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The macroeconomic effects of banking crises: Evidence from the United Kingdom, 1750–1938 ☆

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ABSTRACT

This paper analyses the macroeconomic effects of banking crises in the United Kingdom between 1750 and 1938. We construct a new annual chronology of banking crises, which we define as episodes of runs and panics combined with significant, geographically-dispersed failures and suspensions. Using a vector autoregression, we find that banking crises are associated with short, sharp and significant drops in economic growth. Using the narrative record to identify plausibly exogenous variation, we show that this finding is robust to potential endogeneity.

1. Introduction

The distant memory of banking crises and the Great Moderation meant that from the 1980s the economics profession became less concerned about banking crises and economic downturns. This temporary amnesia dissipated when the 2008 Global Financial Crisis reignited the interest of the profession in the banking crises of the past and their economic consequences. This paper attempts to further this renewed interest by assessing the macroeconomic effects of banking crises in the UK between 1750 and 1938.

However, there are at least two empirical challenges of estimating the impact of banking crises on the economy. First, banking crises are very difficult events to define. As a result, there is little correspondence between existing chronologies of banking crises for the UK. For example, as Table 1 illustrates, over the period 1870 to 1914, Reinhart and Rogoff (2009a) classify crises in 1878, 1890 and 1914, Schularick and Taylor (2012) identify a banking crisis in 1873 and 1890 and Turner (2014) identifies a nonmajor crisis in 1878–9. According to Bordo and Meissner (2016), this "classification uncertainty" results in a potentially wide range of estimates of

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Table 1
Comparison of chronologies, 1750–1938.

Kenny et al. (2020)	Reinhart and Rogoff (2009a)	Schularick and Taylor (2012)	Turner (2014)
1772			
	1810		
1815–6	1815–7		
1820–1			
1825–6	1825–6		1825–6
	1837–9		1836–7
1840–1			
1847	1847–8		1847
1857	1857		1857–8
1866	1866		1866
		1873	
	1878		1878–9
	1890	1890	
	1914		

Notes: The sample period is 1800 to 1938 for Reinhart and Rogoff (2009a) and Turner (2014). The sample period is 1870–1938 for Schularick and Taylor (2012).

output losses. Thus, this uncertainty not only influences our understanding of the incidence, but also introduces measurement error into estimates of the economic consequences, of banking crises (Romer and Romer, 2017).

Our first contribution, therefore, is the construction of a new chronology of banking crises in the United Kingdom based on a better definition, which consists of three elements. First, there must be runs or panics to convert deposits into currency. Based on regional and national newspapers, we are the first to provide systematic evidence of these events. Second, there must be failures and suspensions that result in a large reduction in the capital of the banking system. As a result, we collect new bank-level data on capital, establishment date, closure date and reason for closure for the population of banks between 1750 and 1938. Third, the failures and suspensions must be geographically diffuse, so that we record national, not regional, crises. We therefore geocode our series of failures and suspensions. Based on these criteria, we identify banking crises in 1772, 1815–6, 1820–1, 1825–6, 1840–1, 1847, 1857 and 1866.

The second challenge is to identify whether banking crises affect the macroeconomy or vice versa. If reverse causality is at work, then failing to account for it will lead to biased impulse responses. To deal with this challenge, we use the narrative record to identify events that contemporaries attributed to macroeconomic shocks and those to other factors.

Although a study of the macroeconomic effects of banking crises in the United Kingdom between the Industrial Revolution and Second World War is important in its own right, there is an additional motivation for focusing on this particular setting. Whereas today distressed banks are often rescued by authorities, this was not the case historically. This is important as bailouts would tend to bias the estimates of the macroeconomic effects of crises towards zero because the crises are not as big as they would otherwise be in the absence of intervention. By focusing on the era before “too big to fail”, history offers an ideal laboratory to generate unbiased estimates of the macroeconomic effects of banking crises.

To investigate how banking crises affect the economy, we include our new chronology in a vector autoregression (VAR). We find that real GDP growth declined by 2.7 percentage points in the year following a banking crisis, but there was no effect beyond a year. We also find that equity prices and the money supply slumped, but that the trade balance improved because imports fell but exports were unchanged, which is consistent with a demand or household deleveraging shock.

The next step we take is to use a narrative approach to identify plausibly exogenous variation. We use primary sources to help us understand the perceptions of contemporaries regarding the nature of the crises. The evidence suggests that the crises of 1772, 1825–6, 1857 and 1866 were exogenous, whilst those of 1815–16, 1820–1, 1840–1 and 1847 were endogenous. Using this identification strategy, we find that the causal effect of banking crises is similar, if not a little larger, than the baseline estimate.

The final step we take is to subject our findings to a series of robustness tests. We investigate the effects of different crisis measures, alternative econometric specifications and the inclusion of additional control variables. We find that the results are robust to a range of reasonable permutations of the model.

This paper contributes to the literature on the economic effects of banking crises (Benguria and Taylor, 2020; Bernanke, 1983; da Rocha and Solomou, 2015; Dell’Ariccia et al., 2008; Demirgüç-Kunt et al., 2006; Friedman and Schwartz, 1963; Hoggarth et al., 2002; Jalil, 2015; Laeven, 2011; Laeven and Valencia, 2010). An important contribution is to go back much further than any previous study to a time before systematic bailouts to examine the effect of banking crises on the macroeconomy. Another contribution is to confirm that the behaviour of trade flows is consistent with banking crises as demand or household deleveraging shocks as opposed to supply or firm deleveraging shocks. A final contribution is to show that, while banking crises were less frequent in the United Kingdom than in the United States, the economic consequences of crises were surprisingly similar in the two economies.

2. The new UK banking crisis series

2.1. Defining crises

We define a banking crisis as an event that meets the following criteria. First, there must be bank runs and panics. Specifically, there must be evidence of bank runs or panics in more than one location reported in contemporary newspapers. Rushing to convert deposits into currency is a feature of existing crisis definitions (Reinhart and Rogoff, 2009a; Jalil, 2015) and of the Diamond and Dybvig (1983) model of banking crises.

Second, there must be a significant depth of bank failures and suspensions. Specifically, the fraction of capital in the banking system that belonged to failed or suspended banks must be in the top decile of the sample. Failures and suspensions are important elements of crises that render deposits illiquid, destroy customer relationships and related information advantages and create credit crunches (Anari et al., 2005; Bernanke, 1983; Mishkin, 1991).

Third, there must be diffuse bank failures and suspensions. Specifically, bank failures and suspensions must occur in at least two non-contiguous counties. This condition ensures that we identify national, as opposed to regional, crises.[1] In terms of timing, we define the start of the crisis as the year in which these three conditions are first met and the end as the year in which all three are not.[2]

Our definition has important differences with those that underpin existing chronologies. According to Reinhart and Rogoff (2009a), for example, a banking crisis is defined by: (1) bank runs that lead to the closure, merging or government takeover of one or more financial institutions or (2) the closure, merging, takeover, or government assistance of an important financial institution or group of institutions.

This definition is problematic for a number of reasons. First, the definition implies that a bank failure in itself constitutes a banking crisis. However, multiple bank failures were part and parcel of a normal year in British banking history. In addition, failures may make the banking system more stable by removing imprudent banks (Baker and Collins, 1999; Calomiris and Kahn, 1991). Second, including institutions that are not commercial banks (e.g., investment banks) is unhelpful in a historical context, because they were not involved in either the money supply (via deposits) or credit intermediation (Turner, 2014). Third, while it is possible to quantify the importance of a financial institution, previous chronologies have tended to approach this issue in a subjective, ad hoc fashion.

Jalil (2015) develops an alternative methodology, defining a banking crisis as a cluster of 3 bank runs and suspensions reported in financial newspapers.[3] While this is a clearer, data-driven approach, there are also several issues. First, it does not account for the size of banks. Although this may have been less of an issue in US history, where branch banking was prohibited, there was variation in the size of British banks. Second, it does not account for the size of the banking system. In the United Kingdom, for example, the population of banks fluctuated between nearly 1000 and less than 100 between the Industrial Revolution and the Second World War.

In order to apply these definitions, a common approach is to read the secondary literature relating to the historical development of the banking system concerned. However, using existing literature alone can lead to false positives being perpetuated and false negatives remaining hidden in the historical record. Schularick and Taylor (2012), for example, is based, amongst others, on Reinhart and Rogoff (2009a), which itself is based on Conant (1915). Written over a century ago, this book is a broad history of banks of issue, spanning thousands of years in time and dozens of countries in space, from Babylon to Britain.

2.2. Constructing the new series

The two primary objectives are: (1) to determine the population of banks that existed in the UK each year between 1750 and 1938 and (2) to identify exits from the population that were the result of failure or suspension.

A number of sources were used to construct the new series. Following the work of Bond (2016), we used the Bankers' Almanac, (2009), which was an annual volume first published in 1845 that listed joint-stock and private banks in the UK. This data was later collated in *Almanac* registers. We used the *Almanac* (2009) to identify all banks in the "UK," "Ireland" and "Northern Ireland" over the entire period.[4]

The *Almanac* provides the name, date of establishment, date of closure and type of closure for each bank. A limitation of the source is that there were missing start and end dates and a number of duplicates.[5] To fill in the blanks and remove the duplicates, we used Barrow (1975), Checkland (1975), Dawes and Ward-Perkins (2000), Gilbart (1860), Hall (1949), O'Kelly (1959) and Price (1890).

[1] The local economic effects of regional banking crises is an interesting, but challenging, question as there is little information on economic activity that is rich in both the cross-sectional and time-series dimensions.

[2] It could be argued that as a banking crisis moves beyond its first year, runs and panics may no longer be relevant. However, there were no examples of crises extending beyond the first year where the depth and diffusion criteria were fulfilled but the runs and panics condition was not.

[3] Baron et al. (2020) define banking crises as episodes of large equity price declines. While this definition overcomes some of the drawbacks of other approaches, it is problematic for the United Kingdom between 1750 and 1938 because private banks were partnerships and joint stock banks were not listed on the stock exchange until the 1820s.

[4] Although listings were also reported for both the Channel Islands and the Isle of Man, they are excluded as they are crown dependencies. Every bank that existed in Ireland during the period 1800-1921 is included in the population, while the Northern Irish banks remain in the sample from 1922.

[5] The most common form of duplication was where banks that had changed the name of partnership and maintained the original date of the first partnership as their date of establishment.

After the data was cleaned, the next step was to identify failures in the population. The *Almanac* provides an array of events, such as "failed", "suspended payment", "bankrupt", "name changed", "acquired" and "merged". In order to separate failures from other types of events, we classify a failure as an event that reduces banking capacity. While other events, such as mergers, reduce the number of banks, the capacity of the banking system is unchanged. Where evidence exists in the supplementary sources that financial distress preceded a takeover or merger, we recorded the event as a failure.[6] Overall, our series is based on the lifespans of nearly 2500 unique banks that existed in the UK between 1750 and 1938.[7]

Because we want our series of failures and suspensions to reflect the relative size of banks that failed, we weighted each bank by its paid-up capital. This involved the collection of data from primary and secondary sources (see Appendix A).

In order to determine if there were bank runs and panics, we searched the British Newspaper Archive for articles about runs and panics in the banking system. Runs and panics were headline news in this period. For example, "a universal panic" was reported in 1772 (*The Scots Magazine*, 1 June 1772), "casual" runs in 1821 (*Staffordshire Adviser*, 4 November 1821), a "great panic" in 1866 (*The Observer*, 13 March 1866) and so on.

To geocode the failures and suspensions, we used the *Almanac* (2009), Price (1890) and Dawes and Ward-Perkins (2000) to determine the town in which each bank was based. The geography of failures and suspensions during crises is shown in Appendix C.

2.3. The new series

The new chronology of banking crises is shown in Table 1. Between 1750 and 1938, there were eight banking crises in the United Kingdom: 1772, 1815–6, 1820–1, 1825–6, 1840–1, 1847, 1857 and 1866, which are described in detail in Appendix C. Table 1 also lists the dates from the leading chronologies of Reinhart and Rogoff (2009a), Schularick and Taylor (2012) and Turner (2014). There are three main results.

First, while the majority of the crises that feature in our chronology are also staples of existing series, such as 1815–6, 1825–6, 1847, 1857 and 1866, others are not, such as 1772, 1820–1 and 1840–1. As the existing chronologies do not stretch back to the eighteenth century, 1772 has not been included before, but it has been viewed as a crisis in the historiography (Goodspeed, 2016). 1820–1 does not appear in extant series or the historiography, possibly because it is sandwiched between the major crises of 1815–6 and 1825–6. 1840–1 has not been identified as a banking crises previously, but Bordo et al. (2003) recognized the "moderate distress" of 1840 and the "severe distress" of 1841.

Second, there are a number of episodes that have been extensively covered in the existing chronologies but were not associated with a critical mass of bank failures and suspensions and evidence of bank runs and panics, such as 1810, 1836–9, 1873, 1878–9, 1890 and 1914. Appendix D explains why we do not classify each of these events as a banking crisis. Typically, they were episodes of minor financial distress or foreign rather than domestic banking crises.

Third, the new series suggests that banking crises occurred with an unconditional probability of 4.3 per cent or at a rate of 1 every 24 years between 1750 and 1938. However, this masks considerable variation over time. The frequency was half the average in the second half of the eighteenth century, more than twice the average between 1800 and 1866 and zero thereafter. In the United States, the average frequency was 13 years between 1826 and 1915 (Jalil, 2015). In the United Kingdom, on the other hand, the average frequency was 22 years over the same period.

Why did the frequency of banking crises fall after 1866 and why was the frequency lower in the United Kingdom than the United States? There are two possible, and not necessarily mutually exclusive, explanations. First, by the time Walter Bagehot had published *Lombard Street* in 1873, it was commonly accepted that the Bank of England would act as a lender of last resort during a crisis. Second, by this date, the structure of the UK banking system had moved from one dominated by small unit banks to one increasingly dominated by large branched banks (Capie, 2014; Capie and Rodrik-Bali, 1982; Goodhart, 1988; Turner, 2014), which greatly increased the scope for diversification.

3. The macroeconomic effects of banking crises

3.1. Data and specification

As an introduction to the potential relationship between banking crises and economic activity, Fig. 1 plots the new indicator and real GDP growth. A number of episodes have been associated with economic contractions, such as the crises of 1772, 1815–6, 1825–6, 1840–1, 1847 and 1857, either simultaneously or in the aftermath. Fig. 2 shows the unconditional path of real GDP growth around crises. On average, the British economy expanded going into crises, after which output contracted in the following year. Economic growth resumed in the second year after the crisis.

The sources and definitions of the data used in the paper are given in Table 2. The main economic outcomes of interest are the broad money supply, equity prices, exports and imports, GDP and agricultural, industrial and services output.

A constant concern with historical data is reliability. While we have tried to source the best vintage available for each variable, there are two strands of literature that suggest that measurement error may be an issue in the United Kingdom between 1750 and 1938. First, there is active debate about the reliability of GDP prior to the late-nineteenth century, which focuses on the underlying

[6] Appendix B lists these distressed takeovers, as well as supporting evidence.
[7] The closing stock for the population in 1938 is from the *Bankers' Almanac* (1939).

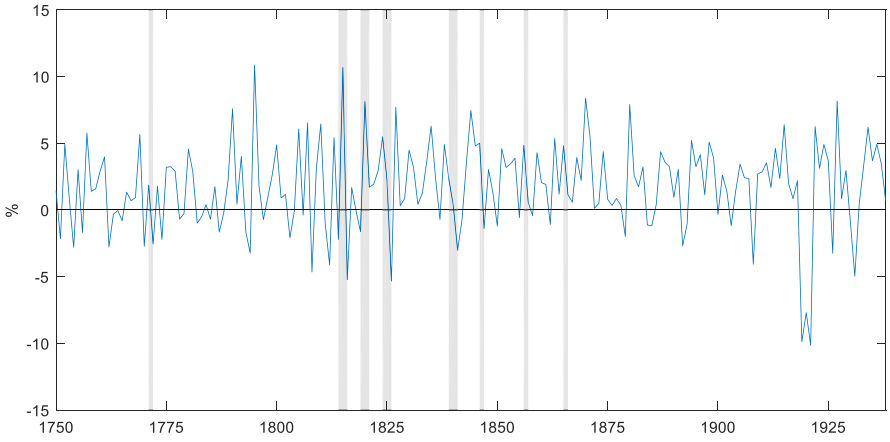

Fig. 1. *Banking crises and real GDP growth, 1750–1938.*
Notes: This figure shows the fluctuations in real GDP growth around banking crises. The shaded areas represent banking crises.
Source: See Table 2.

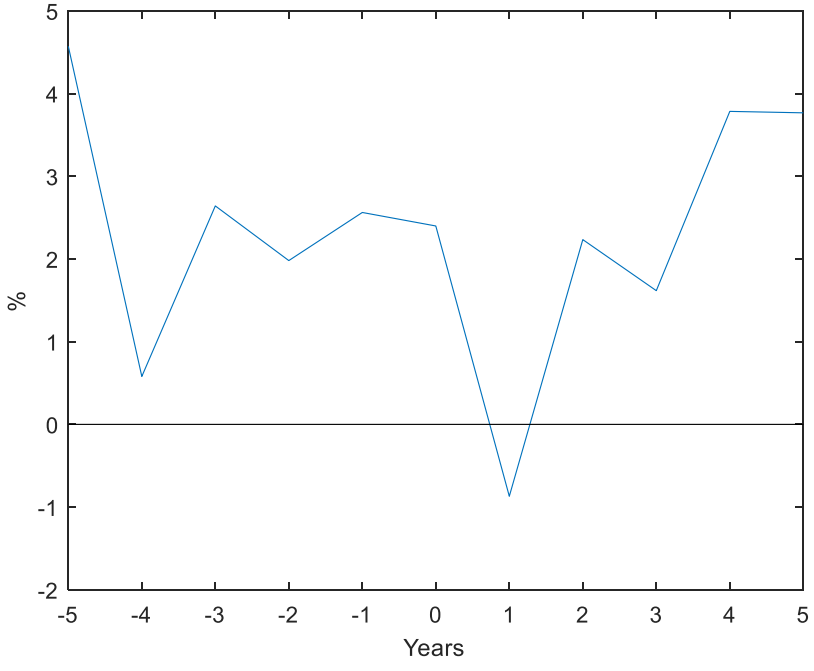

Fig. 2. *Banking crisis and the unconditional path of real GDP growth.*
Notes: This figure shows the unconditional path of real GDP growth before and after banking crises.
Source: See Table 2.

estimates of agricultural output (Broadberry et al., 2018; Clark, 2018). Second, the standard errors for the volume of exports, imports and GDP are believed to be in the range of 10 to 20 per cent between 1870 and 1913 (Solomou and Weale, 1991). In general, measurement error inflates standard errors and attenuates coefficients.

Following Jalil (2015), we estimate the following VAR in order to systematically investigate how banking crises affect the economy:

$$\mathbf{Y_t} = \mathbf{A_0} + \sum_{i=1}^{P} \mathbf{A_i} \mathbf{Y_{t-i}} + \mathbf{u_t} \tag{1}$$

where $\mathbf{Y}_t = (CRISIS_t, y_t)'$. $CRISIS_t$ is our new series of banking crises that takes on the value of 1 in the first year of the crisis and 0 otherwise. y_t is the percentage change in real GDP.

Table 2
Data sources.

Variable	Source	Description
United Kingdom		
Bank Rate	Thomas and Dimsdale (2017)	Per cent. End year. 1750–1938
Broad money supply	Capie and Webber (1985) and Palma (2018)	£ millions. 1750–1938
Consol yield	Thomas and Dimsdale (2017)	Per cent. Annual average. 1750–1938
Consumer price index	Thomas and Dimsdale (2017)	1750 = 100. 1750–1938
Crisis variable	See text	0, 1. 1750–1938
Crisis variable (alternative)	Reinhart and Rogoff (2009a), Schularick and Taylor (2012) and Turner (2014)	0, 1. 1800–2008
Equity prices	Thomas and Dimsdale (2017)	1750 = 100. 1750–1938
Government revenue and spending	Thomas and Dimsdale (2017)	Per cent of GDP. Calendar year. 1750–1938
Real agricultural, industrial and services output	Broadberry et al. (2015) and Feinstein (1972)	1750 = 100. 1750–1913
Real exports and imports	Thomas and Dimsdale (2017)	1750 = 100. 1750–1938
Real GDP at factor cost	Thomas and Dimsdale (2017)	£ millions. 1750–2008
United States		
Crisis variable	Jalil (2015)	0, 1. 1826–1915
Real GDP	Bolt and van Zanden (2014)	$ millions. 1826–1915

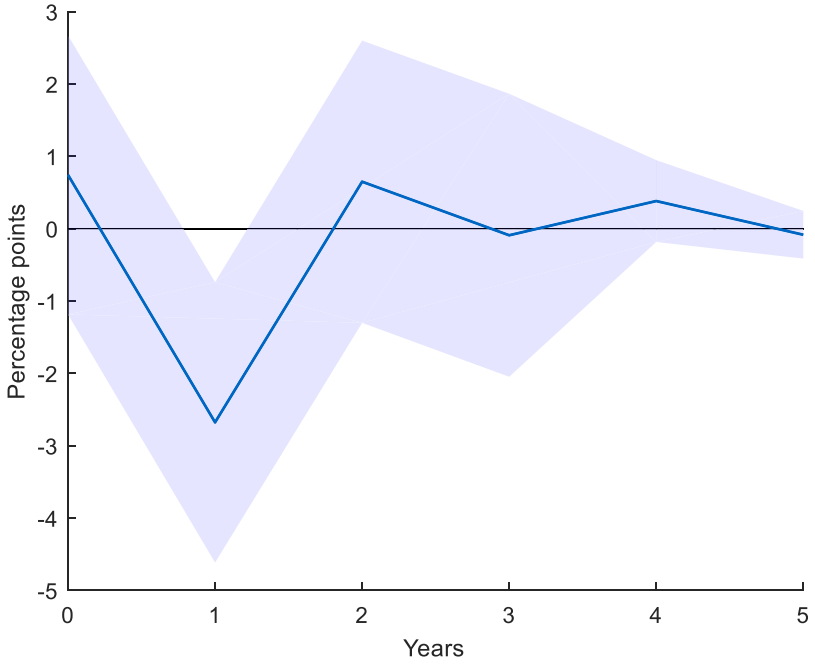

Fig. 3. *The effect of banking crises on real GDP growth.*
Notes: The figure shows the response of real GDP growth to a 1-unit impulse in *CRISIS* based on Eq. (1). The shaded area spans the 90 per cent confidence interval. The sample period is 1750 to 1938.

The number of lags in the model is set to $P = 3$. A Choleski decomposition is used to identify the shocks, with the order following that in $\mathbf{Y}_t$. This assumes that banking crises affect output contemporaneously, but that output does not affect banking crises within the period (da Rocha and Solomou, 2015; Romer and Romer, 2017, 2018).[8] The sample runs from 1750 to 1938.

3.2. Baseline results

The main result of the paper is presented in Fig. 3, which shows that banking crises are associated with economically and statistically significant economic contractions. In the year following a banking crisis, real GDP growth falls by 2.7 percentage points ($t = -2.3$). In the subsequent years, the response is not significantly different from zero. The short-run effect is consistent with the liter-

[8] Although we cannot test contemporaneous exogeneity, VAR Granger causality tests based on equation (1) suggest that banking crises are not predictable from past fluctuations in economic activity. The *p*-value for the null hypothesis that the coefficients on lagged GDP growth are jointly zero is 0.72.

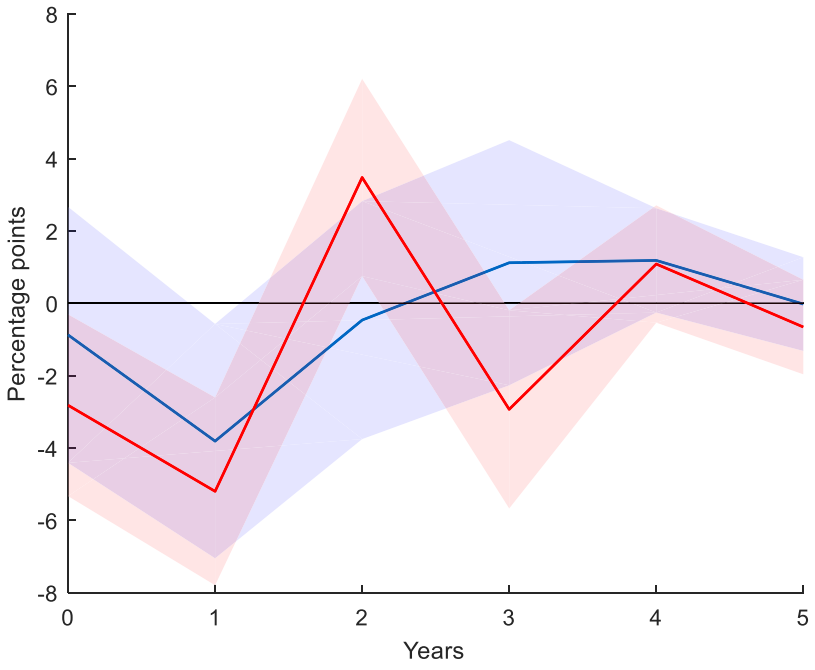

Fig. 4. *The effect of banking crises on real GDP growth: UK* versus *US*.
Notes: The figure shows the response of real GDP growth to a 1-unit impulse in *CRISIS* based on Eq. (1). The estimates for the United Kingdom are in blue. The estimates for the United States are in red. The shaded area spans the 90 per cent confidence interval. The sample period is 1826 to 1915. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

ature that documents the long-run impact of financial crises (Cerra and Saxena, 2008; Jordà et al., 2013; Reinhart and Rogoff, 2009b, 2014). A one-off reduction in the growth rate implies a once and for all impact on the level of economic activity following a banking crisis.

Fig. 4 contextualizes the new results for the United Kingdom by comparing them to Jalil's (2015) results for the United States. The blue line marks the baseline impulse response for the United Kingdom. The red line is the impulse response for the United States. In both cases, the sample period is 1826 to 1915 to facilitate comparison. The similarity is clear, with the biggest decline hitting after a year, which was −3.8 percentage points ($t = -1.9$) in the United Kingdom and −4.6 percentage points ($t = -2.8$) in the United States over the same sample period. The evidence therefore suggests that historical banking crises in both the United Kingdom and the United States have been associated with considerable output losses.

The negative macroeconomic effects of banking crises were not lost on contemporaries. Following the closure of a bank during the 1815–6 crisis, for example, the *Hampshire Chronicle* (27 November 1815) noted that "this failure has led principally to a determination to shorten the number of hands employed there, and lower the wages of others. Upwards of 5000 men have been put out of employ; and a disturbed and riotous populace has become insubordinate in consequence." As the crisis entered its eighth month, the *Morning Chronicle* (19 July 1816) explained:

> We continue to receive the most distressing accounts of the state of business at Sunderland. The failure of Cooke and Co. has paralysed everything. Nearly the whole of the ship carpenters have been discharged, and several vessels have come round from Sunderland to Newcastle to load coals, which they cannot now procure at Sunderland. Credit is completely destroyed, for since the failure of the bank not a single bill has been paid. Never, perhaps, in any place before were the ruinous effects of a sudden deprivation of capital so strikingly exemplified. How to avert the total ruination of the town will be a consideration of the greatest difficulty.

Contemporaries had a similar view of the 1825–6 crisis. The *Sussex Advertiser* (20 February 1826) wrote that "the mass of misery caused to the working class by the failure of a bank was incalculable." The *Hull Advertiser and Exchange Gazette* (16 December 1825) added:

> On Saturday and Monday a run of some magnitude was made upon the different banks in that place [Leeds]; and such was the panic for a time, that the most foolish occurrences were asserted to have taken place – cash transactions were deemed injudicious – the wages of a great number of work-people were left unpaid – and the business of shopkeepers was proceeded in with tardiness and doubt.

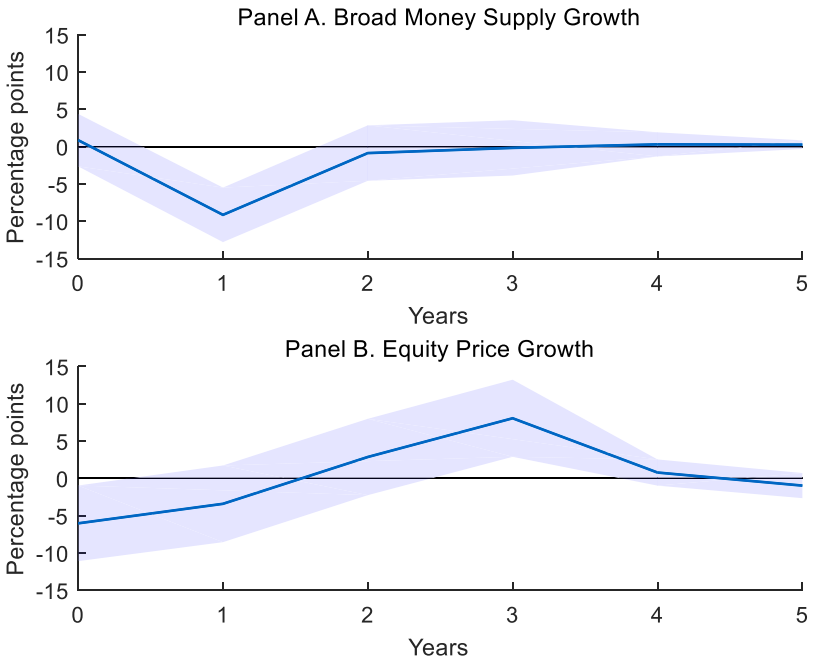

Fig. 5. *The effect of banking crises on broad money supply growth and equity price growth.*
Notes: The figure shows the response of the respective outcome variable to a 1-unit impulse in *CRISIS* based on Eq. (1). The shaded area spans the 90 per cent confidence interval. The sample period is 1750 to 1938.

In the crisis of 1840–1, the *Hampshire Telegraph* (29 November 1841) noted that since the failure of a local bank, "a general gloom has pervaded the City of Chichester, from the ruin it has inflicted on many." The negative consequences of banking crises on the economy are therefore supported by both quantitative and qualitative evidence.

3.3. Other economic outcomes

Our results show that bank failures have a contractionary impact on economic activity. However, as yet, we know little about how banking crises translate into these macroeconomic effects. We therefore investigate the transmission of crises along a number of dimensions. In order to do so, we re-estimate Eq. (1), where y_t is an outcome variable of interest.

A large body of literature documents the impact of banking crises on monetary and financial variables such as the broad money supply (Friedman and Schwartz, 1963) and equity prices (Reinhart and Rogoff, 2009b). The response of these variables to banking crises is shown in Fig. 5.

The top panel shows the response of broad money supply growth. In response to a banking crisis, there is a fall in monetary growth of 9.1 percentage points ($t = -4.1$) in the following year. There are several reasons why the broad money supply might fall during a crisis, such as through the loss of deposits in failed banks or through a rise in the currency-deposit ratio, which typically increases during panics (James, 1984; Mishkin, 1991). The bottom panel plots the effect on share price growth. Following a banking crisis, there is a slump in equity price inflation of 6.0 percentage points ($t = 2.0$) on impact. Thereafter, there is a significant overshoot.

Are banking crises negative shocks to demand or supply? Benguria and Taylor (2020) develop a theoretical model that predicts demand (household deleveraging) shocks reduce imports but leave exports unchanged, while supply (firm deleveraging) shocks contract exports but do not affect imports. Their empirical results suggest that financial crises are demand shocks. Does this stylized fact hold for the United Kingdom in the long run?

Panel A of Fig. 6 shows the response of export volume growth. Panel B plots the effect on import volume growth. The results suggest that banking crises are more consistent with demand or household deleveraging shocks: there is no statistically significant impact on export growth, while there is a large and significant drop in import growth.

There may also be a sectoral transmission mechanism at play. We therefore investigate the response of output growth in the agriculture, industry and services sectors. As the sectoral data has gaps during the First World War, we truncate the sample for all variables to 1750–1913.

Fig. 7 shows how banking crises affect the agriculture, industry and services sectors. Panel A suggests that banking crises do not have a clear impact on agricultural output growth with the response fluctuating from positive at horizons 0 (1.6 percentage points, $t = 0.7$), 2 (3.5 percentage points, $t = 1.3$) and 4 (1.9 percentage points, $t = 1.2$) to negative at horizons 1 (−3.0 percentage points, $t = -1.1$), 3 (−4.3 percentage points, $t = -1.6$) and 5 (−0.3 percentage points, $t = -0.4$). However, the estimated effect is not statistically different from zero at any horizon. Panel B shows that banking crises lead to clear contractions in industrial production

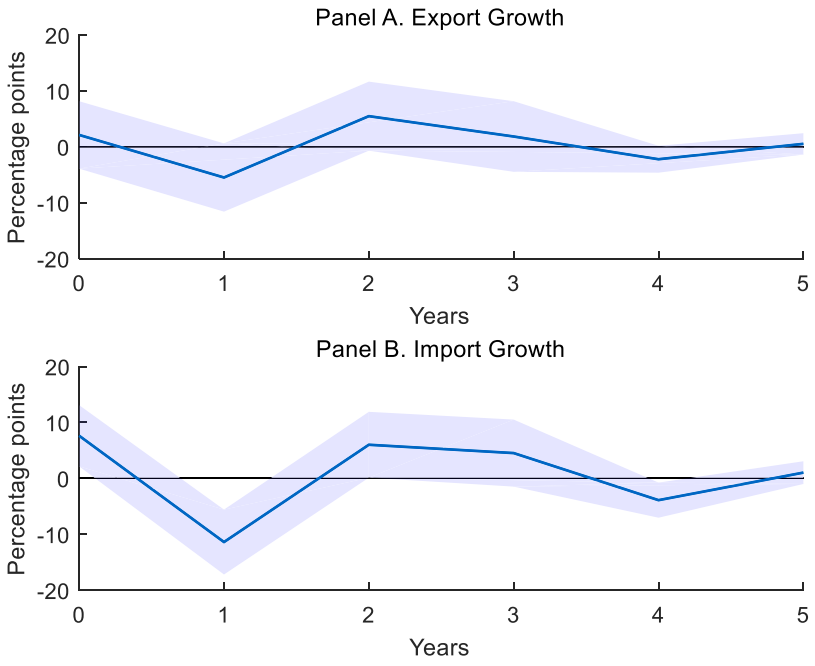

Fig. 6. *The effect of banking crises on real export and import growth.*
Notes: The figure shows the response of the respective outcome variable to a 1-unit impulse in *CRISIS* based on Eq. (1). The shaded area spans the 90 per cent confidence interval. The sample period is 1750 to 1938.

growth with a peak impact of −4.5 percentage points ($t = -2.6$) in year 1. Panel C highlights that banking crises affect the service sector to a lesser extent than agriculture or industry, as output growth declines by up to 1.6 percentage points ($t = -1.8$) in the year after the crisis. However, the standard errors are smaller for services than for agriculture, so that the peak effect is statistically significant at the 10 per cent level.[9]

3.4. Comparison with existing series

A major motivation of our paper is that existing indicators of banking crises are inaccurate. Not only is this problematic in itself but it also causes trouble in assessing the effects of these events on the macroeconomy. This is because binary independent variables which are subject to measurement error lead to attenuation bias (Aigner, 1973), biasing the estimates towards zero. In order to gauge the severity of this issue in existing series, we re-run Eq. (1) and replace $CRISIS_t$ with alternative indicators. The series are Reinhart and Rogoff (2009a), Schularick and Taylor (2012) and Turner (2014). The sample periods are 1800–1938, 1870–1938 and 1800–1938 respectively. To isolate the differences arising from the classification only, the sample period for the baseline estimates and the alternative estimates are the same. We hold all other factors constant.

Panel A of Fig. 8 plots the results for the new indicator and the Reinhart and Rogoff (2009a) series. Reinhart and Rogoff (2009a) indicator is associated with a peak drop of 1.7 percentage points ($t = -1.5$) but the effect is not statistically significant from zero at any horizon. The new chronology, on the other hand, is associated with an economically and statistically significant contraction of 3.2 percentage points ($t = -2.3$) over the common sample period of 1800–1938.

Panel B shows that the Schularick and Taylor (2012) series is associated with a maximum reduction of 2.6 percentage points ($t = -1.0$) in the second year after a crisis but the results are not statistically significant at any horizon. It is not possible to display impulse response functions for the new chronology between 1870 and 1938 because we do not document any crises in this period.

Panel C demonstrates that Turner's (2014) indicator is associated with a slump of up to 2.9 percentage points ($t = -2.1$), which is smaller and less precisely estimated than the baseline over the common sample of 1800–1938. Overall, these results suggest that there is a material degree of measurement error in existing chronologies and justify our construction of a new indicator for the United Kingdom.

As the existing chronologies run up to the beginning of the twenty-first century, a useful exercise is to compare how the baseline estimates that cover 1750 to 1938 compare to equivalent results for the post-war period. We therefore re-run the baseline model rotating in an alternative chronology and change the sample period to 1939 to 2008. The peak results are smallest for Reinhart and Rogoff (2009a) (−2.6 percentage points, $t = -2.5$) and largest for Turner (2014) (−3.8 percentage points, $t = -2.0$) in absolute terms.

[9] A possible explanation for why the impact is clearest for industry is credit intensity (Jordà et al., 2013). If this sector was more leveraged, banking crises may have led to greater output disruption. Understanding this sectoral heterogeneity is an interesting question for future research.

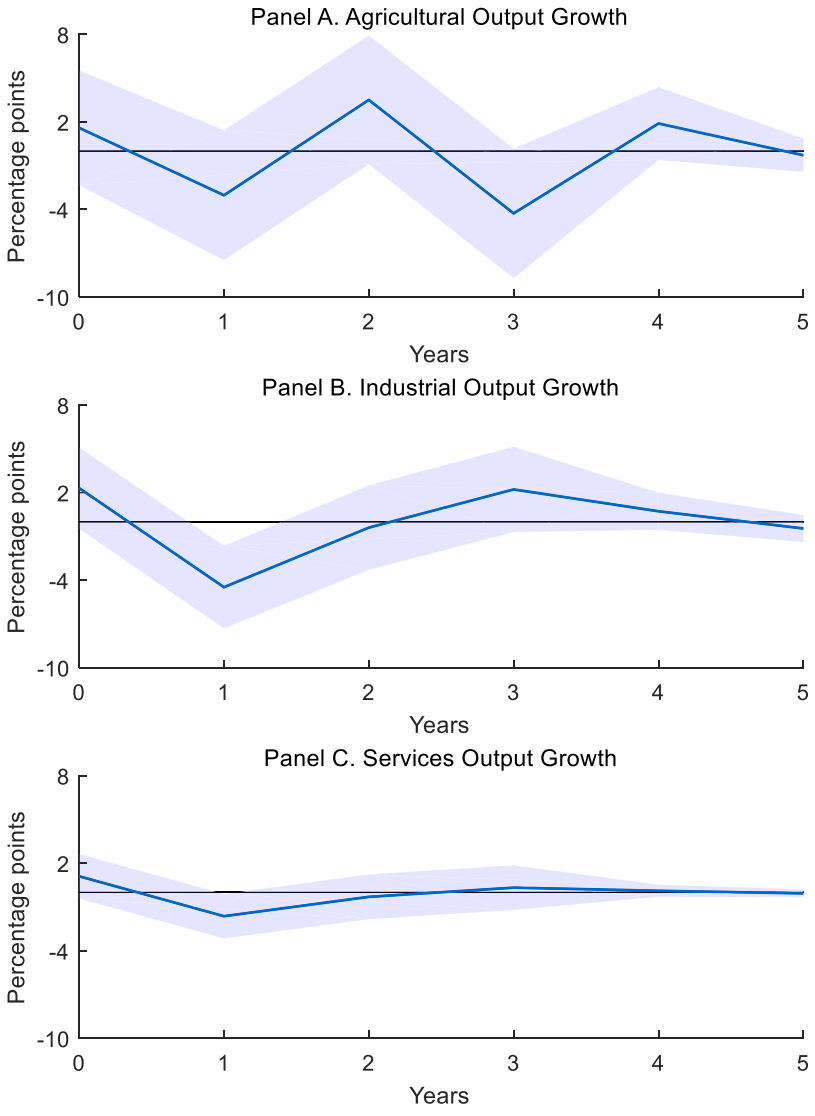

Fig. 7. *The effect of banking crises on real output growth in agriculture, industry and services.*
Notes: The figure shows the response of the respective outcome variable to a 1-unit impulse in *CRISIS* based on Eq. (1). The shaded area spans the 90 per cent confidence interval. The sample period is 1750 to 1913.

While the baseline estimates spanning the Industrial Revolution to the Second World War fall within the interval of the post-1939 estimates, it is perhaps surprising that the estimates are not smaller given the absence of government intervention. While the objective of economic policy would be to limit the economic consequences of crises, there are other changes that may have increased the true, no intervention, cost of crises since the onset of World War 2, such as structural change, the degree of monetary and fiscal policy space (Romer and Romer, 2018), bank capitalization (Jordà et al., 2020) and credit intensity (Jordà et al., 2013).

3.5. Identification

The bulk of existing research has assumed that banking crises affect, but are not affected by, the economy (da Rocha and Solomou, 2015; Romer and Romer, 2017, 2018). However, if banking crises are not random, conditional on controls, then the estimated effects may be biased. A solution to the identification problem in the context of time series has been the narrative approach, which has recently been applied to tax multipliers (Cloyne, 2013; Romer and Romer, 2010), government spending multipliers (Ramey, 2011; Ramey and Zubairy, 2018) and monetary policy (Cloyne and Hürtgen, 2016; Lennard, 2018; Romer and Romer, 2004), but can be traced back to the seminal contribution of Friedman and Schwartz (1963).

In this spirit, we apply the narrative approach, which was pioneered in the case of historical banking crises in the United States by Jalil (2015). The intuition is to use contemporary accounts to disentangle exogenous crises, i.e., those that were not related to output

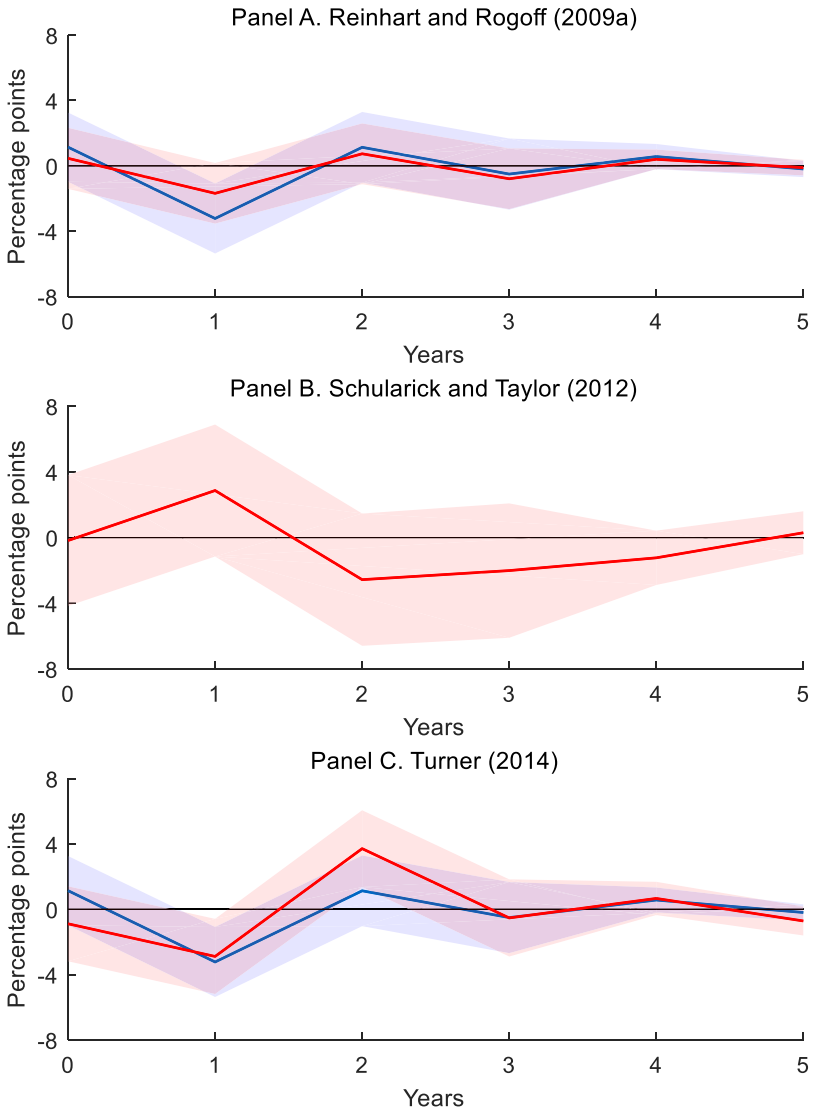

Fig. 8. *The effect of banking crises on real GDP growth: alternative crisis chronologies.*
Notes: The figure shows the response of real GDP growth to a 1-unit impulse in a respective crisis indicator based on Eq. (1). The baseline estimates are in blue. The alternative estimates are in red. The shaded area spans the 90 per cent confidence interval. The sample period is 1800 to 1938 in panels A and C. The sample period is 1870–1938 in Panel B. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

shocks, from endogenous crises, i.e., those that were related to such shocks. This approach assumes that informed contemporaries could accurately identify the cause of a crisis. In order to make the discussion more concrete, consider the following model:

$$y_t = \beta_0 + \beta_1 CRISIS_t + u_t \tag{2}$$

To consistently estimate β_1 it is necessary that $Cov(CRISIS_t, u_t) = 0$. However, it is plausible that banking crises are not only a function of idiosyncratic shocks, x_t, but also the shocks that affect y_t:

$$CRISIS_t = x_t + f(u_t) \tag{3}$$

If this is the case, simply using $CRISIS_t$ will lead to inconsistent estimates of β_1 because, as is documented in Eq. (3), $Cov(CRISIS_t, u_t) \neq 0$. However, isolating those crises in $CRISIS_t$ that are determined by exogenous factors will lead to unbiased estimates of β_1.

The starting point is to classify which of the crises were exogenous using the narrative record. We study a range of primary sources, such as newspapers, parliamentary enquiries and bank archival records. For the sake of robustness, we also cross-reference the reports of contemporaries with the existing historiography. The results show that half of the eight crises were exogenous: 1772, 1825–6, 1857 and 1866, while the other half were endogenous: 1815–6, 1820–1, 1840–1 and 1847. The fact that half of the crises

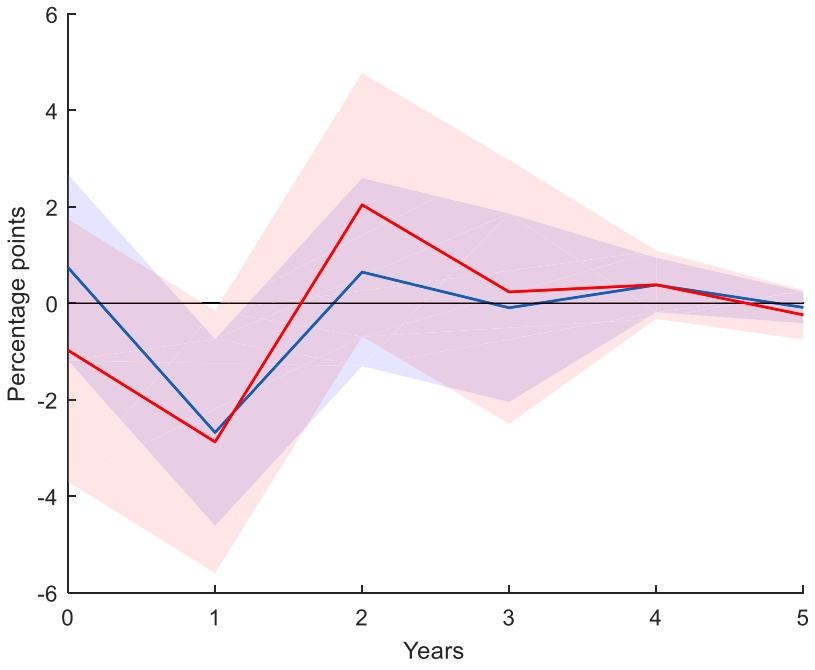

Fig. 9. *The causal effect of banking crises on real GDP growth.*
Notes: The figure shows the response of real GDP growth to a 1-unit impulse in *CRISIS* based on Eq. (1). The baseline estimates are in blue. The estimates based on exogenous crises only are in red. The shaded area spans the 90 per cent confidence interval. The sample period is 1750 to 1938. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

prior to the Second World War were exogenous challenges Aldcroft and Fearon's (1972, p. 95) argument that "the great financial crises of this era occur, almost without exception, after the downturn of the cycle."

The key criteria when analysing the primary sources is whether the crisis was caused by endogenous factors, such as a depression or economic policy, or exogenous factors, such as fraud or risk mismanagement. The evidence we gathered is reported in Appendix C and our classification scheme is shown in Table C1.

To give an impression of how we classify each crisis, we provide examples of the evidence for an endogenous crisis and an exogenous crisis. Prior to and during the crisis of 1820–1, deteriorating economic conditions and deflation featured prominently in narrative accounts, as the UK moved to restore gold convertibility in 1821. The press reported that "the measure of the restoration of cash payments had the necessary effect of restricting the circulation of the country, and hence it was impossible that in the present state of things the same prices could be obtained for corn as in former years" (*Kentish Weekly Post*, 6 March 1821). Another newspaper surmised that the "depression, now so universally felt by the agriculturists […] must, if it continues, terminate at no very distant period in general bankruptcy" (*Bury and Norwich Post*, 17 January 1821). Giving evidence to the Lords Select Committee, one banker, whose institution had failed at the beginning of the crisis, attributed its demise to deflation: "it proceeded chiefly from the fall of prices, which reduced the value of the securities on which we lent money" (Parliamentary Papers, 1826). This evidence means that we classify 1820–1 as an endogenous crisis.

The crisis of 1857 provides a good example of an exogenous crisis. There was widespread evidence that the crisis of 1857 occurred against the backdrop of a buoyant economy and was unexpected by contemporaries. It was described as a tale of "fraud on a wholesale scale" by "reckless" bank directors (*Gloucester Journal*, 2 May 1857; *Edinburgh Evening Courant*, 22 December 1857). The event appeared to take "the whole commercial public by surprise" as the panicking public "imagine dangers that do not exist" (*London Daily News*, 26 September 1857, p. 3). Newspaper reports were corroborated by official inquiries, as evidenced by the Governor of the Bank of England, who stated before a government enquiry that the "trade of the United Kingdom was generally considered to be in a sound and healthy state" and that the public "were little aware that a crisis […] was impending, far less that it was so near at hand" (Parliamentary Papers, 1857-8).

Armed with the new exogenous series, we re-run Eq. (1), where $\mathbf{Y}_t = (CRISIS_t^X, y_t)'$. Fig. 9 shows the causal impact of banking crises on the macroeconomy. The results are similar to the baseline estimates, peaking at −2.9 percentage points ($t = -1.7$) after one year.

3.6. Banking crises and downturns

An important question is whether downturns with a banking crisis differed from those without. Recent research suggests that "financial recessions" are associated with stronger contractions and weaker recoveries than "normal recessions" (Jalil, 2015; Jordà

Table 3
Recessions with and without banking crises.

	Change in Output (%)	Length of Recession (Years)	Length of Recovery (Years)	Average Growth Rate of Recovery (%)
Recessions with banking crisis	−3.1	1.2	2.0	3.9
Recessions without banking crises	−2.1	1.5	1.7	4.8
Difference	−1.0	−0.4	0.3	−0.9

Notes: This table displays averages of: (1) the change in output (from peak to trough), (2) the length of the recession (from peak to trough), (3) the length of the recovery (from trough until previous peak surpassed) and (4) the average growth rate of the recovery (from trough until previous peak surpassed) for recessions with and without banking crises. Recessions are based on the level of real GDP (Thomas and Dimsdale, 2017) and the Bry and Boschan (1971) algorithm. The sample contains 6 recessions with banking crises and 23 recessions without banking crises between the recessions of 1756 and 1892–3.

et al., 2013). Our new chronology allows us to explore this question for the United Kingdom. In order to do so, we do two things. First, following Jordà et al. (2013), we identify recessions based on the level of real GDP and the Bry and Boschan algorithm (1971) because there is no consistent, long-run chronology of British business cycles for this period. Second, we investigate four summary statistics: (1) the change in output (from peak to trough), (2) the length of the recession (from peak to trough), (3) the length of the recovery (from trough until previous peak surpassed) and (4) the average growth rate of the recovery (from trough until previous peak surpassed), as in Jalil (2015).

Table 3 shows the results. The sample starts 3 downturns before our first crisis in 1772 (the slumps of 1756, 1762–5 and 1770) and ends 3 recessions after our last crisis in 1866 (the contractions of 1879, 1884–5 and 1892–3), resulting in a sample of 29 recessions, of which 6 were associated with banking crises.[10] The results suggest that contractions during crisis recessions are roughly 1 percentage point deeper but about 4 months shorter, while the recoveries are shallower by 0.9 percentage points and longer by 4 months. Therefore, our results are largely consistent with existing evidence documenting that financial crisis recessions are associated with worse economic outcomes than normal recessions in both the downturn and the recovery.

4. Robustness

In this section, we put the baseline model through the mill, assessing the sensitivity of the results to alternative crisis measures, alternative model specifications and to the addition of extra control variables.

4.1. Alternative crisis measures

Our record of British banking crises is associated with a significant drop in economic activity. But how sensitive is this key result to our measurement of banking crises?

The first alternative we consider is to study the fraction of banks, as opposed to the fraction of paid-up capital, that failed or suspended. As a result, all banks are treated equally so that the failure of the smallest bank in the country adds no more than the failure of the largest. While this may be inferior, it may help to alleviate concerns about our measure of paid-up capital, which has a number of limitations, as discussed in Appendix A. Altering this aspect of the definition, and holding fixed the conditions on geography and panics, leads to a slightly altered chronology that excludes 1857, suggesting that it was a crisis that involved the failure of large institutions. Panel A of Fig. 10 shows that the results are almost identical to those from the baseline model.

The second alternative is to lower the cut-off for failures and suspensions to the 85th percentile and above, and keeping the other criteria in place. A relaxation of the rules is likely to reduce the costs of banking crises as smaller and more uncertain events are included. On this basis, 1810, 1829 and 1878 meet the criteria, while the beginning of the crisis of 1825–6 is shifted back to 1824. As expected, Panel B shows that banking crises are still associated with reduced output, but the effect is attenuated. The peak point estimate is −1.6 percentage points ($t = -1.6$), which is 39 per cent smaller than the baseline model for the same horizon, while the standard error is virtually the same. At best, broadening the definition includes more minor crises and their more mild economic effects. At worst, it introduces false positives into the chronology and biases the estimated effects towards zero.

The third alternative is to raise the threshold to the 95th percentile and above. A tightening of the rules is likely to increase the negative impact of crises as only the largest are included. Focusing on this subset of more severe episodes disregards the crises of 1772 and 1847 and restricts the crises of 1820–1 and 1840–1 to 1821 and 1841 respectively, despite a wealth of narrative evidence documenting contemporaries' experience of banking crises in these years. In line with our expectations, Panel C shows that larger crises are associated with bigger effects, as the peak impact rises to 3.3 percentage points ($t = -2.5$).

The fourth alternative is to drop the condition of runs and panics. Depositors running and panicking for liquidity is central to existing definitions and theoretical models of banking crises. Nevertheless, it is interesting to see how important this condition is

[10] The results are robust to expanding and narrowing the window, as long as the recession of 1919-21 is avoided. During this slump, economic activity contracted by more than 25 per cent and the recovery lasted 13 years. Including this episode, therefore, majorly skews the results for normal recessions.

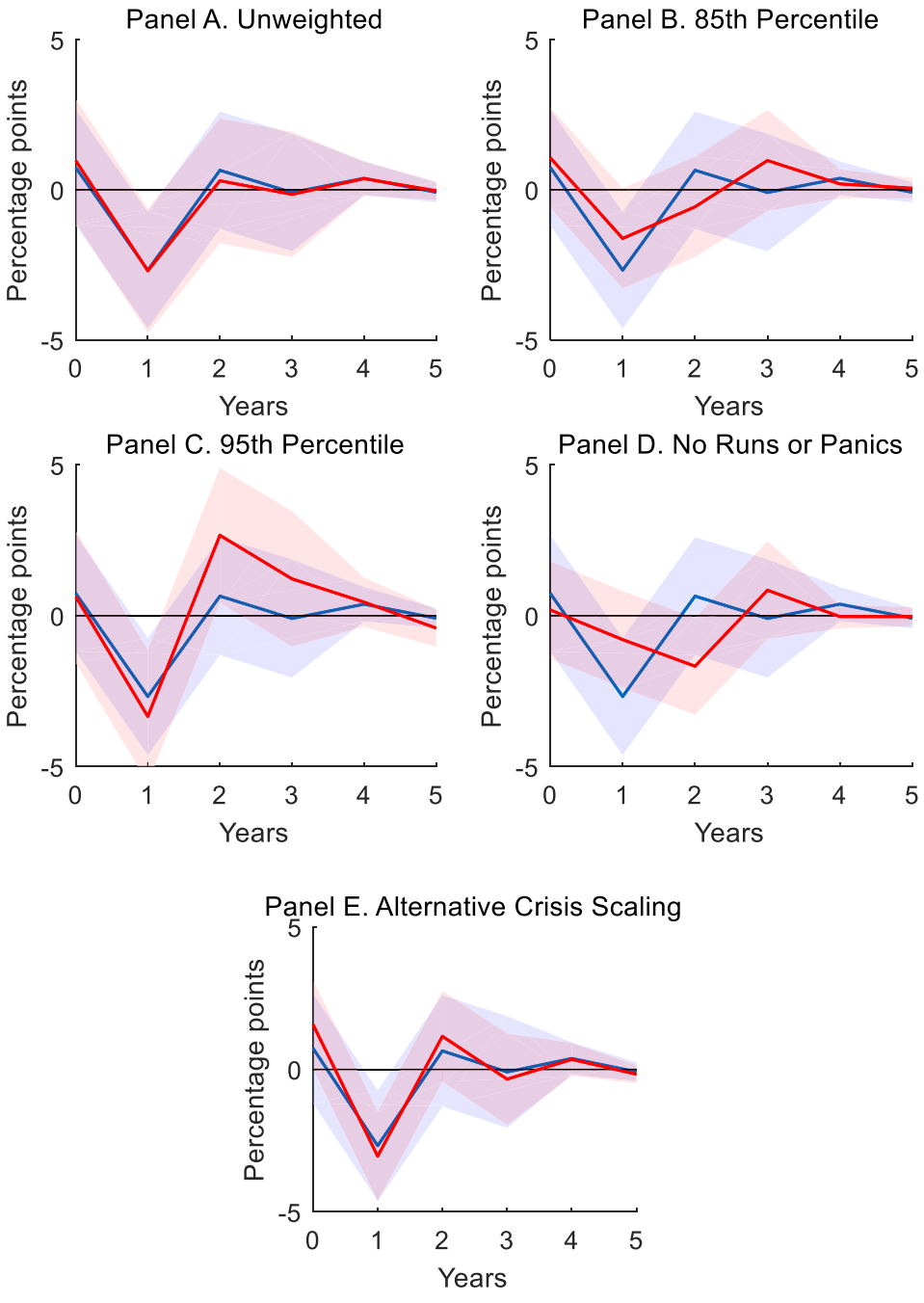

Fig. 10. *The effect of banking crises on real GDP growth: alternative crisis measures.*
Notes: The figure shows the response of real GDP growth to a 1-unit impulse in a respective crisis indicator based on Eq. (1). The baseline estimates are in blue. The alternative estimates are in red. The shaded area spans the 90 per cent confidence interval. The sample period is 1750 to 1938. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

for both the chronology and the econometric results. In all there were six years of significant, geographically-dispersed failures and suspensions that were not associated with runs and panics: 1800, 1812, 1824, 1837, 1929 and 1930. The results of re-running the model with these years included are shown in Panel D. The worst effects of the crisis are pushed back to the second year, but the impact is reduced to 1.7 percentage points ($t = -1.7$). Our preferred explanation is that we do not believe that these years are crises so that the attenuated effect is due to measurement error. Another explanation is that panics amplify the costs of crises. This interpretation would be consistent with Baron et al.'s (2020) analysis of 46 countries between 1870 and 2016, which suggests that banking crises

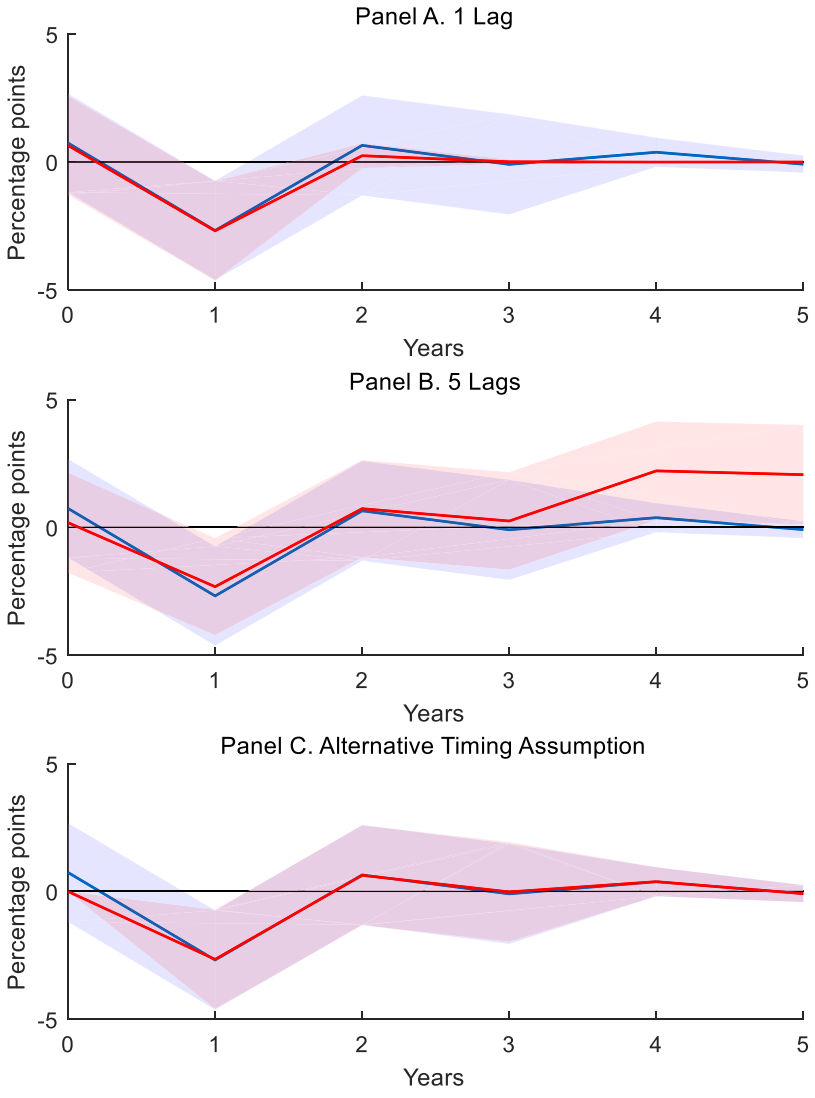

Fig. 11. *The effect of banking crises on real GDP growth: alternative specifications.*
Notes: The figure shows the response of real GDP growth to a 1-unit impulse in *CRISIS* based on Eq. (1). The baseline estimates are in blue. The alternative estimates are in red. The shaded area spans the 90 per cent confidence interval. The sample period is 1750 to 1938. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

without panics are associated with credit and output contractions but that banking crises with panics lead to greater losses so that panics are an amplification mechanism.

The final alternative is to scale banking crises to reflect their severity. Although there are multiple dimensions in our definition along which a crisis can vary in intensity, such as geographic diffusion and the extent of runs and panics, we focus on the fraction of paid-up capital that failed or suspended as this avoids nontrivial problems of how to weight multiple continuous indicators. As a result, we construct a scaled indicator that, in the first year of the crisis, takes on the fraction of the paid-up capital suffering failures and suspensions during the crisis and zero otherwise. The results are shown in Panel E. The impulse response function has been scaled by the mean failure rate during crises of 5.4 per cent. Again, the decline in economic activity is economically and statistically significant, declining by up to 3.0 per cent ($t = -3.2$).

4.2. Alternative specifications

The results may be sensitive to the specification of the VAR. One possibility is the number of lags included in the model. In the baseline specification, 3 lags of $CRISIS_t$ and y_t were included, which was in line with Jalil (2015). Panel A of Fig. 11 shows the results from a model with 1 lag included, while Panel B shows the results from a model with 5 lags included. Reducing the lag length does

Table 4
The effect of banking crises on real GDP growth: additional control variables.

Control Variable(s)	Peak Effect (Percentage Points)
None	−2.7 ($t = -2.3$)
Bank Rate	−2.3 ($t = -1.9$)
Government revenue	−2.7 ($t = -2.3$)
Government spending	−2.8 ($t = -2.5$)
Consol yield	−2.5 ($t = -2.2$)
CPI inflation	−2.5 ($t = -2.2$)
Equity price inflation	−2.6 ($t = -2.2$)
All	−2.1 ($t = -2.0$)

Notes: This table shows the peak response of real GDP growth to a 1-unit impulse in *CRISIS* based on Eq. (1), controlling for the variables in the first column. *t*-statistics are in parentheses. The sample period is 1750 to 1938.

not affect the estimated peak effects. Increasing the number of lags slightly reduces the maximum impact to 2.3 percentage points ($t = -2.0$).

Another possibility is that the results are sensitive to the timing assumption. While the estimates based on crises that were plausibly exogenous suggest that the baseline results are, if anything, a lower bound on the causal effects, we reverse the timing assumptions as a belt and braces approach to the endogeneity problem. As a result, we re-estimate our baseline model where $\mathbf{Y}_t = (y_t,\ CRISIS_t)'$, which assumes that the economy affects, but is not affected by, banking crises contemporaneously. Panel C shows that the results are not sensitive to this assumption, as output growth declines by 2.7 per cent ($t = -2.3$) in the year after a banking crisis.

4.3. Additional control variables

There are a number of factors that could have been correlated with banking crises and output growth. If this was the case, then omitting these factors will result in misleading impulse response functions (Stock and Watson, 2001). While the original specification was intended to be simple, we now extend the model to include a range of control variables. In order to do so, we rotate in a control of interest, x_t, in a sequence of models so that $\mathbf{Y}_t = (CRISIS_t, y_t, x_t)'$.

The first set of control variables relate to stabilization policy. Monetary and fiscal policy are good candidates to be both correlated with banking crises and output growth. According to Dimsdale and Hotson (2014, p. 32), the Bank of England and HM Treasury were to blame for the crisis of 1825–6, while economic policy had large macroeconomic effects historically (Lennard, 2018). Our measure of monetary policy is Bank Rate, the rate at which the Bank of England lent to the banking system. Fiscal policy is captured by government revenue as a percentage of GDP, which can be thought of as an average tax rate, and government spending as a percentage of GDP. We also include the yield on consols, which reflects both monetary and fiscal policy. The next set of controls are general macroeconomic variables: CPI inflation and share price returns.

Table 4 shows the estimated peak responses of output growth to banking crises along with the associated *t*-statistics. The first row shows the effect for the baseline specification for reference, while subsequent rows list the corresponding numbers for the various x_ts. Adding controls has mixed results. Controlling for Bank Rate points to slightly smaller effects compared to those from the baseline model, which possibly reflects the contractionary tendency of raising Bank Rate in crises. Conditioning on the consol yield, CPI inflation and equity price inflation also results in weaker responses. Controlling for government revenue and government spending leads to estimates that are larger than or equal to those from the simple bivariate model.

Conclusions

This paper investigates the macroeconomic effects of banking crises in the United Kingdom between the Industrial Revolution and the Second World War. First, we construct a new chronology of banking crises, which we define as episodes of significant, geographically-dispersed reductions in capital arising from failures and suspensions, accompanied by runs and panics. We identify eight crises: 1772, 1815-6, 1820-1, 1825-6, 1840-1, 1847, 1857 and 1866. The new series differs from existing chronologies, upgrading some underemphasized episodes, such as 1820-1 and 1840-1, and downgrading some overemphasized events, such as 1878 and 1890.

Second, we use our new chronology to understand how banking crises affect the economy. We find that there is a large and significant drop in economic growth in the year after a banking crisis. As there is no subsequent overshoot, the negative impact on the level of economic activity is long lasting. Therefore, banking crises not only of the present but also of the past leave deep economic scars.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.eeh.2020.101357.

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