Bank Equity and Banking Crises*

Matthew Baron, Emil Verner, and Wei Xiong**

November 2018

Abstract

We construct a new historical dataset on bank equity returns for 46 countries over the period 1870-2016 to develop an informative and objective measure of the occurrence and severity of banking crises. We find that large bank equity declines predict persistent credit contractions and output gaps, after controlling for non-financial equities, even outside of banking crises defined by narrative approaches. In particular, severe bank distress *without* panics are associated with adverse future outcomes. Large bank equity declines tend to precede other crisis indicators, suggesting that substantial bank losses are already present at the early stages of the crisis. Finally, large bank equity declines allow us to refine existing narrative chronologies of banking crises, in which we uncover a number of forgotten banking crises and remove spurious crises.

* The authors would like to thank Md Azharul Islam, Jamil Rahman, and Bryan Tam for their extraordinary research assistance. Isha Agarwal, Isaac Green, William Shao, Sylvia Lu, Felipe Silva, and the librarians at the Harvard Business School Historical Collections also provided valuable assistance. The authors would also like to thank Mikael Juselius, Moritz Schularick, Andrei Shleifer, and seminar participants at Cornell University, Erasmus University Rotterdam, University of Bonn, University of Rochester, the Federal Reserve Board, the OCC, the Chicago Booth financial crises conference, and the 2018 AEA meetings for their comments and feedback. We thank Mika Vaihekoski and Frans Buelens for sharing data.

** Contact information: Matthew Baron, Johnson Graduate School of Management, Cornell University, baron@cornell.edu; Emil Verner, MIT Sloan, everner@mit.edu; Wei Xiong, Princeton University and NBER, wxiong@princeton.edu.

I. Introduction

The commonly observed association between banking crises and macroeconomic catastrophes, e.g., Reinhart and Rogoff (2009), has motivated a quickly growing literature of the economic impact of banking crises. In theories of banking crises, e.g., Holmstrom and Tirole (1997) and Gertler and Kiyotaki (2010), bank equity is a key state variable that determines banks' ability to intermediate funds from savers to firms and households. The market value of bank equity provides the best real-time proxy for the shadow value of bank equity in these theories. Despite its strong conceptual appeal, the empirical performance of bank equity returns in identifying banking crises and predicting subsequent economic outcomes is largely unknown. As a reflection of the lack of attention to bank equity returns, the existing literature has primarily used narrative, qualitative, and backward-looking approaches to classify historical banking crises and analyze their causes and consequences. Bordo et al. (2001), Caprio and Klingebiel (2003), Demirgüç-Kunt and Detragiache (2005), Reinhart and Rogoff (2009), Schularick and Taylor (2012), and Laeven and Valencia (2013) identify banking crises based on narrative information about events such as bank runs and large-scale government interventions. To overcome potential biases from these backward-looking accounts, Romer and Romer (2017) construct a real-time measure of financial distress from real-time country economic reports of the OECD for 25 advanced economies starting in 1967, even though the OECD accounts may still be subjective.

Relative to these narrative-based approaches to identifying banking crises, bank equity returns offer several advantages, being objective, real-time, and quantitative. However, as many other factors beyond banking crises may also cause large fluctuations in bank equity prices, their empirical performance in identifying crises and predicting subsequent economic outcomes cannot be taken for granted. So far, the lack of a complete database of historical equity prices for a large set of countries going back to the pre-war period has prevented systematic studies of this important issue. This paper aims to address this gap.

We construct a new historical dataset on bank equity prices and dividends for 46 advanced and emerging economies going back to 1870. We supplement existing bank stock indexes with indexes constructed from new, hand-collected stock price and dividend data from historical newspapers to provide coverage that is as comprehensive as possible. Moreover, to be able to control for broader stock market conditions, we also construct new indexes for non-financial stocks

over the same sample. Our dataset thus provides nearly 4000 country-years of information on bank equities, non-financial equities, and macroeconomic variables. In addition, we also systematically collect new narrative information on other characteristics of banking crises, such as deposit runs, bank failures, and government intervention, backed by over 400 pages of narrative documentation.

We begin by confirming that large bank equity declines provide a useful signal of banking crises in real-time. Specifically, we pool together narrative crises, determined by six influential studies based on narrative approaches, into a *Joint Crisis List* of roughly 300 banking crises. Using receiver operating characteristic (ROC) analysis, a standard tool for assessing diagnostic performance, we find that bank equity returns provide the best real-time signal of narrative banking crisis identified by existing historians relative to a host of other variables, including non-financial equity returns, credit spreads, and macroeconomic conditions. Furthermore, we find that conditional on narrative crises on the Joint Crisis List, a larger decline in the bank equity return is associated with an increased likelihood and severity of deposit runs, non-performing loans, bank failures, and likelihood of government interventions in various forms to support the banking sector, as well as more severe recessions. These findings are not solely driven by general declines in equity markets, as they also hold, albeit not as strongly, when using bank returns in excess of nonfinancial equity returns. These facts confirm that bank equity returns capture the salient features of banking crises.

Turning next to our full-sample of 46 countries from 1870-2016, the main part of our analysis is to test whether bank equity declines have predictive content for future macroeconomic dynamics, beyond the information contained in non-financial equities, and furthermore whether bank equity declines without narrative crises have predictive content. We find that bank equity declines predict persistently lower subsequent output. For example, a decline in bank equity of at least 30% predicts 2.5% lower output after three years. At the same time, bank equity declines predict sharp and persistent contractions in bank credit to the private sector. Three years after a bank equity decline, bank credit-to-GDP declines by 5.4%, relative to periods without a decline. These estimates control for non-financial equities, which capture investor expectations about broader macroeconomic developments. Consistent with a large literature, e.g. Stock and Watson (2003), non-financial equity declines also separately predict lower GDP, but, interestingly, non-financial equity declines have no relation to subsequent bank credit growth. Large bank equity

declines thus likely pick up episodes when output contracts in part due to troubles in the banking sector. Interestingly, the predictability also holds with similar magnitudes even outside of banking crises from existing narrative classifications.

We then investigate the macroeconomic consequences of non-panic banking distress. We define "banking distress" as bank equity declines of over 30% in a year and then separate these bank equity declines into "panic" versus "non-panic" episodes based on a systematic reading of the narrative evidence for each of these episodes. While some of the non-panic bank distress episodes might be driven by equity market noise, some reflect important episodes in which the financial system suffers major losses and is deeply undercapitalized, yet strong regulatory forbearance and implicit government guarantees prevent panics from emerging among bank creditors. Prominent historical examples we highlight include Japan in the early stage of its financial crisis in 1990s and more recently Italy's banking distress around 2016 to the present.

Interestingly, our analysis finds that while the panic crises tend to be followed by greater credit contractions and lower output growth, non-panic banking distress also predicts substantial credit contractions and output drops. For example, even without a narrative crisis, a decline in bank equity of at least 30% predicts that after three years, bank credit-to-GDP declines by 2.9% and output declines by 2.0%. Bernanke (2018) recently attributes the unusual severity of the Great Recession primarily to the panics in funding and securitization market, beyond damaged balance sheets of banks and households.[1] Our finding suggests that in a large historical sample, panics are not necessary for severe economic consequences, as banking distress without panics can also lead to substantial credit contractions and output drops. This finding has an important policy implication that liquidity backstops by the government may not be sufficient to prevent severe economic consequences of financial crises.

We also provide a battery of additional analyses. For example, we find that the relation between bank equity and the macroeconomy is non-linear. Negative, especially large negative, bank equity returns predict credit contractions and output drops, while positive bank equity returns have no predictive power. This non-linear relation nicely supports the theory of constrained

[1] This argument builds on earlier studies by Ivashina and Scharfstein (2010) and Gorton and Metrick (2012), which attribute the dramatic contractions in the U.S. credit markets following the Lehman Brothers bankruptcy in September 2008 to panic runs on banks and repo markets, respectively.

financial intermediaries during crises and distress. Furthermore, by examining the relative timing of bank equity versus other crisis indicators, such as nonfinancial equity and credit spreads, around narrative crisis episodes, we find that bank equity tends to precede other indicators. In particularly, bank equity tends to peak earlier than non-financials and starts to decline earlier as well, especially in the postwar period and in advanced economies. This finding suggests that these banking crises tend to originate with losses specific to the banking sector (due to narrow but highly-concentrated exposures, such as subprime mortgage-backed securities) that are then transmitted to the broader economy, rather than through the reverse direction. Additionally, around narrative crises, large bank equity declines tend to precede bank credit spread spikes, suggesting that substantial bank losses are already present at the early stages of the crisis before panic erupts.

In the final part of the paper, we build on our earlier finding that bank equity robustly captures the occurrence and severity of banking crises identified by existing research to refine the narrative chronology of banking crises using information from bank equity returns. One strategy would be to rely only on bank equity declines, as is sometimes done in the currency crisis literature (Frankel and Rose, 1996). In practice, this approach produces a number of "false positives", i.e. episodes that have none of the characteristics of banking crises, such as runs, bank failures, or government intervention. Therefore, we refine the existing lists by combining a systematic reading of the narrative evidence (drawing on hundreds of new archival sources) with the "hard" information from bank equity returns. With the help of large bank equity declines as a screening tool, we uncover a number of "forgotten" banking crises that are strongly backed by the historical narrative. Second, we remove spurious crises from the Joint Crisis List, again with a procedure that combines the objective content of bank equity returns with a systematic reading of the narrative evidence. Many of these deleted episodes are typos or historical errors from previous approaches, while others are monetary or currency issues that have only minor effects on the banking sector. By adding new crises and removing spurious crises, we create a revised chronology of banking crises as a practical tool for future researchers.

Our paper contributes to empirical studies of the real consequences of banking distress. Bernanke (1983) argues that disruptions in the banking sector during the Great Depression increased the cost of credit intermediation and further depressed economic activity. Calomiris and Mason (2003) provide further evidence to isolate the bank lending channel from other effects

correlated with credit demand during the Great Depression. Other studies have employed instruments and shocks to identify effects of the bank lending channel in other contexts. For example, Peek and Rosengren (2000) uses shocks from Japanese banks which transmitted through U.S. bank linkages to economic activity in the U.S., Khwaja and Mian (2008) analyzes a bank credit supply shock created by a political event in Pakistan, while Chodorow-Reich (2013) exploits the Lehman bankruptcy during the Great Recession as a credit supply shock to study its effect on the U.S. employment. Our paper expands the evidence on consequences of banking sector distress with *and* without panics, by studying a large sample of banking crises and distress. This sample, by refining and expanding the sample used by the prior literature, aims to help future studies of financial crises.

Our paper is organized as follows. Section II discusses the new historical data. Section III presents the results on the informativeness of bank equity returns. Section IV analyzes the performance of bank equity in predicting macroeconomic outcomes, while Section V explores the macroeconomic implications of non-panic bank distress. Section VI compares the timing of bank equity and other crisis indicators in advance of banking crises, and Section VII presents our revised chronology of banking crises.

II. Data

As this paper relies on new historical data, we start by describing how we gather and construct the historical database used in our analysis. We discuss, in turn, the following types of variables: narrative banking crisis dates, bank and nonfinancial equity total returns and credit spread, macroeconomic variables, and variables of characteristics or "symptoms" of banking crises. All variables are annual (except those noted as monthly variables) and form an unbalanced country panel across 46 countries over the period 1870-2016. See the Appendix for further details on data sources and data construction beyond what is presented here.

Potential banking crisis dates. We collect the starting years of banking crises from six prominent papers: Bordo (2001), Caprio and Klingebiel (2003) Demirguc-Kunt and Detragiache (2005), Laeven and Valencia (2013), Reinhart and Rogoff (2009, and online spreadsheets updated

2014)[2], and Schularick and Taylor (2012, online update 2017). We use the most recent update of each paper.

These lists of crises and their starting dates are presented together in Appendix Table 2. We take the union of all these crisis dates as the Joint Crisis List that we will use throughout this paper.[3] We will later refine the Joint Crisis List into a new list of banking crises, called the Revised Crisis List, presented in Section VII. However, initially we want to cast a net as wide as possible to include any event that has ever been labeled a crisis. (As we will see in Section VII, even this Joint Crisis List omits several banking crises that we newly identify.) We occasionally merge two successive banking crisis dates into one event, if other papers consider these events to be a single event (see Appendix Table A8). For the starting dates of crises on the Joint Crisis List, we take the earliest date among the six papers.

Annual bank and nonfinancial stock returns. We construct a new historical dataset on bank equity prices and dividends for 46 advanced and emerging economies going back to 1870. As documented in Appendix Table A1, the data starts around 1870 for Australia, Austria, Belgium, Canada, France, Germany, Ireland, Italy, New Zealand, Sweden, Switzerland, the U.K. and the U.S. and even around 1870 for emerging market economies such as Argentina, Brazil, Egypt, Greece, Hong Kong, India, Mexico, Russia, and Ottoman Turkey.

For each country in the sample, we construct annual (as of December 31 of each year) price return and dividend return indexes for both bank and nonfinancial stocks. The price and dividend indexes in a given country may not necessarily correspond to the exact same underlying banks due to data availability, but they are both generally market-cap-weighted or price-weighted indexes of the broad domestic banking and nonfinancial sectors within each country. Each of these series is

[2] Reinhart and Rogoff (2009) present three slightly different banking crisis lists: in Appendix A3, in Appendix A4, and in online spreadsheets (we use the latest 2014 update). We generally take the union of these lists; however, when there is a small disagreement regarding the starting date of a banking crisis, we use the most recent online update.

[3] Romer and Romer (2017) construct a continuous, narrative measure of "financial distress" for OECD countries rather than present a list of banking crises. We do not include the Romer and Romer (2017) dates in the Joint Crisis List because it is unclear which threshold of "financial distress" should be used to define a banking crisis.

pieced together from a variety of sources, discussed below (with additional documentation and source tables in the Appendix).[4,5]

We start by collecting premade bank equity indexes from Global Financial Data (mainly price indexes only), Datastream (price and dividend indexes), and Baron and Xiong (2017, which contains newly constructed bank dividend indexes). In addition to using premade indexes, we form price-weighted bank equity price and dividend indexes from individual bank and nonfinancial companies' stock prices and dividends. Our most prominent source of new data on individual bank stock comes from individual newspapers. We hand-collect price and dividend information on an annual basis (the closing price closest to December 31) for commercial banks and nonfinancial firms listed in the following newspapers: *Journal de Bruxelles* for Belgium (1868-1935); *Dagens Nyheder* for Denmark (1868-1909); *De Telegraaf* and *De Standaard* for the Netherlands (1875-1933); *Le Temps* for France (1873-1939); *Berliner Borsen-Zeitung* and *Berliner Morgenpost* for Germany (1871-1933); *La Stampa* for Italy (1865-1934); *Japan Times* for Japan (1897-1915); *Diario de Lisboa* for Portugal (1921-1990); the *Straits Times* for Singapore (1965-1980); *ABC* for Spain (1909-1965); and *Gazette de Lausanne*, *Journal de Genève*, *Le Temps*, and *Neue Zürcher Zeitung* for Switzerland (1852-1936). Examples of historical newspapers can be seen in Figure 1.

[INSERT FIGURE 1 HERE]

Additional dividend data for individual bank stocks is hand-collected from Moody's Banking Manuals (1928-2000) and from individual financial statements of banks accessed at the Harvard Business School library's Historical Collections. Other data on individual stocks prices and dividends of banks and nonfinancial firms come from several databases from Yale's International Center for Finance (gathered and made publicly available by William Goetzmann and K. Geert Rouwenhorst) including *Investor's Monthly Manual* data (1869-1934), New York

[4] The bank equity index generally contains a broad representation of the largest domestically-chartered commercial banks mainly located in the country's financial center. The exact range of included banks varies across countries and historical periods, due to historical data limitations, and is documented in the Appendix. It is important to note that the focus on large banks in the country's financial center may lead the bank equity measures to under-represent banking crises centered on smaller or provincial banks.

[5] The non-financial equity index is constructed to represent a diverse set of important and large industrial and retail companies, mainly covering the following industries: iron steel, goods manufacturing, electrical equipment, textiles, chemicals, paper and pulp products, food suppliers and breweries, and retail. We generally avoid transportation stocks (railroads and shipping), commodity-related stocks (including mining), utilities, real estate companies, and foreign and colonial enterprises, due to their exposure to international factors or their concentrated exposure to real estate specifically.

Stock Exchange data (1800-1871), and St. Petersburg Stock Exchange data (1865-1917). Finally, we collect stock returns data from a variety of additional sources including: Argentinian stock returns data (1900-1935) from Nakamura and Zarazaga (2001); Belgian stock returns data from the SCOB database (University of Antwerp, Belgium); Danish stock returns data (1911-1956) from *Denmark Statistical Yearbooks*; Finnish stock returns data (1911-1974) from Nyberg and Vaihekoski (2010, the authors generously shared their underlying data); French stock returns data (1860-1871) from Sumner (1896); and Swedish stock returns data (1870-1901) from Waldenstrom (2014).

We add the bank equity price returns and dividend returns to get bank equity total returns and then adjust by the CPI for each country to get bank equity real total returns.

Monthly stock returns and credit spreads for banks and nonfinancials. For studying whether bank equity declines pick up crises before or after other crisis indicators, we turn to monthly stock price and credit spread data. In particular, we construct monthly series for each country for bank equity index returns and nonfinancial equity index returns, and, when available, a bank credit spread index and a nonfinancial corporate credit spread index.

Due to data availability issues, the monthly data is a subset of the larger annual data set on bank stock returns.[6] Sources include Datastream, which covers the period 1980-2016 over a wide range of countries, *Investor's Monthly Manual*, and Global Financial Data. In addition, going back further historically to 1870, the monthly data covers fifteen countries (Argentina, Australia, Belgium, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, U.K., and U.S.), where monthly bank and nonfinancial stock prices were transcribed from the historical newspapers listed in the previous section or obtained from other new historical sources. The smaller sample of countries going back to 1870 and the focus on just around banking crises are due to the difficulty of hand-collecting over a hundred years of monthly data from historical records.

Macroeconomic variables. From Global Financial Data, we obtain annual data for each country on nominal GDP and the CPI for each country, which we use to calculate real GDP. We

[6] For bank equity returns, the monthly and annual data come from the same source, so that, for consistency, the monthly data aggregates to the annual data.

fill in the gaps for real GDP with additional data from Maddison, the Jorda-Schularick-Taylor Macrohistory Database, and the OECD, IMF, and World Bank datasets. The same CPI used to deflate returns is used to obtain real GDP.

Data on bank credit-to-GDP comes mainly from Jorda-Schularick-Taylor (which goes back to 1870 but for 17 countries only) and from the BIS long credit series for other countries. The BIS data is supplemented with newly transcribed data from IMF statistical manuals from the 1940s and 50s and from "League of Nations: Money and Banking Statistics" volumes from 1925 to 1939, which allows us to form aggregate bank credit-to-GDP series going back to at least 1918 for almost all the countries in our sample.

The Jorda-Schularick-Taylor dataset is also used to collect additional macroeconomic variables, though data is available only for a subsample of 17 countries. Variables include: real consumption per capita, investment to GDP, the broad money supply, government debt to GDP, total mortgages, and a house prices index.

"Symptoms" and policy responses of banking crises. Our main measure of a banking crisis is the decline in the bank equity index, which roughly captures the degree of undercapitalization of the aggregate banking sector during a banking crisis. However, banking crises are multi-dimensional and may exhibit other "symptoms" and policy responses such as bank runs, bank failures, government equity injections or nationalization of banks, and central bank liquidity support.

We construct a database of banking crisis symptoms. Following Laeven and Valencia (2013), who build a similar database for the period 1970-2012, we define the following variables for each potential crisis in our sample:

- Deposit runs (1 if a number of significant banks experience widespread and sustained runs on deposit or short-term liabilities, 0 otherwise);
- Decline in deposits (the peak-to-trough % decline in aggregate deposits of the banking sector, only calculated for pre-1945 banking crises, since postwar crises are generally not associated with a loss in aggregate deposits);
- Significant bank closures (1 if a number of significant banks fail or are closed or absorbed by other institutions or the government because they are about to fail, 0 otherwise);

- Failed banks (% of total bank assets or deposits);
- Largest banks failing (1 if any of the failed banks are among the very largest banks in the country, 0 otherwise)；
- NPL at peak (the peak level of non-performing loans of the banking sector or of the largest banks);
- Significant liability guarantees (1 if the central bank or government provides extraordinary guarantees of bank deposits and other short-term liabilities, 0 otherwise);
- Significant liquidity support (1 if the central bank or government provides extraordinary liquidity support to the banking sector, 0 otherwise);
- Banks nationalized (1 if the government nationalizes any major banks, 0 otherwise);
- Government equity injections (1 if the government purchases newly issued equity of major banks in an effort to recapitalize the banking sector, 0 otherwise).

The above variables are gathered for each of the crises on the Joint Crisis List, which involved a major data collection effort using an extensive number of primary and secondary sources. First, we started with the dataset of Laeven and Valencia (2013), which collected all the above variables for their set of crises over the period 1970 – 2012. To extend our dataset back further, we examined the descriptions of crises in the following secondary sources and gathered information on the above variables, whenever it was present; sources include Reinhart and Rogoff (2009, Appendix A3), Bordo (2001), Caprio and Klingebiel (2003), Kindleberger (1993), Mehrez and Kaufmann (2000), Rocha and Solomou (2015), Conant (1915), Sumner (1896), and Grossman (2010).

We then supplemented this list with over 150 other papers and books on individual bank crises, detailed in the Appendix. Many were secondary sources written about specific crisis episodes. We also used primary sources, including the "League of Nations: Money and Banking Statistics", volumes from 1925 to 1939, which was useful for gathering data on bank failures and deposit declines in a wide range of countries during the interwar period, and various individual primary sources covering individual countries and banking crisis episodes. All sources are carefully documented in the Appendix, and we plan to provide this new database to other researchers studying historical banking crises.

III. Bank equity returns as an informative signal of banking crisis

This section shows that bank equity returns provide an informative measure of the occurrence and severity of banking crises identified by existing research. This section serves to validate the use of bank equity declines as an objective real-time measure of a crisis.

A. Bank equity provides the best real-time signal of a banking crisis

We begin by showing that bank equity returns provide the best real-time signal of banking crises identified by existing narrative histories compared with a host of other financial and macroeconomic variables. To test the performance of bank equity returns in detecting crises, Figure 2 presents receiver operating characteristic (ROC) curves for diagnosing banking crises. The ROC curve is a simple tool that allows us to assess the performance of bank equity in identifying narrative crises in real-time. We can then compare the bank equity ROC curve with the curve for other macro and financial variables. To be clear, we are not predicting banking crises, but simply asking which variable best coincides with banking crises identified from existing classifications.

For a given classifying variable, the ROC curve plots the "true positive" rate against the "false positive" rate (Type I error) when varying the classification threshold. A higher value of the ROC curve, therefore, indicates a better classifying variable, as it implies a higher "true positive rate" for a given "false positive" rate. The area under the ROC curve (AUC) provides a summary measure of the performance of the classifying variable. The 45-degree line represents the benchmark uninformative classifier for a variable having no information content, which has an AUC of 0.50.

It is, of course, unclear what a "true" banking crisis should be—hence, Section VII of this paper. However, for this preliminary ROC analysis, we use as our set of "true" banking crises the narrative-based banking crises on the Joint Crisis List, because the revised list of banking crises presented in Section VI incorporates information from bank equity, which would give bank equity returns an unfair advantage in picking up these crises. The Joint Crisis List is simply a natural starting point to test whether bank equity returns provide an informative signal of those banking crises put forward by other researchers.

Panel A in Figure 2 presents the ROC curves for bank equity returns and other financial market variables. The other variables are non-financial returns, broad market returns, corporate credit spreads, and bank credit spreads. We compute the ROC curves for the sample for which bank equity returns, non-financial equity returns, and market returns are non-missing.

Panel A shows that for most false positive rates, the bank equity return ROC curve is the highest curve and has the highest AUC (0.73). Bank equity is more successful at diagnosing JCL crises than non-financial equities and the broader stock market. Non-financial equities do provide incremental value in classifying crises, however. The bank abnormal return, which subtracts non-financial returns from bank equity returns, performs substantially worse than both bank equity returns and non-financial returns, with an AUC of (0.57). Bank equity also provides a better signal of a crisis compared to bank credit spreads and corporate credit spreads, although bank credit spreads provide the best signal of a JCL crisis after bank equity, with an AUC of 0.70.[7]

Panel B repeats the ROC analysis for several macroeconomic variables. To facilitate comparison, we perform compute the ROC curves on the same sample for all variables in Panel B. The ROC curves show that bank equity returns provide a better real-time signal of a JCL crisis than the increase in the unemployment rate, the decline in GDP growth, and future credit contraction from t to t+5. Many negative macroeconomic shocks are not as powerful a classifying variable of banking crises, presumably because they frequently also occur outside of banking crises, thus generating a lot of "false positives".

B. Bank equity declines are correlated with common symptoms of banking crises

We next validate the usefulness of bank equity declines by showing that they are highly correlated with other common symptoms of banking crises and policy responses like bank failures and government intervention when the crisis occurs. We estimate the following regression, with each of the observations being a single banking crisis from the Joint Crisis List:

[7] The ROC curve for corporate credit spreads in Figure 2 uses the *level* of corporate credit spreads. The diagnostic performance of corporate credit spreads is similar, albeit slightly weaker, using the change in the spread or the spread relative to its five-year moving average. We should note that we only have credit spreads for about one-third of our overall sample. However, repeating the analysis on the same sample actually strengthens the results in favor of bank equity, whose AUC rises from 0.73 to 0.80.

$$y_{i,t} = \alpha_i + \beta r_{i,t}^B + \gamma 1_t^{postwar} + \varepsilon_{i,t} \quad (1)$$

where $y_{i,t}$ represents banking crisis symptom or policy response; α_i is a country fixed effect, $1_t^{postwar}$ is a dummy variable that takes on the value of 1 if the year of the crisis is greater than 1945; and r_{it}^B is the peak-to-trough change in the real bank equity index during the crisis. The postwar dummy is important, since prewar data is generally more volatile (though part of this may be an artifact of the data, e.g., Romer, 1999). The sample size of regressions with different dependent variables vary due to differences in data availability. Again, we take the Joint Crisis List as a starting point from which to evaluate the informativeness of bank equity.

[INSERT TABLE 2 HERE]

Table 2 Panel A shows that bank equity peak-to-trough declines during banking crises are strongly correlated with other symptoms of banking crises. Banking crises with larger bank equity declines are associated with a significantly increased likelihood of depositor runs and larger declines in bank deposits. A larger bank equity decline also correlates with an increased incidence of failure of the largest banks and higher non-performing loans. Moreover, bank equity declines predict an increased probability of various forms of government intervention including significant liability guarantees, liquidity support, bank nationalization, or government equity injections. Thus, although crises are multidimensional and evolve in different ways, greater bank equity declines are associated with increased likelihood and severity of symptoms and policy responses.

C. Bank equity declines are informative about the severity of crises

Next, we show the informativeness of bank equity declines in the sense that they are associated with the severity of banking crises in terms of various macroeconomic outcomes. We re-estimate Equation (1), replacing the dependent variable with the peak-to-trough decline in real GDP and other macroeconomic variables. As before, each observation is a single banking crisis on the Joint Crisis List.

Panel B of Table 2 shows that greater declines in bank equity prices are associated with larger output declines. The output decline is measured in three ways. In column 1, the dependent variable is the peak-to-trough decline in real GDP. However, one problem with this measure is that

real GDP growth does not turn negative in many crises if the country's underlying growth rate is high, even if there a substantial slowdown in growth. Therefore, the dependent variable used in column 2 is the percentage point decline in real GDP growth (measured peak-to-trough), and the dependent variable in column 3 is the maximum deviation of real GDP growth from its past 10-year average. The estimates from all three columns show that a 100% peak-to-trough decline in bank equity returns is associated with a 13.3% peak-to-trough decline in real GDP, an 12.3 percentage point decline in the real GDP growth rate (peak-to-trough), and an 8.2 percentage point decline in the real GDP growth rate from its past 10-year average. Appendix Table A3 shows that these results are robust to using bank abnormal returns (bank minus non-financial returns) and using bank market capitalization returns (which seeks to capture the total change in the market value of equity within the banking sector).[8]

Panel C reports similar results, also estimated from Equation (1), for other macroeconomic variables. Note that the sample size of different columns varies due to data availability of the dependent variable. A 100% peak-to-trough decline in bank equity returns is associated with a 9.9% decline in real consumption per capita, a 5.1% decline in investment to GDP, a 33.0% decline in the broad money supply, and a 22.8 percentage point increase in government debt to GDP. A 100% peak-to-trough decline in bank stock returns also predicts a 19.9% decline in total bank loans, a 28.9% decline in mortgage loans, and a 15.1% decline in house prices. All estimates in panel C are statistically significant. The adjusted R^2 ranges in 4-21%, demonstrating a reasonably high correlation between bank equity declines and macroeconomic outcomes.

IV. Bank equity declines and future macroeconomic dynamics

The previous section established that bank equity returns provide an informative real-time signal of the occurrence and severity of banking crises. In this section, we explore the macroeconomic implications of large bank equity declines without conditioning on narrative crises.

[8] As discussed in Appendix Section II, it is bank equity price returns plus new issuance of bank equity. We use price returns rather than total returns, because dividends are paid out from the bank and hence deplete bank equity. Equity issuance is new capital raised by the bank, which may be important as banks seek to recapitalize.

A. Bank equity declines and future GDP growth

We begin by examining the consequences of large bank equity declines for subsequent GDP in our full annual panel dataset. To do this, we estimate impulse responses of real GDP to bank equity crashes using Jordà (2005)'s local projection method. Specifically, we estimate the response of real GDP to large declines in bank equity using

$$\Delta_{\mathrm{h}} y_{i,t+h} = \alpha_i^h + \gamma_t^h + \sum_p \beta_p^h \, BE\ Crash_{i,t-p} + \sum_p \delta_p^h \, NFE\ Crash_{i,t-p} + X_{i,t}\Gamma^{\mathrm{h}} + \varepsilon_{i,t}^h, \qquad (2)$$

for each horizon h=1,…,6. The variables $BE\ Crash_{i,t}$ and $NFE\ Crash_{i,t}$ equal 1 when the bank and non-financial return indexes are below -30% in year t, and zero otherwise. The variables α_i^h and γ_t^h are country and year fixed effects. $X_{i,t}$ represents controls for contemporaneous (t-1 to t) and lagged real GDP growth and the change in bank credit-to-GDP. We include three annual lags for all variables (p=0,…,3), but the results are not sensitive to the lag length.

The local projection impulse response of real GDP to a bank equity crash is given by the sequence of coefficient estimates $\{\hat{\beta}_0^h\}$. Relative to a traditional VAR framework, the local projection method is robust to misspecification and allows for the estimation of non-linearities and state-dependence responses, a feature we will exploit below. Standard errors are dually clustered on country and year. This corrects for serial correlation in $\varepsilon_{i,t}^h$ that mechanically arises from overlapping observations at horizons h>1 and accounts residual correlation across countries induced by common shocks.

The key parameters of interest are the sequence of local projection impulse responses $\{\beta_0^h\}$. What does this impulse response capture? Our specification allows a bank equity return shock to affect GDP only with a lag, and it controls for GDP growth and the change in credit-to-GDP from t-1 to t. This helps to control for potential reverse causality in which real economic distress negatively impacts bank equity. Using bank equity crashes also avoids hindsight bias inherent in narrative-based approaches of dating banking crises, as it is a real-time, objective measure. However, equities are forward looking, so bank equity prices may crash in anticipation of lower future growth. Controlling for non-financial equities partially addresses this concern, as non-financial equity returns summarize growth expectations for a broader range of sectors in the economy. However, it is important to note that the estimates must also, in part, capture the consequences of household or corporate balance sheet distress that leads to defaults and loan losses

for banks—because for every bank loan that goes bad, there must be a defaulting borrower on the other side. Therefore, it is important to emphasize that the impulse responses cannot be interpret as the causally, but rather as the predictive content of bank equity distress, which can arise from a variety of sources that may also affect future growth.

[INSERT FIGURE 3 HERE]

Figure 3 Panel A presents the impulse response function of real GDP to large declines in bank equities, and Table 3 Panel A presents the regression version of Figure 3 at the 1- and 3-year ahead horizons. A bank equity crash of at least 30% is associated with a persistent decline in real GDP of about 1.7% after one year and 2.5% after three years. The decline is highly statistically significant. Real GDP remains persistently depressed relative to its pre-crash trend and does not fully recover even after six years. In Figure 3 panel A we also plot the real GDP response to a crash in the non-financial equity index. A non-financial equity crash also predicts significant and persistently lower real output, and the magnitude is similar to the impact of a bank equity crash.

[INSERT TABLE 3 HERE]

Figure 4 explores the relation between bank equity returns and subsequent growth in more detail. To flexibly estimate the impact of bank equity return shocks and explore potential nonlinearities, we estimate the following Jordà (2005) local projection specification for horizons h=1,…,6

$$\Delta_{\mathrm{h}} y_{i,t+h} = \alpha_i^h + \gamma_t^h + \sum_j \beta_j^h \, BE\ Bin_{i,t}^j + \sum_j \delta_j^h \, NFE\ Bin_{i,t}^j + X_{i,t}\Gamma^{\mathrm{h}} + \varepsilon_{i,t}^h, \qquad (3)$$

where α_i is a country fixed effect, γ_t is a year fixed effect, and $BE\ Bin^j$ ($NFE\ Bin^j$) is an indicator variable for whether the bank (non-financial) equity return in year t is within bin j. The controls in $X_{i,t}$ are three lags of the BE and NFE bins, contemporaneous GDP growth and the change in credit-to-GDP, and three lags in GDP growth and the change in credit-to-GDP.

[INSERT FIGURE 4 HERE]

To examine the impact of bank equity shocks across the full distribution of returns, we expand on the bank equity crash measure by including six bins for returns: less than -50%, -50% to -25%, -25% to 0%, 0% to 25%, 25% to 50%, and greater than 50%. The omitted bin is the 0% to 25% range. The ability to estimate the impulse response flexibility and allow for nonlinearities

is an advantage of the local projection framework, combined with our large panel dataset. The key parameters of interest are the sequence of local projection impulse responses $\{\beta_j^h\}$ for each bin j.

The left panel in Figure 4A shows the response of real GDP to the bank equity return bins. Relative to "normal times" (0% to 25% returns), declines in bank equity of greater than 50% predict 5% lower output three year after the shock. This negative effect is highly persistent, translating into a permanent loss in output after 6 years of about 5%. More moderate, but still substantial shocks of -25% to -50% are followed by 3% lower output after 4 years, with limited subsequent recovery. In contrast, smaller negative shocks of -25% to 0% and positive shocks lead to weaker effects on future GDP.

The large effect of large *negative* bank equity returns but smaller effect of large *positive* returns provides evidence that shocks to bank equity have non-linear effects on the real economy. A non-linear effect of bank equity distress is consistent with models of constrained intermediaries such as He and Krishnamurthy (2013). This evidence of non-linearity contrasts with the results in Romer and Romer (2017), who find no evidence of non-linearity between a narrative continuous measure of financial distress and subsequent output.

The right panel in Figure 4A shows the GDP responses to non-financial equity shock. Not surprisingly, larger declines in non-financial equity predict lower subsequent output. In contrast with the bank equity shocks, there is less evidence of non-linearity for non-financial equity returns. The ability of non-financial equities to predict future GDP growth is consistent with Stock and Watson (2003).

B. Bank equity declines and future bank credit growth

Why do bank equity declines predict lower future growth, even controlling for non-financial equities? This may seem surprising. Banks represent a small subset of companies in the economy and controlling for non-financial equities captures the stock market's expectation about future growth of corporate fundamentals, at least of public companies. In this section we argue that bank credit to the private sector, i.e., the bank lending channel, plays a key role.

In Figure 3 panel B, we present estimates of equation (2), replacing GDP growth with the change in bank credit-to-GDP as the dependent variable. The figure shows that bank equity crashes lead to sizeable and persistent contractions in bank credit relative to the pre-crash trend. Three years after a bank equity crash, bank credit-to-GDP is 5 percentage points below the pre-crash trend, controlling for non-financial equities, and the estimate rises to 8 percentage points after six years. Table 3 panel B presents the regression version of Figure 3 for the change in bank credit-to-GDP, showing that the estimate is highly statistically significant and robust to including controls.

Figure 4 panel B explores the effect across the distribution of bank equity returns. The figure plots the responses from estimating (3) with bank credit-to-GDP as the dependent variable. The left panel shows that, after 5 years, a bank equity crash of over 50% predicts a 12-percentage point decline in credit-to-GDP. Declines of between -25% and -50% also predict sizeable credit contractions, amounting to credit-to-GDP decline of -7 percentage points after 5 years.

Figure 4B also shows that the response of credit-to-GDP to bank equity return shocks is nonlinear. Large declines in bank equity are followed by sharp credit contraction, but smaller declines (0% to -25%) and increases in bank equity are followed by muted changes in bank equity. While the evidence for nonlinearity between bank equity and future output was modest, nonlinearity for bank credit is strong in the data. Non-linearity in credit growth is consistent with models in which banks are financial constrained. Larger shocks to bank net wealth are more likely to force banks against their capital constraint and therefore to contract the asset side of their balance sheet.

The right panel in Figure 4B shows the credit-to-GDP response to non-financial equity shocks. There is a striking asymmetry between the bank equity and non-financial equity shocks. Non-financial equity shocks have essentially no effect on future credit-to-GDP. Even large declines or increases in non-financial equity returns have a limited impact on the subsequent credit-to-GDP ratio. This asymmetry between bank and non-financial equity shocks provides one explanation for why bank equity shocks matter for future growth, even when we control for non-financials. Bank equity declines capture shocks to bank net wealth, which translate into a credit supply contraction that depresses household consumption, corporate investment, and production.

C. Robustness and subsamples

Appendix Figure 2 presents the responses of real GDP and credit-to-GDP to bank and non-financial equity *returns*. This assumes a linear relation between innovations to returns and subsequent outcomes. Panel A shows that shocks to both bank equity and non-financial equity predict higher subsequent growth. Interestingly, the magnitudes of the responses are similar. Panel B shows that only bank equity returns predict future credit-to-GDP. Again, non-financial equity returns have zero predictive content for subsequent credit-to-GDP.

Appendix Figure 3 estimates the responses to bank and non-financial equity crashes separately for various subsamples. Panel A excludes the Great Depression and Great Recession years. Specifically, we drop years 1927-1937 and 2005-2015 for all countries and find similar estimates to the full sample. Panel B focuses on the pre-war sample and finds more modest effects of bank equity crashes on both real GDP and credit-to-GDP. In contrast, Panel C shows that effects are stronger in the post-war period. The post-war results hold in the Bretton Woods Era (1946-1973, Panel D), but the output and credit declines are larger and more persistent in recent decades (1974-2016, Panel E). The fact that we find that bank equity crashes predict output declines and credit contraction during the Bretton Woods Era, a period without major financial crises according to narrative histories, points to the role of bank equity distress outside of formally-defined banking crises and during normal recessions. We explore this point in detail in Section V.

D. What happens prior to bank equity crashes?

So far, we have seen that bank equity crashes predict subsequent declines in bank credit and output. But what happens prior to bank equity crashes? Is the evolution of real activity and credit markets different in the run-up to crashes compared to "normal times"? In Figure 5, we present an event study around bank equity crashes. We compute the average cumulative change in log GDP and credit-to-GDP around bank equity crashes relative to five years before the crash. Year t=0 is defined as the year of the bank equity crash.. For reference, we also plot the average dynamics around normal times, defined as years without a crash.

Figure 5 panel A shows that, in the years leading up to a bank equity crash, GDP growth is similar, or even slightly lower, than in normal times. In contrast, credit-to-GDP expands rapidly in

the run-up to bank equity crashes. This pattern is consistent with the evidence in Baron and Xiong (2017) that credit expansions predict bank equity crashes and shows the result holds for a broader and longer sample. As we saw in the preceding analysis, after the crash, real GDP and credit-to-GDP contract relative to normal times without a crash.

V. Bank distress without panics

A. Bank equity declines predict macroeconomic outcomes outside of narrative crises

In this subsection, we first show that bank equity declines predict macroeconomic outcomes outside of narrative banking crises. To do so, we estimate Equation 3, as in Section IV, but *excluding* narrative crisis episodes. Specifically, we exclude country-year observations within a ±2-year window around a Revised Crisis List episode. As before, we estimate Equation 3 controlling for non-financial equity return indicators, along with the standard control variables (year fixed effects, three lags in the bank equity crash and nonfinancial equity crash indicators, as well as contemporaneous and lagged real GDP growth and credit-to-GDP change).

Figure 6 plots impulse responses from local projections for future real GDP and bank credit to GDP. As can be seen in this non-parametric specification, the magnitudes of the real GDP decline are just as large outside of banking crises as they are in the full sample (Figure 4). The magnitudes of the credit-to-GDP contraction are somewhat smaller outside of banking crises, though they are still large in magnitude. For example, bank equity declines of greater than -50% predict a nearly 7 percentage point decline in credit-to-GDP after 6 years, compared to 12 percentage points in the full sample response in Figure 4.

[INSERT FIGURE 6 HERE]

[INSERT TABLE 4 HERE]

Differences between the predictive content of bank equity crashes in narrative crisis and non-crisis episodes are formally tested in Table 4. We report estimates from Equation 2, interacting the bank equity crash indicator variable, $BE\ Crash_{i,t}$, with an indicator variable for whether there is a banking crisis within a ±2-year window of events on the Revised Crisis List. According to the estimates at the (t+1) and (t+3) horizons reported in Table 4, the interaction term is small in

magnitude and not statistically significant in most cases (the exception being the contraction in credit-to-GDP at the 3-year horizon). There is generally little difference in the predictive content of bank equity between banking crisis and non-banking crisis episodes.

Thus, the predictive content of bank equity declines does not seem to be simply driven by narrative banking crises and holds nearly as strongly outside of them. This finding suggests that banking sector losses and distress may play an important role in driving non-financial recessions. They may also be important during "quiet" banking crises—times of non-panic banking sector distress—a topic we take up next.

B. Non-panic bank distress

We turn to investigating the macroeconomic implications of "quiet" banking crises, or, more precisely, times of non-panic banking sector distress. As we discuss in detail in the next subsection, there are numerous historical episodes of non-panic banking distress that were followed by adverse macroeconomic outcomes. For example, during the early stages of Japan's 1990s financial crisis, strong regulatory forbearance and implicit government guarantees to creditors were effective in forestalling panics, even though it was widely thought that the financial system had suffered major losses and was deeply undercapitalized. In a more recent example (2016 to the present), Italy's banks—in particular, Monte dei Paschi—have reported large losses and required government assistance, and credit conditions in Italy are generally tight, even though there has not been an outright banking panic.

Our analysis in this section sheds light on the macroeconomic consequences of "non-panic" banking distress. In general, there is a question of whether, if policy makers are able to forestall a panic during a banking crisis, the resulting macroeconomic downturn can be mitigated. Although we are not able to provide causal evidence on the effects of panics, we show that even non-panic bank distress episodes tend to be followed by severe adverse outcomes. In the next section, we will similarly see that bank equity declines are generally realized before the onset of panics, suggesting that large banking sector losses are already "baked in" before the panic even starts.

To analyze whether non-panic bank distress episodes can have adverse macroeconomic consequence, we need to systematically identify such events. We implement a two-step procedure.

First, we identify episodes of "bank distress" as country-year observations in which the annual real bank equity return is less than -30%.[9] (Later, in the forecasting regressions, we will control, as usual, for nonfinancial equity returns.) Second, we separate these bank equity crashes into "panic" versus "non-panic" episodes. We research each individual observation, drawing both on standard narrative accounts of crises and also new narrative sources (e.g., newspaper articles, research papers, IMF and governmental reports), which we carefully document.

In practice, it is difficult to define a "panic", given that traditional depositor runs are rare in modern bank crises due in part to the advent of deposit insurance and because banks do not generally report their funding status at daily or weekly frequencies. There are many potential definitions of what modern banking "panics" look like. Furthermore, there are differing notions of concepts such as "liquidity" and "contagion" in the theoretical literature, and it is difficult to gauge them empirically by looking at balance sheet quantities or prices such as interbank lending spreads.

We sidestep these issues and simply use the following *operational* definition of a "panic". We define a "panic" as an episode containing any of the following criteria appearing in narrative accounts: 1) widespread sudden depositor or creditor withdrawals at several of a country's largest banks, large enough to threaten these banks' ability to stay open; 2) severe and sudden strains in interbank lending markets; or 3) severe and sudden foreign-currency capital outflows from the banking sector.[10] The goal of this definition is to be overly-inclusive, so we can be sure that the "non-panic" episodes that we are most interested in do not include any of these characteristics. The resulting list of "panic" versus "non-panic" bank distress episodes is reported in Appendix Table A5.

With this list of "non-panic bank distress" episodes in hand, we implement the macroeconomic forecasting regression from Equation 2, but now split the indicator variable $BE\ Crash_{i,t}$ into indicator variables $(BE\ Crash\ and\ Panic)_{i,t}$ and $(BE\ Crash\ and\ No\ Panic)_{i,t}$,. These variables take the value of 1 during "panic" and "non-panic" bank distress episodes, respectively,

[9] We exclude countries experiencing major wars in their territories: European countries in 1914-1918 and 1939-1949, Japan in 1939-1949, and Israel and Egypt in 1973-4.

[10] The follow criteria would not, by themselves, be enough to classify an episode as a panic: 1) low or moderate levels of depositor outflows or central bank liquidity support to banks, or 2) a run on a single institution or a handful of small banks.

and 0 otherwise. As in Figure 3, the specification for Equation 2 also includes a non-financial equity crash indicator, $NFE\ Crash_{i,t}$, along with the standard control variables.

Impulse responses of real GDP and bank credit to GDP to "panic" and "non-panic" bank distress episodes are plotted in Figure 7. The corresponding coefficient estimates at the (t+1) and (t+3) horizons are reported in Table 5. As Figure 7 shows, the response of real GDP and credit-to-GDP for both "panics" and "non-panic" episodes are quite similar up to 2-year-ahead horizons. Table 5 reports there is no statistical difference at 1- and 3-year-ahead horizons. However, the responses diverge at longer than 3-year horizons, with bank equity crashes involving "panics" leading to worse outcomes, both in terms of real GDP and more so for credit-to-GDP.[11]

[INSERT FIGURE 7 HERE]

[INSERT TABLE 5 HERE]

It is not surprising that "panic" episodes are worse.[12] What we want to emphasize is that "non-panic" bank distress episodes can also lead to adverse macroeconomic outcomes. According to Table 5, bank equity crashes with no panics predict output gaps of -1.21% and -1.63% at 1- and 3-year horizons and credit-to-GDP gaps of -0.76 percentage points and -3.01 percentage points at 1-and 3-year horizons, even after accounting for non-financial equity crashes, year fixed effects, and contemporaneous and lagged real GDP and credit-to-GDP. Figure 7 shows these gaps are persistent over 6-year horizons. These estimates suggest that even "quiet" banking distress are associated with deeper recessions and persistently tight credit conditions.

One possibility, raised by the model of Gertler and Kiyotaki (2015), is that low output in non-panic bank distress episodes may partly reflect *anticipated* panics that do not materialize. Anticipated panics that do not occur ex post can increase bank funding costs, reduce bank net worth, and decrease credit supply. In practice, it is difficult to ascertain whether bank creditors assign a positive probability of a panic in our non-panic bank distress episodes. Nevertheless, our results show that banking distress can be associated with adverse macroeconomic outcomes

[11] Appendix Figure A4 estimates a similar specification, but compares the impact of negative *continuous* returns to episodes of bank distress and panic. In this specification, bank equity declines also predict output declines and credit contractions, even when controlling for "panic bank distress" episodes.

[12] This result also holds even after using finer bank equity decline thresholds, to ensure that the comparisons of panics and non-panics are made for episodes with similar magnitude of bank equity declines.

without the occurrence of a panic. This fact may shed light on the question of whether the Great Recession would have been as severe without the panic in the fall of 2008 (Bernanke 2018).

C. Important episodes of non-panic bank distress

Here we highlight several prominent episodes of non-panic bank distress. A well-known example is the initial stages of the Japan's banking crisis (1991-1996). In this phase of Japan's crisis, most of the major banks were thought to be near insolvency, but significant regulatory forbearance and perceptions of strong government guarantees to creditors forestalled a panic and a collapse of any major bank. (In general, strong government guarantees as a way to forestall panics characterize many episodes of "non-panic bank distress".) This situation lasted until the fall of 1997, when the collapse of two major securities firms and the Hokkaido Takushoku Bank led interbank markets to seize up, ushering in the panic phase of the crisis (1997-8).[13]

Other selected examples of non-panic bank distress from our list are as follows:

- 1973-5: Many countries experienced bank distress during the global downturn of 1973-5. There was an overt banking crisis in the U.K., which followed a major real estate boom and bust. However, there were lesser, though still problematic, episodes of non-panic bank distress in countries such as Australia, Finland, France, Greece, Hong Kong, Ireland, Italy, Singapore, Switzerland, Turkey, and the U.S., which saw large drops in bank equity, both in absolute terms and relative to nonfinancial equity. Among these non-panic episodes, the banking problems were perhaps the most severe in Australia, which saw a large real estate bust and numerous failures of building societies and small banks between 1974 and 1979 (Fitz-Gibbon and Gizycki, 2001). In Western Europe, countries faced balance of payment

[13] Although our methodology does not classify it as a "non-panic bank distress" episode because the bank equity index did not decline by over 30% in a single year, another example is the case of Canada during the Great Depression. This episode is not labeled a banking crisis on the Joint or Revised Crisis Lists (there were no bank panics, and the single bank to fail, Weyburn Security Bank, was tiny – though several trust companies did fail), but there was nevertheless a steep decline in bank stock prices (a log peak-to-trough decline of -0.363). Kryzanowski and Roberts (1993) note that the large Canadian banks "were insolvent at market values and remained in business only due to the forbearance of regulators coupled with an implicit guarantee of all deposit", both policies being held over from the previous Canadian banking crisis of 1923. The largest Canadian bank at the time, the Bank of Montreal, had estimated non-performing loans in excess of 40%. Thus, the large and widespread bank losses in Canada, as reflected by the large fall in bank stock prices, may help explain the severity of the Great Depression in Canada, in which the fall in real GDP and rise in unemployment rivalled the U.S. in severity.

crises, which impacted the banking sector especially through large foreign exchange losses at banks and tight Eurodollar funding (Coombs, 1973). In particular, Germany's Herstatt Bank failed in 1974, and Germany's Westdeutsche Landesbank and Switzerland's UBS suffered large losses in foreign exchange markets (Schwartz, 1987). In Singapore, the Chung Khiaw Bank, then part of United Overseas Bank, was rumored to be close to bankruptcy. And, in the U.S., there were large aggregate bank losses, widespread symptoms of financial distress, and several prominent failures of large regional banks.[14,15] It is likely, based on the analysis of this paper, that the financial distress in the U.S. and other countries in 1973-5 was one of the reasons why the recession was relatively severe and prolonged, compared to other postwar recessions up until then.

- 2002-3: There were episodes of non-panic bank distress in several countries including Germany, Greece, Israel, Italy, Japan, which saw large drops in bank equity, both in absolute terms and relative to nonfinancial equity. In Germany, for example, according to the IMF's financial stability report for Germany in 2003, three out of the four largest German private commercial banks suffered major losses in 2002, and a number of small and medium sized institutions had to be merged, closed by the regulator or assisted, due to serious difficulties. In Israel, banks suffered large credit losses, with the collapse of Trade Bank, large depositor outflows at Industrial Development Bank, and large losses at

[14] Doyran (2016) summarizes the situation of U.S. banks in 1973-5 as follows: "Although bank profits subsided in 1974 because of high interest rates and foreign competition, US banks were particularly hard hit by had loan portfolios, poor regulatory oversight over foreign exchange transactions. inadequate capital (high loan/capital ratio), deficient internal controls and audit procedures, and aggressive expansion through the use of short-term borrowed funds, especially Eurodollar funds, money market CDs and federal funds. In early 1974, a tightened monetary policy surprised banks expecting eased interest rates. This led to short-term borrowing for large real estate projects as many large banks borrowed billions on a daily basis to collateralize short-term loans. When higher interest rates were announced, they suffered enormous losses. The concern over the effects of financial instability increased greatly as regulators reported substantial increases in the number of 'problem banks' under their supervision… In December 1973, the US banking system experienced its first billion-dollar bank failure—the US National Bank of San Diego. Four large bank failures worth $4 billion in deposits, including Franklin National Bank of New York … by far the largest and most serious bank failure since the Great Depression…."

[15] Similarly, Minsky (1976) writes: "We have just [in 1973-5] gone through the most serious slump since World War II and the most trying period of financial disturbances since the Great Depression… four billion plus dollar banks failed over the years 1973-5… In addition, during 1973-75, a twenty billion dollar financial industry, the Real Estate Investment Trusts (REITs), lost its ability to sell debt in the market… As a result of financial developments over 1973-75 which affected REITs, real estate, municipal governments, developed countries, and giant corporations, banking and financial institutions remain weakened even as an election year boomlet is taking place… many feared that the sky was about to fall: that we were about to have a financial collapse and another great depression."

Discount Bank.[16] And in Japan, still recovering from the banking crisis of the 1990s, new problem loans were disclosed across the banking sector; in particular, the government injected 2 trillion yen into Resona Bank, one of Japan's largest banks which was effectively insolvent, and nationalized Ashikaga Bank, a large regional bank.[17]

- 2011-5: Emerging market countries, such as Argentina (2011), Hungary (2011), India (2013), Turkey (2011), Peru (2014), Venezuela (2014), South Africa (2015), experienced banking problems due to a fall in commodity prices, Federal Reserve "tapering", and other concerns. The banking losses in India and Venezuela have been widely noted.[18]
- 2016: A few European countries (Ireland, Italy, Portugal) were hit by yet another round of banking losses. Italy's banks (in particular, Monte dei Paschi) reported losses and required government assistance, and credit conditions in Italy were generally tight.[19]

VI. Relative timing of bank equity declines and other indicators

A. Comparing the timing of bank and non-financial equity declines around banking crises

A key implication of our results is that banking sector distress, originating from banking losses on loans or securities, is associated with lower future output, even outside of narrative chronology banking crises and without the occurrence of a panic. In this section, we provide related evidence that around narrative banking crises, bank equity declines precede both nonfinancial equity declines and "panics" (which we operationally define for the purposes of this section as a spike in credit spreads). This suggests that a non-trivial proportion of bank losses are already present at the early stages of the crisis. These early bank losses cannot easily be attributed to worsening nonfinancial corporate activity or "panics," as those come later.

[16] http://www.boi.org.il/en/NewsAndPublications/RegularPublications/Pages/skira02_skira02e.aspx

[17] https://www.wsj.com/articles/SB106125690512408200

[18] India's banks: https://www.brookings.edu/blog/up-front/2018/03/01/how-to-solve-issue-of-rising-non-performing-assets-in-indian-public-sector-banks/. Venezuela's banks: http://www.eiu.com/industry/article/274932011/venezuela-banking-sector-risk/2016-12-08

[19] https://www.reuters.com/article/us-eurozone-banks-italy-monte-dei-paschi/italian-government-rides-to-rescue-of-stricken-bank-monte-dei-paschi-idUSKBN14C05J

We use monthly data to zoom in on the relative timing of bank equity declines, non-financial equity declines, and credit spreads spikes during narrative banking crises on the Revised Crisis List. The key result can be seen in the case of the U.S. 2007-8 banking crisis, so we start with previewing this case before showing these results more generally. Figure 8 shows that, for the 2007-8 U.S. crisis, bank equity prices detected the impending crisis before nonfinancial equity and before credit spread measures. Bank equity declined ten months before the nonfinancial index peaked (January 2007 for bank equity, compared to October 2007 for nonfinancial equity). Additionally, corporate spreads (the AAA-Govt and BAA-AAA spreads) and interbank lending spreads (the LIBOR-OIS spread) did not spike (which we define in this section as an increase by more than a percentage point relative to baseline levels) until September 2008, a full 21 months later.

[INSERT FIGURE 8 HERE]

We next analyze the dynamics of bank equity prices relative to nonfinancial equity prices and credit spreads more systematically across all crises on the Revised Crisis List. To do this, we turn to our monthly dataset, which contains four series for each country: bank equity index returns, nonfinancial equity index returns, a bank credit spread index, and a nonfinancial corporate credit spread index. We focus on a three-year window around narrative crises on the Revised Crisis List.

In order to pick up in "real time" whether a bank equity decline is happening, we record a bank equity decline (or, similarly, a nonfinancial equity decline) in the first month in which the equity index falls a cumulative -30% in real total returns from its peak. Column 1 in Table 6 Panel A starts by showing that, on average across banking crisis episodes on the RCL, bank equities declines by 30% 1.84 months before non-financial equity experiences a 30% decline. This average is statistically significant. Column 1 also shows that in 64 out of 127 crises, the bank equity index is the first to fall 30% when compared the non-financial equity index ("Pos"). In contrast, non-financial equity falls by 30% first in 46 crises ("Neg"), and the two series fall by 30% in the same month in 17 cases ("Zero"). Bank equity thus declines before non-financials in 58.2% of cases. This ratio is statistically significant based on a p-value calculated under the null hypothesis that the "bank equity declines first" is Bernoulli-distributed with parameter 0.50.

Table 6A column 2 performs the same analysis, but compares the month that the bank equity index peaks, relative to the month of the peak in the non-financial equity index. On average,

the bank equity index peaks 1.71 months before the non-financials index. Across RCL banking crises, bank equity peaks first in 60.4% of crises, and the difference is statistically significantly different from 50%.

Figure 9 further explores the timing and magnitude of bank and non-financial equity declines by plotting the average dynamics of monthly bank and non-financial equities around narrative banking crises. Time 0 in event time is defined as January of the narrative crisis year, based on the Revised Crisis List. Panel A shows that bank equity peaks before non-financials and starts declining earlier, consistent with the results in Table 6A.

These findings are consistent with the view that banking crises originate with shocks to a narrow sector of the economy, leading to banking sector losses, that are then transmitted to the broader economy through a bank lending channel. If most banking crises were caused by macro shocks to the real economy that then led to banking sector losses, we would expect non-financial equities to decline before or at the same time as bank equity.

Table 6 panel B studies the relative timing of bank and non-financial 30% equity declines in various subsamples. Bank equity tends to decline before non-financial equities in the post-war period and in advanced economies. In contrast, in the prewar and in emerging economies, non-financial equities are more likely decline by 30% first. Panels B and C in Figure 9 show the distinction across the pre- and post-war sample graphically. One interpretation of this is that the initial causes of crises have changed over time, with more recent crises starting with distress in the banking sector exposed to narrow segment of the economy, as opposed to broader macroeconomic shocks, which may have been more common for prewar banking crises.

Panel C in Table 6 compares the timing of 30% bank equity declines to the timing of credit spreads spikes. We record a credit spread "spike" as the first month in which credit spreads increase at least 1 or 2 percentage points above their pre-crisis average levels. We use both 1 and 2 percentage points for robustness; a level too low can potentially pick up too many false positives, while a level too high might never be reached. In the subsamples for which we have credit spread data, bank equity 30% declines detect the crisis 2.91 months before a 1% spike in bank credit spreads (column 2) and 5.00 months before a 1% spike in corporate credit spreads (column 4). These differences are statistically significant, and suggest that bank losses tend to be realized by bank equity investors before panics or other factors that would lead to a spike in bank credit

spreads. As argued earlier, this result suggests that a non-trivial proportion of bank losses are already present at the early stages of the crisis before the "panic", suggesting that large banking sector losses are already "baked in" before the panic even starts.

Figure 9 also reveals several additional new facts about bank equity around banking crises in postwar economies. These three facts are also clear for the US case in Figure 8. First, bank equity returns decline substantially more than nonfinancial equity returns, even though, unconditional on a crisis, bank equity has a beta of 0.8, so is actually less volatile than the market most of the time. Second, bank equity declines are "permanent," in the sense that they do not recover post-crisis, presumably reflecting permanent credit losses, a cash flow effect. In contrast, nonfinancial equities recover after the crisis, suggesting nonfinancial equity declines are mainly driven by a discount rate effect. This can be clearly seen in the U.S. case in Figure 5 and in the general case across all crises in Figure 9, Panel A.

Finally, bank equity declines tend to unfold gradually over one to three years. In other words, in equity prices, there is generally not a "Minsky moment" where equity declines suddenly; there is a surprisingly slow and gradual process from peak to trough. Across all crises, the average duration of the bank equity decline was 29.11 months, according to column 3 in Table 6 Panel A. This slow decline could potentially reflect a behavioral bias of overoptimistic investors initially underestimating the true depth of the crises. Alternatively, in a rational framework, investors may face informational frictions, making it difficult to piece together the extent of bank losses when bad lending practices start to become apparent.

VII. A revised chronology of banking crises

In this section, we use bank equity index returns, along with other narrative information on crises, to refine the existing chronology of banking crises.

A. Narrative approaches contain information beyond what is captured in bank equity declines

The results from the previous sections—that bank equity declines forecast macroeconomic outcomes even outside of formally-defined banking crises, and, similarly, that non-panic bank distress forecasts poor macroeconomic outcomes—may suggest that bank distress is a continuum

that underlies many recessions and there is little use in "binary" classifications of formally-defined banking crises episodes.

While there is partial truth to this view, we present evidence in this section that there is substantial information from narrative lists about crisis severity beyond that contained just in bank stock prices. Banking crises are heterogeneous in their "symptoms", and their severity cannot fully be quantified by a single bank stock measure. Furthermore, the information from narrative chronologies is not entirely due to a look-back bias (which Romer and Romer, 2017, suggest may be problem) but is in part due to specific aspects from the narrative accounts. We therefore view our bank equity measure of banking crises and narrative chronologies as complementary.

Specifically, we first examine how the impact of bank equity declines relates to the impact of narrative crises. We know from Section III that bank equity declines correlate strongly with crises, but the overlap is far from perfect. Do bank equity declines subsume effect of narrative crises? Or do narrative crises contain additional information?

Figure 10 explores these questions by jointly estimating the impact of 30% bank equity declines and narrative crises using the following local projection specification:

$$\Delta_{\mathrm{h}} y_{i,t+h} = \alpha_i^h + \gamma_t^h + \beta^h BE\ Crash_{i,t}^j + \phi^h Narrative\ Crisis_{i,t}^j + \Gamma^{\mathrm{h}} X_{i,t} + \varepsilon_{i,t}^h. \quad (4)$$

In this specification, $X_{i,t}$ controls for lags in bank equity crash and narrative crisis indicators, as well as contemporaneous and lagged non-financial equity crash indicators, real GDP growth, and credit-to-GDP change. For this exercise we use our Revised Crisis List to capture the most correct narrative chronology available.

The solid lines in Figure 10, Panel A, presents the sequence of estimates of $\{\beta^h\}$ and $\{\phi^h\}$ for GDP growth, and Table A7, Panel A, columns 1 and 2 report the regression versions at the three-year horizon. Both bank equity crash and narrative crisis shocks are associated with lower subsequent growth, and the magnitudes are similar. Panel B shows the response of credit-to-GDP. Again, both bank equity declines and narrative crises predict a credit-to-GDP contraction of similar magnitude. Note that the total effect from both bank equity crash and narrative crises would be obtained by adding these two coefficients.

[INSERT FIGURE 10 HERE]

An implication of Figure 10 is that bank equity declines do not drive out the narrative crisis indicator. Instead, both estimates are negative and significant. There are two potential reasons for this. First, the narrative crisis indicator may capture additional information not incorporated by bank equity, such as distress among non-banks or private banks, other "symptoms" of banking crises not fully captured by bank equity declines, or policy interventions such as liquidity support or equity injections. Second, another reason may be that narrative crises select crises with more severe macroeconomic outcomes (a "look-back bias"), leading to biased estimates of the effect of banking sector distress on the real economy.

The dashed lines in Figure 10 provide some support for the hypothesis that narrative crises capture additional information about the shock to the banking sector. Specifically, we re-estimate Equation 4, controlling for key symptoms of crises (significant liquidity support, government equity injections, and bank nationalization) which may not be entirely captured by bank equity declines.[20] For example, crises with significant government liquidity support may force banks to suppress lending, but the intervention may cushion equity markets. The estimated effect of a narrative crisis is attenuated by one-third to one-half when these symptoms of crises are included as controls. However, this still means that a substantial fraction of the narrative effect cannot be accounted for by bank equity measures or crisis symptoms. Therefore, the narrative chronology also likely captures some hindsight bias in identifying crises.

B. Constructing a revised chronology of banking crises

We use the following algorithm to construct a refined chronology of banking crises. The intuition behind the strategy is as follows: we first cast as wide a net as possible to capture all potential banking crises (which adds new banking crises not previously on the Joint Crisis List), then narrow down this list (eliminating spurious crises or events that do not rise to the level of a true banking crisis) primarily using bank equity returns data but also additional narrative

[20] Why do we use these three symptoms of crises (significant liquidity support, government equity injections, and bank nationalization)? One can add the full list of banking crisis "symptoms" discussed in Section II as controls, or other subsets of them, but the results in Figure 10 are not meaningfully different. These three symptoms thus capture most of the information contained in the full set of symptoms.

information on banking crises collected from a wealth of primary and secondary sources on each of the potential crises.

Specifically, we start with the Joint Crisis List and add events that meet both of the following two criteria: i) the peak-to-trough bank equity decline is greater than 30%, and ii) there is overwhelming evidence from the new narrative evidence of either widespread panics or significant bank failures (or both).[21] Then, to narrow down this list, we eliminate events which meet *both* of the following criteria: i) the bank equity decline is less than 30%, and ii) there is overwhelming narrative evidence of a lack of both widespread bank failures or bank runs.[22] The philosophy behind this algorithm is to be conservative when adding episodes and deleting episodes, hence only making changes where there is both overwhelming bank stock *and* narrative evidence supporting these change.

The narrative information comes from wealth of primary and secondary sources, which we use to create over 400 pages of documentation regarding the specific timelines of each of these potential crises. For each crisis episode, we reconstruct a history of which specific banks saw deposit runs, failed, and/or were rescued; the specific action taken by central bankers and government officials (liquidity support, liability guarantees, bank holidays, asset purchases, recapitalization efforts); other symptoms, background causes, and consequences of each crisis. We sought to be painstakingly careful in documenting each event.

[INSERT TABLE 7 HERE]

To highlight some of the refinements we make to the Joint Crisis List, we first present newly identified banking crises in Table 7, Panel A, which we add to our revised chronology of banking crises. We also present a list of spurious banking crises in Table 7, Panel B, which we argue should not be considered banking crises and are removed from our revised chronology of

[21] Based on narrative evidence of widespread banking panics, we also added one episode (Hong Kong 1965), in which the bank equity decline was less than 30%. There are also a few added episodes for which bank stock data is unavailable but where the narrative evidence is persuasive. Similarly, there were a few deleted episodes where we did not have bank stock data but where the narrative evidence strongly suggested these were erroneously labeled as banking crises.

[22] As noted in the previous section, we base the 30% threshold on an analysis of "true" crises: among all episodes on the Joint Crisis List in which there is unanimous agreement among at least three papers, only three crises do not fall below the -30% threshold. (These three episodes are Argentina 1995, Chile 1976, and the U.S. 1984.) Thus, -30% seems a natural threshold under which almost all "true" banking crises fall.

banking crises. Many of these deleted events in Panel B are typos or historical errors, while others are monetary or currency issues that had only minor effects on the banking sector. Finally, we present in Panel C our new revised chronology of banking crises. We also list the bank equity return (i.e. the peak-to-trough log real total return) as a measure of the severity of each banking crisis.[23]

C. Newly-uncovered crises and spurious crises

We highlight several examples of newly-uncovered crises (episodes added to our revised chronology) and spurious crises (episodes deleted from our chronology) to showcase some of the improvements of our chronology. Three interesting newly-uncovered crises, taken from Table 7, Panel A, are:

- Belgium in 1876. As reported by Grossman (2010): "the boom in Belgium after Franco-Prussian war led to the establishment of new banks. Several of these failed when the international crisis of 1873 arrived in Belgium. A few smaller banks went into receivership, and the larger Banque de Belgique, Banque de Bruxelles, and Banque Central Anversoise had to be re-organized. Durviaux (1947) calls this a serious crisis, while Chelpner (1943) suggests it may have been less serious."
- Japan in 1922. This episode is distinct from the Japanese banking crises of 1920 and 1923, the latter of which was triggered by the Great Kanto earthquake of 1923. Regarding 1922, Shizume (2012) writes: "Ishii Corporation, a lumber company engaged in speculative activities, went bankrupt at the end of February 1922, triggering bank runs in Kochi Prefecture (in south-western part of Japan) and Kansai region (Osaka, Kyoto and their environs). Then, from October through December 1922, bank runs spread far across the country, from Kyushu (the westernmost part of Japan) through Kanto (Tokyo and its environs in eastern Japan). In 1922, operations were

[23] We occasionally combined several pairs of episodes (see Appendix Table 4, Panel A) occurring close together in time, when it seemed more appropriate to consider them as a single crisis (i.e. when bank equity prices did not show two separate declines and when the narrative evidence on bank failures and panics conveyed a continuous sequence of banking distress across time, not clustered into two phases). We also revised the starting years of several bank crises (see Appendix Table 3, Panel B) by looking at the timing of bank stocks declines.

suspended at 15 banks, either permanently or temporarily. The BOJ extended "special loans" to 20 banks from December 1922 to April 1923."

- Portugal in 1876. As reported by the Banker's Magazine (October 1876) in an article titled "The Banking Crisis in Portugal": "The first announcement of this trouble was made in London, 19th August, when the telegraph announced that a general run on the banks had begun on the previous day, and that the banks had suspended payments. The explanation was given that the trouble arose from the failure of some financing banks in Oporto, last May, when several of the weak institutions were assisted by the Bank of Portugal… It thus became apparent that the banks of Lisbon, by aiding the suspended banks of Oporto, had so weakened themselves that suspension was inevitable. Under these circumstances, two expedients were adopted by the Portuguese Government. The first was to issue a decree suspending for sixty days the payment of debts… The second expedient was to use the credit of the Government in London, and to obtain from several financial houses there advances of about $5,000,000. An export of gold to Lisbon was thus begun, and for the present the financial excitement seems almost to have ceased."

Other less surprising additions to our revised chronology of banking crises include the 2010-12 Eurozone banking crises in Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain. In Appendix Section III, we further showcase several added and deleted episodes from the Great Depression.

We next highlight three episodes, taken from Table 7 Panel B, as examples of spurious banking crises that we delete from our revised chronology of banking crises.[24] Removing spurious crises reflects the concerns of Schwartz (1987) on distinguishing real crises from pseudo-crises.[25]

[24] We also wish to mention one other important example of a spurious crisis, even though it's out of our sample period, since it incorrectly shows up in many banking crisis chronologies: the U.S. in 1825. Although there was a major banking crisis in the U.K. in 1825, there were no notable bank panics in the U.S. (see Jalil, 2015).

[25] Schwartz (1987) argues that the U.S. and U.K. have not experienced "real" banking crises over the period 1933-1987 and 1866-1987, respectively. She defines "pseudo-crises" as episodes only featuring: a "decline in asset prices of equity stocks, real estate, commodities; depreciation of the exchange value of a national currency; financial distress of a large non-financial firm, a large municipality, a financial industry, or sovereign debtors." She defines a "real crisis" as an event leading to a "scramble for high-powered money" that "squeezes the reserves of the banking system," in other words, a panic. In contrast, in our paper, we use a broader characterization of banking crisis to include episodes featuring widespread bank failures and solvency concerns (the latter as measured by large bank equity declines), even

- Argentina 1985. This episode seems to be the result of a typographical error in Reinhart and Rogoff. Their original source for this crisis was Kaminsky and Reinhart (1999), but after looking at the description of the 1985 crisis in that paper, this episode seems to actually be the Argentina 1989 crisis.
- Germany 1977. Reinhart and Rogoff (2009) simply report that "Giro institutions faced problems" (though we have not been able to independently confirm this fact), and, from reading (English-language) newspaper clippings, there seemed to be no unusual problems affecting the banking sector at the time. The peak-to-trough bank equity decline was small (-11.7%).
- Netherlands 1893 and 1897. According to Sumner (1896), 1893 was a monetary crisis but did not feature depositor panics or bank failures. There was a large outflow of gold, which necessitated the Netherlands Bank and foreign banks to raise their discount rates to stem the outflow. The discount rate was lowered to normal levels after three months when the gold outflows had subsided. There was no decline in annual bank equity prices. As for 1897, we could not find any reference to a banking crisis[26], and there was no decline in annual bank equity prices.

We summarize the properties of all the added and deleted episodes in Table 8, Panel A, which is further supporting evidence that the added banking crises are real and the deleted banking crises are spurious. Column 1 shows that the added crises have an average peak-to-trough bank equity decline of -57.2% an average peak-to-trough real GDP decline of -7.4%, a high likelihood of deposit runs, liability guarantees, and liquidity support, and high non-performing loans and deposit outflows. These numbers are comparable to, or in most case greater than, the average for episodes from the Revised Chronology (column 3), suggesting that these added episodes are truly crises.

[INSERT TABLE 8 HERE]

when there is no traditional panic. Our chronology of banking crises also includes minor or non-systemic banking crises but in which the capitalization of the banking sector was nonetheless largely affected.

[26] Reinhart and Rogoff (2009) justify this banking crisis by citing Bordo et al. (2001) and Homer and Sylla (1991). However, Bordo et al. (2001) gives no explanation regarding this crisis, and Homer and Sylla (1991) only show in a graph that short-term interest rates were high; Homer and Sylla (1991) never actually refers to 1897 as a crisis year.

Column 2 has statistics for deleted crises: an average peak-to-trough bank equity decline of -10.1, an average peak-to-trough real GDP decline of -2.4%, a low likelihood of deposit runs, liability guarantees, and liquidity support, and low non-performing loans and deposit outflows. These numbers are considerably less than the average for episodes from the Revised Chronology (column 3), suggesting that these deleted episodes are not actually banking crises.

D. Comparisons to other chronologies of banking crises

How does our revised chronology of banking crises compare to other chronologies? Table 8, Panel B, compares the average severity of crises by looking at declines in real GDP and also selected symptoms of crises.

In our revised chronology, the average crisis has a -5.3% peak-to-trough decline in real GDP, as discussed above. In comparison, Reinhart and Rogoff's (2014) headline number is an average peak-to-trough decline in real GDP per capita of -9.6%. However, Reinhart and Rogoff's headline statistic overstates the severity of banking crises, since it is calculated over a subsample of 100 severe banking crises (it is unclear what criteria is used to select this sample, other than ex-post severity). Instead, estimating the consequences of banking crises on Reinhart and Rogoff's entire list of banking crises, we find the consequences are much less severe — the average fall in real GDP that we calculate for Reinhart and Rogoff in Table 8, Panel B, is -4.5% — in fact less severe than using our revised chronology (a difference of 0.8% with a t-statistic of 2.40). Looking at the likelihood and magnitude of other symptoms of crises and policy interventions – including liability guarantees, liquidity support, deposit runs, non-performing loans, and declines in deposits – our revised list is also more severe.

The fact that our revised chronology is on average more severe is, in large part, due to the fact that we eliminate many spurious crises from their list.[27] And if one restricts our list to episodes featuring a large negative shock to bank equity (defined as a greater than 30% decline), our list makes banking crises look even more severe than using the full Reinhart-Rogoff chronology, as

[27] In our revised chronology, we delete 51 events from Reinhart and Rogoff's list, having an average GDP decline of -2.6%. This small number brings the average severity down for Reinhart and Rogoff's crises.

shown in column 3 of Panel B.[28] Comparing our revised chronology to previous chronologies, the aftermath of banking crises tends to be more severe, especially when restricting our chronology to crises featuring large bank equity declines. However, it's important to note that the evidence is nuanced and also that the comparisons are sensitive to the sample studied.

[28] Similarly, our revised chronology crises are more severe than Schularick and Taylor's (when compared on their sample of 14 countries) and Bordo's, but slightly less severe than Laeven and Valencia's (when compared on their time sample 1970-2012), perhaps because Laeven and Valencia only identify crises that are serious enough to warrant several forms of major government intervention.

References

Baron, Matthew, and Wei Xiong. "Credit expansion and neglected crash risk." *Quarterly Journal of Economics* 132.2 (2017): 713-764.

Bernanke, Ben. "Nonmonetary effects of the financial crisis in the propagation of the Great Depression." *American Economic Review* 73.3 (1983): 257-276.

Bernanke, Ben. "The real effects of disrupted credit: Evidence from the Global Financial Crisis." Working paper. (2018)

Bordo, Michael, Barry Eichengreen, Daniela Klingebiel, and Maria Soledad Martinez-Peria. "Is the crisis problem growing more severe?" *Economic policy* 16, no. 32 (2001): 52-82.

Calomiris, Charles, and Joseph Mason. "Consequences of bank distress during the Great Depression." *American Economic Review* 93.3 (2003): 937-947.

Caprio, Gerard, and Daniela Klingebiel. "Episodes of systemic and borderline banking crises." In *Managing the real and fiscal effects of banking crises*, World Bank publication (2003): 31-49.

Chelpner, B. S. *Belgian Banking and Banking Theory*. Washington: Brookings Institution. (1943)

Chodorow-Reich, Gabriel. "The employment effects of credit market disruptions: Firm-level evidence from the 2008–9 financial crisis." *Quarterly Journal of Economics* 129.1 (2013): 1-59.

Conant, C. A. *A History of Modern Banks of Issue*. GP Putnam's Sons. (1915)

Coombs, Charles A. "Treasury and Federal Reserve foreign exchange operations." *Monthly Review* (New York Fed) 55 (1973): 47-65.

Demirgüç-Kunt, Asli, and Enrica Detragiache. "Cross-country empirical studies of systemic bank distress: a survey." *National Institute Economic Review* 192.1 (2005): 68-83.

Doyran, Mine Aysen. *Financial crisis management and the pursuit of power: American pre-eminence and the credit crunch*. Routledge (2016).

Durviaux, R., *La banque mixte: origine et soutien de l'expansion économique de la Belgique*. (1947).

Fitz-Gibbon, Bryan, and Marianne Gizycki. "A history of last-resort lending and other support for troubled financial institutions in Australia." Reserve Bank of Australia working paper (2001).

Frankel, Jeffrey, and Andrew Rose, "Currency Crashes in Emerging Markets: An Empirical Treatment," *Journal of International Economics*, 41 (1996), 351-366.

Gertler M, Kiyotaki N. "Financial intermediation and credit policy in business cycle analysis." In *Handbook of monetary economics*, vol. 3, Elsevier. (2010): 547-599

Gertler M, Kiyotaki N. "Banking, Liquidity, and Bank Runs in an Infinite Horizon Economy," *American Economic Review*, 105.7 (2015), 2011-2043.

Gorton, Gary, and Andrew Metrick. "Securitized banking and the run on repo." Journal of Financial economics 104.3 (2012): 425-451.

Grossman, Richard S. *Unsettled Account: The Evolution of Banking in the Industrialized World since 1800*. Princeton University Press (2010).

He, Zhiguo, and Arvind Krishnamurthy. "Intermediary asset pricing." American Economic Review 103.2 (2013): 732-70.

Holmstrom, Bengt, and Jean Tirole. "Financial intermediation, loanable funds, and the real sector." *Quarterly Journal of Economics* 112, no. 3 (1997): 663-691.

Homer, Sidney and Richard Sylla. *A History of Interest Rates*. Rutgers University Press (1991).

Ivashina, Victoria, and David Scharfstein. "Bank lending during the financial crisis of 2008." *Journal of Financial Economics* 97.3 (2010): 319-338.

Jalil, Andrew. "A new history of banking panics in the United States, 1825-1929: construction and implications." *American Economic Journal: Macroeconomics* 7.3 (2015): 295-330.

Jordà, Òscar. "Estimation and inference of impulse responses by local projections." *American Economic Review* 95.1 (2005): 161-182.

Kaminsky, Graciela, and Carmen Reinhart. "The twin crises: the causes of banking and balance-of-payments problems." *American Economic Review* 89.3 (1999): 473-500.

Kindleberger, Charles. *A Financial History of Western Europe*. Oxford University Press, (1993).

Khwaja, Asim, and Atif Mian. "Tracing the impact of bank liquidity shocks: Evidence from an emerging market." *American Economic Review* 98.4 (2008): 1413-42.

Kryzanowski, Lawrence, and Gordon Roberts. "Canadian banking solvency, 1922-1940." *Journal of Money, Credit and Banking* 25.3 (1993): 361-376.

Laeven, Luc, and Fabian Valencia. "Systemic banking crises database." *IMF Economic Review* 61, no. 2 (2013): 225-270.

Mehrez, Gil, and Daniel Kaufmann. "Transparency, liberalization, and financial crisis." World Bank publication, (2000).

Minsky, Hyman "Review of 'Did Monetary Forces Cause the Great Depression?' by Peter Temin." *Challenge* 19.4 (1976): 44-46.

Nakamura, Leonard, and Carlos Zarazaga. "Banking and Finance in Argentina in the Period 1900-35." Working paper, (2001).

Nyberg, Peter, and Mika Vaihekoski. "A new value-weighted total return index for the Finnish stock market." In *Research in international business and finance* 24.3 (2010): 267-283.

Peek, Joe, and Eric Rosengren. "Collateral damage: Effects of the Japanese bank crisis on real activity in the United States." *American Economic Review* 90.1 (2000): 30-45.

Reinhart, Carmen and Kenneth Rogoff, *This Time Is Different: Eight Centuries of Financial Folly*, Princeton University Press, (2009).

Reinhart, Carmen, and Kenneth Rogoff. "Recovery from financial crises: Evidence from 100 episodes." *American Economic Review* 104.5 (2014): 50-55.

Rocha, Bruno, and Solomos Solomou. "The effects of systemic banking crises in the inter-war period." *Journal of International Money and Finance* 54 (2015): 35-49.

Romer, Christina "Changes in business cycles: evidence and explanations." *Journal of Economic Perspectives* 13.2 (1999): 23-44.

Romer, Christina, and David Romer, "New evidence on the impact of financial crises in advanced countries," *American Economic Review* 107 (2017), 3072-3118.

Schularick, Moritz and Alan Taylor, "Credit Booms Gone Bust: Monetary Policy, Leverage Cycles and Financial Crises, 1870–2008," *American Economic Review*, 102 (2012), 1029-1061.

Schwartz, Anna. "Real and pseudo-financial crises." In *Money in historical perspective*. University of Chicago Press, (1987): 271-288.

Shizume, Masato. "The Japanese economy during the interwar period: instability in the financial system and the impact of the world depression." In *The Gold Standard Peripheries*. Palgrave Macmillan, (2012): 211-228.

Stock, James H., and Mark W Watson. "Forecasting output and inflation: The role of asset prices." *Journal of Economic Literature* 41.3 (2003): 788-829.

Sumner, William G. *A History of Banking in All the Leading Nations*. Vol. 1-4. (1896).

Waldenström, Daniel. "Swedish stock and bond returns, 1856–2012." Working paper, (2014).

Figure 1: Sample historical data

This figure shows scans of three historical newspapers containing bank stock price data. Panel A shows Italian bank stock prices at the end of 1904 from the newspaper *La Stampa*. Panel B shows Dutch bank stock prices at the end of 1908 from the newspaper *De Telegraaf*. Panel C shows German bank stock prices at the end of 1873 from the newspaper *Berliner Boersen-Zeitung*. The full list of historical primary sources for bank stock prices and dividends can be found in Appendix Section I.

(A) Italian bank stock prices, 1904

BORSE ITALIANE.

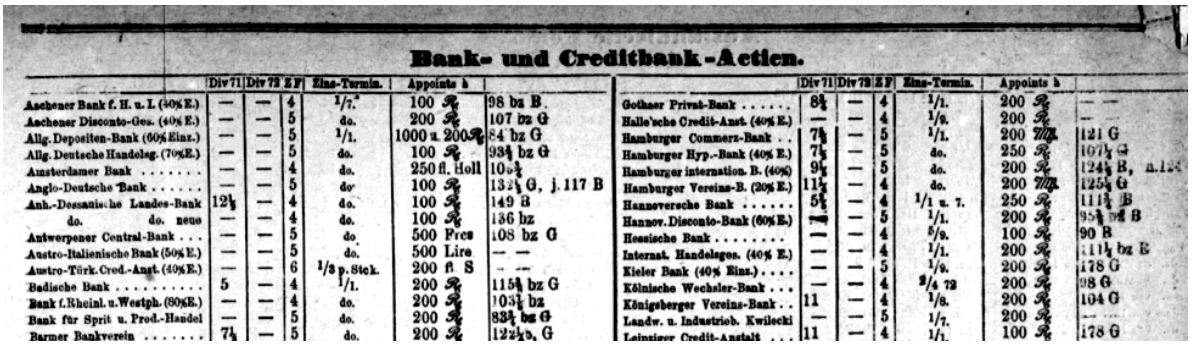
Corsi di chiusura del 28 dicembre 1904.

Valori	Roma	Milano	Genova	Firenze
Rend. It. 5 0/0 perc.	105 35	105 25	105 32 1/2	105 37
» f.m.	105 30	105 30	105 37 1/2	105 32 1/2
3 1/2 0/0 p.e.	103 42 1/2	— —	— —	103 35
» f.m.	103 35	103 32 1/2	103 37 1/2	103 30
Az. Banca d'It.	1132 —	1134 50	1135 50	— —
» Banca Comm.	828 —	828 50	828 —	— —
» Credito Ital.	611 —	611 —	612 —	— —
» Meridionali	758 —	760 —	758 —	758 —
» Mediterranee	— —	459 —	460 —	460 50
» Rubattino	— —	468 50	470 —	— —
» Terni	— —	1945 —	1949 —	— —
» Elba	— —	— —	— —	— —
» Savona	— —	— —	— —	— —
» Molini Alta It.	— —	— —	— —	— —
» Kridania	— —	— —	— —	— —
» Carburo Rom.	— —	— —	— —	— —

(B) Dutch bank stock prices, 1908

	V.K.	L.K.	H.K.
Amst. Liq.-Kas. dito...	115	—	—
Buit. Bankver. A-U. dito	64	—	—
Cent. Bankv. L. & N. dito	—	—	—
Cen. Cred.-Bank S.....4½	99¾	—	—
Cent. Werkg. Ris.-B. O.4½	100¾	100¾	—
Crediet-Vereen. A.....	101½	—	—
Disc. en Eff.b. 1&2ser.do.	112	—	—
Disc.-Mij te Rotterd. do.	—	—	—
Fin. Mij v. Zuid-Afr. do.	95	—	—
Geld. Credietvereenig.	165	—	—
Gemeente-Cred. Obl. 4	101½	—	—
dito dito dito 3½	96½	96⅛	—
dito dito dito 3	85¾	85⅝	—
dito dito dito 2½	—	—	—
Holl. Beleggr. Cie. dito 4	98	—	—
Holl. Voorsch. Bk. S. b..	100	—	—
Incasso Bank Aand...	116½	—	—
Ind. Bnk. te Haarl. di'o	—	—	—
Kas Vereeniging Aand.	142	142½	—

(C) German bank stock prices, 1873



Bank- und Creditbank-Actien.

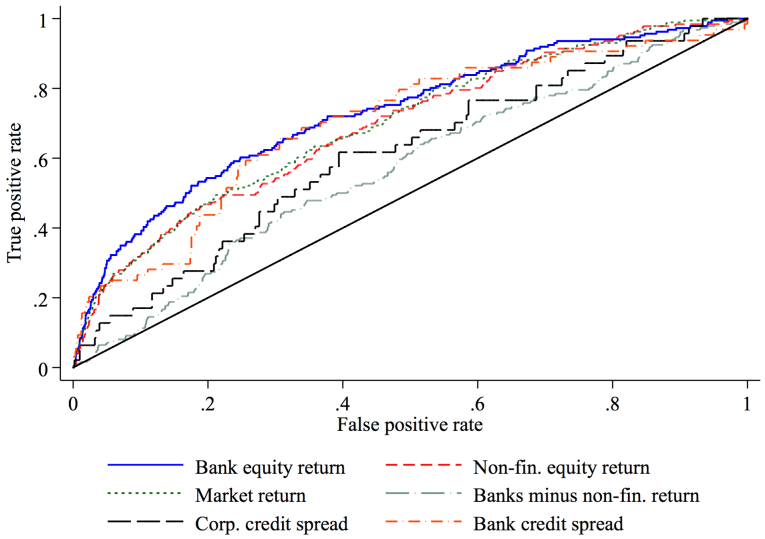
	Div 71	Div 72	Z F	Zins-Termin.	Appoints à	
Aachener Bank f. H. u. L. (40% E.)	—	—	4	1/7.	100 ℛ	98 bz B
Aachener Disconto-Ges. (40% E.)	—	—	5	do.	200 ℛ	107 bz G
Allg. Depositen-Bank (60% Einz.)	—	—	5	1/1.	1000 u. 200 ℛ	84 bz G
Allg. Deutsche Handelsg. (70% E.)	—	—	5	do.	100 ℛ	93¾ bz G
Amsterdamer Bank	—	—	4	do.	250 fl. Holl	10⅝
Anglo-Deutsche Bank	—	—	5	do.	100 ℛ	132½ G, j. 117 B
Anh.-Dessauische Landes-Bank	12½	—	4	do.	100 ℛ	149 B
do. do. neue	—	—	4	do.	100 ℛ	136 bz
Antwerpener Central-Bank ...	—	—	5	do.	500 Frcs	108 bz G
Austro-Italienische Bank (50% E.)	—	—	5	do.	500 Lire	— —
Austro-Türk. Cred.-Angt. (40% E.)	—	—	6	1/3 p. Stck.	200 fl S	— —
Badische Bank	5	—	4	1/1.	200 ℛ	115⅛ bz G
Bank f. Rheinl. u. Westph. (80% E.)	—	—	4	do.	200 ℛ	103½ bz
Bank für Sprit u. Prod.-Handel	—	—	5	do.	200 ℛ	83⅛ bz G
Barmer Bankverein	7½	—	5	do.	200 ℛ	122½ b. G

	Div 71	Div 72	Z F	Zins-Termin.	Appoints à	
Gothaer Privat-Bank	8⅝	—	4	1/1.	200 ℛ	— —
Halle'sche Credit-Anst. (40% E.)	—	—	4	1/9.	200 ℛ	— —
Hamburger Commerz-Bank ..	7⅛	—	5	1/1.	200 ℛ	121 G
Hamburger Hyp.-Bank (40% E.)	7⅛	—	5	do.	250 ℛ	107½ G
Hamburger internation. B. (40%)	9⅛	—	5	do.	200 ℛ	124⅛ B, a. 123
Hamburger Vereins-B. (20% E.)	11½	—	4	do.	200 ℛ	125⅛ G
Hannoversche Bank	5⅛	—	4	1/1 u. 7.	250 ℛ	111⅛ B
Hannov. Disconto-Bank (60% E.)	—	—	5	1/1.	200 ℛ	95⅛ bz B
Hessische Bank	—	—	4	5/9.	100 ℛ	90 B
Internat. Handelsges. (40% E.)	—	—	4	1/1.	200 ℛ	111½ bz B
Kieler Bank (40% Einz.)	—	—	5	1/9.	200 ℛ	178 G
Kölnische Wechsler-Bank ...	—	—	4	2/4 72	200 ℛ	98 G
Königsberger Vereins-Bank ..	11	—	4	1/8.	200 ℛ	104 G
Landw. u. Industrieb. Kwilecki	—	—	5	1/7.	200 ℛ	— —
Leipziger Credit-Anstalt ...	11	—	4	1/1.	100 ℛ	178 G

Figure 2: Bank equity returns provide the best real-time signal of narrative banking crises: ROC analysis

This figure presents receiver operating curves (ROC) to understand which variables best coincide with banking crises from the Joint Crisis List (JCL). The higher the ROC curve, the better a given variable is at diagnosing a JCL crisis. Panel A compares the ROC curve constructed from bank equity returns with the ROC curves constructed using other financial variables. Panel B performs the comparison relative to macroeconomic variables. Panel A uses the sample for which bank equity returns, non-financial equity returns, and market returns are non-missing. Panel B uses the sample for which bank equity returns, unemployment rate change, GDP growth, and credit contraction are non-missing.

(A) Bank equity compared with other financial variables



(B) Bank equity compared with macroeconomic variables

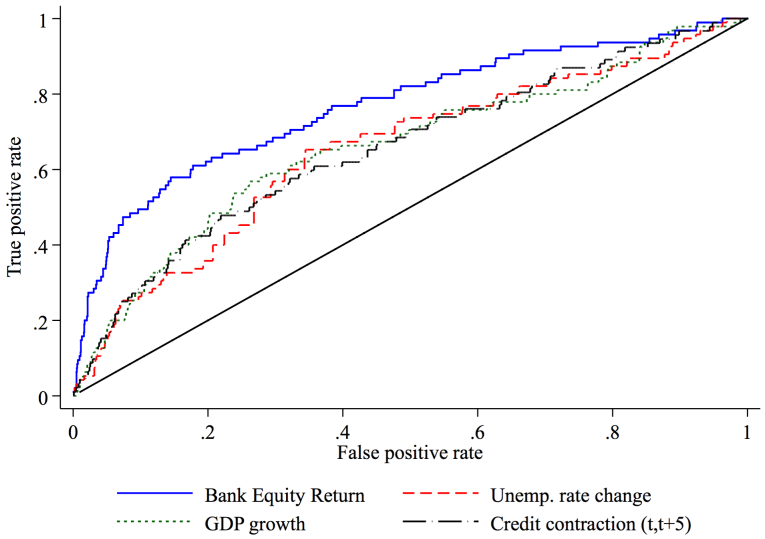
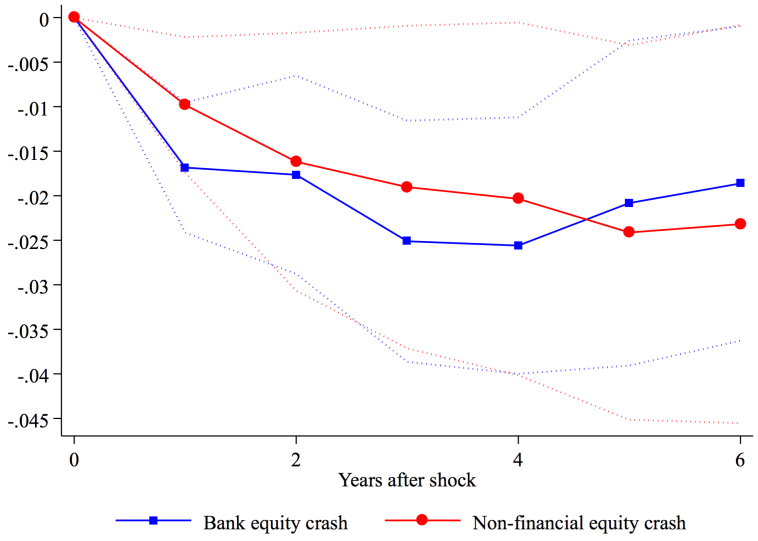


Figure 3: Bank equity crashes and subsequent macroeconomic outcomes

This figure plots the responses of real GDP and credit-to-GDP to 30% crashes in bank equity and non-financial equity. The responses are estimated using Jordà (2005) local projections with controls for three lags in bank and non-financial equity crash indicators, country fixed effects, year fixed effects, and contemporaneous and lagged of real GDP growth and credit-to-GDP change. The bank equity crash and non-financial equity crash responses are estimated jointly. The dashed lines represent 95% confidence intervals based on standard errors dually clustered on country and year.

(A) Real GDP response



(B) Credit-to-GDP response

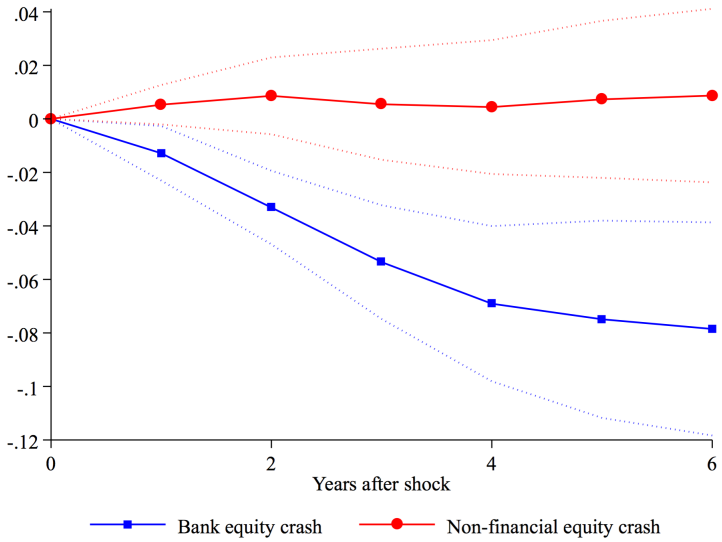
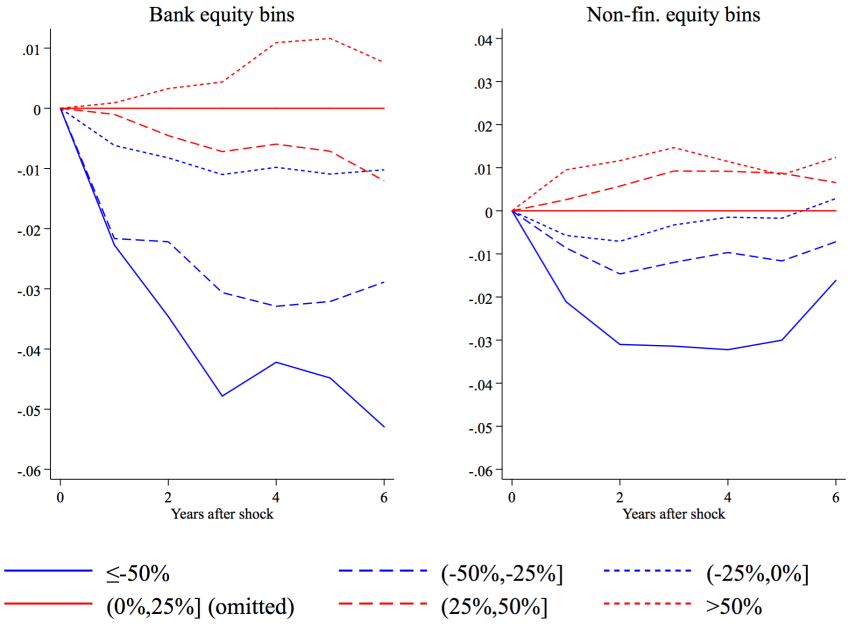


Figure 4: Nonlinearities in the impact of bank equity return innovations

This figure plots the impact of bank equity and non-financial equity returns on real GDP (panel a) and bank credit-to-GDP (panel b). The responses are estimated usingEquation 3, with controls for year fixed effects and lags in GDP growth and the change in credit-to-GDP. The bank equity crash and non-financial equity crash responses are estimated jointly. The x-axis is time in years, and the y-axis is real GDP or bank credit-to-GDP relative to the omitted category of returns between 0% and 25%.

(A) Real GDP response



(B) Credit-to-GDP response

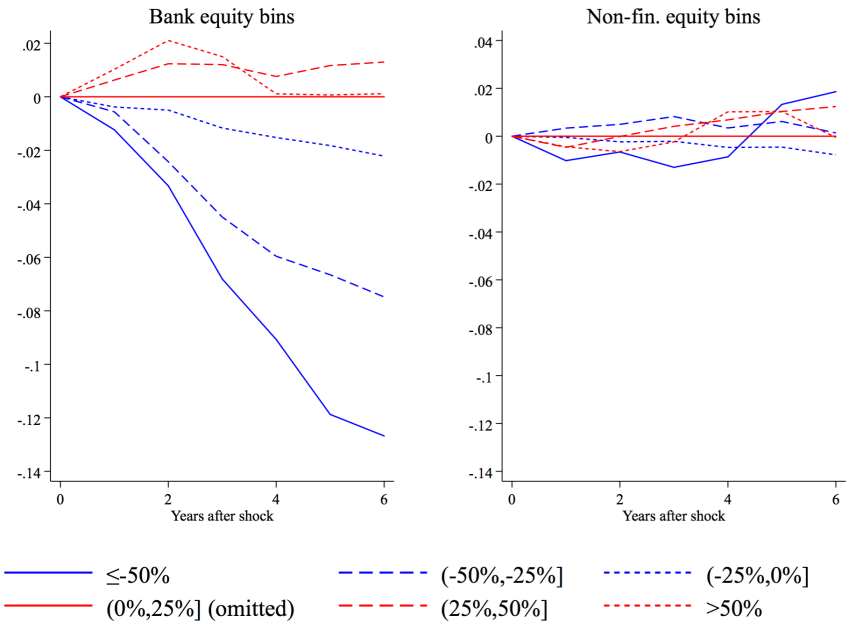
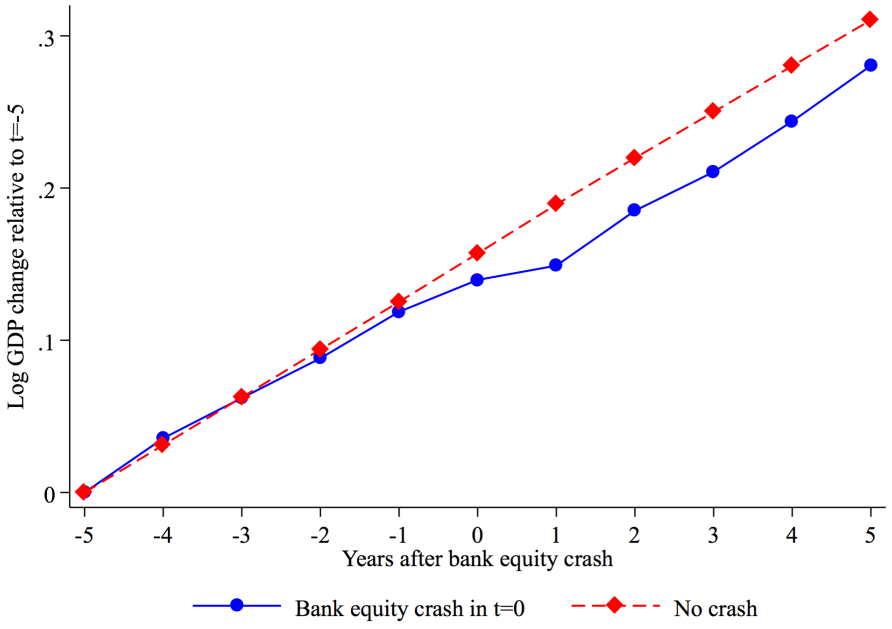


Figure 5: Dynamics of output and credit around bank equity crashes

This figure presents the average dynamics of key variables around bank equity crashes. Bank equity crashes are defined to occur in year $t = 0$. Each panel plots cumulative growth in a given variable from five years before a bank equity crash ($t = -5$) to five years after the crash ($t = 5$). For comparison, average dynamics arounds years with no crash are presented in red.

(A) Real GDP



(B) Credit-to-GDP

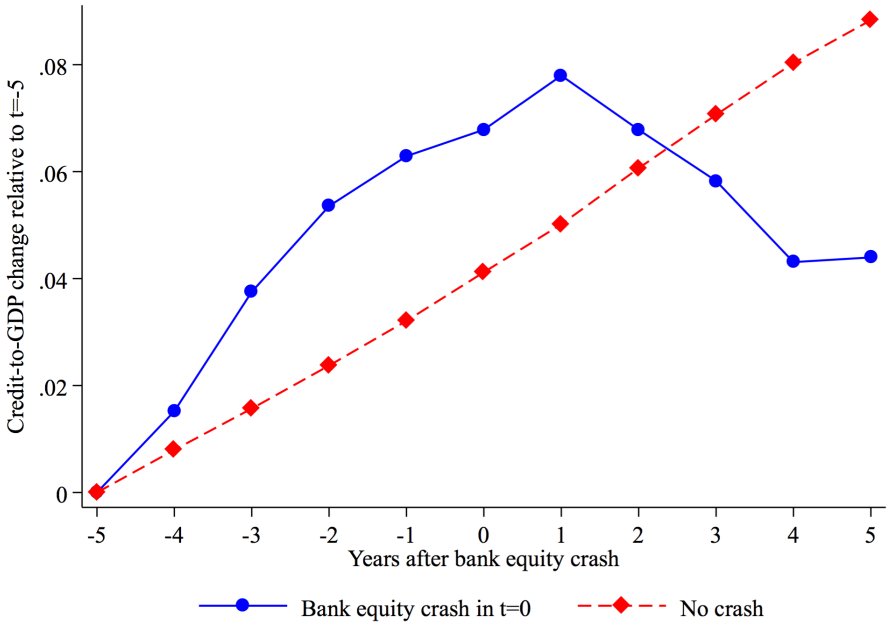
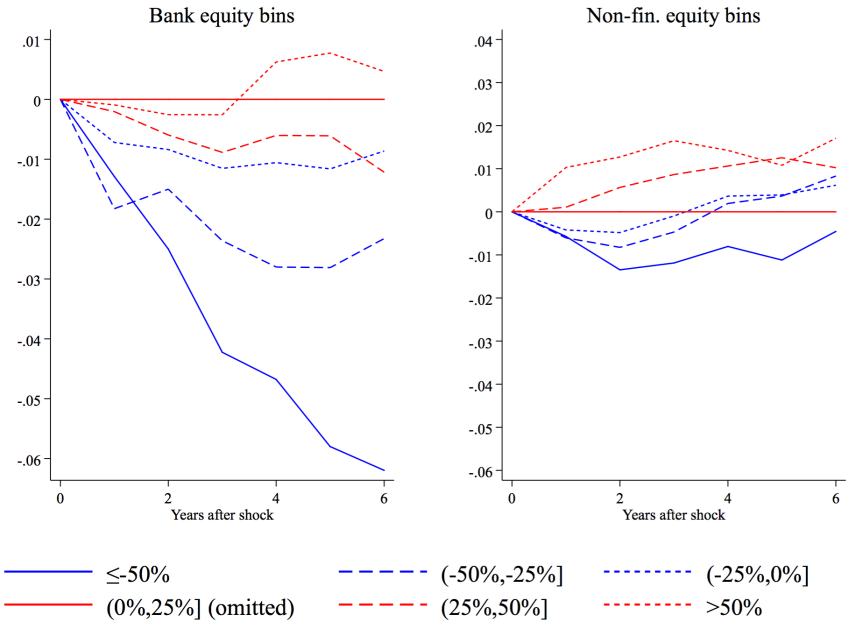


Figure 6: Bank equity crashes *outside* of narrative crises

This figure shows that bank equity declines predict real output and credit contraction even outside of narrative banking crisis episodes. We estimate local projection impulse responses to bank equity returns across different bins, as in Figure 4, excluding observations with a narrative crisis on the Revised Crisis List in $t-2, ..., t, ..., t+2$.

(A) Real GDP response outside of narrative crises



(B) Credit-to-GDP response outside of narrative crises

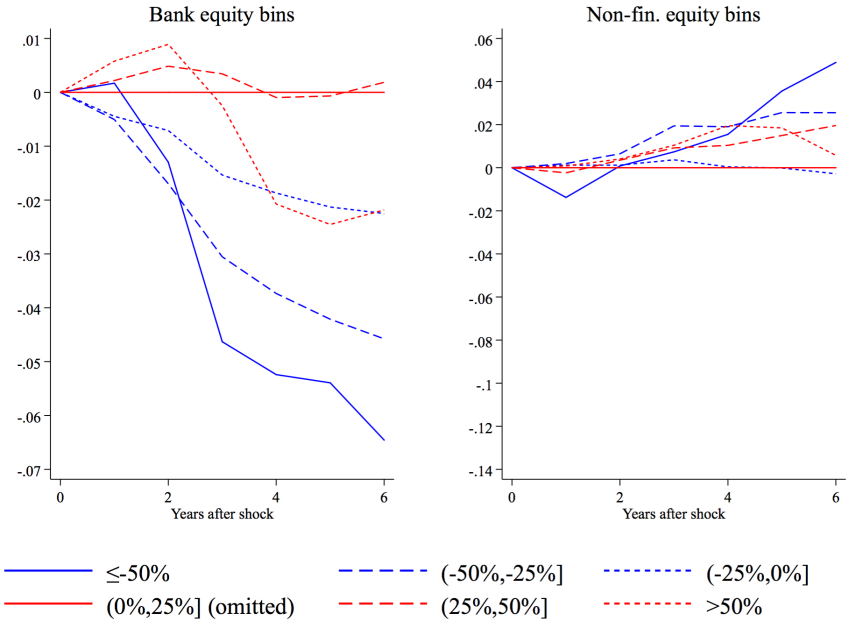
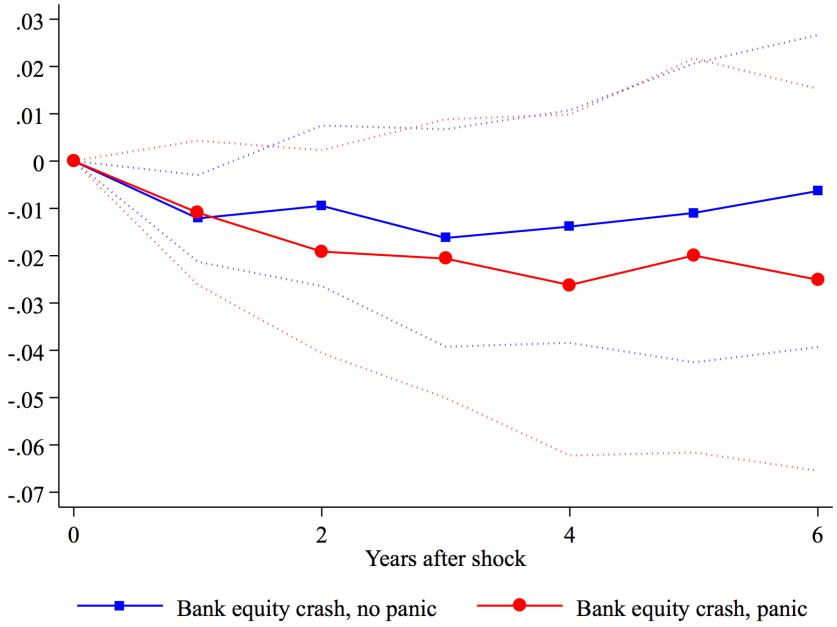


Figure 7: Impact of non-panic banking distress

The figure presents response of real GDP (panel a) and credit-to-GDP (panel b) to 30% bank equity crashes, distinguishing between 30% bank equity crashes that coincide with a bank panic and crashes that are not associated with a panic. The responses are estimated using local projections, controlling for contemporaneous and lagged non-financial equity crashes, real GDP growth, and the change in credit-to-GDP. The specification also controls for country and year fixed effects. The dashed lines represent 95% confidence intervals based on standard errors dually clustered on country and year.

(A) Real GDP response



(B) Credit-to-GDP response

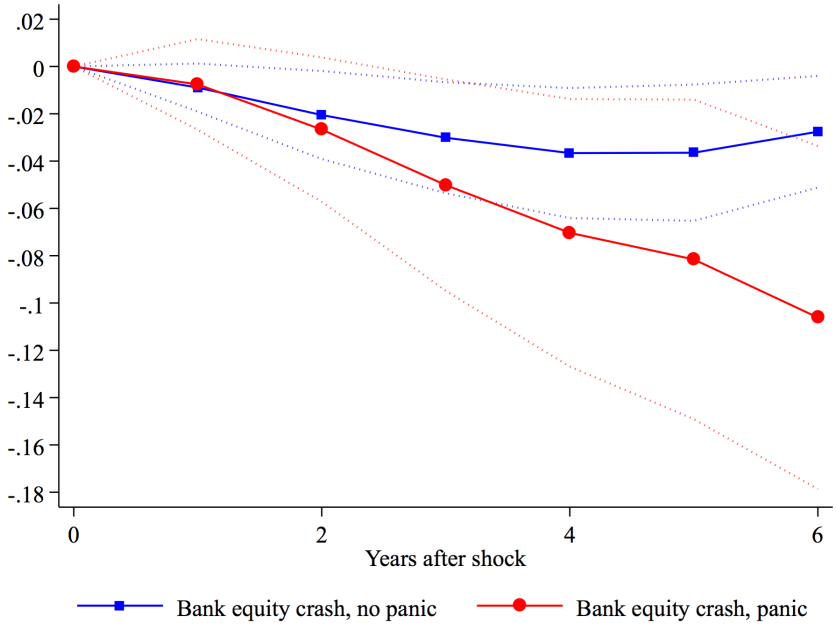


Figure 8: Equity returns and credit spreads around the U.S. 2007-8 banking crisis

This figure plots equity total return indexes and credit spreads around the U.S. 2007-8 banking crisis. The bank equity index is in blue, the nonfinancial equity index is in red, corporate credit spreads are in black (dashed is the AAA 10-year Corporate minus 10-year Treasury yield, solid is the BAA minus AAA 10-year Corporate spread), and the 3-month LIBOR minus OIS spread is in green. The scale on the left corresponds to equity returns, and the scale on the right corresponds to bond yield spreads.

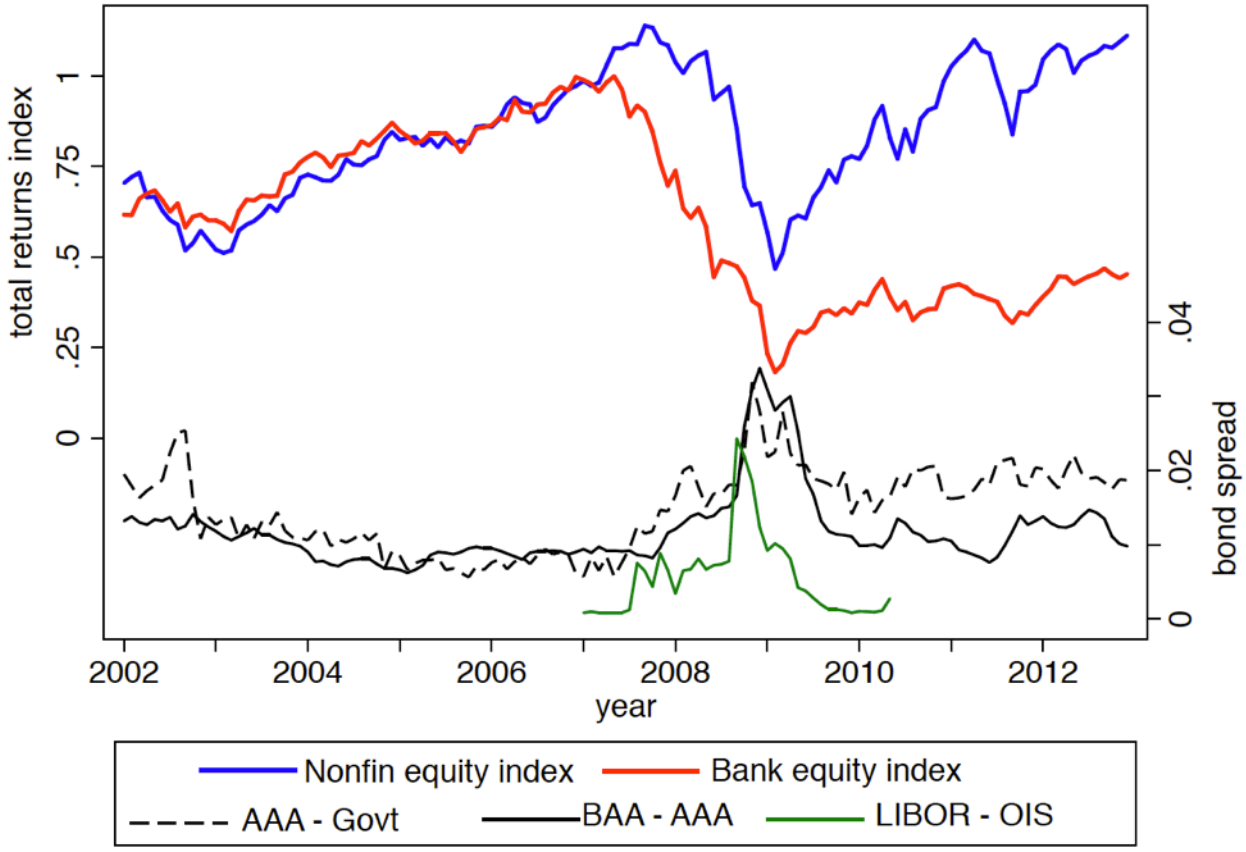
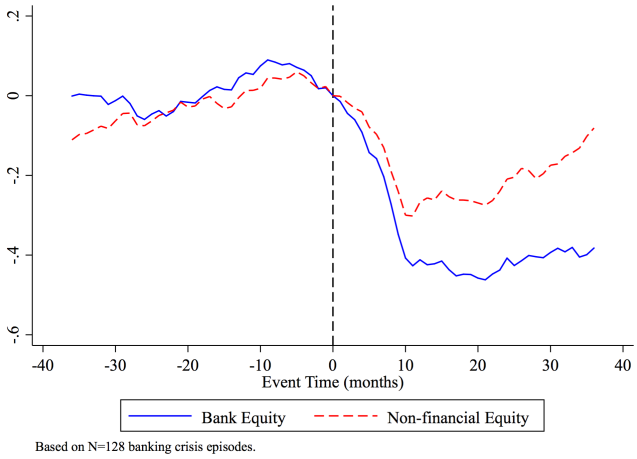


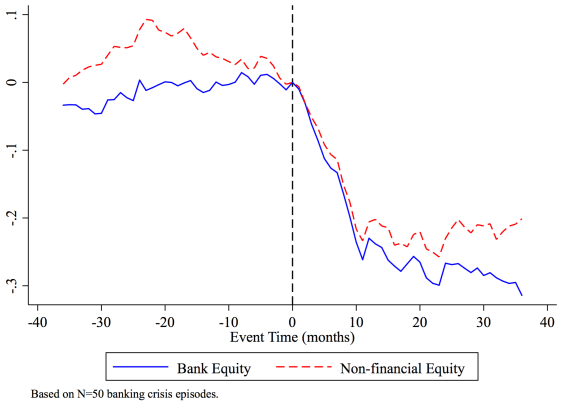
Figure 9: Timing of bank versus nonfinancial equity declines

This figure compares the evoluation of bank stocks and nonfinancial stocks around banking crises on the Revised Crisis List. Event time is defined around January of the crisis year for each crisis episode. The stock indexes are computed by averaging the cumulative log returns (relative to t = 0) across all banking crisis episodes. Panel A is for the full sample (1870 – 2016), Panel B is for the prewar sample (1870-1945), and Panel C is for the postwar sample (1946-2016).

(A) Full sample



(B) Pre-war



(C) Post-war

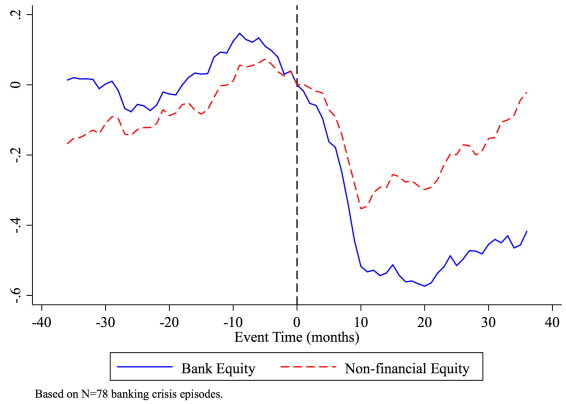
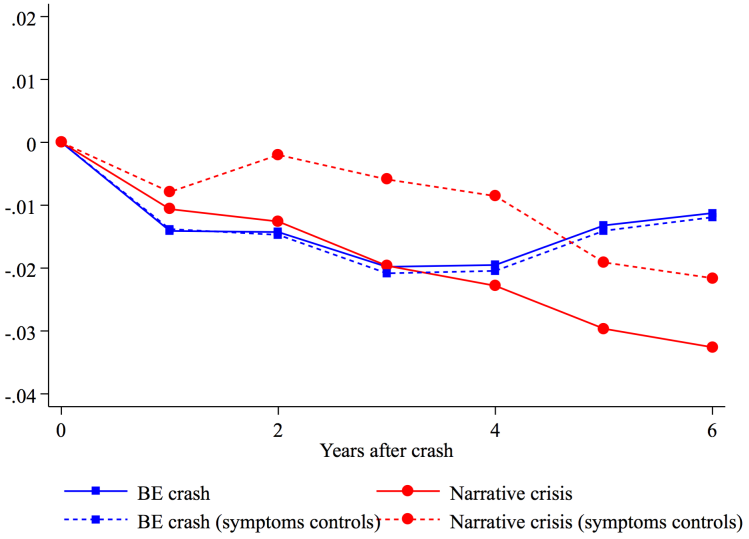


Figure 10: The information content of bank equity versus narrative approaches

This figure presents responses of real GDP (panel A) and credit-to-GDP (panel B) to bank equity declines and "narrative crisis" episodes. Bank equity decline is an indicator that equals one if country-year experiences a 30% drop in the bank equity total returns index. Narrative crisis is an indicator that equals one if a country-year is classified as a crisis based on our Revised Crisis List. The responses in the solid lines are estimated controlling for country and year fixed effects; contemporaneous credit-to-GDP change, real GDP growth, and a non-financial decline; and three lags in all variables. The dashed lines represent a separate specification that also controls for symptoms of financial crises (bank nationalization, significant liquidity support, and government equity injection).

(A) Impact of bank equity declines and narrative crises on real GDP



(B) Impact of bank equity declines and narrative crises on credit-to-GDP

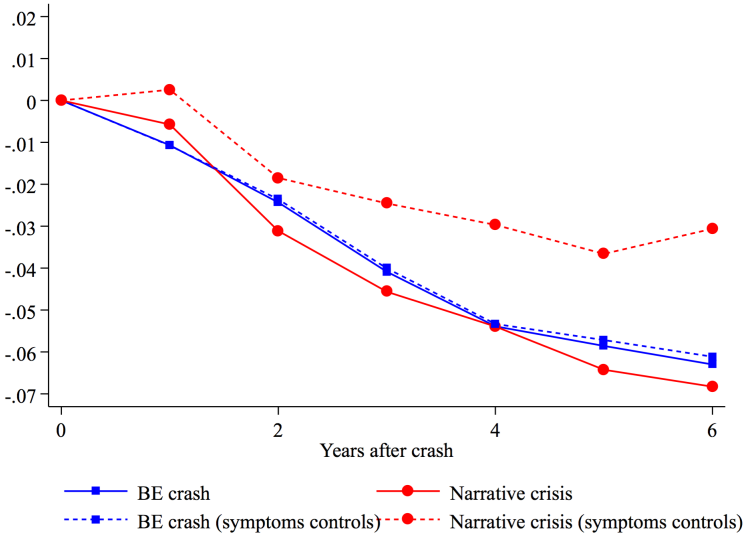


Table 1: Banking crises in Germany

This table illustrates disagreement in the literature regarding the occurrence of banking crises, looking at the case of Germany (similar results hold for other countries, see Appendix Table A2). The following table lists the occurrence of banking crises according to six prominent papers. Years listed correspond to the starting year (and quarter, if available) of the banking crisis, according to each paper. A "0" means that the source reports no banking crisis in a given year, while a blank cell means that the crisis is not covered in the sample period (i.e. no information provided either way as to whether a banking crisis occurred).

Legend:
YYYY = starting year of banking crisis
0 = "no crisis"
[blank] = outside of sample

Reinhart Rogoff	Schularick Taylor	Laeven Valencia	Bordo	Caprio Klingebiel	Demirguc-Kunt & Detragiache
0	1873				
1880	0				
1891	1891		0		
1901	1901		1901		
0	1907		0		
1925	0		0		
1929	1931		1931		
1977	0	0	0	late 1970s	
2008	2008	2008		0	

Table 2: Bank equity captures the symptoms and severity of banking crises

This table shows that bank equity peak-to-trough declines during banking crises are correlated with the "symptoms" and economic severity of banking crises. The table reports estimates from Equation 1, which regresses various dependent variables (in the various columns) on bank equity peak-to-trough returns. Each observation is a banking crisis from the Joint Crisis List, which covers 46 countries over the period 1870-2016. The sample size in different columns varies due to data available of the dependent variable. Data sources for the dependent variables are described in Section II of the text. t-statistics in brackets are computed using robust standard errors. *,**,*** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Symptoms of banking crises

	Deposit run	Decline in deposits (pre-war only)	Significant bank closures	Failed banks (% of total bank assets)	Largest banks failing
	(1)	(2)	(3)	(4)	(5)
Bank equity decline	-0.615***	0.291**	-0.211*	-0.398**	-0.454*
	[-3.327]	[2.599]	[-1.773]	[-2.133]	[-1.841]
Post-1945 dummy	✓	✓	✓	✓	✓
R^2 (within)	0.106	0.121	0.0740	0.178	0.0378
N	98	51	139	59	115

	NPL at peak	Significant liability guarantees	Significant liquidity support	Banks nationalized	Govt equity injections
	(6)	(7)	(8)	(9)	(10)
Bank equity decline	-0.153*	-0.350	-0.804***	-0.638**	-1.357***
	[-1.743]	[-1.406]	[-3.586]	[-2.452]	[-4.761]
Post-1945 dummy	✓	✓	✓	✓	✓
R^2 (within)	0.0500	0.119	0.184	0.279	0.373
N	61	122	127	96	81

Panel B: Severity of banking crises – Real GDP

	Real GDP (peak-to-trough decline)	Real GDP growth (%.-pt. decline, peak-to-trough)	Real GDP growth (max deviation from trend)
	(1)	(2)	(3)
Bank equity decline	0.133***	0.123***	0.0881***
	[5.190]	[6.014]	[4.660]
Post-1945 dummy	✓	✓	✓
R^2 (within)	0.165	0.172	0.128
N	183	183	183

Panel C: Severity of banking crises – Other macroeconomic measures

	Real cons. per capita	Invest. to GDP	Broad money	(minus) Govt debt to GDP	Total loans	Mort. loans	House prices
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bank equity decline	0.0996**	0.0514**	0.330***	0.228**	0.199***	0.289***	0.151*
	[2.224]	[2.048]	[3.924]	[2.348]	[2.916]	[3.785]	[1.744]
Post-1945 dummy	✓	✓	✓	✓	✓	✓	✓
R^2 (within)	0.210	0.0493	0.176	0.0674	0.149	0.157	0.0463
N	102	98	101	129	94	95	80

Table 3: Bank equity crashes and subsequent GDP and credit growth

This table shows that bank equity crashes predict lower subsequent GDP and credit growth. A bank (non-financial) equity crash is defined as 30% year-on-year decline in the bank (non-financial) equity total return index. Controls refers to contemporaneous real GDP growth and credit-to-GDP change, as well as three lags in bank equity crash, non-financial equity crash, credit-to-GDP change, and real GDP growth. t-statistics in brackets are computed from standard errors dually clustered on country and year. *,**,*** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Real GDP growth

	Real GDP growth$_{t,t+1}$		Real GDP growth$_{t,t+3}$	
	(1)	(2)	(3)	(4)
Bank equity crash	-0.029***	-0.017***	-0.039***	-0.025***
	[-6.18]	[-4.52]	[-4.37]	[-3.64]
Non-financial equity crash	-0.021***	-0.0098**	-0.025**	-0.019**
	[-3.58]	[-2.53]	[-2.23]	[-2.06]
Country fixed effects	✓	✓	✓	✓
Controls		✓		✓
Year fixed effects		✓		✓
R^2 (within)	0.062	0.31	0.026	0.31
N	2960	2960	2960	2960

Panel B: Credit-to-GDP change

	Credit-to-GDP change$_{t,t+1}$		Credit-to-GDP change$_{t,t+3}$	
	(1)	(2)	(3)	(4)
Bank equity crash	-0.019***	-0.013**	-0.073***	-0.054***
	[-2.87]	[-2.47]	[-5.01]	[-4.90]
Non-financial equity crash	0.012***	0.0053	0.015	0.0054
	[2.89]	[1.41]	[1.50]	[0.51]
Country fixed effects	✓	✓	✓	✓
Controls		✓		✓
Year fixed effects		✓		✓
R^2 (within)	0.0065	0.27	0.022	0.23
N	2921	2921	2921	2921

Table 4: Bank equity crashes *outside* of narrative crises

This table compares the predictive content of bank equity crashes and narrative banking crisis indicators. Narrative crises are crises on the Revised Crisis List. Controls include three lags in the bank equity crash variables, three lags in the non-financial equity crash, as well as contemporaneous and lagged real GDP growth and credit-to-GDP change. t-statistics in brackets are computed from standard errors dually clustered on country and year. *,**,*** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Real GDP growth

	Real GDP growth$_{t,t+1}$		Real GDP growth$_{t,t+3}$	
	(1)	(2)	(3)	(4)
Bank equity crash	-0.015***	-0.011**	-0.020***	-0.015*
	[-3.89]	[-2.36]	[-3.09]	[-1.66]
Narrative crisis	-0.0048	-0.0040	-0.029***	-0.029***
	[-1.55]	[-1.35]	[-4.13]	[-3.96]
Bank eq. crash × Narrative crisis		-0.0093		-0.0092
		[-1.28]		[-0.70]
Non-financial equity crash	-0.0090**	-0.0093**	-0.017*	-0.017*
	[-2.33]	[-2.45]	[-1.77]	[-1.82]
Country fixed effects	✓	✓	✓	✓
Controls	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓
R^2	0.31	0.31	0.32	0.32
N	2960	2960	2960	2960

Panel B: Credit-to-GDP change

	Credit/GDP change$_{t,t+1}$		Credit/GDP change$_{t,t+3}$	
	(1)	(2)	(3)	(4)
Bank equity crash	-0.011**	-0.0072	-0.043***	-0.027***
	[-2.01]	[-1.30]	[-4.65]	[-3.66]
Narrative crisis	-0.0042	-0.0036	-0.016	-0.013
	[-0.92]	[-0.75]	[-1.52]	[-1.25]
Bank eq. crash × Narrative crisis		-0.0077		-0.034**
		[-0.97]		[-2.24]
Non-financial equity crash	0.0048	0.0046	0.0056	0.0048
	[1.38]	[1.34]	[0.59]	[0.50]
Country fixed effects	✓	✓	✓	✓
Controls	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓
R^2	0.27	0.27	0.25	0.25
N	2921	2921	2924	2924

Table 5: Impact of non-panic banking distress

This table compares the predictive content of bank equity crashes by whether the crash coincides with a banking panic. Controls include three lags in the bank equity crash variables, three lags in the non-financial equity crash, as well as contemporaneous and lagged real GDP growth and credit-to-GDP change. t-statistics in brackets are computed from standard errors dually clustered on country and year. *,**,*** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Real GDP growth

	Real GDP growth$_{t,t+1}$		Real GDP growth$_{t,t+3}$	
	(1)	(2)	(3)	(4)
Bank equity crash, no panic [1]	-0.0183***	-0.0121***	-0.0232**	-0.0163
	[-3.06]	[-2.65]	[-2.05]	[-1.51]
Bank equity crash, panic [2]	-0.0248***	-0.0109	-0.0366**	-0.0206
	[-2.63]	[-1.43]	[-2.27]	[-1.40]
Non-financial equity crash	-0.0209***	-0.00993***	-0.0245**	-0.0193**
	[-3.57]	[-2.58]	[-2.17]	[-2.09]
Country fixed effects	✓	✓	✓	✓
Controls		✓		✓
Year fixed effects		✓		✓
Test for equality of [1] and [2], p-value	.645	.912	.586	.857
R^2	0.0676	0.309	0.0291	0.313
N	2960	2960	2960	2960

Panel B: Credit-to-GDP change

	Credit/GDP change$_{t,t+1}$		Credit/GDP change$_{t,t+3}$	
	(1)	(2)	(3)	(4)
Bank equity crash, no panic [1]	-0.0158**	-0.00892*	-0.0434***	-0.0301***
	[-2.38]	[-1.78]	[-3.08]	[-2.86]
Bank equity crash, panic [2]	-0.00807	-0.00758	-0.0696***	-0.0501**
	[-0.71]	[-0.79]	[-3.00]	[-2.25]
Non-financial equity crash	0.0123***	0.00521	0.0154	0.00483
	[2.87]	[1.43]	[1.46]	[0.45]
Country fixed effects	✓	✓	✓	✓
Controls		✓		✓
Year fixed effects		✓		✓
Test for equality of [1] and [2], p-value	.608	.913	.383	.49
R^2	0.00686	0.271	0.0283	0.240
N	2921	2921	2924	2924

Table 6: Timing of bank equity declines

This table analyzes when crises are first detected, comparing bank equity declines to nonfinancial equity declines. A bank or non-financial equity decline is recorded as the first month in which the equity index falls a cumulative 30% in log real total returns from its peak. We analyze the timing of events in 3-year pre and post window around Revised Crisis List episodes. In Panel A, we record for each banking crisis the average time difference in months between picking up a bank equity decline relative to a nonfinancial equity decline (Column 1); in addition, we also record the average time difference in months between a bank equity peak and a nonfinancial equity peak (Column 2), and the average duration of a bank equity decline from peak to trough (Column 3). Panel B performs the same analysis as Panel A Column 1 for separate subsamples. Panel C performs a similar analysis but compares the timing of the bank equity decline with credit spread indicators (bank credit spread spikes and non-financial corporate credit spread spikes, where a credit spread spike is recorded as the first month in which credit spreads increase at least 1 or 2 percentage points above their pre-crisis average levels). In all these analyses, the time difference is positive if the bank equity decline is recorded before the other event and negative if after the event. For each column, a t-statistic is calculated under the null hypothesis that the average time different is zero. As an alternative non-parametric test, we also count in how many of the banking crisis the bank equity decline is recorded first ("pos"), the other event is recorded first ("neg"), or both events are recorded in the same month ("zero"); we then calculate the fraction of times that the bank equity decline happens first ("pos / (pos + neg)") and calculate a p-value under the null hypothesis that the bank equity decline happening first is Bernoulli-distributed with parameter 0.50.

Panel A: Timing of bank vs. nonfinancial equity declines

	Bank equity decline before non-fin. eq. decline	Bank equity peak before non-fin. eq. peak	Duration of bank equity decline
Avg. (in months, signed)	1.84**	1.71**	29.11***
t-stat	2.24	2.25	15.50
N	127	132	117
Pos	64	58	Duration $\geq$ 12 mo. = 107 episodes
Zero	17	36	
Neg	46	38	Duration $<$ 12 mo. = 10 episodes
Pos / (Pos + Neg)	58.2%**	60.4%**	% Duration $\geq$ 12 mo. = 91.5%***
p-value	0.035	0.016	0.000

Panel B: Timing of bank vs. nonfinancial equity declines: Subsample analysis

	Prewar	Postwar	Postwar and Emerging	Postwar and Advanced	Postwar and Advanced (pre-2006)
Average (in months, signed)	-0.58	3.32***	0.09	5.755***	5.625***
t-stat	-0.38	3.65	0.05	6.58	3.97
N	48	79	34	45	16
Pos	20	48	13	35	12
Zero	4	13	7	6	3
Neg	24	18	14	4	1
Pos / (Pos + Neg)	45.5%	72.7%***	48.1%	89.7%***	92.3%***
p-value	0.674	0.000	0.500	0.000	0.000

Panel C: Timing relative to credit spread spikes

	Before 2% spike in bank credit spread	Before 1% spike in bank credit spread	Before 2% spike in corp credit spread	Before 1% spike in corp credit spread
Avg. (in months, signed)	6.37***	2.91**	10.30***	5.00**
t-stat	5.31	2.42	5.22	2.37
N	54	56	23	23
Pos	40	22	2	5
Zero	7	5	0	3
Neg	7	29	21	15
Pos / (Pos + Neg)	85.1%***	56.9%	91.3%***	75.0%**
p-value	0.000	0.201	0.000	0.021

Table 7: Newly identified and spurious banking crises

This table lists the newly identified banking crises in Panel A, spurious banking crises in Panel B, and our new Revised Crisis List in Panel C. The bank equity return is the peak-to-trough log real total return. "0" indicates no decline in bank equity. A blank entry indicates a lack of bank equity return data for that episode.

Panel A: Newly-identified banking crises

Country	Starting year of crisis	Bank equity return
Austria	2011	-0.509
Belgium	1876	-0.565
	2011	-0.755
Chile	1878	
	1931	-0.356
Colombia	1931	-0.675
Czech	1923	
	1997	-0.904
Denmark	2011	-0.444
Egypt	1914	-0.407
France	2011	-0.512
Germany	1914	
	2011	-0.419
Greece	2010	-0.961
Hong Kong	1891	-0.565
	1965	-0.197
Hungary	1873	-0.518
Iceland	1920	-0.875
	1930	
Ireland	2011	-0.908
Italy	2011	-0.601
Japan	1922	-0.404
Luxembourg	2012	-0.914
Netherlands	1931	-0.418
	2011	-0.523
Peru	1914	-0.612
	1931	-0.373
Portugal	1876	
	2011	-0.725
Spain	2010	-0.411
Switzerland	1914	
Turkey	1914	-0.654
Average		**-0.585**

Panel B: Spurious banking crises

Country	Starting year of crisis	Bank equity return	Country	Starting year of crisis	Bank equity return
Argentina	1885	0	India (cont.)	1947	
	1985		Israel	1977	0
Australia	1931	-0.23	Italy	1935	
Belgium	1870	-0.031	Japan	1871	
	1925	-0.193		1914	-0.232
Brazil	1897	0		1917	-0.239
	1926	0	Korea	1986	0
	1963		Mexico	1992	0
	1985		Netherlands	1893	0
Canada	1873	0		1897	0
	1906	0	Norway	1914	
	1912	-0.002		1927	0
Chile	1890	-0.254		1936	-0.209
Czech	1931	-0.099	Portugal	1986	
Denmark	1902	0	Singapore	1982	-0.275
	1914	-0.296	South Africa	1877	-0.004
	1931	-0.102		1977	-0.153
Finland	1939	-0.111		1989	0
France	1871	-0.364	Sweden	1897	-0.183
	1904	0	Switzerland	1910	0
	1907	-0.049	Turkey	1991	-0.634
	1939	-0.121	U.K.	1908	-0.011
Germany	1880	0		1984	0
	1907	-0.051		1991	-0.147
	1977	-0.117		1995	-0.159
India	1908	0	U.S.	1914	-0.158
	1929		**Average**		**-0.101**

Panel C: A revised chronology of banking crises in 46 countries, 1870-2016

Country	Starting year of crisis	Bank equity return	Country	Starting year of crisis	Bank equity return
Argentina	1890	-0.307	Chile (cont.)	1981	-0.837
	1914	-0.473	Colombia	1931	-0.675
	1931	-0.819		1982	-0.831
	1934	-0.563		1998	-0.813
	1980		Czech	1923	
	1989			1991	
	1995	-0.305		1997	-0.904
	2001	-0.656	Denmark	1877	-0.207
Australia	1893	-0.469		1885	-0.043
	1989	-0.281		1907	-0.269
Austria	1873	-0.715		1921	-0.347
	1924	-0.24		1987	-0.425
	1929	-0.566		2008	-0.739
	2008	-0.673		2011	-0.444
	2011	-0.509	Egypt	1907	-0.132
Belgium	1876	-0.565		1914	-0.407
	1885	0		1931	-0.608
	1914			1980	
	1929	-0.831		1990	
	1939	-0.511	Finland	1877	
	2008	-0.842		1900	
	2011	-0.755		1921	-0.569
Brazil	1890	-0.275		1931	-0.252
	1900	0		1991	-0.814
	1914	-0.374	France	1882	-0.456
	1923	-0.131		1889	-0.106
	1929	-0.038		1914	-0.475
	1990			1930	-0.571
	1994			1994	-0.246
Canada	1907	-0.081		2008	-0.64
	1923	-0.426		2011	-0.512
	1983	-0.164	Germany	1873	-0.371
Chile	1878			1891	-0.23
	1898	-0.003		1901	-0.05
	1907			1914	
	1914			1925	-0.42
	1925			1929	-0.489
	1931	-0.356		2008	-0.728
	1976	0		2011	-0.419

Panel C: A revised chronology of banking crises in 46 countries, 1870-2016 (cont.)

Country	Starting year of crisis	Bank equity return
Greece	1931	-0.727
	1991	-0.391
	2008	-0.671
	2010	-0.961
Hong Kong	1891	-0.565
	1965	-0.197
	1982	-0.445
	1998	-0.464
Hungary	1873	-0.518
	1931	
	1991	-0.398
	2008	-0.671
Iceland	1920	-0.875
	1930	
	1985	
	1993	
	2008	-0.963
India	1913	-0.249
	1921	-0.495
	1993	-0.561
Indonesia	1992	-0.659
	1997	-0.88
Ireland	2007	-0.918
	2011	-0.908
Israel	1983	-0.499
Italy	1873	-0.237
	1887	-0.348
	1891	-0.453
	1907	-0.24
	1914	-0.333
	1921	-0.55
	1930	-0.073
	1990	-0.397
	2008	-0.575
	2011	-0.601
Japan	1882	
	1890	
Japan (cont.)	1901	-0.221
	1907	-0.377
	1920	-0.405
	1922	-0.405
	1923	-0.157
	1927	-0.168
	1990	-0.546
	1997	-0.605
Korea	1983	-0.326
	1997	-0.726
Luxembourg	2008	-0.474
	2012	-0.914
Malaysia	1985	-0.368
	1997	-0.686
Mexico	1883	
	1893	-0.325
	1908	-0.029
	1913	-0.596
	1921	
	1929	-0.839
	1981	
	1994	-0.602
Netherlands	1907	-0.083
	1914	-0.093
	1921	-0.251
	1931	-0.418
	1939	-0.366
	2008	-0.562
	2011	-0.523
New Zealand	1887	-0.549
	1894	-0.337
	1987	-0.892
Norway	1898	
	1921	-0.71
	1931	0
	1987	-0.464
Peru	1872	
	1914	-0.612

Panel C: A revised chronology of banking crises in 46 countries, 1870-2016 (cont.)

Country	Starting year of crisis	Bank equity return
Peru (cont.)	1931	-0.373
	1983	-0.98
	1999	-0.396
Philippines	1981	-0.719
	1997	-0.687
Portugal	1876	
	1890	
	1920	-0.643
	1923	-0.684
	1931	-0.597
	2008	-0.613
	2011	-0.725
Russia	1875	-0.188
	1896	-0.401
	1995	
	1998	-0.751
	2008	-0.723
Singapore	(no crises)	
South Africa	1881	-0.27
	1890	-0.062
	1984	-0.492
Spain	1882	-0.349
	1890	-0.124
	1913	
	1920	-0.14
	1924	-0.222
	1931	-0.336
	1977	-0.814
	2008	-0.466
	2010	-0.411
Sweden	1878	
	1907	-0.135
	1922	-0.395
	1931	-0.431
	1991	-0.787
	2008	-0.519
Switzerland	1870	-0.418
	1914	
	1921	-0.432
	1931	-0.559
	1991	-0.326
	2008	-0.676
Taiwan	1923	
	1927	
	1983	
	1995	-0.307
	1997	-0.557
Thailand	1979	-0.461
	1983	0
	1997	-0.734
Turkey	1914	-0.654
	1931	-0.719
	1982	-0.409
	1994	-0.203
	2000	-0.622
U.K.	1878	-0.132
	1890	-0.128
	1914	
	1974	-0.737
	2007	-0.707
U.S.	1873	-0.172
	1884	0
	1890	0
	1893	-0.29
	1907	-0.334
	1929	-0.654
	1984	-0.263
	1990	-0.332
	2007	-0.676
Venezuela	1978	-0.34
	1993	-0.839
	2009	-0.614

Table 8: Comparison of banking crisis chronologies

This table compares quantities across the various banking crisis chronologies. Panel A compares averages of Added episodes (newly-uncovered banking crises), Deleted episodes (spurious banking crises), Revised Chronology episodes, and Revised Chronology episodes having a bank equity decline of greater than -30%. Panel B compares episodes from Reinhart-Rogoff's chronology to episodes on the Revised Chronology List and to the episodes on the Revised Chronology List having a bank equity decline of greater than -30%. Differences in averages are computed, along with t-statistic in brackets (which are computed using a pooled standard deviation across the differenced groups).

Panel A: Summary statistics of added, deleted, and Revised Chronology episodes

	Added	Deleted	Revised Chronology	Revised Chronology (Bank equity decline < -30%)
Bank equity decline	-0.572	-0.101	-0.344	-0.446
Abnormal bank equity decline	-0.407	-0.159	-0.352	-0.443
Bank market cap decline	-0.530	-0.077	-0.424	-0.528
Real GDP decline (pk to tr)	-0.074	-0.024	-0.052	-0.060
Real GDP growth decline (pk to tr)	-0.083	-0.055	-0.084	-0.089
Real GDP growth (max dev from trend)	-0.071	-0.037	-0.059	-0.063
Failed banks (% of total bank assets)	0.322	0.025	0.292	0.301
NPL at peak	0.113	0.046	0.152	0.149
Decline in deposits (pre-war only)	-0.143	-0.056	-0.191	-0.199
Significant liability guarantees	1.000	0.346	0.547	0.631
Significant liquidity support	0.750	0.273	0.750	0.817

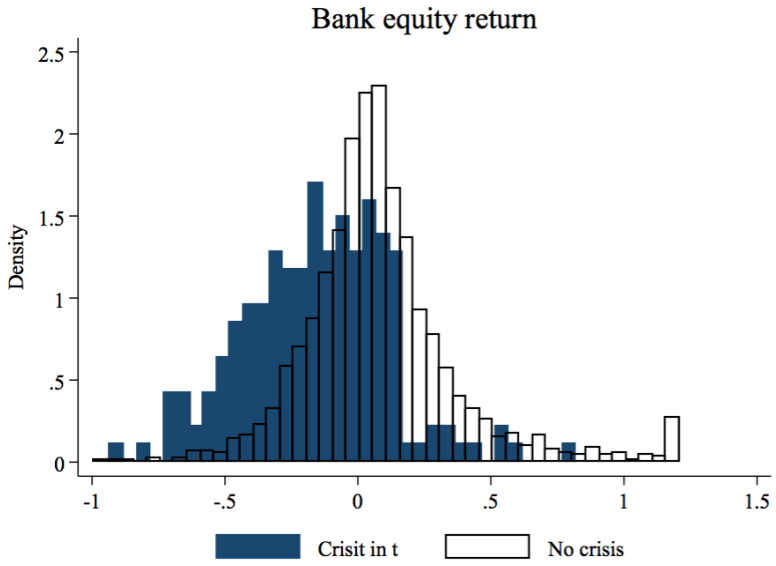
Panel B: Comparison of Reinhart and Rogoff episodes with Revised Chronology episodes

	Reinhart Rogoff	Difference with Revised Chronology		Difference with Revised Chronology having Bank Eq Decline < -30%	
Bank equity decline	-0.288	0.056	[6.17]	0.158	[17.80]
Abnormal bank equity decline	-0.310	0.043	[3.01]	0.134	[8.57]
Bank market cap decline	-0.326	0.098	[5.07]	0.201	[10.37]
Real GDP decline (pk to tr)	-0.045	0.008	[2.40]	0.015	[4.27]
Real GDP growth decline (pk to tr)	-0.080	0.005	[1.82]	0.009	[3.23]
Real GDP growth (max dev from trend)	-0.055	0.005	[2.19]	0.009	[3.53]
Failed banks (% of total bank assets)	0.252	-0.041	[-1.89]	-0.049	[-2.05]
NPL at peak	0.144	-0.008	[-0.84]	-0.006	[-0.54]
Decline in deposits (pre-war only)	-0.164	0.028	[2.01]	0.035	[2.35]
Significant liability guarantees	0.504	-0.043	[-1.39]	-0.127	[-3.66]
Significant liquidity support	0.681	-0.069	[-2.55]	-0.136	[-4.51]

Appendix Tables and Figures

Figure A1: Distribution of bank and non-financial equity returns

This figure presents histograms of bank equity and non-financial equity returns during years identified by the Joint Crisis List as crisis years and other years. Bank and non-financial equity returns are annual total returns. The figure shows that the bank equity return distribution for Joint Crisis List years relative to non-crisis years is shifted further left and more skewed left. These patterns are qualitatively similar but quantitatively weaker for the non-financial equity return distribution.



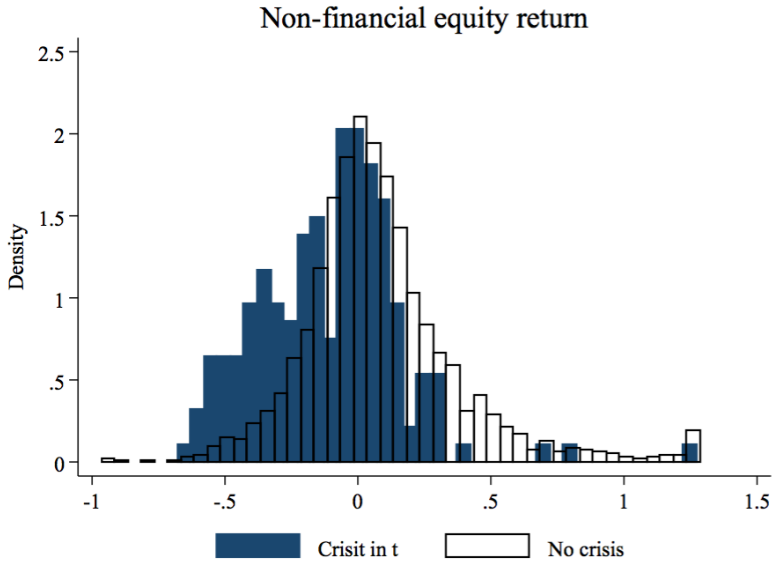
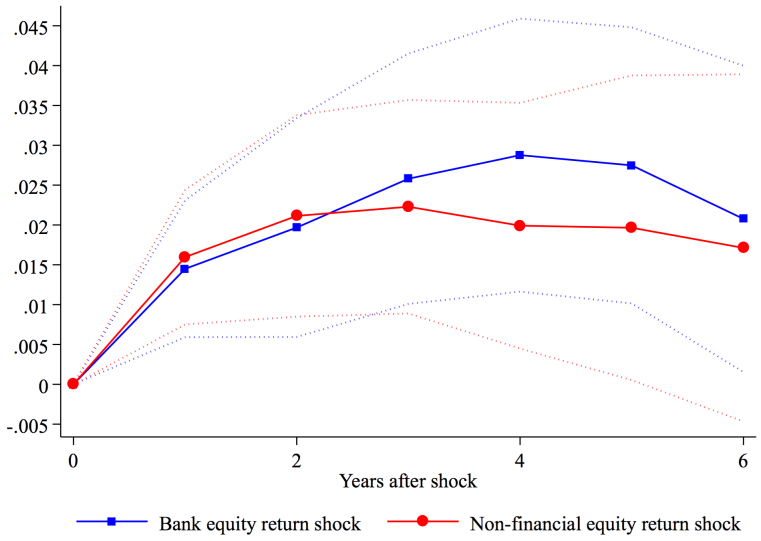


Figure A2: Bank equity continuous *continuous* returns and subsequent macroeconomic outcomes

This figure presents the responses of real GDP (panel a) and credit-to-GDP (panel b) to innovations in bank and non-financial equity returns. The responses are estimated using local projections. The specification controls for country and year fixed effects, lags in bank and non-financial equity returns, and contemporaneous and lagged real GDP growth and credit-to-GDP change. The dashed lines represent 95% confidence intervals based on standard errors dually clustered on country and year.

(A) Real GDP



(B) Credit-to-GDP

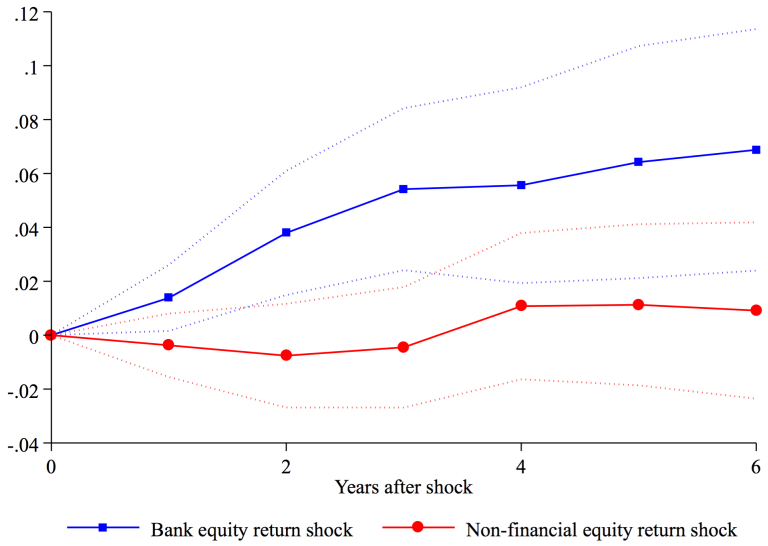
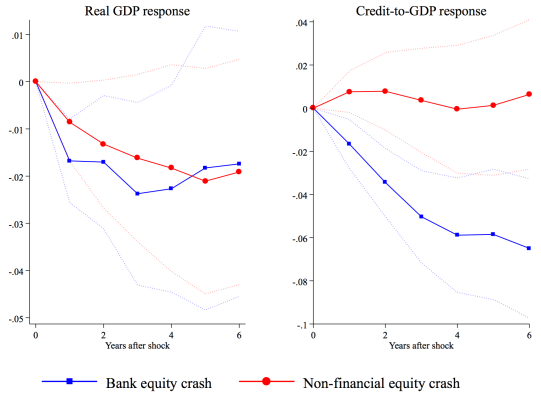


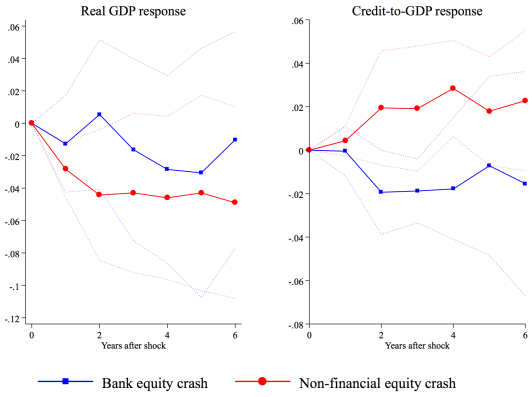
Figure A3: Bank equity crashes and subsequent macroeconomic outcomes: Subsample analysis

The dashed lines represent 95% confidence intervals based on standard errors dually clustered on country and year.

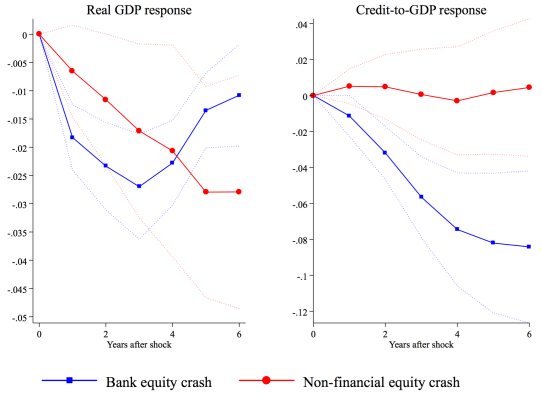
(A) Excluding the Great Depression and Great Recession



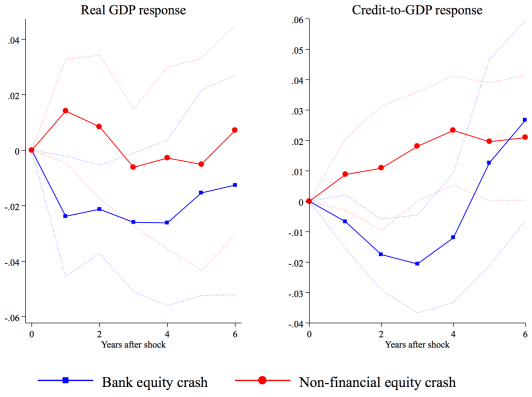
(B) Pre-WWII subsample



(C) Post-WWII subsample



(D) 1946-1973



(E) 1974-2016

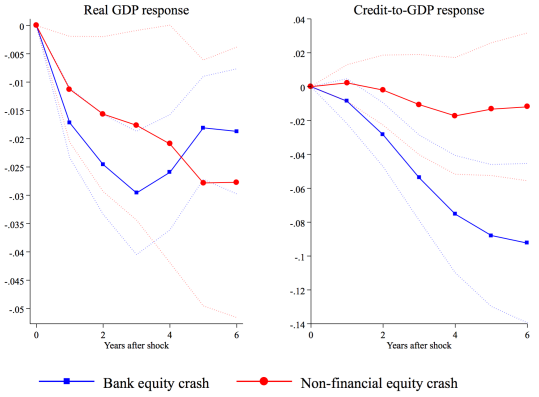


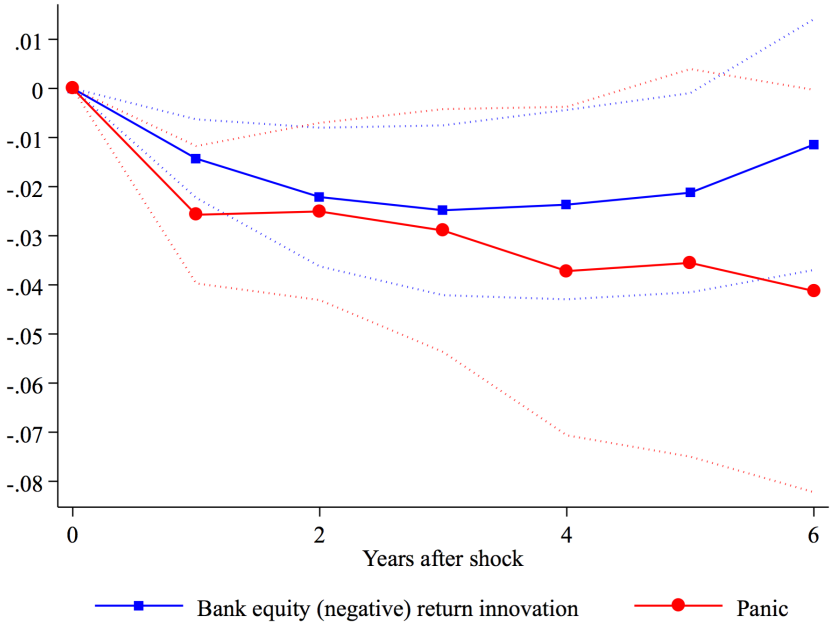
Figure A4: Bank equity negative *continuous* returns and panics

This figure presents local projection impulse responses estimated using

$$\Delta_h y_{i,t+h} = \alpha_i + \sum_{j=0}^{4}[\beta_j^h(-r_{i,t-j}^B) + \gamma_j^h Panic_{i,t-j}] + \sum_{j=0}^{4}\Gamma X_{i,t-j} + \epsilon_{i,t+h}, \quad h = 1, 2, \ldots.$$

The dashed lines represent 95% confidence intervals based on standard errors dually clustered on country and year.

(A) Real GDP response



(B) Credit-to-GDP response

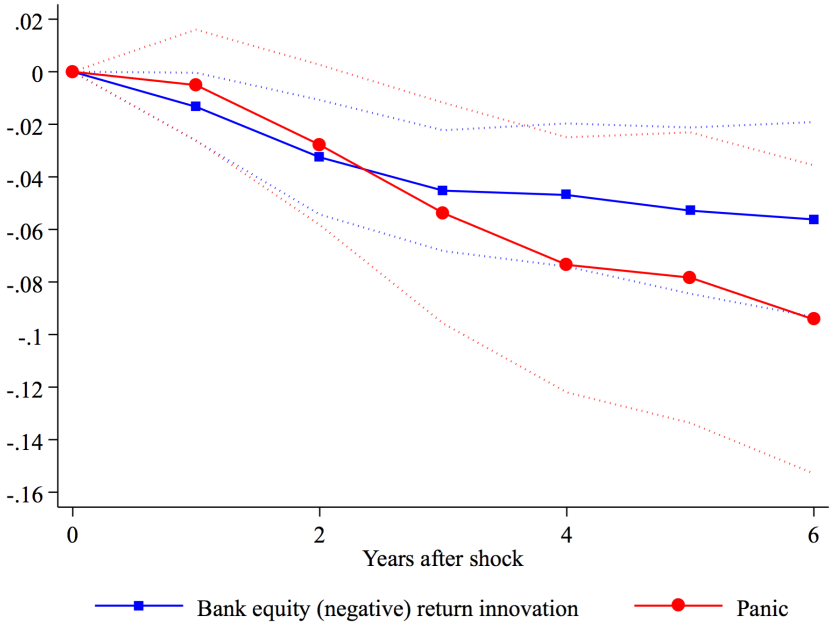
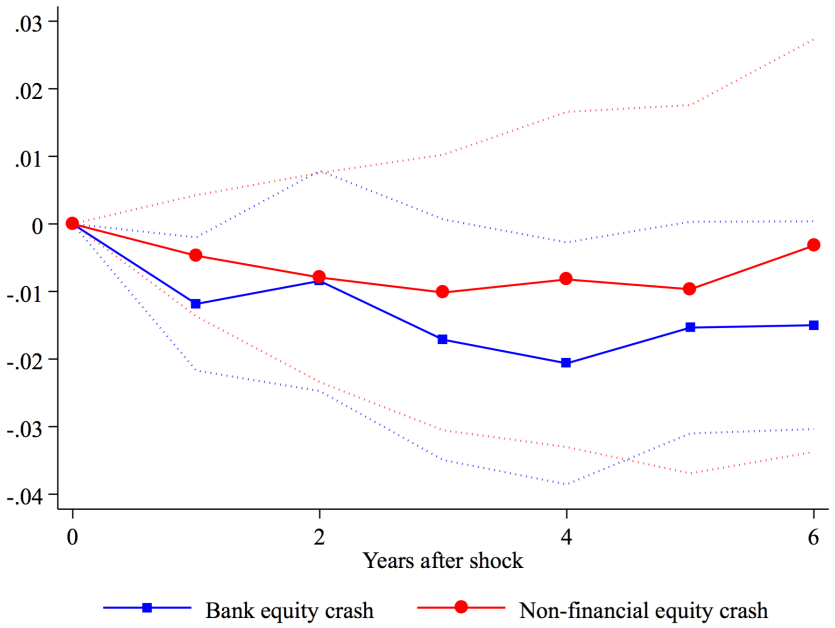


Figure A5: Bank equity crashes *outside* of narrative crises

This figure shows that bank equity crashes predict real output and credit contraction even outside of narrative banking crisis episodes. We estimate local projection impulse responses to 30% bank equity crashes, excluding observations with a narrative crisis on the Revised Crisis List in $t-2, ..., t, ..., t+2$. The dashed lines represent 95% confidence intervals based on standard errors dually clustered on country and year.

(A) Real GDP response outside of narrative crises



(B) Credit-to-GDP response outside of narrative crises

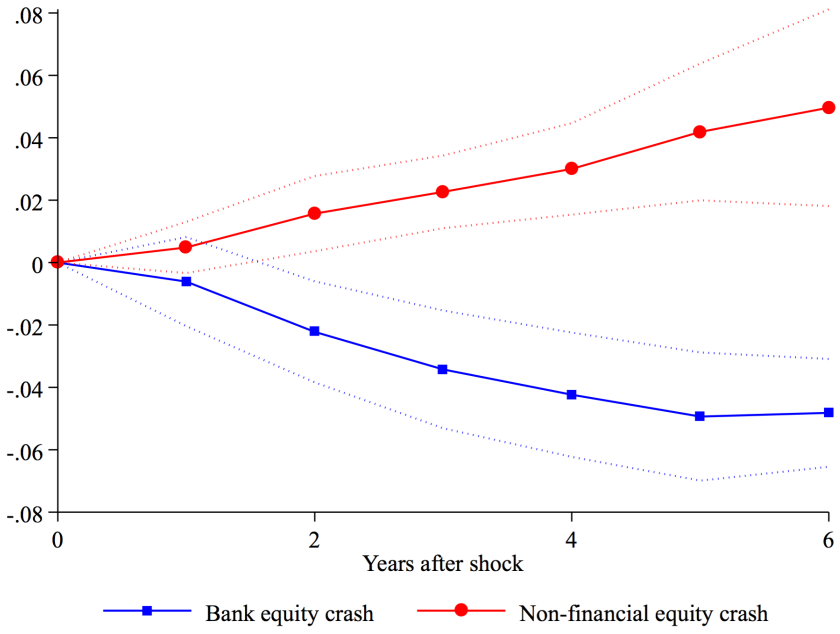


Figure A6: Bank equity declines and the Great Depression

This figure plots the peak-to-trough decline in real GDP against the peak-to-trough bank equity decline over the period 1929-1933. Note that this figure plots *all* countries in the sample for which data is available, not just those that experienced banking crises.

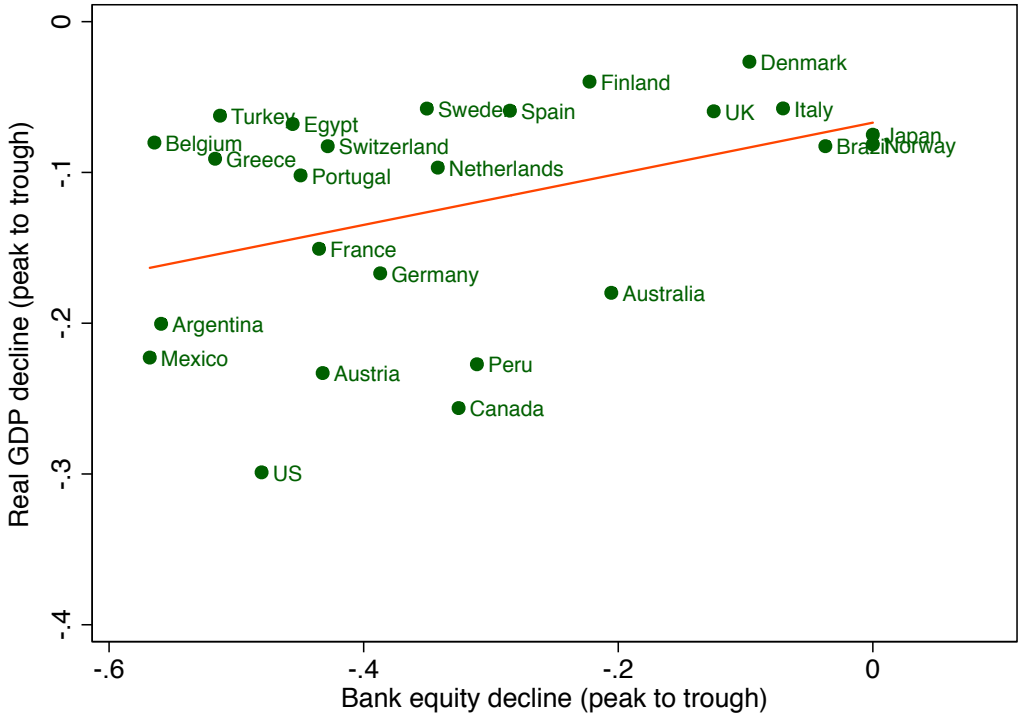


Table A1: Sample period by country

The table lists the starting year of the bank equity real total returns index for each country in the sample. The ending year is 2016 for all countries, though there are gaps in the data corresponding to wars, stock market closures, and other reasons.

Country	First year	Country	First year
Argentina	1870	Japan	1898
Australia	1870	Korea	1975
Austria	1870	Luxembourg	1872
Belgium	1870	Malaysia	1970
Brazil	1870	Mexico	1885
Canada	1870	Netherlands	1873
Chile	1891	New Zealand	1870
Colombia	1927	Norway	1915
Czech	1922	Peru	1870
Denmark	1870	Philippines	1952
Egypt	1870	Portugal	1921
Finland	1913	Russia	1872
France	1870	Singapore	1967
Germany	1872	South Africa	1870
Greece	1870	Spain	1874
Hong Kong	1870	Sweden	1891
Hungary	1870	Switzerland	1870
Iceland	2000	Taiwan	1987
India	1870	Thailand	1975
Indonesia	1990	Turkey	1870
Ireland	1870	UK	1870
Israel	1967	US	1870
Italy	1870	Venezuela	1949

Table A2: The Joint Crisis List and associated peak-to-trough bank index returns

Argentina	1885						1885	no decline
Argentina	1890			1890			1890	-0.307
Argentina	1914			1914			1914	-0.473
Argentina	1931			1931			1931	-0.916
Argentina	1934			1934			1934	-0.921
Argentina	1980		1980	1980	1980	1980	1980	
Argentina	1985		0	0	0	0	1985	
Argentina	1989		1989	1989	1989	1989	1989	
Argentina	1995		1995	1995	1995	1995	1995	-0.305
Argentina	2001		2001		2001	2001	2001	-0.673
Australia	1893	1893		1893			1893	-0.469
Australia	1931	0		0			1931	-0.23
Australia	1989	1989	0	1989	1989	0	1989	-0.281
Austria	1873						1873	-0.593
Austria	1924						1924	-0.973
Austria	1929						1929	-0.64
Austria	1931						1931	-0.566
Austria	2008		2008				2008	-0.673
Belgium	1870	1870					1870	-0.307
Belgium	0	1885					1885	
Belgium	1914	0		1914			1914	-0.15
Belgium	1925	1925		1925			1925	-0.25
Belgium	1931	1931		1931			1931	-0.816
Belgium	1934	1934		1934			1934	-0.831
Belgium	1939	1939		1939			1939	-0.737
Belgium	2008	2008	2008				2008	-0.842
Brazil	1890			1890			1890	-0.021
Brazil	1897			1897			1897	-0.011
Brazil	1900			1900			1900	-0.099
Brazil	1914			1914			1914	-0.374
Brazil	1923			1923			1923	-0.514
Brazil	1926			0			1926	-0.25
Brazil	1929			0			1929	-0.182
Brazil	1963			1963			1963	-0.841
Brazil	1985		0	0	0	0	1985	
Brazil	1990		1990	1990	1990	1990	1990	
Brazil	1994		1994	1994	1994	1994	1994	no decline
Canada	1873	0					1873	no decline
Canada	1906	0					1906	-0.081
Canada	1908	1907					1907	-0.081
Canada	1912	0					1912	-0.081
Canada	1923	0		1923			1923	-0.426
Canada	1983	0	0	1983	1982	0	1983	-0.164
Chile	1890			1889			1890	-0.075
Chile	1898			1898			1898	-0.254
Chile	1907			1907			1907	
Chile	1914			1914			1914	
Chile	1926			1925			1925	no decline
Chile	1976		1976	1976	1976		1976	-0.724
Chile	1980		1981	1981	1981	1981	1980	-0.526

	Reinhart Rogoff	Schularick Taylor	Laeven Valencia	Bordo	Caprio Klingebiel	Demirguc-Kunt Detrag.	Joint Crisis List	Bank Total Return
Colombia	1982		1982	1982	1982	1982	1982	-0.737
Colombia	1998		1998	0	0	1999	1998	-0.813
Czech	1931						1931	-0.099
Czech	1991		1996		1991		1991	
Denmark	1877	1877					1877	-0.207
Denmark	1885	1885		1885			1885	-0.043
Denmark	1902	0		0			1902	-0.022
Denmark	1907	1908		1907			1907	-0.269
Denmark	1914	0		1914			1914	-0.329
Denmark	1921	1921		1921			1921	-0.406
Denmark	1931	1931		1931			1931	-0.143
Denmark	1987	1987	0	1987	1987	0	1987	-0.193
Denmark	2008	2008	2008				2008	-0.739
Egypt	1907						1907	-0.132
Egypt	1931						1931	-0.608
Egypt	1980		1980	1981	1980s	0	1980	
Egypt	1990		0	1991	1991	0	1990	
Finland	0	1877					1877	
Finland	1900	1900		1900			1900	
Finland	1921	1921		1921			1921	-0.9
Finland	1931	1931		1931			1931	-0.252
Finland	1939	0		1939			1939	-0.329
Finland	1991	1991	1991	1991	1991	1991	1991	-0.814
France	1871						1871	-0.364
France	1882	1882		1882			1882	-0.456
France	1889	1889		1889			1889	-0.475
France	1904	0		0			1904	-0.008
France	1907	0		1907			1907	-0.049
France	1914	0		0			1914	-0.475
France	1930	1930		1930			1930	-0.571
France	1939	0		0			1939	-0.498
France	1994	0	0	1994	1994	0	1994	-0.412
France	2008	2008	2008				2007	-0.64
Germany	0	1873					1873	-0.286
Germany	1880	0					1880	-0.371
Germany	1891	1891		0			1891	-0.23
Germany	1901	1901		1901			1901	-0.05
Germany	0	1907		0			1907	-0.051
Germany	1925	0		0			1925	-0.487
Germany	1929	1931		1931			1929	-0.531
Germany	1977	0	0	0	late 1970s		1977	-0.334
Germany	2008	2008	2008		0		2007	-0.728
Greece	1931			1931			1931	-0.727
Greece	1991		0	1991	1991	0	1991	-0.391
Greece	2008		2008				2008	-0.798
Hong Kong	1982		0	1982	1982		1982	-0.31
Hong Kong	1983		0	1983	1983		1983	-0.445
Hong Kong	1998		0		1998		1998	-0.464
Hungary	1931						1931	

	Reinhart Rogoff	Schularick Taylor	Laeven Valencia	Bordo	Caprio Klingebiel	Demirguc-Kunt Detrag.	Joint Crisis List	Bank Total Return
Hungary	1991		1991		1991	0	1991	
Hungary	2008		2008				2008	-0.671
Iceland	1985		0	1985	1985	0	1985	
Iceland	1993		0	1993	1993	0	1993	
Iceland	2007		2008				2006	-0.935
India	1908						1908	-0.162
India	1913						1913	-0.531
India	1921						1921	-0.073
India	1929						1929	
India	1947						1947	
India	1993		1993	1993	1993	1991	1991	-0.355
Indonesia	1992		0	0	0	1992	1992	-0.659
Indonesia	1994		0	1994	1994	0	1994	-0.659
Indonesia	1997		1997	1997	1997	1997	1997	-0.88
Ireland	2007		2008				2007	-0.918
Israel	1977		1977	1977	1977	0	1977	-0.479
Israel	1983		0	counted above	counted above	1983	1983	-0.499
Italy	0	1873					1873	-0.305
Italy	1887	1887					1887	-0.348
Italy	1891	0		1891			1891	-0.532
Italy	1893	1893		1893			1893	-0.644
Italy	1907	1907		1907			1907	-0.24
Italy	1914	0		1914			1914	-0.404
Italy	1921	1921		1921			1921	-0.711
Italy	1930	1930		1930			1930	-0.328
Italy	1935	1935		1935			1935	
Italy	1990	1990	0	1990	1990	1990	1990	-0.298
Italy	2008	2008	2008				2007	-0.575
Japan	1872	1871					1871	
Japan	1882	0					1882	
Japan	0	1890		0			1890	
Japan	1901	0		1901			1901	-0.221
Japan	1907	1907		1907			1907	-0.377
Japan	1914	0		0			1914	-0.377
Japan	1917	0		1917			1917	-0.383
Japan	0	1920		0			1920	-0.568
Japan	1923	0		0			1923	-0.547
Japan	1927	1927		1927			1927	-0.3
Japan	1992			1992	1991	1992	1991	-0.546
Japan	counted above	1997	1997	counted above	counted above	counted above	1997	-0.726
Korea	1983		0	0	0	0	1983	-0.326
Korea	1986		0	0	0	0	1986	-0.326
Korea	1997		1997	1997	1997	1997	1997	-0.814
Luxembourg			2008				2008	-0.474
Malaysia	1985		0	1985	1985	1985	1985	-0.368
Malaysia	1997		1997	1997	1997	1997	1997	-0.686
Mexico	1883						1883	

	Reinhart Rogoff	Schularick Taylor	Laeven Valencia	Bordo	Caprio Klingebiel	Demirguc-Kunt Detrag.	Joint Crisis List	Bank Total Return
Mexico	1893						1893	-0.325
Mexico	1908						1908	-0.029
Mexico	1913						1913	-0.596
Mexico	1920						1920	-0.562
Mexico	1929						1929	-0.878
Mexico	1981		1981	1981	1981	0	1981	
Mexico	1982		counted above	0	counted above	1982	1982	
Mexico	1992		0	0	0	0	1992	no decline
Mexico	1994		1994	1995	1994	1994	1994	-0.602
Netherlands	0	1893		0			1893	no decline
Netherlands	1897	0		1897			1897	no decline
Netherlands	0	1907		0			1907	-0.083
Netherlands	1914	0		1914			1914	-0.093
Netherlands	1921	1921		1921			1921	-0.262
Netherlands	1939	1939		1939			1939	-0.366
Netherlands	2008	2008	2008				2008	-0.562
New Zealand	1890						1890	-0.549
New Zealand	1893						1893	-0.565
New Zealand	1987		0	1987	1987	0	1987	-0.901
Norway	1898	1899		0			1898	
Norway	1914	0		0			1914	-0.176
Norway	1921	1922		1921			1921	-0.791
Norway	1927	0		0			1927	-0.084
Norway	1931	1931		1931			1931	-0.084
Norway	1936	0		0			1936	-0.079
Norway	1987	1988	1991	1987	1987	1987	1987	-0.464
Peru	1872						1872	no decline
Peru	1983		1983	1983	1983	1983	1983	-0.98
Peru	1999		0		0	0	1999	-0.396
Philippines	1981		1983	1983	1981	1981	1981	-0.719
Philippines	1997		1997		1998	1998	1997	-0.524
Portugal	1890	1890		1891			1890	
Portugal	1920	1920		1920			1920	-0.643
Portugal	1923	1923		1923			1923	-0.907
Portugal	1931	1931		1931			1931	-0.603
Portugal	0	0	0	0	0	1986	1986	-0.119
Portugal	2008	2008	2008				2008	-0.668
Russia	1875						1875	-0.188
Russia	1896						1896	-0.162
Russia	1995		0		1995	0	1995	
Russia	1998		1998		1998	0	1998	-0.751
Russia	2008		2008				2008	-0.723
Singapore	1982		0	1982	1982		1982	-0.236
South Africa	1877						1877	
South Africa	1881						1881	
South Africa	1890						1890	
South Africa	1977		0	1977	1977		1977	-0.527
South Africa	0		0	0	0	1985	1985	-0.472

	Reinhart Rogoff	Schularick Taylor	Laeven Valencia	Bordo	Caprio Klingebiel	Demirguc-Kunt Detrag.	Joint Crisis List	Bank Total Return
South Africa	1989		0	0	1989	0	1989	-0.492
Spain	0	1883					1883	-0.4
Spain	0	1890		0			1890	-0.124
Spain	0	1913		0			1913	-0.038
Spain	1920	1920		1920			1920	-0.32
Spain	1924	1924		1924			1924	-0.293
Spain	1931	1931		1931			1931	-0.336
Spain	1977	1977	1977	1977	1977		1977	-0.84
Spain	2008	2008	2008				2008	-0.466
Sweden	1876	1878					1876	
Sweden	1897	0		1897			1897	-0.183
Sweden	1907	1907		1907			1907	-0.192
Sweden	1922	1922		0			1922	-0.669
Sweden	1931	1931		1931			1931	-0.431
Sweden	1991	1991	1991	1991	1991	1990	1991	-0.787
Sweden	2008	2008	2008				2008	-0.519
Switzerland	1870	1870					1870	-0.418
Switzerland	1910	1910		0			1910	-0.097
Switzerland	1921	0		0			1921	-0.534
Switzerland	1931	1931		1931			1931	-0.559
Switzerland	1933	0		1933			1933	-0.559
Switzerland	0	1991	0	0	0	0	1991	-0.502
Switzerland	2008	2008	2008				2007	-0.676
Taiwan	1923						1923	
Taiwan	1927						1927	
Taiwan	1983			1983	1983	0	1983	
Taiwan	1995			1995	1995	0	1995	-0.748
Taiwan	1997			1997	1997	1997	1997	-0.748
Thailand	1979		0	0	0		1979	-0.461
Thailand	1983		1983	1983	1983	1983	1983	-0.461
Thailand	1996		1997	1997	1997	1997	1996	-0.734
Turkey	1931						1931	-0.719
Turkey	1982		1982	1982	1982	1982	1982	-0.409
Turkey	1991		0	0	0	1991	1991	-0.758
Turkey	1994		0	1994	1994	1994	1994	-0.758
Turkey	2000		2000		2000	2000	2000	-0.716
U.K.	1878	0					1878	-0.132
U.K.	1890	1890		1890			1890	-0.055
U.K.	1908	0		0			1908	-0.011
U.K.	1914	0		0			1914	-0.219
U.K.	1974	1974	0	1974	1974		1974	-0.737
U.K.	1984	0	0	0	1980s-90s	0	1984	-0.215
U.K.	1991	1991	0	0	0	0	1991	-0.147
U.K.	1995	0	0	0	0	0	1995	-0.159
U.K.	2007	2007	2007				2007	-0.638
U.S.	1873	1873					1873	-0.172
U.S.	1884	0		1884			1884	-0.029
U.S.	1890	0		0			1890	-0.016
U.S.	1893	1893		1893			1893	-0.29

	Reinhart Rogoff	Schularick Taylor	Laeven Valencia	Bordo	Caprio Klingebiel	Demirguc-Kunt Detrag.	Joint Crisis List	Bank Total Return
U.S.	1907	1907		1907			1907	-0.495
U.S.	1914	0		1914			1914	-0.334
U.S.	1929	1929		1930			1929	-0.653
U.S.	1984	1984	1988	1984	1984	1980	1984	-0.261
U.S.	counted above	counted above	counted above	0	counted above	counted above	1990	-0.332
U.S.	2007	2007	2007				2007	-0.676
Venezuela	1978		0	1978	late 1970s		1978	-0.294
Venezuela	1993		1994	1994	1994	1993	1993	-0.839
Venezuela	2009		0				2009	-0.614

Table A3: Alternative measures of bank equity declines

This table is similar to Table 2 but uses alternate measures of bank equity declines as the independent variable. In Panel A, the independent variable is abnormal bank equity decline, which is defined as the peak-to-trough decline of the bank equity total return minus nonfinancial equity total return. In Panel B, the independent variable is bank market capitalization decline, defined as the peak-to-trough decline in an index defined by annual returns of (1+bank equity price returns)*(1+bank equity new issuance). Panel C has two independent variables: bank equity decline and bank equity recovery (positive returns in the bank equity total returns index subsequent to the trough within three years after a banking crisis).

Panel A: Abnormal bank equity decline (i.e. bank equity minus non-financial equity returns)

	Real GDP (peak-to-trough decline)	Real GDP growth (%.-pt. decline, peak-to-trough)	Real GDP growth (max deviation from trend)
	(1)	(2)	(3)
Abnormal bank decline	0.0550***	0.0464***	0.0376***
	[3.148]	[3.371]	[3.155]
Post-1945 dummy	✓	✓	✓
R^2 (within)	0.0789	0.0593	0.0580
N	175	175	175

Panel B: Bank market capitalization decline

	Real GDP (peak-to-trough decline)	Real GDP growth (%.-pt. decline, peak-to-trough)	Real GDP growth (max deviation from trend)
	(1)	(2)	(3)
Bank market cap decline	0.109***	0.0829***	0.0763***
	[4.046]	[4.912]	[5.181]
Post-1945 dummy	✓	✓	✓
R^2 (within)	0.288	0.273	0.240
N	78	78	78

Panel C: Bank equity recoveries

	Real GDP (peak-to-trough decline)	Real GDP growth (%.-pt. decline, peak-to-trough)	Real GDP growth (max deviation from trend)
	(1)	(2)	(3)
Bank equity decline	0.132***	0.114***	0.0799***
	[4.077]	[4.965]	[3.879]
Bank equity recovery	-0.00395	-0.0224	-0.0197
	[-0.142]	[-1.052]	[-0.950]
Post-1945 dummy	✓	✓	✓
R^2 (within)	0.165	0.177	0.134
N	183	183	183

Table A4: Bank equity crashes and subsequent GDP and credit growth: Subsample analysis

A bank (non-financial) equity crash is defined as 30% year-on-year decline in the bank (non-financial) equity total return index. Controls refers to contemporaneous real GDP growth and credit-to-GDP change, as well as three lags in bank equity crash, non-financial equity crash, credit-to-GDP change, and real GDP growth. t-statistics in brackets are computed from standard errors dually clustered on country and year. *,**,*** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Real GDP growth from year t to $t+3$

	Pre-1939		1946-1973		1974-2016	
	(1)	(2)	(3)	(4)	(5)	(6)
Bank equity crash	-0.0075	0.011	-0.030***	-0.026**	-0.042***	-0.030***
	[-0.20]	[0.48]	[-2.83]	[-2.04]	[-5.09]	[-5.32]
Non-financial equity crash	-0.051	-0.050**	-0.025**	-0.0062	-0.015	-0.018**
	[-1.30]	[-2.32]	[-1.96]	[-0.57]	[-1.62]	[-2.06]
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls		✓		✓		✓
Year fixed effects		✓		✓		✓
R^2 (within)	0.012	0.36	0.026	0.31	0.059	0.30
N	800	780	666	666	1396	1396

Panel B: Credit-to-GDP change from year t to $t+3$

	Pre-1939		1946-1973		1974-2016	
	(1)	(2)	(3)	(4)	(5)	(6)
Bank equity crash	-0.027	-0.0064	-0.020**	-0.021**	-0.096***	-0.054***
	[-1.19]	[-0.50]	[-2.21]	[-2.51]	[-5.30]	[-4.11]
Non-financial equity crash	0.026	0.013	0.014*	0.018**	0.0086	-0.011
	[0.95]	[0.83]	[1.92]	[1.97]	[0.72]	[-0.71]
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls		✓		✓		✓
Year fixed effects		✓		✓		✓
R^2 (within)	0.0038	0.37	0.0060	0.15	0.040	0.24
N	764	764	666	666	1384	1384

Table A5: Panic and non-panic bank equity crashes

Country	Year	Revised List Crisis	Panic	Bank eq. real total return	Nonfin. eq. real total return
Argentina	1931-33	1	1	-0.484	-0.012
Argentina	2000-01	1	1	-0.353	-0.134
Argentina	2008	0	0	-0.541	-0.366
Argentina	2011	0	0	-0.432	-0.211
Australia	1893	1	1	-0.441	-0.006
Australia	1974	0	1	-0.433	-0.321
Australia	2008	0	0	-0.422	-0.445
Austria	1873	1	1	-0.529	
Austria	1888	0	0	-0.361	
Austria	1920-2	0	0	-0.618	
Austria	1933	1	1	-0.372	-0.128
Austria	2008	1	1	-0.661	-0.553
Austria	2011	1	0	-0.509	-0.239
Belgium	1929-30	1	1	-0.391	-0.353
Belgium	1933	1	1	-0.368	-0.089
Belgium	2008	1	1	-0.814	-0.244
Belgium	2011	1	0	-0.674	-0.061
Brazil	1957	0	0	-0.397	-0.010
Brazil	1962-4	0	0	-0.431	0.649
Brazil	1998	0	0	-0.301	-0.362
Brazil	2008	0	0	-0.442	-0.470
Canada	2008	0	0	-0.358	-0.265
Chile	1931	1	1	-0.346	-0.222
Chile	1964	0	0	-0.332	-0.044
Chile	1970	0	0	-0.538	-0.470
Chile	1972	0	0	-0.488	-0.338
Chile	1982	1	1	-0.365	-0.273
Chile	1987	0	0	-0.323	0.327
Chile	1998	0	0	-0.336	-0.222
Colombia	1931	1	1	-0.675	-0.311
Colombia	1982, 1984-5	1	1	-0.316	-0.228
Colombia	1998, 2000	1	1	-0.459	-0.403
Colombia	2008	0	0	-0.383	-0.409
Czech	1995	1	1	-0.301	-0.144
Czech	1997-8	1	1	-0.330	-0.122
Denmark	2008	1	1	-0.694	-0.542
Denmark	2011	1	0	-0.444	-0.280
Egypt	1931	1	1	-0.454	
Finland	1921	1	1	-0.391	-0.391
Finland	1974	0	0	-0.346	-0.288
Finland	1990-2	1	1	-0.310	-0.349
Finland	2008	0	0	-0.487	-0.580
France	1882	1	1	-0.371	-0.163
France	1920	0	0	-0.313	-0.304
France	1931	1	1	-0.374	-0.200
France	1937	0	1	-0.305	-0.314
France	1974	0	0	-0.359	-0.451
France	1987	0	0	-0.412	-0.396

Country	Year	Revised List Crisis	Panic	Bank eq. real total return	Nonfin. eq. real total return
France	2008	1	1	-0.573	-0.435
France	2011	1	0	-0.424	-0.157
Germany	1920	0	0	-0.420	-0.337
Germany	1962	0	0	-0.308	-0.252
Germany	1987	0	0	-0.420	-0.315
Germany	2002	0	0	-0.422	-0.400
Germany	2008	1	1	-0.694	-0.509
Germany	2011	1	0	-0.346	-0.187
Greece	1920	0	0	-0.314	
Greece	1929, 1931	1	1	-0.313	-0.111
Greece	1973	0	0	-0.369	-0.262
Greece	1980	0	0	-0.365	-0.103
Greece	1983	0	0	-0.410	-0.350
Greece	1988	0	0	-0.380	-0.072
Greece	2001-2	0	0	-0.328	-0.262
Greece	2008	1	1	-0.671	-0.600
Greece	2010-1, 2014	1	1	-0.550	-0.188
Hong Kong	1892	1	1	-0.309	
Hong Kong	1974	0	0	-0.516	-0.619
Hong Kong	1982	1	1	-0.310	-0.447
Hong Kong	1988	0	0	-0.386	0.202
Hong Kong	1998	1	1	-0.464	-0.027
Hungary	1873, 1876	1	1	-0.439	
Hungary	1924-5	0	0	-0.955	
Hungary	1995	0	1	-0.398	-0.172
Hungary	2008	1	0	-0.667	-0.596
Hungary	2011	0	0	-0.349	-0.442
Iceland	2008	1	1	-0.930	-0.476
Iceland	2011	0	0	-0.355	-0.031
India	1920	1	1	-0.422	-0.455
India	1993	1	1	-0.355	0.013
India	1998	0	0	-0.380	-0.191
India	2011	0	0	-0.325	-0.361
Indonesia	1990-1	1	1	-0.356	-0.044
Indonesia	1998, 2000-2001	1	1	-0.834	0.287
Ireland	1974	0	0	-0.541	-0.077
Ireland	1990	0	0	-0.358	-0.307
Ireland	2007-8	1	1	-0.350	-0.362
Ireland	2010-1	1	1	-0.632	-0.068
Ireland	2016	0	0	-0.322	0.004
Israel	1983	1	0	-0.499	-0.676
Israel	1988	0	0	-0.305	-0.127
Israel	2002	0	0	-0.377	-0.206
Israel	2008	0	0	-0.546	-0.451
Israel	2011	0	0	-0.302	-0.153
Italy	1889	1	1	-0.301	
Italy	1921	1	1	-0.402	-0.323
Italy	1962	0	0	-0.312	-0.148
Italy	1974	0	0	-0.455	-0.386
Italy	1977	0	0	-0.400	-0.349

Country	Year	Revised List Crisis	Panic	Bank eq. real total return	Nonfin. eq. real total return
Italy	2001	0	0	-0.314	-0.147
Italy	2008	1	1	-0.520	-0.418
Italy	2011	1	0	-0.442	-0.276
Italy	2016	0	1	-0.304	0.071
Japan	1907	1	1	-0.377	-0.238
Japan	1920	1	1	-0.300	-0.465
Japan	1953	0	0	-0.662	-0.148
Japan	1990	1	0	-0.397	-0.397
Japan	1997	1	1	-0.364	-0.276
Japan	2001	0	0	-0.392	-0.148
Japan	2008	0	0	-0.425	-0.485
Korea	1997, 2000	1	1	-0.463	-0.318
Korea	2008	0	0	-0.471	-0.521
Luxembourg	1879	0	0	-0.487	
Luxembourg	1924, 1926-7	0	0	-0.494	
Luxembourg	1930	0	0	-0.308	-0.321
Luxembourg	2008	1	1	-0.474	-0.505
Luxembourg	2012, 2014	1	0	-0.592	0.115
Malaysia	1973-4	0	0	-0.643	-0.464
Malaysia	1997	1	1	-0.686	-0.529
Malaysia	2008	0	0	-0.349	-0.322
Mexico	1913	1	1	-0.415	-0.216
Mexico	1924	0	0	-0.350	0.055
Mexico	1930-1	1	1	-0.496	
Mexico	1994-5	1	1	-0.310	-0.230
Mexico	1998	0	0	-0.500	-0.465
Netherlands	2012	1	0	-0.345	0.344
New Zealand	1960	0	0	-0.323	0.280
New Zealand	1984	0	0	-0.631	0.105
New Zealand	1987, 1989	1	1	-0.563	-0.508
New Zealand	2000	0	0	-0.339	-0.120
New Zealand	2008	0	0	-0.622	-0.318
Norway	1920	1	1	-0.348	-0.307
Norway	1987, 1990-2	1	1	-0.338	-0.105
Norway	2008	0	1	-0.640	-0.476
Peru	1877	0	0	-0.409	
Peru	1931	1	1	-0.368	-0.070
Peru	1981-3	1	1	-0.758	-0.790
Peru	1987-90	0	0	-0.635	-0.560
Peru	1998, 2000	1	1	-0.358	-0.254
Peru	2014	0	0	-0.943	-0.391
Philippines	1971	0	1	-0.440	-0.566
Philippines	1981	1	1	-0.322	-0.353
Philippines	1997, 2000	1	1	-0.505	-0.419
Philippines	2008	0	0	-0.420	-0.542
Portugal	1921-2	1	1	-0.441	
Portugal	1923	1	1	-0.550	
Portugal	1931	1	1	-0.424	-0.165
Portugal	2008	1	1	-0.613	-0.478
Portugal	2011	1	0	-0.618	-0.244

Country	Year	Revised List Crisis	Panic	Bank eq. real total return	Nonfin. eq. real total return
Portugal	2014	0	0	-0.548	-0.224
Singapore	1973-4	0	0	-0.642	-0.544
South Africa	1969-70	0	0	-0.302	0.055
South Africa	2015	0	0	-0.851	-0.001
Spain	1977	1	1	-0.453	-0.422
Spain	1982	1	1	-0.305	-0.107
Spain	2008	1	1	-0.456	-0.384
Spain	2010	1	1	-0.300	-0.126
Sweden	1992	1	1	-0.594	0.231
Sweden	2008	1	1	-0.509	-0.453
Switzerland	1931	1	1	-0.412	-0.276
Switzerland	1974	0	0	-0.393	-0.397
Switzerland	1987	0	0	-0.381	-0.186
Switzerland	1990	1	1	-0.326	-0.192
Switzerland	2008	1	1	-0.590	-0.355
Taiwan	1990	0	0	-0.474	-0.597
Taiwan	1992	0	0	-0.318	-0.165
Taiwan	1995	1	1	-0.307	-0.192
Taiwan	1998	1	1	-0.360	0.067
Taiwan	2008	0	0	-0.335	-0.503
Thailand	1979	1	0	-0.307	-0.450
Thailand	1997, 2000	1	1	-0.569	-0.551
Thailand	2008	0	0	-0.479	-0.442
Turkey	1875-6	0	1	-0.356	
Turkey	1931, 1934	1	1	-0.536	
Turkey	1974	0	0	-0.525	
Turkey	1980	1	1	-0.325	
Turkey	1988	0	0	-0.564	-0.631
Turkey	1991-2	0	1	-0.634	-0.185
Turkey	1998	0	0	-0.573	-0.542
Turkey	2001	1	1	-0.622	-0.103
Turkey	2008	0	0	-0.485	-0.544
Turkey	2011	0	0	-0.307	-0.277
UK	1973-4	1	1	-0.403	-0.305
UK	2008	1	1	-0.552	-0.309
UK	2011	0	0	-0.321	-0.048
US	1907	1	1	-0.334	-0.366
US	1930-1	1	1	-0.372	-0.299
US	1937	0	0	-0.324	-0.362
US	1974	0	0	-0.404	-0.434
US	1990	1	0	-0.332	-0.097
US	2007-8	1	1	-0.320	0.111
Venezuela	1988-9	0	0	-0.389	-0.266
Venezuela	1992-3, 1985	1	1	-0.402	-0.481
Venezuela	1998-9	0	0	-0.444	-0.559
Venezuela	2008	1	1	-0.504	-0.236
Venezuela	2014	0	0	-0.331	-0.124

Table A6: Bank equity *continuous* returns and panics

This table is similar to Table 5, but replaces the bank and non-financial equity crash variables with the negative continuous return. t-statistics in brackets are computed from standard errors dually clustered on country and year. *,**,*** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Real GDP growth

	Real GDP growth$_{t,t+1}$		Real GDP growth$_{t,t+3}$	
	(1)	(2)	(3)	(4)
Bank equity (negative) return	-0.0173***	-0.0123***	-0.0290***	-0.0212**
	[-3.62]	[-2.82]	[-2.77]	[-2.56]
Non-financial equity (negative) return	-0.0219***	-0.0160***	-0.0161	-0.0222***
	[-3.49]	[-3.69]	[-1.57]	[-3.23]
Panic	-0.0344***	-0.0160***	-0.0484***	-0.0280***
	[-4.72]	[-2.64]	[-3.84]	[-2.95]
Country fixed effects	✓	✓	✓	✓
Controls		✓		✓
Year fixed effects		✓		✓
R^2	0.0959	0.321	0.0382	0.320
N	2960	2960	2960	2960

Panel B: Credit-to-GDP change

	Credit/GDP change$_{t,t+1}$		Credit/GDP change$_{t,t+3}$	
	(1)	(2)	(3)	(4)
Bank equity (negative) return	-0.0231**	-0.0148**	-0.0586***	-0.0446***
	[-2.23]	[-2.39]	[-3.77]	[-3.33]
Non-financial equity (negative) return	0.0163***	0.00467	0.0192	0.00405
	[2.59]	[0.80]	[1.60]	[0.40]
Panic	-0.00987	-0.00919	-0.0767***	-0.0566***
	[-0.91]	[-1.07]	[-3.33]	[-2.91]
Country fixed effects	✓	✓	✓	✓
Controls		✓		✓
Year fixed effects		✓		✓
R^2	0.0125	0.278	0.0390	0.246
N	2921	2921	2924	2924

Table A7: The information content of bank equity versus narrative approaches

This table compares the predictive effect of bank equity declines and narrative crises for GDP growth (Panel A) and the change in credit-to-GDP (Panel B). Narrative crisis is an indicator that equals one if a country-year is a narrative crisis based on the revised crisis list. All columns control for country fixed effects, and three lags of bank equity decline, non-financial equity decline, narrative crisis, GDP growth, and credit-to-GDP change. Columns 2 and 4 include year fixed effects. Columns 3 and 4 control for specific symptoms of banking crises. t-statistics in brackets are computed from standard errors dually clustered on country and year. *,**,*** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Real GDP growth

	(1)	(2)	(3)	(4)
Bank equity crash	-0.024***	-0.020***	-0.024***	-0.021***
	[-3.19]	[-2.94]	[-3.29]	[-3.09]
Non-financial equity crash	-0.020**	-0.019**	-0.019*	-0.018**
	[-1.97]	[-2.01]	[-1.92]	[-2.03]
Narrative crisis	-0.031**	-0.020*	-0.015	-0.0059
	[-2.07]	[-1.78]	[-0.77]	[-0.40]
Country fixed effects	✓	✓	✓	✓
Controls	✓	✓	✓	✓
Year fixed effects		✓		✓
Symptoms controls			✓	✓
R^2 (within)	0.067	0.31	0.070	0.32
N	2960	2960	2960	2960

Panel B: Credit-to-GDP change

	(1)	(2)	(3)	(4)
Bank equity crash	-0.042***	-0.041***	-0.042***	-0.040***
	[-4.28]	[-4.74]	[-4.44]	[-4.74]
Non-financial equity crash	0.014	0.0060	0.016*	0.0077
	[1.59]	[0.62]	[1.93]	[0.85]
Narrative crisis	-0.052***	-0.046**	-0.025	-0.025
	[-2.66]	[-2.41]	[-1.16]	[-1.17]
Country fixed effects	✓	✓	✓	✓
Controls	✓	✓	✓	✓
Year fixed effects		✓		✓
Symptoms controls			✓	✓
R^2 (within)	0.14	0.24	0.14	0.25
N	2924	2924	2924	2924

Table A8: Changes to start years of banking crises

This table lists other modifications made in constructing our revised chronology of banking crises. Panel A lists episodes from the Joint Crisis List which were deemed to be part of the same episode. Panel B lists changes in start dates of banking crises that were made by examining the year in which bank equity returns index declined -30% or more.

Panel A: Combined episodes for the revised chronology of banking crises

Country	Combined Events
Austria	1924 and 1926
Austria	1929 and 1931
Belgium	1931 and 1934
Hong Kong	1982 and 1983
Indonesia	1992 and 1994
Italy	1891 and 1893
Mexico	1981 and 1982
Mexico	1992 and 1994
Switzerland	1931 and 1933

Panel B: Changes in starting dates of banking crises

Country	Changes in starting date
Belgium	1931 $\rightarrow$ 1929
Chile	1980 $\rightarrow$ 1981
France	2007 $\rightarrow$ 2008
Germany	2007 $\rightarrow$ 2008
Iceland	2006 $\rightarrow$ 2008
India	1991 $\rightarrow$ 1993
Italy	2007 $\rightarrow$ 2008
Japan	1991 $\rightarrow$ 1990
Mexico	1920 $\rightarrow$ 1921
New Zealand	1890 $\rightarrow$ 1887
New Zealand	1893 $\rightarrow$ 1894
South Africa	1985 $\rightarrow$ 1984
Spain	1883 $\rightarrow$ 1882
Sweden	1876 $\rightarrow$ 1878
Switzerland	2007 $\rightarrow$ 2008
Thailand	1996 $\rightarrow$ 1997

Table A9: Additional episodes of minor bank distress from narrative accounts

This table lists additional episodes of minor bank disturbances that are not classified as banking crises on the Revised Crisis List (Table 9, Panel C) or as non-panic bank distress episodes in Table A5 (because the bank equity declines are less than -30% in magnitude). These episodes are listed purely for historical interest and are not analyzed in this paper. These episodes are generally instances of a single idiosyncratic bank failure or failures of many small banks that collectively do not rise to the level of a "widespread" crisis.

Country	Starting year of bank distress
Argentina	1985
Australia	1931
Belgium	1900, 1920, 1925
Brazil	1985
Canada	1873, 1887, 1891, 1901, 1905, 1912
Czech	1931
Denmark	1914, 1931, 1984
France	1991
Germany	1907, 1974
India	1938
Ireland	1885
Italy	1926, 1982, 1997
Netherlands	1981
Norway	1886, 1914, 1926
South Africa	1977, 1991
Spain	1990
Switzerland	1910
Turkey	1998
U.K.	1984, 1991, 1995
U.S.	1998