2008	Yes	9/2008	10/2008	1/2013	1	9	Yes	4	40%	76%
Norway 1921		12/1921								
Norway 1988	Yes	10/1991	10/1991	-	0	47	No	20	100%	>95%
Portugal 1925		7/1920								
Portugal 1931		11/1930								
Portugal 2008	Yes	9/2008	6/2012	8/2014, 7/2015, 1/2017	45	53	Yes	5	50%	71%
Spain 1977		no panic								
Spain 2009	Yes	9/2008	3/2010	3/2011, 12/2012	18	22	Yes	41	50%	40%
Sweden 1922		no panic								
Sweden 1932		no panic								
Sweden 1991	Yes	9/1992	5/1993	-	8	40	Yes	4	50%	37%
Sweden 2008		9/2008								
Switzerland 1931		7/1931								
Switzerland 2008		9/2008								
UK 1973		2/1974								
UK 2008	Yes	9/2008	10/2008	-	1	9	Yes	5	44%	43%
USA 1931	Yes	11/1930	6/1934	-	43	55	Yes	5752	10%	18%
USA 1990		no panic								
USA 2008	Yes	9/2008	10/2008	-	1	10	No	707	100%	>95%
MEAN	43%			1.6	10.0	26.9	65%	394	55%	56%
SD	50%			0.9	13.8	27.3	49%	1391	31%	32%
Min	0			1	0	-8	0	2	10%	6%
25th	0			1	1	10	0	4	38%	30%
50th	0			1	4	18	1	5	50%	56%
75th	1			2	9	40	1	41	78%	83%
Max	1			4	45	108	1	5752	100%	95%
N	40			17	17	17	17	17	17	17