Identifying Banking Crises*

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Abstract

We identify historical banking crises in 46 countries over the period 1870 - 2016 using new historical data on bank equity returns. We argue bank equity crashes provide an objective, quantitative, and theoretically-motivated measure of banking crises. We validate our measure by showing that bank equity crashes line up well with other indicators of banking crises (e.g., panics, bank failures, government intervention). They also forecast long-run output gaps. Bank equity declines tend to pick up impending crises first before credit spread and nonfinancial equity measures. Nevertheless, crises gradually unfold in bank equity prices over one to three years, rather than in sudden Minsky moments. Our approach uncovers several newly-identified banking crises and removes spurious banking crises. Comparing our revised chronology to previous ones, the aftermath of banking crises appears more severe, especially when restricting to crises featuring large bank equity declines.

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I. Introduction

Banking crises are often associated with macroeconomic catastrophes. A growing body of empirical research attempts to identify banking crises in order to distill the key lessons from these crises for economic theory and policymaking, e.g., Reinhart and Rogoff (2009). This line of research has produced a number of stylized facts about their causes and consequences. Banking crises tend to be preceded by expansions in private-sector credit and associated with significantly larger output losses relative to "normal" recessions, greater contractions in bank lending, sharper declines in asset prices, and increases in government debt. The existing literature has primarily used narrative, qualitative, and backward-looking approaches to classify banking crisis. Bordo et al. (2001), Reinhart and Rogoff (2009), and Schularick and Taylor (2012) identify banking crises based on narrative information about events such as bank runs and large-scale government interventions. A related approach defines a crisis based on whether there is a significant banking policy intervention, e.g., Caprio and Klingebiel (2003), Demirgüç-Kunt and Detragiache (2005), Laeven and Valencia (2013).

These approaches have several limitations. Narrative-based approaches are biased to pick out the most sensationalized and salient crises and may overlook other important but forgotten historical events. In addition, because these approaches are backward looking, they are biased to pick out banking crises associated with the worst macroeconomic outcomes, which may overstate the negative real economic consequences of banking crises. The policy-intervention-based approaches are based on an endogenous policy response, but governments do not always respond to banking sector distress. Because these approaches are subjective, the various narrative-based classifications often disagree on whether episodes are actually banking crises. For example, Table 1 shows that there is striking disagreement regarding historical banking crises in Germany. Accounts for other countries display similar disagreement (see Appendix Table 2).

[INSERT TABLE 1 HERE]

In response to these concerns, Romer and Romer (2017) construct a quantitative, real-time, and systematic measure of financial distress from real-time country economic reports from the OECD for 25 advanced economies starting in 1967. This approach overcomes biases from backward-looking accounts. However, it is only available for recent decades and for OECD

countries. OECD accounts also may still be subjective, and they seem to still overlook some major crises (e.g., Spain 1977).

This paper adopts an alternative approach by using information from bank equity prices. Specifically, we define a *potential* banking crisis as an episode featuring a large crash in a country's bank equity index. We then combine our measure of banking sector distress based on bank equity prices with existing classifications of banking crises in order to provide a refined history of banking crises and shed new light on the connection between banking crises and business cycles. There are several advantages to using bank equity prices relative to existing approaches. First, bank equity prices are a *theoretically-motivated* measure of banking crises. Models of banking crises argue that the value of equity in the banking sector is the key state variable that determines banks' ability to intermediate funds from savers to firms and households, e.g., Holmstrom and Tirole (1997) and Gertler and Kiyotaki (2011). The market value of bank equity provides the best real-time proxy for the shadow value of bank equity in these theoretical models. Second, bank equity prices provide an *objective* measure of distress in the banking sector. In particular, our measure does not rely on subjective assessments about whether a period of banking sector instability constitutes a crisis. Third, bank stock prices provide *real-time* information and therefore do not suffer from biases inherent in any backward-looking classification scheme. Fourth, this measure provides a *quantitative* measure of banking sector distress that allows us to rank crises by their severity. While banking crises tend to be heterogeneous in how they unfold and how policy makers respond, bank equity index declines are arguably well-suited to quantitatively measure an important aspect of the crisis: the insolvency or under-capitalization of the banking sector as a whole.

Defining banking crises using bank stock crises is also consistent with methodology in the literature on currency crises, which defines a currency crisis as a large and sudden exchange rate depreciation, e.g., Frankel and Rose (1996). Interestingly, Reinhart and Rogoff (2009) also note that "the relative price of bank stocks (or financial institutions relative to the market) would be a logical indicator to examine."

To implement this approach, 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.

In addition, we also collect new narrative information on the symptoms of banking crises, such as deposit runs, bank failures, and government intervention, backed by over 400 pages of narrative documentation.

To validate our approach, we first establish that bank equity prices are strongly correlated with traditional symptoms of banking crises. We pool together banking crises from seven influential studies into a *Joint Crisis List* of roughly 300 banking crises. Within these existing banking crises, a larger decline in the bank equity return predicts an increase in the likelihood of government interventions to support the banking sector, such as liquidity support, liability guarantees, and bank nationalization. Larger declines in bank equity returns are also associated with deposit runs, non-performing loans, and bank failures. These facts confirm that bank equity returns capture the salient features of banking crises.

To further motivate the use of bank equity prices, we present evidence highlighting the informativeness of bank stock prices. Most importantly, larger declines in bank equity are associated with more severe recessions along a number of dimensions. This result confirms that our measure of bank equity quantitatively captures the severity of crises within existing classifications. Moreover, it is consistent with models that emphasize the importance of bank equity for aggregate outcomes. To explore whether the behavior of bank equity in the early phase of a crisis helps understand the real economic consequences of banking crises, we estimate Jorda (2005) local projections tracing out the future path of real output. We find that the degree of impairment to bank equity, rather than simply the occurrence of a banking crisis, forecasts long-run output gaps.

We demonstrate that the informativeness of bank equity is not driven by the general decline in equity markets during a banking crisis. In fact, our results are unchanged when using bank returns in excess of nonfinancial equity returns. This is due to the fact that bank equity reacts differently from nonfinancial equity to banking crises. In particular, we show that bank equity declines before nonfinancial equity, falls substantially more (even though, unconditional on a crisis, bank equity has a market beta of 0.8, so is actually less volatile than the market most of the time), and does not generally recover after the crisis, in contrast to nonfinancial equity, which does.

Why do we choose bank stock prices instead of other financial measures such as nonfinancial corporate or bank credit spreads? One reason is practical. Bank stock prices are

available for a broader set of countries for a longer range of time. Another reason is that bank equity is more sensitive than bank debt to information about bank net worth, e.g., Gorton and Pennacchi (1990). Empirically, we confirm this by documenting that bank equity price crashes recognize crises 2.6 months before a spike in bank credit spreads and 5.4 months before a spike in corporate credit spreads. Although this result follows from the standard credit risk model of Merton (1974) (i.e., bank shareholders take first losses, while creditors do so only later as banks approach default), regulators tend to focus on credit spreads as indicators of banking distress. Our findings suggest that bank equity measures may be more sensitive indicators, especially at the start of financial distress.

Having established that bank equity robustly captures the severity of existing banking crises, we refine the chronology of banking crises using our approach. Our goal is to combine the wealth of information in the narrative crisis lists with "hard" information from bank equity returns. One strategy would be to rely only on bank equity declines, as in the currency crisis literature. In practice, this approach produces a number of "false positives." Therefore, we refine the existing lists as follows. First, we uncover new banking crises that are not in existing databases but for which two criteria are satisfied: (i) there is a decline in the bank equity index of at least 30%, and (ii) there is an abundance of narrative evidence consistent with a banking crisis (featuring historical evidence of widespread bank failures or bank runs, which we document in great detail).[1] Using this method, we uncover a number of "forgotten" banking crises that are strongly backed by the historical narrative. Second, after combining the Joint Crisis List with these new crises, we remove spurious crises when *both* of the following criteria are met: (i) bank stock prices do not display a crash of at least 30%, and (ii) we cannot find evidence in the historical record that there were either widespread bank failures or bank runs. Many of these deleted episodes are typos or historical errors in previous approaches, while others are monetary or currency issues that had only minor effects on the banking sector. By adding new crises and removing spurious crises, we create a revised chronology of banking crises.

We showcase some features of our revised chronology of banking crises. We first highlight several interesting historical examples of added and deleted crises. We then compare our revised chronology to previous ones, and find that the aftermath of banking crises tends to be more severe,

[1] We define "widespread" to mean covering 25% or more of the banking sector, weighted by deposits or assets.

especially when restricting our chronology to crises featuring large bank equity declines. This is surprising, since the previous narrative-based approaches have been thought to be biased to pick out the most sensationalized and salient crises. The slight increase in severity is due in large part to the deletion of spurious crises. Finally, we revisit the banking crises of the Great Depression. Our bank stock evidence helps resolve historical debate about the presence and severity of banking crises in various countries during the Great Depression, and also helps assess the degree to which banking crises help explain the severity of the Great Depression.

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, and Section IV highlights 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: bank equity prices and dividends, other financial market variables, macroeconomic variables, indicator variables of "symptoms" of banking crises, and stock index returns and credit spread indexes for banks and non-financials. 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 dates of banking crises from seven prominent papers: Bordo (2001), Caprio and Klingebiel (2003) Demirguc-Kunt and Detragiache (2005), Laeven and Valencia (2013), Romer and Romer (2017)[2], Reinhart and Rogoff (2009, and online spreadsheets updated 2014)[3], and Schularick and Taylor (2012, online update 2017). We

[2] Specifically, Romer and Romer (2017) quantify episodes of "financial distress" rather than present a list of banking crises. We convert their measure into a list of banking crises by taking the starting year in which their distress measure is non-zero.

[3] 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.

use the most recent update of each paper. Starting dates of banking crises are generally year only, but quarters are used when the data is available.

These lists of crises and their starting dates are presented together in Appendix Table 1. We take the union of all these crisis dates as the Joint Crisis List that we will use throughout this paper. We will later refine the Joint Crisis List into a new list of banking crises presented in Section IV, but initially 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 IV, 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. For the starting dates of crises on the Joint Crisis List, we take the earliest date among the seven papers. This is to be a generous as possible in allowing these sources to pick up the crisis early on, when we compare these dates to the onset of crises as picked up by bank equity declines in Section III.E.

Bank stock returns. We construct a new historical dataset on bank equity prices and dividends for 46 advanced and emerging economies going back to 1870. 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) bank price return and dividend return indexes. (For a subsample, we also collect monthly bank equity total returns, which we describe at the end of this section.) 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 sector within each country. Each of these series is pieced together from a variety of sources, discussed below (with extensive documentation and source tables in Appendix A1). 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 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 all commercial banks listed in the following newspapers: *Journal de Bruxelles* for Belgium (1868-1935); *Dagens Nyheder* for Denmark (1868-1909); *De Telegraaf* 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 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 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); 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.

Other financial market variables. We make use of other financial market variables at the annual frequency. (Additional variables collected at the monthly frequency are discussed in the subsection below.)

First, we build real total return indexes for nonfinancial equity in each country. We then compute "bank abnormal returns" as the difference between bank real total returns and nonfinancial real total returns. We use "bank abnormal returns" to test if there's something special

about the predictive power of bank equity; our analysis show that our results are not simply driven by a general decline in equity prices but in particular by bank stocks.

We also construct a variable called “bank market capitalization returns”, which measures the change in the market equity value for the entire banking sector. Specifically, it is bank equity price returns plus bank equity issuance over the previous year. 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 after banking crises, as banks seek to recapitalize. An index of bank equity issuance is constructed for each country using new historical data and methodology from Baron (2017). Further details on constructing indexes of bank equity issuance can be found in the Appendix.

It is important to note that “bank abnormal returns” and “bank market capitalization returns” can only be constructed on a subsample of the data, due to historical data limitations. As a result, we only use these variables for robustness analysis.

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 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 is used to deflate returns to obtain real returns.

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, reported on an annual basis, include: real consumption per capita, investment to GDP, the broad money supply, government debt to GDP, total bank loans, 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 corresponds to the degree of undercapitalization of the 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. In Section III.A, we show that the severity of bank equity declines is correlated with the likelihood and severity of these “symptoms” and policy responses.

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:

- Major or systemic (1 if any of the seven prominent lists of banking crises label the crisis as major or systemic, or if a majority of the banks in the country suffer significant distress, 0 otherwise)
- 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)
- Peak liquidity support (liquidity provided to the banking sector, expressed as % of total bank deposits)
- Significant bank closures (1 if a number of significant banks are closed or absorbed by other institutions or the government because they are about to fail, 0 otherwise)
- Significant deposit runs (1 if a number of significant banks experience widespread and sustained deposit runs, 0 otherwise)
- Change 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)
- 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)
- Net cost of recapitalization (the loss to the government due to recapitalization efforts, may be negative if the government profits from its bank equity purchases)
- NPL at peak (the peak level of non-performing loans of the banking sector or of the largest banks)
- Fiscal cost (the increase in government spending and decrease in tax revenues due to the crisis, as % of GDP)
- 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)

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.

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 data. Due to data availability issues, the monthly data is a subset of the larger annual data set on bank stock returns.[4] Monthly data comes from Datastream, which covers the period 1980-2016 over a wide range of countries. Going back further historically, the monthly data only covers five countries (the U.S., U.K., France, Germany, and Denmark) due to the difficulty of hand-collecting over a hundred years of monthly data from historical records.

In particular, we construct four monthly series for each country: bank equity index returns, nonfinancial equity index returns, a bank credit spread index, and a nonfinancial corporate credit

[4] 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.

spread index. These indexes are generally created from individual stocks and bonds, with data on individual securities coming from Global Financial Data, *Investor's Monthly Manual*, the Denmark Statistical Yearbook (1896-1940), the German Statistical Yearbooks (1927-1934), the French newspaper *Le Temps* (1871-1939), the German newspaper *Berliner Borsen-Zeitung* (1871-1930), and the Danish newspaper *Dagens Nyheder* (1868-1896). Additional details on data construction can be found in the Appendix.

III. The informativeness of bank equity returns

In this section, we demonstrate that bank equity returns are an accurate and informative way of characterizing and studying banking crises. First, we validate the usefulness of bank equity declines by showing that they are highly correlated with the likelihood and severity of traditional symptoms of banking crises and policy responses like depositor runs, bank failures, and government intervention. Second, we show the informativeness of bank equity declines in the sense that they forecast the severity of banking crises in terms of various macroeconomic outcomes. Third, we further investigate the macroeconomic outcomes by estimating Jorda (2005) local projections, using measures of bank equity declines to show that a severe impairment to bank equity forecasts a long-run output gap. Fourth, we show stylized facts highlighting other advantages of bank stock prices, such as that they behave differently from nonfinancial equity around banking crisis and also that bank equity declines tend to pick up the impending start of a banking crisis before credit spread indicators.

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

We first 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. Recall the variables described in Section II, which relate to symptoms and policy responses of crises.

We estimate the following regression, with each of the observations being a single banking crisis from the Joint Crisis List:

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

where $y_{i,t}$ represents a host of common symptoms of banking crises and policy responses like bank failures and government intervention; 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 $r_{i,t}$ is the peak-to-trough decline 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 different regressions with different dependent variables differs due to data available of the dependent variable.

[INSERT TABLE 2 HERE]

Table 2 shows that bank equity peak-to-trough declines during banking crises are correlated with other symptoms of banking crises. Table 2 shows that banking crises with larger bank equity declines are associated with increased likelihood of the crisis: being labeled major or systemic, having a bank holiday declared, having significant liabilities guarantees, having significant liquidity support, having more bank failures, featuring widespread deposit runs, having banks nationalized, featuring government asset purchases, featuring government equity injections, and having large banks failings. In addition, banking crises with larger bank equity declines are associated with greater peak liquidity support, highly net cost of recapitalization, higher non-performing loans (NPLs) at peak, higher fiscal cost, more bank failures (both in terms of count and assets or deposits), and greater outflow of aggregate deposits from the banking system. 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.

B. Bank equity declines forecast the severity of crises

Next, we show the informativeness of bank equity declines in the sense that they forecast the severity of banking crises in terms of various macroeconomic outcomes. This section also tests a key hypothesis that the undercapitalization of the banking sector is a key driver of banking crises.

We re-estimate Equation 1, with each of the observations being a single banking crisis from the Joint Crisis List, as before. The dependent variable $y_{i,t}$ now represents a host of macroeconomic

variables (e.g., real GDP), all expressed as the peak-to-trough change during the banking crisis; the other variables remain the same as before.

[INSERT TABLE 3 HERE]

Panel A of Table 3 reports estimates from Equation 1 and 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% log peak-to-trough decline in bank equity returns is associated with a 12.9% peak-to-trough decline in real GDP, a 11.6 percentage point decline in the real GDP growth rate (peak-to-trough), and an 8.5 percentage point decline in the real GDP growth rate from its past 10-year average.

Panel B reports similar results, also estimated from Equation 1, for a host of macroeconomic variables, including real consumption per capita, investment to GDP, the broad money supply, government debt to GDP, total bank loans, total mortgages, and a house prices index. Note that the sample size of different columns varies due to data availability of the dependent variable. A 100% log peak-to-trough decline in bank stock prices is associated with a 9.7% percentage point decline in real consumption per capita, a 4.5% decline in investment to GDP, a 26.8% decline in the broad money suppply, a 23.4% percentage point increase in government debt to GDP, a 20.2% percentage point decline in total bank loans, and a 11.2% percentage point decline in house prices. The adjusted R^2 ranges between about 5-25%, demonstrating a reasonably high correlation between bank stock declines and macroeconomic outcomes.

Thus, we conclude that bank equity index declines during banking crises are correlated with the severity of the crisis, thus showing the informativeness of bank equity declines as a way to capture banking crises severity.

C. Alternative measures of bank equity declines

We next show the above results are robust to alternative measures of bank equity declines. One may be concerned, for example, that the bank equity decline simply reflects a general decline in equity markets, rather than something specific about bank equity. Therefore, in Table 4 Panel A, we show that our results are robust to replacing bank equity returns with *bank abnormal returns* (defined as bank equity total returns minus nonfinancial equity total returns).

[INSERT TABLE 4 HERE]

We start by pointing out that, around banking crises, the dynamics of bank equity declines are different from nonfinancial equity declines, a point we take up later in more detail in Section III.E. For example, the bank equity decline tends to precede the nonfinancial equity decline, is more severe in magnitude (even though, unconditional on a crisis, the bank equity index has a lower market beta, about 0.8), and, unlike the nonfinancial index, does not generally recover post-crisis. We present systematic evidence of these facts in Section III.E. These findings help explain the specialness of bank equity returns and the predictive content of *bank abnormal returns* reported in Table 4, Panel A.

Panel B re-estimates Equation 1 with *bank market capitalization returns* as the independent variable. Recall that this variable seeks to capture the change in the market value of equity within the banking sector. Specifically, 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. Given that theory (e.g. Bernanke, Gertler, and Gilchrist, 1999; Brunnermeier and Sannikov, 2014) links the net equity of the banking sector to macroeconomic outcomes, we should expect *bank market capitalization returns* to have the strongest predictability for output. Indeed, this is the case, as Panel B shows adjusted R^2 values in the range of 18% to 24%, substantially higher than the 10% to 14% in Table 2.

It is important to note that *bank abnormal returns* and *bank market capitalization returns* can only be constructed on a subsample of the data, due to historical data limitations on the

availability of nonfinancial equity indices and new bank equity issuance. As a result, we use these variables only for robustness analysis.

Panel C of Table 4 is similar to Table 3 but has an additional independent variable, the *bank equity recovery* (the positive returns in the bank equity total returns index subsequent to the trough within three years after a banking crisis). Rebounds in bank equity returns may be due to unexpected policy interventions or to the fact that the crisis may not have been as severe as initially perceived by equity investors. However, surprisingly, Panel C shows that the *bank equity recovery* has no forecasting power for economic output, a result which is robust to various other measures of bank equity recoveries.

D. Banking crises and long-term output gaps

To explore whether the behavior of bank equity in the early phase of a crisis helps understand the real economic consequences of the financial crises, we estimate the following Jorda (2005) local projection specification:

$$y_{i,t+h} - y_{i,t-1} = \sum_{j=0} \left[\beta_{0,j}^{h} * BC_{i,t-j} + \beta_{BE,j}^{h} * BC_{i,t-j} * BEDecline_{it-j} + \delta_{j}^{h} * \Delta y_{t-j-1}\right] + \alpha_{i}^{h} + \alpha_{t}^{h} + \epsilon_{it}^{h} \quad (2)$$

for h = 1,…,H. Here, BC is an indicator variable for a banking crisis from the Joint Crisis List, and $BEDecline$ is the bank equity real total return at time (t-j).[5] For our main specifications, we define large declines as episodes when the bank equity total return is below the median (10%) in the year of the crisis. Results are very similar (see Appendix Figure 1) if we replace $BEDecline$ with an indicator variable of a "large" bank equity declines ("large" meaning the bank equity decline is less than -30%), rather than using a continuous measure of bank equity decline.

[5] Note that, for Jorda local projections studied in this Subsection, we use the bank equity return at (t-j) to forecast output at future times (t+h). Although in most of the rest of the paper we use peak-to-trough bank equity declines, we use the bank equity return at (t-j) in this section both to accord with standard procedure for Jorda local projections and also to avoid the peak-to-trough return being contemporaneous or even ahead of the output decline. However, we show in Appendix Figure 1, Panel C, that the results are robust to using bank equity peak-to-trough declines.

Our baseline equation includes country fixed effects, to absorb differences in average growth rates across countries, and year fixed effects, to absorb common shocks. The sequence of coefficients $\beta_{0,0}^{h}$ and $\beta_{BE,0}^{h}$ trace out the response of real GDP to a financial crisis. Panel A plots $\beta_{0,0}^{h}$, reflecting the forecast of real GDP conditional on a banking crisis, and Panel B plots $\beta_{BE,0}^{h}$, reflecting real GDP conditional on a banking crisis interacted with the magnitude of the banking equity decline. Thus, Panel A can be roughly interpreted as the estimated response of real GDP for the average banking crisis, and Panel B as the additional response of real GDP when the bank equity decline is severe.

[INSERT FIGURE 2 HERE]

Figure 2 shows that financial crises are associated with large and significant declines in real economic activity. However, there is substantial heterogeneity across crisis episodes. Conditional on simply a banking crisis (Panel A), there is decline of output subsequent to the banking crisis of -4% (relative to a non-crisis period) that later recovers. In contrast, when bank equity declines more than average (Panel B), output falls by an additional 1.5% for each hypothetical 10% decline in bank equity below the average (since the trough in Panel B is about -15% and 15% * 10% = 1.5%), and remains below trend for over 15 years. The decline in bank equity in the year of the crisis therefore contains information about the real consequences of the crisis well into the future. These results show that a severe impairment to bank equity forecasts a long-run output gap.

E. Dynamics of bank equity prices around banking crises

We examine the dynamics around banking crises to showcase several other advantages of bank stock prices. One important finding is that bank equity declines tend to pick up the impending start of a banking crisis before other indicators like credit spread spikes. Nevertheless, it typically takes one to three years for a crisis to gradually unfold in equity prices.

We present four stylized facts regarding the dynamics of bank equity prices around banking crises. Nearly all these stylized facts can be seen in the case of the U.S. 2007-8 banking crisis, so we start there. Then, we show that these stylized facts are systemically present across most banking crises in our sample. The stylized facts are as follows:

[INSERT FIGURE 3 HERE]

[INSERT FIGURE 4 HERE]

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. In the U.S. case in Figure 3, the bank equity index falls over 80% peak-to-trough (red line), compared to about 60% for nonfinancials (blue line). Looking at the general case for all crises, plotted in Figure 4, the average peak-to-trough decline in bank equity is -29.9% across all episodes on the Joint Crisis List, compared to -13.6% for nonfinancial equity. Among all banking crises on the Joint Crisis List, the average peak-to-trough abnormal return (bank minus nonfinancial return) is -26.6%; among crises where bank equity falls in excess of 30%, the average abnormal return is -37.5% and is negative in 98% of cases.

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 equity 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 3 and in the general case across all crises in Figure 4.

Third, bank equity prices pick up the impending crisis first – before nonfinancial equity measures and before credit spread measures. This makes sense, as bank shareholders take first losses, and thus should be most sensitive to potential loan losses – while creditors respond only later when banks approach default. In the U.S. case in Figure 3, 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; dashed and solid black lines, respectively) did not reach historically-unusual levels until September 2008, a full 21 months later. However, in this specific case, interbank lending spreads (the LIBOR-OIS spread, green line) did reach historically-unusual levels early on, in August 2007, though this is not generally the case in most historical banking crises.

We next analyze the dynamics of bank equity declines relative to nonfinancial equity prices and credit spreads more systematically across all crises. 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.

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.[6] To see when credit spreads pick up financial distress, 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.) We also compare the onset of a banking crisis (as judged by the onset of a bank equity decline) relative to crisis dating from Reinhart and Rogoff (2009), Romer and Romer (2017), and the Joint Crisis List (i.e. the earlieest of all dates among the seven banking crisis papers).

[INSERT TABLE 5 HERE]

Table 5, Panel A, analyzes when crises are first detected, comparing the timing of bank equity declines to the onset of crises according to other existing papers and other financial indicators (nonfinancial equity index declines, bank credit spread spikes, and non-financial corporate credit spread spikes). We analyze the timing of events in 3-year pre and post windows around Joint Crisis List banking crisis. For each crisis, we record the average time difference in months between picking up a bank equity decline relative to various other events listed in each column (the time difference is positive if the bank equity decline is recorded before the other event and negative if after the event). A t-statistic is calculated under the null hypothesis that the average time difference is zero. As an alternative nonparametric 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

[6] To further show that bank equity tends to falls *first* and not just *more* than nonfinancial equities, we also compare the timing of peaks. Table 5, Panel B, shows that bank equity reaches its peak, on average, a statistically-significant 1.37 months before nonfinancial equity. Bank equity peaked first in 41% of cases, at the same time in 44% of cases, and after in 14% of cases.

the null hypothesis that the bank equity decline happening first is Bernoulli-distributed with parameter 0.50.

As Table 5, Panel A, shows, the detection of bank equity declines precedes the start of the crisis as dated by the Joint Crisis List, Reinhart and Rogoff (2009), and Romer and Romer (2017). The detection of bank equity declines also precedes the detection of nonfinancial equity declines, bank credit spread spikes, and nonfinancial corporate credit spread spikes around financial crises. Thus, from a statistical perspective, bank equity has an advantage in picking up the crisis first.

This finding has two important implications. First, it suggests that regulators may want to use bank equity returns as indicators of the severity of the crisis. Although the theoretical advantages of using bank equity returns rather than credit spreads follow from the Merton (1974) model that bank shareholders take first losses while creditors respond only later when banks approach default, regulators tend to focus almost completely on credit spreads as indicators of banking distress. Second, the timing of bank equity declines helps resolve debate on the start of various historical banking crises. On the basis of bank equity declines, we revised the start dates of 18 crisis episodes, where the bank equity decline was in conflict with start date from other papers (see Appendix Table 3).

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 crashes suddenly; there is a surprisingly slow and gradual process from peak to trough. In the U.S. case in Figure 3, the bank equity decline begins in August 2007 and reaches its trough in February 2009. There is not a sudden free-fall moment; in fact, bank equity had already declined over 45% before March 2008 when Bear Stearns collapsed and 65% before September 2008 when Lehman Brothers collapsed. Across all crises, the average duration of the bank equity decline was 18.82 months, according to Table 5, Panel B. In 83.8% of cases, the decline took greater than 12 months, and only in two of those cases did the majority of the decline happen within a single month.

This slow decline could potentially reflect a behavioral bias of overoptimistic investors initially underestimating the true depths of the crises. Alternatively, in a rational framework, investors may face informational frictions, making it difficult to piece together the extent of bank loan losses when bad lending practices start to become apparent. Nevertheless, bank equity

declines are slow and gradual, and there does not seem to be evidence of a single "Minsky moment" in bank equity prices.

IV. 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. 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 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 less than -30%, and ii) there is overwhelming evidence from the new narrative evidence of either widespread panics or significant bank failures (or both).[7] 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

[7] Based on narrative evidence of widespread banking panics, we also added one episodes (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.

overwhelming narrative evidence of a lack of both widespread bank failures or bank runs.[8,9,10] The philosophy behind this algorithm is to be conservative when adding episodes and deleted 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 6 HERE]

To highlight some of the refinements we make to the Joint Crisis List, we first present newly identified banking crises in Table 6, Panel A, which we add to our revised chronology of banking crises. We also present a list of spurious banking crises in Table 6, Panel B, which we argue should not be considered banking crises and are removed from our revised chronology of 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

[8] 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.

[9] Episodes were also deleted if they were labeled as, at most, a minor credit event by Romer and Romer (2017) and not considered as banking crises by any other papers. This extra criterion just rules out Australia, Canada, Japan, and Finland in 2007-2008, as these countries were generally not considered to have banking crises. This extra criterion is necessary for ruling out spurious crises in 2008, since these countries' bank stock declines exceeded -30%; however, their bank stock declines were considerably less than in other countries in 2008 that experienced full-blown banking crises.

[10] There are some episodes for which we did not have bank stock data, but for which the narrative evidence strongly suggested these were erroneously labeled as banking crises (narrative evidence in Appendix Section 3). We deleted these episodes too.

return (i.e. the peak-to-trough log real total return) as a measure of the severity of each banking crisis.[11]

B. 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 6, 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 suspended at 15 banks, either

[11] We occasionally combined several pairs of episodes (see Appendix Table 3, 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.

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.

We next highlight three episodes, taken from Table 6, Panel B, as examples of spurious banking crises that we delete from our revised chronology of banking crises.[12] Removing spurious crises reflects the concerns of Schwartz (1987) on distinguishing real crises from pseudo-crises.[13]

[12] 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).

[13] Schwartz (1987) argues that the U.S. and U.K. have not experienced "real" banking crises since 1933 and 1866, 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

These examples are, as follows. In subsection IV.D, we further showcase several added and deleted episodes from the Great Depression.

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[14], and there was no decline in annual bank equity prices.

[INSERT TABLE 7 HERE]

widespread bank failures and solvency concerns (the latter as measured by large bank equity declines), even 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.

[14] 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.

We summarize the properties of all the added and deleted episodes in Table 7, 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 -53.9, an average peak-to-trough real GDP decline of -6.6%, 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 even greater than, the average for episodes from the Revised Chronology (column 3), suggesting that these added episodes are truly crises.

Column 2 has statistics for deleted crises: an average peak-to-trough bank equity decline of -15.4, 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.

C. Comparisons to other chronologies of banking crises

How does our revised chronology of banking crises compare to other chronologies? Table 7, Panels B and C, 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 -5.7% 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 7, Panel B, is -4.5% — in fact less severe than using our revised chronology (a difference of 0.6% with a t-statistic of 2.05). 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.[15] 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.

Comparing our revised chronology (using our full sample) to Romer and Romer's (2017) chronologies (Table 7, Panel C), our chronology has more severe crises — though the sample periods are different. However, if one compares them over the same sample period (i.e. OECD countries from 1967-2012 for Romer-Romer), the Romer-Romer crises are roughly similar in severity to ours (a non-statistically significant difference of -0.4% for the decline in real GDP). However, looking at the magnitude of other crisis symptoms including deposit runs and non-performing loans, our revised list is also more severe.

We therefore conclude that, 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.[16] However, it's important to note that the evidence is nuanced and also that the comparisons are sensitive to the sample studied.

D. Revisiting the Great Depression

As an example to showcase the usefulness of our revised chronology, along with the informativeness of bank equity prices, we revisit the banking crises of the Great Depression. While there is no doubt of the presence of severe banking crises in some countries (e.g., Austria and the U.S.) and their absence in other countries (e.g., Japan and the U.K.), there is considerable debate about the presence and severity of banking crises in other countries. Additionally, because of previous data limitations, the literature has had difficulty assessing the degree to which banking crises help explain the severity of the Great Depression. For example, in their cross-country study, Bernanke and James (1991) write, "A weakness of our approach is that, lacking objective

[15] 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.

[16] 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).

indicators of the seriousness of financial problems, we are forced to rely on dummy variables to indicate periods of crisis."

We use bank equity declines to assess the severity of banking problems across countries in the Great Depression. Figure 5 plots the peak-to-trough decline in real GDP against the peak-to-trough bank equity decline over the period 1929-1933. This figure plots all countries in the sample for which data is available, not just those that may have experienced banking crises.[17]

[INSERT FIGURE 5 HERE]

The decline in bank equity has moderate explanatory power (R^2 = 18%), consistent with the evidence in Bernanke and James (1991) on the role of banking crises in explaining the severity of the Great Depression. However, from Figure 5, there is still substantial unexplained heterogeneity in outcomes. Much of this is surely measurement error in real GDP and other idiosyncratic country shocks. Other potential reasons for this heterogeneity, which are non-mutually exclusive, include: the duration of adherence to the gold standard (Eichengreen and Sachs, 1985), the sharp monetary contraction in certain countries (Friedman and Schwartz, 1963), the trade collapse (Madsen, 2001), and political instability (e.g., the 1930 coups in Argentina and Brazil). Nevertheless, the severity of banking crises explains an important part of the variation across countries.

Additionally, bank equity declines help resolve some of the controversy over which countries experienced banking crises during the Great Depression. First, we should point out areas of agreement. For example, Figure 5 shows large declines in bank equity for well-known examples of severe banking crises (classified as banking crises by both the Joint Crisis List and our revised chronology): Austria, Belgium, France, Germany, Switzerland, and the U.S. Similarly, Japan and the U.K. are considered not to have had banking crises during this period (by both the Joint Crisis List and our revised chronology).

[17] The picture is similar if one plots the peak-to-trough decline in industrial production on the y-axis. Using our data on real GDP (taken from Maddison and Schularick and Taylor, 2012), in contrast to industrial production, makes the Great Depression look less severe in Belgium and the Netherlands (which may be attributable to the larger service sector in these economies) but much more severe in Latin America (attributable to the higher share of commodity production in these economies).

However, in other countries, there is disagreement and uncertainty about the extent of banking crises. In our revised chronology, we remove Australia, Denmark, India (these episodes from the Joint Crisis List are labeled as spurious), since these countries had mild bank stock declines (less than 30%); the narrative evidence we gathered further confirmed a lack of widespread or major bank panics or failures (narrative evidence for these countries is presented in Appendix Section 3). Two other interesting cases are Brazil and Finland, which both had mild bank equity decline (less than 30%); however, the narrative evidence on Brazil and Finland (presented in Appendix Section 3) suggests widespread bank failures involving, in particular, the largest banks in these countries, so we keep them as a banking crisis. Italy is the final country that had a relatively mild bank stock decline (though there was, in fact, a severe banking crisis), but this is due to the unusually early and vigorous policy intervention in 1931, culminating in a near-total nationalization of the banking sector by 1933. Thus, bank stock prices did not decline as much as in other countries.

We also add several newly-identified banking crises to our revised chronology that are overlooked in the previous approaches: newly-identified banking crises in Chile, Colombia, Iceland, the Netherlands, and Peru during the Great Depression. All of these countries experienced large bank stock declines (greater than 30%), and the narrative evidence strongly supports widespread and serious banking problems in these countries (see Appendix Section 3).

Finally, there is the case of Canada. While not labeled a banking crisis on the Joint Crisis List or in our revised chronology (there were no bank panics, and the single bank to fail, Weyburn Security Bank, was tiny – though several trust companies did fail), there was nevertheless a steep decline in bank stock prices. This evidence is consistent with the argument of Kryzanowski and Roberts (1993), 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 holdovers from the previous Canadian banking crisis of 1923.[18] 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.

[18] The largest Canadian bank at the time, the Bank of Montreal, had estimated non-performing loans in excess of 40% (Kryzanowski and Roberts, 1993).

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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.

Panel A: Italian bank stock prices, 1904

BORSE ITALIANE.

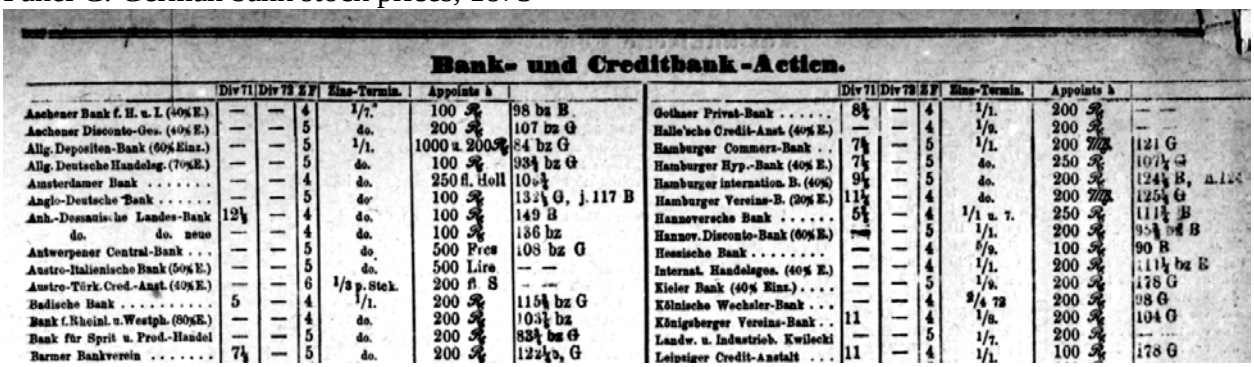
Corsi di chiusura del 28 dicembre 1904.

Valori	Roma	Milano	Genova	Firenze
Rend. it. 5 0/0 perc.	105 35	105 25	105 32 1/2	105 37
» f.m.	105 50	105 38	105 37 1/2	105 32 1/2
3 1/2 0/0 p.c.	103 42 1/2	— —	— —	103 35
» f.m.	103 35	103 37 1/2	103 37 1/2	103 30
Az. Banca d'It.	1132 —	1134 50	1133 50	— —
» Banca Comm.	629 —	628 50	628 —	— —
» Credito Ital.	611 —	611 —	612 —	— —
» Meridionali	758 —	758 —	758 —	758 —
» Mediterranee	— —	459 —	459 —	466 50
» Rubattino	— —	468 50	470 —	— —
» Terni	— —	1946 —	1949 —	— —
» Elba	— —	— —	— —	— —
» Savona	— —	— —	— —	— —
» Molini Alta It.	— —	— —	— —	— —
» Fridania	— —	— —	— —	— —
» Carburo Rom.	— —	— —	— —	— —

Panel 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.co.	113	—	—
Disc.-Mij te Rotterd. do.	—	—	—
Fin. Mij v. Zuid-Afr. do.	95	—	—
Geld. Crediet vereenig.	165	—	—
Gemeente-Cred. Obl. 4	101½	—	—
dito dito dito 3½	96½	96⅛	—
dito dito dito 3	85¾	86⅛	—
dito dito dito 2½	—	—	—
Holl. Belegg. Mo. dito 4	98	—	—
Holl. Voorsch. Bk. S. t.z.	100	—	—
Incasso Bank Aand...	116½	—	—
Ind. Bnk. te Haarl. dito	—	—	—
Kas Vereeniging Aand.	142	142½	—

Panel C: German bank stock prices, 1873



Bank- und Creditbank-Actien.

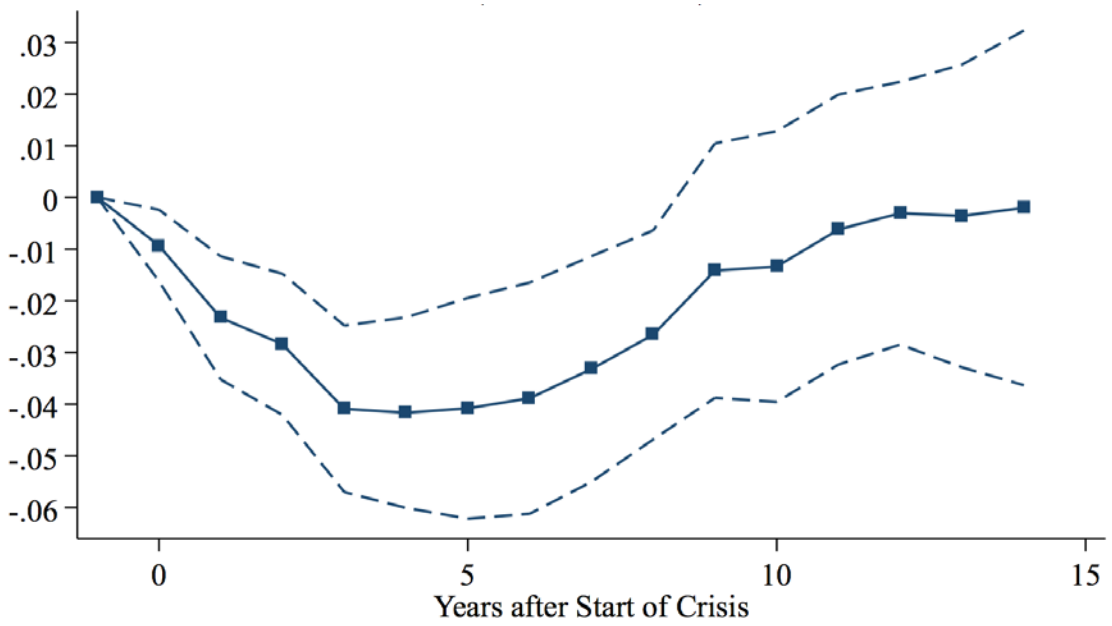
	Div 71	Div 72	E.F	Zins-Termin.	Appoints b	
Aachener Bank f. H. u. L. (40% E.)	—	—	4	1/7.	100 ℛ	98 bz B
Aachener Disconto-Ges. (40% E.)	—	—	5	do.	200 ℛ	107 bz G
Allg. Depositen-Bank (60% Einz.)	—	—	5	1/1.	1000 u. 200 ℛ	84 bz G
Allg. Deutsche Handelsg. (70% E.)	—	—	5	do.	100 ℛ	93¾ bz G
Amsterdamer Bank	—	—	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.-Anst. (40% E.)	—	—	6	1/3 p. Stck.	200 fl S	— —
Badische Bank	5	—	4	1/1.	200 ℛ	115¼ 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	83¾ bz G
Barmer Bankverein	7½	—	5	do.	200 ℛ	122½, G

	Div 71	Div 72	E.F	Zins-Termin.	Appoints b	
Gothaer Privat-Bank	8½	—	4	1/1.	200 ℛ	— —
Halle'sche Credit-Anst. (40% E.)	—	—	4	1/9.	200 ℛ	— —
Hamburger Commerz-Bank ..	7½	—	5	1/1.	200 ℛ	121 G
Hamburger Hyp.-Bank (40% E.)	7½	—	5	do.	250 ℛ	107½ G
Hamburger internation. B. (40%)	9½	—	5	do.	200 ℛ	124½ B, a.
Hamburger Vereins-B. (20% E.)	11½	—	4	do.	200 ℛ	125¼ G
Hannoversche Bank	5½	—	4	1/1 u. 7.	250 ℛ	111½ B
Hannov. Disconto-Bank (60% E.)	—	—	5	1/1.	200 ℛ	95½ 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: Response of Real GDP to Banking Crises

This figure plots the response of real GDP conditional on the magnitude of banking crises (i.e. events on the Joint Crisis List). The response is estimated using Equation 2, with controls for year fixed effects and lags in GDP growth. The x-axis is years after the start of the crisis, and the y-axis is real GDP relative to its initial value at (t-1). Panel A plots the forecast of real GDP conditional on a banking crisis, and Panel B plots real GDP conditional on a banking crisis interacted with the magnitude of the banking equity decline. Thus, Panel A can be interpreted as the estimated response of real GDP for an average banking crisis, and Panel B as the additional response of real GDP conditional on the magnitude of the bank equity decline. The dashed lines represent 95% confidence intervals based on standard errors clustered on years.

Panel A



Panel B

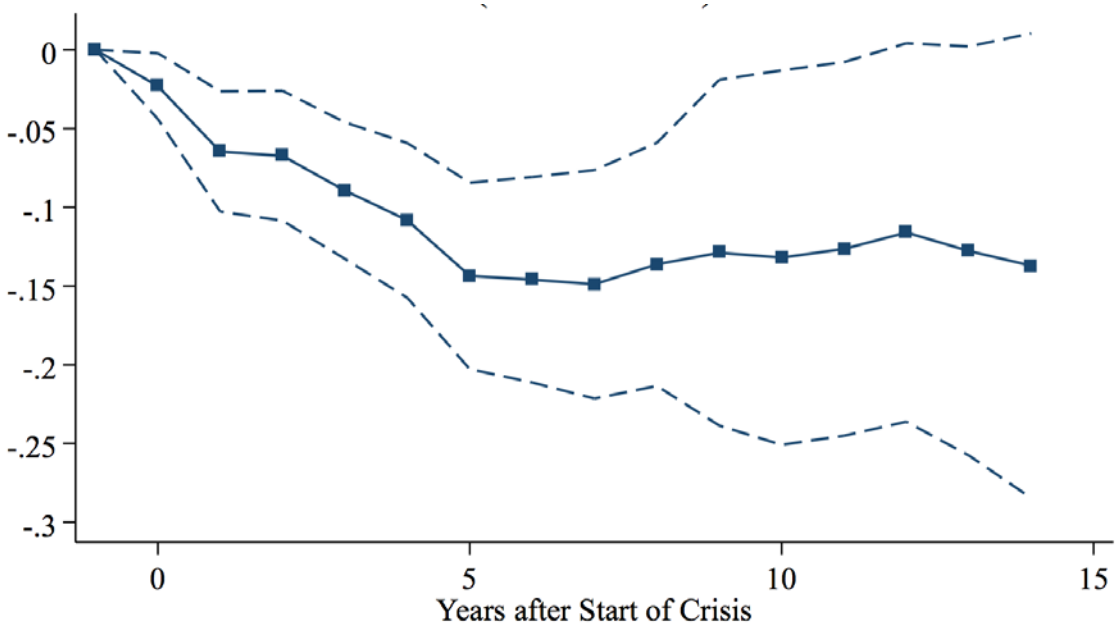


Figure 3: Equity returns and credit spreads around the U.S. 2007-8 banking crisis

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.

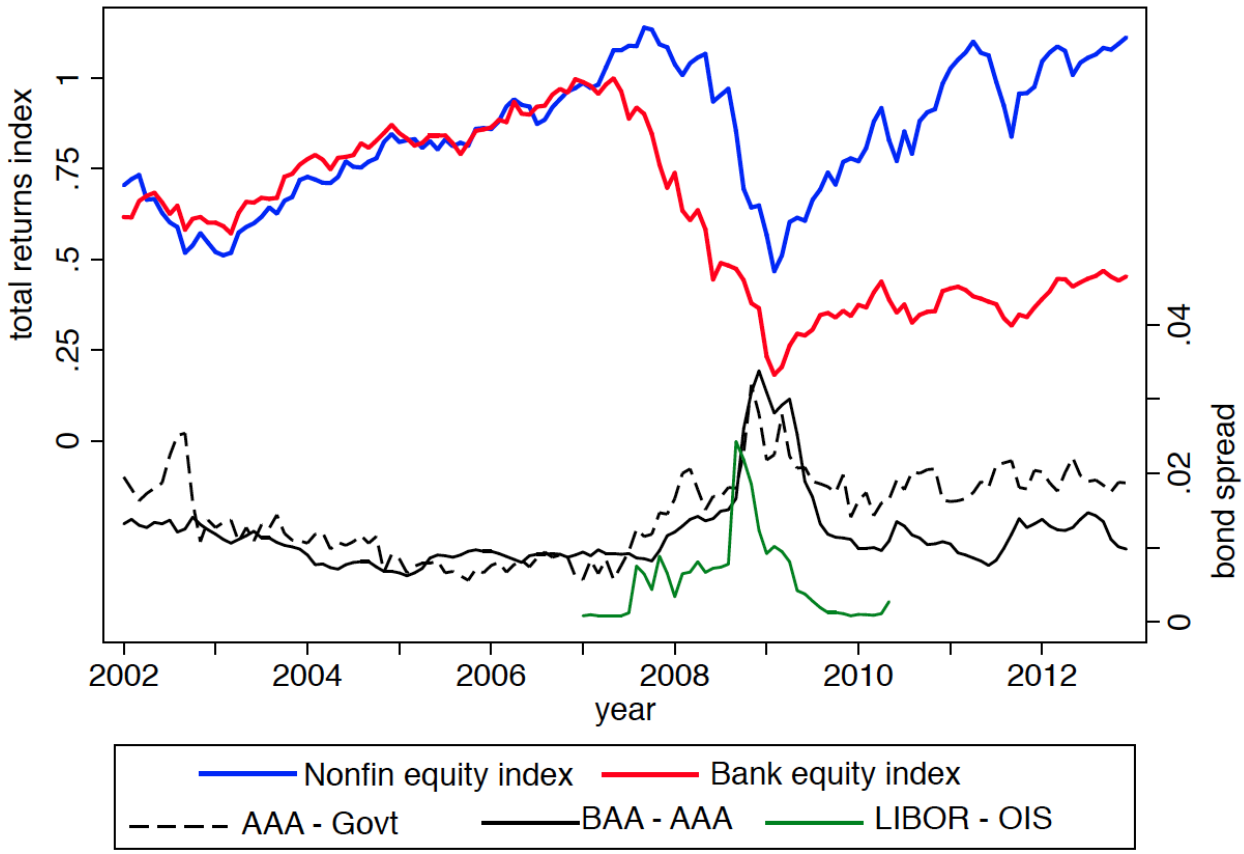


Figure 4: Bank and nonfinancial equity cumulative total returns subsequent to banking crises

This figure plots the average response of bank equity total returns and broad equity total returns subsequent to banking crises (i.e. events on the Joint Crisis List). The x-axis is years subsequent to the banking crisis, and the y-axis is cumulative total equity returns.

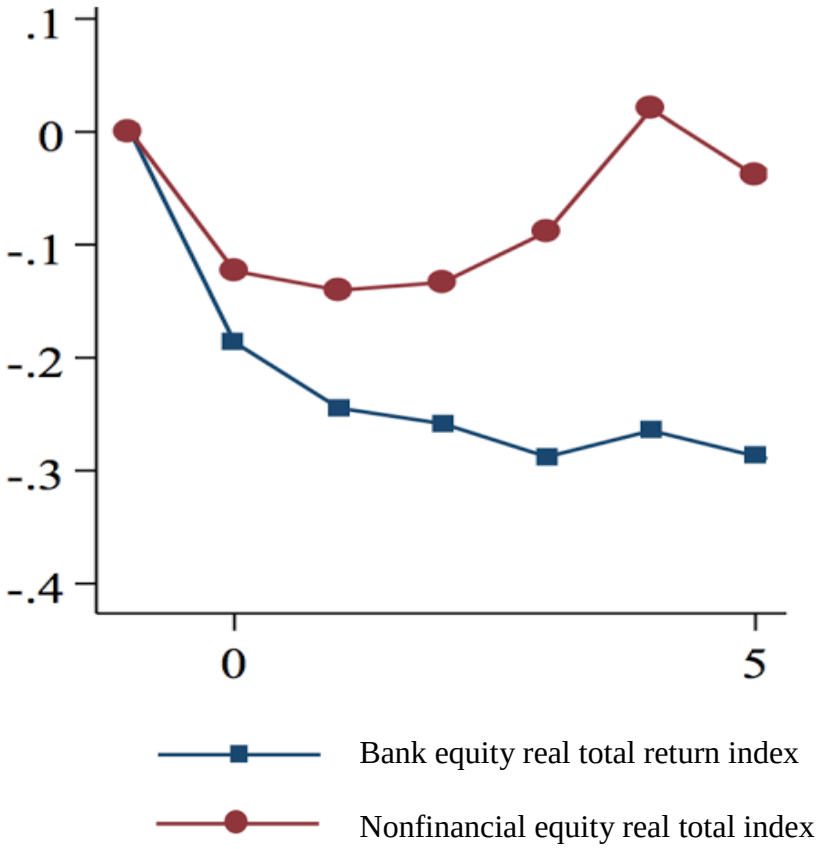


Figure 5: Bank equity declines and the Great Depression

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. In our revised chronology, Australia, Canada, Denmark, Japan, Norway, and UK are considered not to have had banking crises during this period.

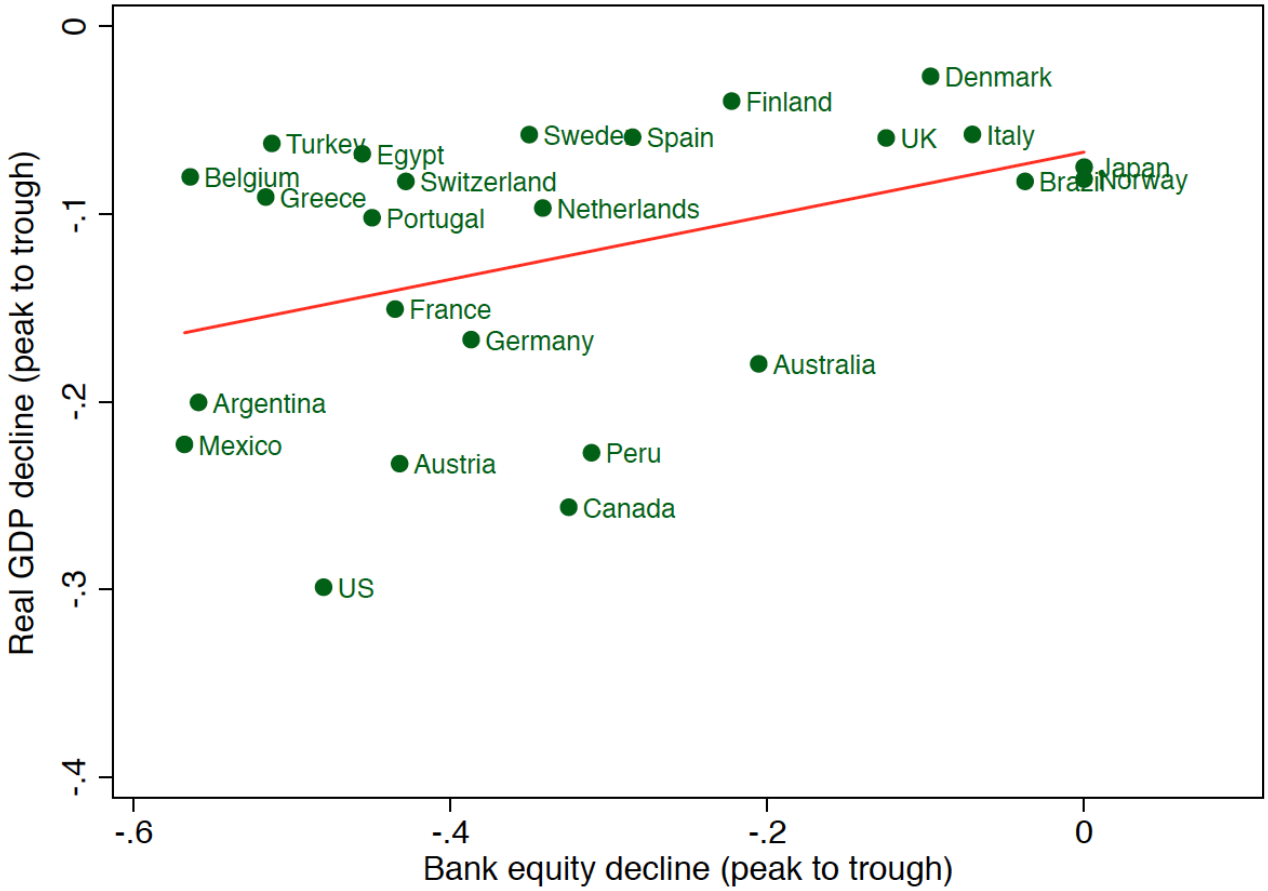


Table 1: Banking crises in Germany

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 2). The following table lists the occurrence of banking crises according to seven 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	Romer Romer	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		
0	0	1974q2	0	0	0	
1977	0	0	0	0	late 1970s	
0	0	2003q1	0		0	
2008	2008	2007q2	2008		0	

Table 2: Symptoms of banking crises

This table shows that bank equity peak-to-trough declines during banking crises are correlated with other "symptoms" 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 (see Appendix Table 2), which covers 46 countries over the period 1800-2016; the sample size of 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.

	Major or systemic crisis	Significant liability guarantees	Significant Liquidity Support	Peak liquidity support	Significant bank closures	Deposit runs	Decline in deposits (pre-war only)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bank equity decline	-1.575***	-0.357	-0.768***	0.395*	-0.199	-0.683***	0.273**
	[-5.867]	[-1.438]	[-3.504]	[1.967]	[-1.352]	[-3.774]	[2.480]
Post-1945 dummy	✓	✓	✓	✓	✓	✓	✓
Adj. R^2 (within)	0.287	0.111	0.151	0.074	0.062	0.106	0.089
N	87	127	136	37	150	105	54

	Banks nationalized	Govt equity injections	Net cost of recapitaliz.	NPL at peak	Fiscal cost (% of GDP)	Failed banks (% of total bank assets)	Largest banks failing
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Bank equity decline	-0.678***	-1.424***	-0.201	-0.166*	-0.135	-0.457**	-0.432*
	[-2.646]	[-4.893]	[-1.510]	[-1.914]	[-0.827]	[-2.422]	[-1.715]
Post-1945 dummy	✓	✓	✓	✓	✓	✓	✓
Adj. R^2 (within)	0.24	0.32	0.037	0.026	-0.01	0.136	0.013
N	104	88	34	65	34	64	126

Table 3: Severity of banking crises

This table reports estimates from Equation 1, in which various dependent variables are regressed on the peak-to-trough bank equity index return. Each observation is a banking crisis from the Joint Crisis List (see Appendix Table 2), which covers 46 countries over the period 1800-2016; the sample size of different columns varies due to data available of the dependent variable. Dependent variables are all calculated as the percentage-point change (peak to trough) in the growth rate of each of the following variables listed above each column. Data sources for the dependent variables are described in Section II of the text.

Panel A: Output measures

	Real GDP (peak-to-trough decline)	Real GDP growth (pctage.-pt. decline, peak-to-trough)	Real GDP growth (max deviation from trend)
	(1)	(2)	(3)
Bank equity decline	0.129***	0.116***	0.085***
	[5.800]	[5.989]	[5.203]
Post-1945 dummy	✓	✓	✓
Adj. R^2 (within)	0.141	0.145	0.108
N	207	208	209

Panel B: Other macroeconomic measures

	Real consumption per capita	Investm. to GDP	Broad money	(minus) Govt debt to GDP	Total loans	Total mortgages	House prices
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bank equity decline	0.097**	0.045*	0.268***	0.234**	0.202***	0.264***	0.112
	[2.355]	[1.970]	[3.541]	[2.575]	[3.351]	[3.870]	[1.346]
Post-1945 dummy	✓	✓	✓	✓	✓	✓	✓
Adj. R^2 (within)	0.241	0.047	0.146	0.054	0.161	0.123	0.036
N	123	118	119	152	113	115	100

Table 4: Alternative measures of bank equity declines

This table is similar to Table 3 but uses alternate measures of bank equity declines as the independent variable in Equation. 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*, which is 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* (as in Table 2) 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 nonfinancial equity returns)

	Real GDP (peak-to-trough decline)	Real GDP growth (pctage.-pt. decline, peak-to-trough)	Real GDP growth (max deviation from trend)
	(1)	(2)	(3)
Abnormal bank decline	0.056***	0.051***	0.042***
	[3.738]	[3.804]	[3.742]
Post-1945 dummy	✓	✓	✓
Adj. R^2 (within)	0.069	0.063	0.057
N	199	201	201

Panel B: Bank market capitalization decline

	Real GDP (peak-to-trough decline)	Real GDP growth (pctage.-pt. decline, peak-to-trough)	Real GDP growth (max deviation from trend)
	(1)	(2)	(3)
Bank market cap decline	0.100***	0.071***	0.071***
	[4.964]	[3.941]	[4.610]
Post-1945 dummy	✓	✓	✓
Adj. R^2 (within)	0.238	0.223	0.187
N	93	94	94

Panel C: Bank equity recoveries

	Real GDP (peak-to-trough decline)	Real GDP growth (pctage.-pt. decline, peak-to-trough)	Real GDP growth (max deviation from trend)
	(1)	(2)	(3)
Bank equity decline	0.130***	0.110***	0.079***
	[5.369]	[5.255]	[4.458]
Bank equity recovery	0.002	-0.015	-0.016
	[0.079]	[-0.737]	[-0.936]
Post-1945 dummy	✓	✓	✓
Adj. R^2 (within)	0.137	0.143	0.107
N	207	208	209

Table 5: Timing of bank equity declines

This table analyzes when crises are first detected, comparing bank equity declines to various lists of crises (the Joint Crisis List, Reinhart and Rogoff, and Romer and Romer) and other financial indicators (non-financial equity index declines, bank credit spread spikes, and non-financial corporate credit spread spikes). Unlike the other analyses in the paper, which are based on annual price data, the present analysis is based on monthly price data, which is available only on a subset of the broader data set (see Section II for details). 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. 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. We analyze the timing of events in 3-year pre and post window around Joint Crisis List episodes. For each crisis, we record the average time difference in months between picking up a bank equity decline relative to various other events list in each column (the time difference is positive if the bank equity decline is recorded before the other event and negative if after the event). In Panel B, we also record the average time difference in months between a bank equity peak and a nonfinancial equity peak, along with the average duration of bank equity declines from peak to trough. In 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: Bank equity declines of -30% pick up the crisis first before…

	Before Joint Crisis List date	Before Reinhart-Rogoff start date	Before Romer-Romer start date	Before non-fin. eq. decline	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)	0.81	2.38***	4.41***	2.78***	6.18***	2.63***	10***	5.40***
t-stat	1.39	2.86	4.16	4.43	5.83	2.44	5.59	2.85
N	84	69	47	77	62	62	26	26
Pos	27	29	26	42	46	33	24	18
Zero	38	29	13	18	8	5	0	3
Neg	19	11	8	17	8	24	2	5
Pos / (Pos + Neg)	58.7%*	72.5%***	76.5%***	71.2%***	85.2%***	57.9%*	92.3%***	78.3%***
p-value	0.092	0.001	0.000	0.000	0.000	0.092	0.000	0.001

Panel B: Additional statistics on the timing of bank equity declines

	Bank equity peak before nonfin equity peak	Duration of bank equity decline
Avg. (in months, signed)	1.37***	18.82***
t-stat	3.51	20.36
N	70	74
Pos	29	Duration ≥ 12 mo. = 62 episodes
Zero	31	
Neg	10	Duration < 12 mo. = 12 episodes
Pos / (Pos + Neg)	74.4%***	% Duration ≥ 12 mo. = 83.8%***
p-value	0.001	0.000

Table 6: Newly identified and spurious banking crises

This table lists examples of several newly identified banking crises in Panel A and spurious banking crises in Panel B. These lists are based on the criteria for banking crises in Section IV.A, which uses both bank equity returns and narrative evidence on the "symptoms" of crises. The starting year of the crisis is taken from the Joint Crisis List, and the bank equity return is the peak-to-trough log real total return.

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	
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
Israel	2002	-0.442
Italy	1926	-0.328
	2011	-0.601
Japan	1922	-0.404
	2001	-0.619
Luxembourg	2012	-0.914
Netherlands	1931	-0.418
	2011	-0.523
Peru	1914	-0.612
	1931	-0.373
Portugal	1876	
	2011	-0.725
	2014	-0.799
Spain	2010	-0.411
Switzerland	1914	
Turkey	1914	-0.654
Average		**-0.539**

Panel B: Spurious banking crises

Country	Starting year of crisis	Bank equity return
Argentina	1885	0
	1985	
Australia	1931	-0.230
	2008	-0.422
Belgium	1870	-0.031
	1925	-0.193
Brazil	1897	0
	1926	0
	1963	
	1985	
Canada	1873	0
	1906	0
	1908	-0.081
	1912	-0.002
	2008	-0.401
Chile	1890	-0.254
Czech	1931	-0.099
Denmark	1902	0
	1914	-0.296
	1931	-0.102
Finland	1939	-0.111
	2008	-0.487
France	1871	-0.364
	1904	0
	1907	-0.049
	1939	-0.121
	1991	-0.263
Germany	1880	0
	1891	-0.230
	1907	-0.051
	1974	-0.276
	1977	-0.117
India	1908	0
	1929	
	1947	
Israel	1977	0
Italy	1935	
	1997	0
Japan	1871	
	1914	-0.232
	1917	-0.239
	2008	-0.752
Korea	1986	0
Mexico	1992	0
Netherlands	1893	0
	1897	0
Norway	1914	
	1927	0
	1936	-0.209
Portugal	1986	
Singapore	1982	-0.275
South Africa	1877	-0.004
	1977	-0.153
	1989	0
Sweden	1897	-0.183
Switzerland	1910	0
Turkey	1991	-0.634
	2008	-0.485
UK	1908	-0.011
	1984	0
	1991	-0.147
	1995	-0.159
US	1914	-0.158
	1998	-0.158
Average		**-0.145**
Average (excl. 2007-8)		**-0.109**

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

Country	Starting year of crisis	Bank equity return
Argentina	1890	-0.307
	1914	-0.473
	1931	-0.819
	1934	-0.563
	1980	
	1989	
	1995	-0.305
	2001	-0.656
Australia	1893	-0.469
	1989	-0.281
Austria	1873	-0.715
	1924	-0.240
	1929	-0.566
	2008	-0.673
	2011	-0.509
Belgium	1876	-0.565
	1885	0
	1914	
	1929	-0.831
	1939	-0.511
	2008	-0.842
	2011	-0.755
Brazil	1890	-0.275
	1900	0
	1914	-0.374
	1923	-0.131
	1929	-0.038
	1990	
	1994	
Canada	1923	-0.426
	1983	-0.164
Chile	1878	
	1898	-0.003
	1907	
	1914	
	1925	
	1931	-0.356
	1976	0.000
Chile (cont.)	1981	-0.837
Colombia	1931	-0.675
	1982	-0.831
	1998	-0.813
Czech	1923	-0.074
	1991	
	1996	-0.715
Denmark	1877	-0.207
	1885	-0.043
	1907	-0.269
	1921	-0.347
	1987	-0.425
	2008	-0.739
	2011	-0.444
Egypt	1907	-0.132
	1914	-0.407
	1931	-0.608
	1980	
	1990	
Finland	1877	
	1900	
	1921	-0.569
	1931	-0.252
	1991	-0.814
France	1882	-0.456
	1889	-0.106
	1914	-0.475
	1930	-0.571
	1994	-0.246
	2008	-0.640
	2011	-0.512
Germany	1873	-0.371
	1901	-0.050
	1914	
	1925	-0.420
	1929	-0.489
	2003	-0.570
	2008	-0.728

Country	Starting year of crisis	Bank equity return
Germany (cont.)	2011	-0.419
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	-0.880
Ireland	2007	-0.918
	2011	-0.908
Israel	1983	-0.499
	2002	-0.442
Italy	1873	-0.237
	1887	-0.348
	1891	-0.453
	1907	-0.240
	1914	-0.333
	1921	-0.550
	1926	-0.328
	1930	-0.073
	1990	-0.397
	2008	-0.575
	2011	-0.601
Japan	1882	
	1890	

Country	Starting year of crisis	Bank equity return
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
	2001	-0.619
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
	2008	-0.707
Norway	1898	
	1921	-0.710
	1931	0
	1987	-0.464
	2008	-0.651
Peru	1872	
	1914	-0.612

Country	Starting year of crisis	Bank equity return
Peru (cont.)	1931	-0.373
	1983	-0.980
	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
	2014	-0.799
Russia	1875	-0.188
	1896	-0.401
	1995	
	1998	-0.751
	2008	-0.723
Singapore	(no crises)	
South Africa	1881	-0.270
	1890	-0.062
	1984	-0.492
Spain	1882	-0.349
	1890	-0.124
	1913	
	1920	-0.140
	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
Sweden (cont.)	2008	-0.519
Switzerland	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
UK	1878	-0.132
	1890	-0.128
	1914	
	1974	-0.737
	2007	-0.707
US	1873	-0.172
	1884	0
	1890	0
	1893	-0.290
	1907	-0.334
	1929	-0.654
	1984	-0.263
	1990	-0.332
	2007	-0.676
Venezuela	1978	-0.340
	1993	-0.839
	2009	-0.614

Table 7: 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 less than -30%. Panel B and C compare episodes from Reinhart-Rogoff's and Romer-Romer's chronologies to episodes on the Revised Chronology and to the episodes on the Revised Chronology having a bank equity decline of less than -30%. Differences in averages are computed, along with t-statistic in brackets (which is computed using a pooled standard deviation across the differenced groups). The Romer-Romer comparison is relative to the Revised Chronology taken over a comparable sample period: OECD countries over the period 1967-2012.

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

	Added	Deleted	Revised Chronology	Revised Chronology (Bank equity decline < -30%)
Bank equity decline	-0.539	-0.145	-0.351	-0.448
Abnormal bank equity decline	-0.381	-0.159	-0.355	-0.439
Bank market cap decline	-0.516	-0.135	-0.431	-0.529
Real GDP decline (pk to tr)	-0.066	-0.024	-0.051	-0.057
Real GDP growth decline (pk to tr)	-0.079	-0.055	-0.084	-0.087
Real GDP growth (max dev from trend)	-0.065	-0.037	-0.059	-0.062
Significant liability guarantees	1.000	0.367	0.547	0.631
Significant liquidity support	0.750	0.333	0.750	0.817
Deposit runs	1.000	0.556	0.950	0.979
NPL at peak	0.113	0.035	0.152	0.149
Decline in deposits (pre-war only)	-0.143	-0.057	-0.195	-0.199

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

	Reinhart Rogoff	Difference with Revised Chronology		Difference with Revised Chronology (Bank equity decline < -30%	
Bank equity decline	-0.288	0.063	[7.05]	0.160	[18.44]
Abnormal bank equity decline	-0.310	0.045	[3.23]	0.129	[8.38]
Bank market cap decline	-0.326	0.104	[5.48]	0.203	[10.59]
Real GDP decline (pk to tr)	-0.045	0.006	[2.05]	0.012	[3.57]
Real GDP growth decline (pk to tr)	-0.080	0.004	[1.56]	0.007	[2.65]
Real GDP growth (max dev from trend)	-0.055	0.004	[1.83]	0.008	[3.03]
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]
Deposit runs	0.868	-0.082	[-4.17]	-0.110	[-4.72]
NPL at peak	0.144	-0.008	[-0.84]	-0.006	[-0.54]
Decline in deposits (pre-war only)	-0.164	0.032	[2.28]	0.035	[2.35]

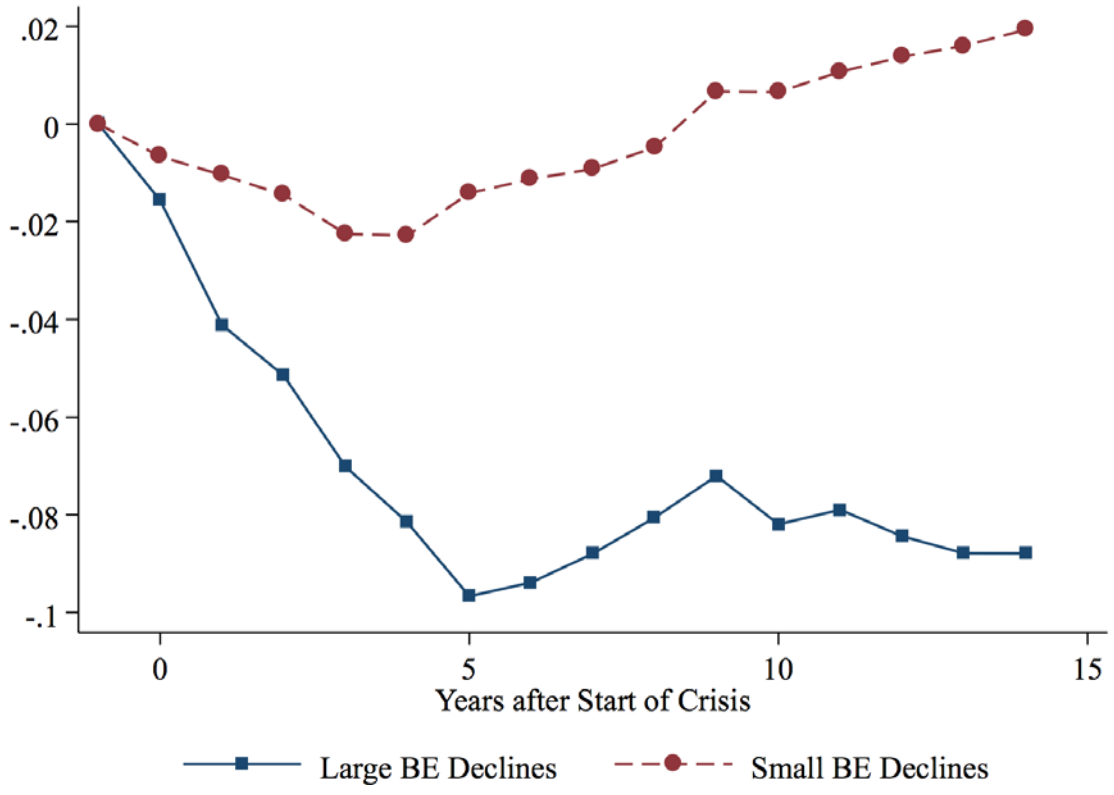
Panel C: Comparison of Romer and Romer episodes with Revised Chronology episodes

	Romer Romer	Difference with Revised Chronology		Difference with Revised Chronology (Bank equity decline < -30%	
Bank equity decline	-0.417	0.018	[1.38]	0.050	[4.14]
Abnormal bank equity decline	-0.406	0.051	[1.74]	0.080	[2.64]
Bank market cap decline	-0.509	0.033	[1.35]	0.083	[3.46]
Real GDP decline (pk to tr)	-0.035	-0.004	[-1.04]	0.000	[0.01]
Real GDP growth decline (pk to tr)	-0.066	-0.009	[-2.81]	-0.006	[-1.91]
Real GDP growth (max dev from trend)	-0.049	-0.006	[-2.15]	-0.005	[-1.66]
Significant liability guarantees	0.909	0.052	[1.11]	0.004	[0.1]
Significant liquidity support	0.913	0.051	[1.13]	-0.042	[-1.09]
Deposit runs	0.600	-0.400	[-3.92]	-0.400	[-2.94]
NPL at peak	0.088	-0.018	[-1.17]	-0.025	[-1.53]
Decline in deposits (pre-war only)	N/A				

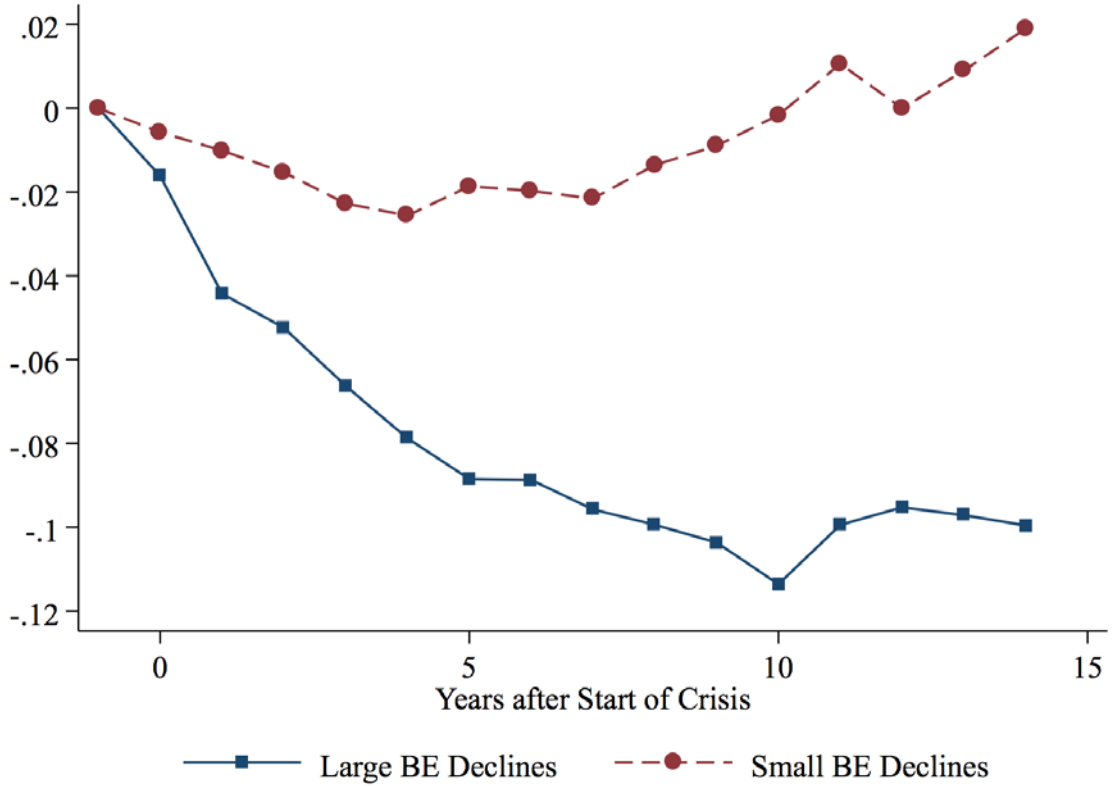
Appendix Figure 1: Additional plots of real GDP growth subsequent to banking crises

These plots are similar to Figure 2 and show the results of various specifications examining the response of real GDP growth subsequent to banking crises (i.e. events on the Joint Crisis List). As in Figure 2, the response is estimated using Equation 2, with controls for year fixed effects and lags in GDP growth. The x-axis is years after the start of the crisis, and the y-axis is real GDP growth relative to trend (i.e. a 10-year past moving average of real GDP growth). Panel A plots the response of real GDP growth subsequent to crises with "large" versus "small" bank equity decline ("large" means a decline greater than -30%; "small" means a decline less than -30%). Panel B is the same as Panel A but excludes the years of World War I (1914-1918) and World War II (1939-1945). Panel C is the same as Panel A but measures the bank equity decline as the peak-to-trough decline rather than the decline between time -1 and 0 (as is done in Figure 3 and Panels A and B).

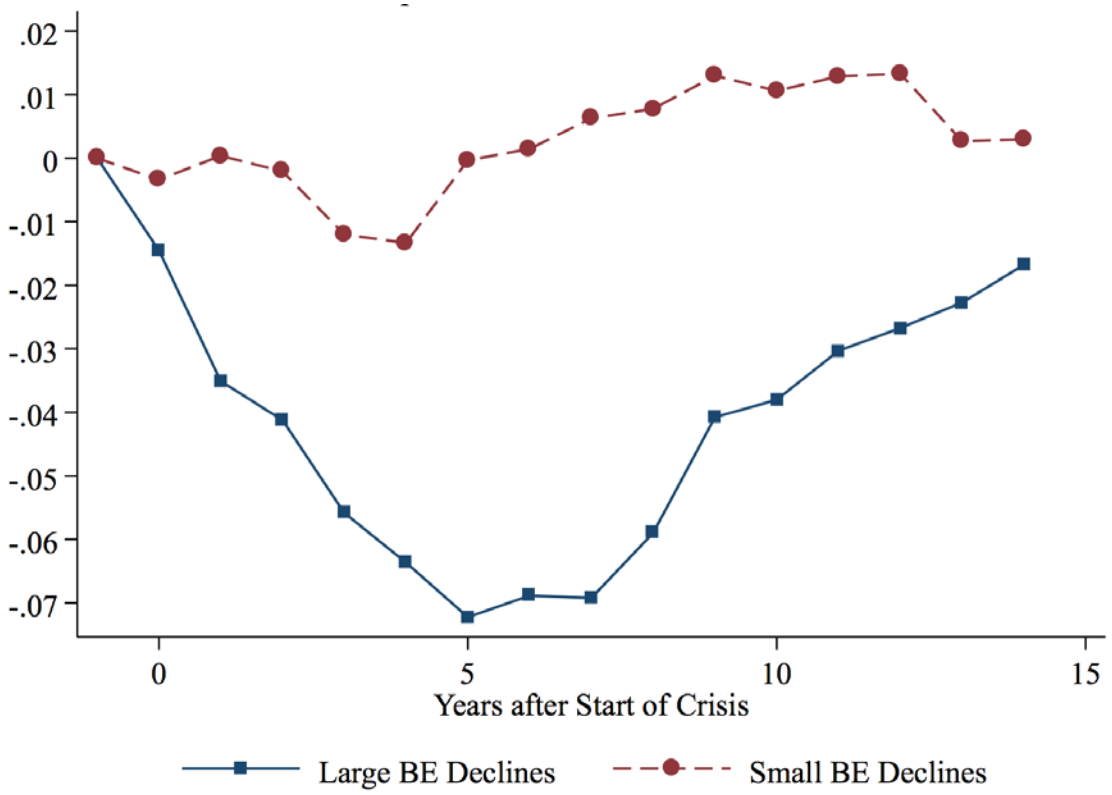
Panel A



Panel B


.02
0
-.02
-.04
-.06
-.08
-.1
-.12
0
5
10
15
Years after Start of Crisis
Large BE Declines
Small BE Declines

Panel C


.02
.01
0
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-.02
-.03
-.04
-.05
-.06
-.07
0
5
10
15
Years after Start of Crisis
Large BE Declines
Small BE Declines

Appendix Table 1: Sample period and data sources 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	1839	Korea	1975
Austria	1857	Luxembourg	1872
Belgium	1869	Malaysia	1970
Brazil	1866	Mexico	1886
Canada	1841	Netherlands	1873
Chile	1891	New Zealand	1865
Colombia	1927	Norway	1915
Czech	1919	Peru	1869
Denmark	1869	Philippines	1952
Egypt	1857	Portugal	1921
Finland	1913	Russia	1872
France	1855	Singapore	1967
Germany	1872	South Africa	1864
Greece	1840	Spain	1865
Hong Kong	1869	Sweden	1891
Hungary	1869	Switzerland	1853
Iceland	2000	Taiwan	1987
India	1868	Thailand	1975
Indonesia	1990	Turkey	1864
Ireland	1827	UK	1836
Israel	1967	US	1800
Italy	1865	Venezuela	1949

Appendix Table 2: Peak-to-trough bank equity index returns around potential banking crises

The following table reports the Joint Crisis List, defined as the union of all banking crises from seven prominent papers. Years listed correspond to the starting year (and quarter, if available) of the banking crisis, according to each paper. The starting year of the Joint Crisis list is the earliest year across all seven papers. 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). The bank total return is the peak-to-trough return of the log real total return bank equity index.

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

	Reinhart Rogoff	Schularick Taylor	Romer Romer	Laeven Valencia	Bordo	Caprio Klingebiel	Demirguc-Kunt Detrag.	Joint Crisis List	Bank Total Return
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	1826							1826	
Australia	1843							1843	-0.122
Australia	1893	1893			1893			1893	-0.469
Australia	1931	0			0			1931	-0.230
Australia	1989	1989	0	0	1989	1989	0	1989	-0.281
Australia	0	0	2008q1	0				2008	-0.422
Austria	1873							1873	-0.593
Austria	1924							1924	-0.973
Austria	1929							1929	-0.640
Austria	1931							1931	-0.566
Austria	2008		2008q2	2008				2008	-0.673
Belgium	1838							1838	
Belgium	1842							1842	-0.233
Belgium	1848							1848	
Belgium	1870	1870						1870	-0.307
Belgium	0	1885						1885	
Belgium	1914	0			1914			1914	-0.150
Belgium	1925	1925			1925			1925	-0.250
Belgium	1931	1931			1931			1931	-0.816
Belgium	1934	1934			1934			1934	-0.831
Belgium	1939	1939			1939			1939	-0.737
Belgium	2008	2008	2008q2	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	-0.250
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	1837							1837	
Canada	1866							1866	-0.056
Canada	1873	0						1873	no decline
Canada	1906	0						1906	-0.081
Canada	1908	1907						1908	-0.081
Canada	1912	0						1912	-0.081
Canada	1923	0			1923			1923	-0.426
Canada	1983	0	0	0	1983	1982	0	1983	-0.164
Canada	0	0	2007q2	0				2007	-0.401
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
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	1813							1813	
Denmark	1857							1857	
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	0	1987	1987	0	1987	-0.193
Denmark	2008	2008	2008q1	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	-0.900
Finland	1931	1931			1931			1931	-0.252
Finland	1939	0			1939			1939	-0.329
Finland	1991	1991	1992q1	1991	1991	1991	1991	1991	-0.814
Finland	0	0	2008q2	0				2008	-0.487
France	1802							1802	
France	1805							1805	
France	1827							1827	
France	1838							1838	
France	1848							1848	

France	1864							1864	-0.244
France	1867							1867	-0.079
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	0	0	1991q2	0	0	0	0	1991	-0.412
France	1994	0	1995q1	0	1994	1994	0	1994	-0.412
France	2008	2008	2007q2	2008				2007	-0.640
Germany	1857							1857	
Germany	0	1873						1873	-0.286
Germany	1880	0						1880	-0.371
Germany	1891	1891			0			1891	-0.230
Germany	1901	1901			1901			1901	-0.050
Germany	0	1907			0			1907	-0.051
Germany	1925	0			0			1925	-0.487
Germany	1929	1931			1931			1929	-0.531
Germany	0	0	1974q2	0	0	0		1974	-0.334
Germany	1977	0	0	0	0	late 1970s		1977	-0.334
Germany	0	0	2003q1	0		0		2003	-0.570
Germany	2008	2008	2007q2	2008		0		2007	-0.728
Greece	1931				1931			1931	-0.727
Greece	1991		0	0	1991	1991	0	1991	-0.391
Greece	2008		2008q2	2008				2008	-0.798
Hong Kong	1982			0	1982	1982		1982	-0.310
Hong Kong	1983			0	1983	1983		1983	-0.445
Hong Kong	1998			0		1998		1998	-0.464
Hungary	1931							1931	
Hungary	1991			1991		1991	0	1991	
Hungary	2008			2008				2008	-0.671
Iceland	1985		0	0	1985	1985	0	1985	
Iceland	1993		0	0	1993	1993	0	1993	
Iceland	2007		2006q2	2008				2006	-0.935
India	1863							1863	no decline
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	-0.880
Ireland	1836							1836	-0.069
Ireland	1856							1856	-0.052
Ireland	2007		2007q2	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	1866							1866	-0.305
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	-0.240
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	0	1990	1990	1990	1990	-0.298
Italy	0	0	1997q1	0	0	0	0	1997	-0.397
Italy	2008	2008	2007q2	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	-0.300
Japan	1992		1990q2		1992	1991	1992	1991	-0.546
Japan	counted above	1997	counted above	1997	counted above	counted above	counted above	1997	-0.726
Japan	0	0	2008q2	0				2008	-0.698
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			2008q1	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	
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 counted	1981	1981 counted	0	1981	
Mexico	1982			above	0	above	1982	1982	
Mexico	1992			0	0	0	0	1992	no decline
Mexico	1994			1994	1995	1994	1994	1994	-0.602
Netherlands	1819							1819	
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	2008q1	2008				2008	-0.562
New Zealand	1890							1890	-0.549
New Zealand	1893							1893	-0.565
New Zealand	1987		0	0	1987	1987	0	1987	-0.901
New Zealand	0		2007q2	0				2007	-0.707
Norway	1814							1814	
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	1991q2	1991	1987	1987	1987	1987	-0.464
Norway	0	0	2007q2	0				2007	-0.651
Peru	1872							1872	no decline
Peru	1983			1983	1983	1983	1983	1983	-0.980
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	1828							1828	
Portugal	1846							1846	
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	0	1986	1986	-0.119
Portugal	2008	2008	2008q1	2008				2008	-0.668
Russia	1862							1862	
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	1865							1865	
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
South Africa	1989			0	0	1989	0	1989	-0.492
Spain	1814							1814	
Spain	1829							1829	
Spain	1846							1846	
Spain	0	1883						1883	-0.400
Spain	0	1890			0			1890	-0.124
Spain	0	1913			0			1913	-0.038
Spain	1920	1920			1920			1920	-0.320
Spain	1924	1924			1924			1924	-0.293
Spain	1931	1931			1931			1931	-0.336
Spain	1977	1977	0	1977	1977	1977		1977	-0.840
Spain	2008	2008	2008q1	2008				2008	-0.466
Sweden	1811							1811	
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	1992q2	1991	1991	1991	1990	1991	-0.787
Sweden	2008	2008	2008q1	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	0	1991	-0.502
Switzerland	2008	2008	2007q2	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		0	1982	1982	1982	1982	1982	-0.409
Turkey	1991		0	0	0	0	1991	1991	-0.758
Turkey	1994		0	0	1994	1994	1994	1994	-0.758
Turkey	2000		2001q1	2000		2000	2000	2000	-0.716
Turkey	0		2008q2	0				2008	-0.716
UK	1810							1810	
UK	1814							1814	
UK	1825							1825	
UK	1837							1837	-0.237
UK	1847							1847	-0.117
UK	1857							1857	-0.201
UK	1866							1866	-0.274
UK	1878	0						1878	-0.132
UK	1890	1890			1890			1890	-0.055
UK	1908	0			0			1908	-0.011
UK	1914	0			0			1914	-0.219
UK	1974	1974	0	0	1974	1974		1974	-0.737
UK	1984	0	0	0	0	1980s-90s	0	1984	-0.215
UK	1991	1991	0	0	0	0	0	1991	-0.147
UK	1995	0	0	0	0	0	0	1995	-0.159
UK	2007	2007	2007q2	2007				2007	-0.638
US	1814							1814	-0.486
US	1817							1817	
US	1825							1825	-0.046
US	1836							1836	-0.326
US	1841							1841	-0.326
US	1857							1857	-0.199
US	1861							1861	-0.160
US	1864							1864	-0.160
US	1873	1873						1873	-0.172
US	1884	0			1884			1884	-0.029
US	1890	0			0			1890	-0.016
US	1893	1893			1893			1893	-0.290
US	1907	1907			1907			1907	-0.495
US	1914	0			1914			1914	-0.334
US	1929	1929			1930			1929	-0.653
US	1984	1984	1986q1	1988	1984	1984	1980	1984	-0.261
US	counted above	counted above	1990q1	counted above	0	counted above	counted above	1990	-0.332
US	0	0	1998q2	0		0	0	1998	-0.158
US	2007	2007	2007q1	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

Appendix Table 3: 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 -> 1929
Chile	1980 -> 1981
France	2007 -> 2008
Germany	2007 -> 2008
Iceland	2006 -> 2008
India	1991 -> 1993
Italy	1931 -> 1930
Italy	2007 -> 2008
Mexico	1920 -> 1921
New Zealand	1890 -> 1887
New Zealand	1893 -> 1894
New Zealand	2007 -> 2008
South Africa	1985 -> 1984
Spain	1883 -> 1882
Sweden	1876 -> 1878
Switzerland	2007 -> 2008
Thailand	1996 -> 1997

Appendix Table 4: Selected episodes of minor bank distress

This table lists selected episodes of minor bank distress that were not classified as banking crises in our revised chronology. 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. The list contains only selected episodes and is far from complete. This table is presented simply as a guide for the interested reader; these episodes are not analyzed in this paper.

Country	Starting year of bank distress
Argentina	1985
Australia	1931, 1974, 1977, 2008
Belgium	1900, 1920, 1925
Brazil	1985
Canada	1873, 1887, 1891, 1901, 1905, 1912
Czech	1931
Denmark	1914, 1931, 1984
Germany	1907, 1974
India	1938
Ireland	1885
Italy	1982
Netherlands	1981
Norway	1886, 1914, 1926
South Africa	1977, 1991
Spain	1990
Switzerland	1910
U.K.	1984, 1991, 1995
U.S.	1998