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Episodes of Financial Deepening: Credit Booms or Growth Generators?

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Abstract. One strand of the economics literature addresses financial deepening as a precursor to economic growth. Another views it as a cause of financial crises. We examine historical data for 17 economies from 1870 to 1929 to distinguish episodes of growth induced by financial deepening from crises induced by credit booms. Cross-country panel regressions with five-year averages indicate that deepening episodes, defined as increases of more than thirty percent (and alternatively more than twenty percentage points) in the ratio of M2 to GDP over a ten year period, significantly enhanced the standard finance-growth dynamic, while deepening associated with financial crises sharply hindered it. We then describe some specific episodes of financial deepening in our sample.

Keywords – finance-growth nexus, Atlantic economies, financial deepening, financial crisis

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1. Introduction

A well-developed literature now recognizes that financial development plays an important role in promoting long-run growth.[1] Yet measures commonly used to gauge the extent of financial development, such as the ratio of broad money to output, also serve well as predictors of financial crises, especially when expressed as rapid changes in the ratio (Radelet and Sachs 1998; Terrones 2004; Schularick and Taylor 2012). History reinforces the second interpretation with account after account of credit booms and the accompanying monetary expansions leading to financial crashes and panics (Calomiris and Haber 2014).

These two parallel strands in the literature on financial development and the economic performance of countries have for the most part developed independently of one another. The first, the finance-growth nexus, focuses on the role of financial deepening in economic growth while the second emphasizes the costly effects of financial crises that can follow from episodes of excessive leveraging and credit expansion. The two facets are particularly interesting because it is often difficult to distinguish one from the other.

The emphasis on financial crises, though certainly justified in the wake of the 2007-2008 disturbances and the obvious costs associated with them, may produce the impression that all credit expansions are unhealthy. Recent historical work such as Reinhart and Rogoff (2009) and Schularick and Taylor (2012) reinforce that conclusion. We examine whether there is also scope for virtuous episodes of credit expansion that spur growth and provide a countervailing force against crises. Rousseau and Wachtel (1998) offer evidence supporting this relationship in a study of five industrializing countries (Canada, Norway, Sweden, the United Kingdom and the

[1] See, among many others, King and Levine (1993), Demetriades and Hussein (1996), Rousseau and Wachtel (1998), and Levine, Loayza, and Beck (2000).

United States) covering the period from 1870 to 1929, but sample selection may limit the generality of the findings.[2] Cross country studies with many countries and data after 1960, such as King and Levine (1993), show correlations from financial development to higher subsequent growth rates, but it unclear whether the effects emerge from dynamics within individual countries as the relevant theory indicates they should (Gurley and Shaw 1955; Goldsmith 1969; McKinnon 1973), or are artifacts of omitted country characteristics that correlate with financial development to yield a result dominated by variation across countries (Wachtel 2001; 2011).

A connection between the two strands of the literature was suggested by our panel study with data for the last 50 years, Rousseau and Wachtel (2011). We found that the strength of the finance growth nexus weakened in the last decade of the 20th century and suggested that the reason might be the increased incidence of financial crises. The long term impact of financial deepening on economic growth is muted when a country experiences a financial crisis.

In this chapter, we examine the financial "deepening" experiences of 17 economies from 1880 to 1929 to identify cases of growth-enhancing expansions of credit.[3] The historical focus is useful because it is believed that financial development can have its strongest effects in the earlier stages of economic growth (Cameron 1963), and considering a simpler global economy and nations that would be classified as emerging markets by today's standards might shed light on the effects of credit expansions in modern emerging and transitional economies. Our broad scope of 17 countries also serves to attenuate selection issues.

We conduct the analysis using cross country regressions similar to those in the seminal literature on finance and growth with some important additional features. We identify episodes

[2] Rousseau (1999) provides similar evidence for Meiji-era Japan.

[3] The 17 countries are Argentina, Australia, Brazil, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, United Kingdom, and the United States.

of financial deepening and distinguish the effects of those ending in a crisis from those that do not. This allows us to illustrate how expansions in credit affect the operation of the finance-growth nexus. We close by discussing some of the episodes of beneficial deepening that appear in our sample.

2. Describing the Data

The analysis covers 17 countries for which we have annual macroeconomic accounts dating back to at least 1880. Data for population, the broad money stock (M2), gross domestic product (GDP), the GDP deflator, imports, and exports are from worksheets underlying Bordo and Jonung (1987), Obstfeld and Taylor (2000), Rousseau and Wachtel (1998), and Rousseau (1999). For the dating of financial crises since 1870, we use the list from the on line appendix of Schularick and Taylor (2012), which we adjust for Canada and the United Kingdom, and then add our own dates for two countries (Argentina and Brazil) which are not included in their sample.[4]

The ratio of M2 to GDP is our measure of financial development; it primarily reflects the size of a country's banking system. Ideally we would like additional measures of financial development such as the ratio of private credit or stock market capitalization to GDP, but these aggregates are not available for a broad range of countries over the full period of our study.[5] The

[4] Schularick and Taylor (2012) use documentary descriptions of crisis events from Bordo et al. (2001) and Reinhart and Rogoff (2009) to date financial crises. Correspondence with Michael Bordo and our own reading of Bordo et al. (2001) suggest that Canada and the United Kingdom did not experience systemic financial crises between 1870 and 1929, and we adjust the list accordingly by removing financial crises for Canada in 1873, 1907, and 1923, and for the United Kingdom in 1873 and 1890. Our econometric findings are qualitatively identical when we use Schularick and Taylor's list without our adjustments.

[5] Schularick and Taylor (2012) build a dataset of bank loans for 15 of the countries we study starting as early as 1870 in some instances, but the coverage across countries is not adequate for

M2 to GDP ratio of course emphasizes the role of banks, which were the primary financial intermediaries at the time, and includes the provision of the transactions asset by both private-sector financial intermediaries and the government. Money creation by the private banking sector is a fundamental form of intermediation since bank liabilities are a way of holding savings and bank assets are used to finance investment activity.

We convert output to real per capita values using population and the GDP deflator before computing growth rates.

We determine episodes of financial deepening from our annual data for M2/GDP for each of the 17 countries by rolling through the samples and computing for each country-year:

$D_{i.t} = 1$ if $F_{i,t}/F_{i,t-10} > 1.3$, and

$D_{i,t} = 0$ otherwise,

where F represents the ratio of M2 to GDP, and the subscripts *i* and *t* index countries and individual years respectively. In words, we begin by turning on a dummy variable indicating an episode of "financial deepening" in year *t* when the growth rate of M2/GDP over the previous 10 years exceeds 30 percent. This implies an average annual deepening of about 2.7 percent over the decade. Deepening episodes can thus span multiple years when the ratio's ten-year growth rate remains above 30 percent in consecutive years. We also work with an alternative definition of a deepening episode based on computing for each country-year

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our purposes. In particular, the sample of loan data prior to 1900 is about one-third smaller than our M2 sample and would leave to the omission of many 19th century crisis episodes. Given our interest in exploring relationships between financial development, financial crises, and growth going back well into the 19th century, we proceed with M2 as our financial aggregate. At the same time, we note that the annual series for bank loans and M2 have correlations greater than 0.9 for all 15 countries common to our samples when calculated with the available common observations. We thank Moritz Schularick for making an updated version of the bank loan data available to us.

$D_{i,t} = 1$ if $F_{i,t} - F_{i,t-10} > 0.2$, and

$D_{i,t} = 0$ otherwise.

This criterion turns on a dummy for an episode of financial deepening in year *t* when the ratio of M2 to GDP (in percent) rises by more than 20 percentage points over the previous 10 years. The use of these type of criteria to identify deepening episodes was hinted at by Jordà, Schularick and Taylor (2013, p. 9) who note that "three quarters of all episodes during which credit to GDP rose by 30 percentage points or more over a five-year period ended in a systemic crisis."

Determining whether a country is in the midst of a deepening episode at any point in time depends on criteria set by the researcher, and our strategy is no exception. For example, one year of extraordinary advance in ratio of M2 to GDP could trigger the dummy variable for as many as ten subsequent years, even if there was no deepening in the interim. As it turns out, however, our thresholds of 30 percent or 20 percentage point increases avoids this outcome and we see very few lengthy episodes in the sample. This would not be the case if we lowered the thresholds. Our criteria therefore reflect a balance between finding too many or too few deepening episodes.

Table 1 lists both the systemic financial crises and the episodes of financial deepening for the 17 countries. There were 49 systemic financial crises between 1870 and 1929. Six countries experienced crises in 1907 and four countries in 1893 and 1921.

Using the 30 percent criterion, there are 54 episodes of financial deepening starting between 1880 and 1929, though 25 of these represent only a single year. Each country has at least one such episode. Since we require data on M2/GDP for at least ten past years to identify a deepening episode for a particular country in a given year, we go back as far as 1870 to compute the ten-year growth rates needed to determine episodes in the 1880s. Although data are unavailable for more than two-thirds of the countries in our sample before 1870, Table 1 shows

another twelve episodes of financial deepening that begin prior to 1880.

We identify only 24 episodes of financial deepening that begin in 1880 or later using the 20 percentage point criterion, and 13 of these represent a single year. Notably nine of the 17 countries (Argentina, Australia, Brazil, Canada, Germany, France, Italy, Portugal, and the United States) never experience a deepening using this criterion, and this seems unlikely given evidence for long-term financial deepening in Canada and the United States provided by Rousseau and Wachtel (1998). For this reason we prefer the 30 percent criterion and focus on results that use it, leaving the alternate criterion for robustness checks.

Table 2 shows that both crises and deepening episodes are spread throughout the sample period.

Table 3 reports the frequency of deepening episodes (using the 30 percent criterion) and crises by country since 1870. The left column shows the number of times a financial crises occurred during a deepening episode, the center column indicates deepening episodes not associated with a crisis and the right column indicates financial crises that occur outside of deepening episodes. There are as many financial crises that occur outside of deepening episodes in our sample as occur within them (22), and nearly two thirds of deepening episodes do not involve a financial crisis. Since economic theory suggests that the relation between finance and growth is a dynamic one, it is natural that distinguishing between these two types of deepening episodes turns out to be central in the empirical models we estimate in Section 3.

Table 4 reports average growth rates of real per capita GDP for the 17 countries across five-year periods from 1880 to 1929 based on whether a financial deepening, crisis, or both a

deepening and crisis occurs during the period.[6] The table shows that growth rates are much higher on average in periods of financial deepening that are not associated with a crisis than those that are (1.75% compared to 0.93%). Average growth is about the same when there is financial deepening but without crisis or a crisis period without with financial deepening. In the subsequent five-year period, growth is most rapid following a period of deepening with crisis. Focusing on the financial crises, subsequent growth is more rapid after crises that are associated with a deepening than after crises occurring outside of a deepening (2.92% compared to 1.67%). Finally, growth rates during episodes of financial deepening without a crisis are higher than the average of 1.58% across all countries and five-year periods.

These statistics suggest a narrative in which episodes of financial deepening can promote growth if not taken to excess, but also that growth tends to recover rapidly after financial crises that follow credit booms. Given that financial deepening episodes are related to only about half of the financial crises in our sample (Table 3), this suggests that episodes of modest financial deepening may help to drive economic growth, and that taking them too far on occasion may be preferable to no deepening at all. In the following section, we develop an econometric framework that enables us to explore these hypotheses.

3. Econometric Findings

Our econometric methodology is a modified version of the cross-country growth regression developed by Barro (1991) and extended to the study of the finance-growth nexus by King and Levine (1993). The analysis covers five-year periods from 1880 to 1929 to impose a

[6] Our econometric analysis uses the five-year periods as the unit of observation as is common in the literature. A country experiences a financial deepening in a given five year period if at least one of the deepening spells indicated in Table 1 falls within the period, and similarly for the financial crises.

reasonable degree of balance across the panel of countries and to work with the sample data that are most reliable. The baseline regression has the form

$$Growth\ Y_{i,t} = \alpha_0 + \alpha\ Y_{i,t} + \beta\ F_{i,t} + \Phi_t + \mu_{i,t,} \qquad (1)$$

where the dependent variable is the average annual percentage growth rate of real per capita income over the five year period *t* and $Y_{i,t}$ is the natural logarithm of the level of real per capita income in U.S. dollars in the first year of period *t*. $F_{i,t}$ is the average ratio of M2 to GDP over the five-year period, the Φ_t are dummy variables for the five-year periods, and $\mu_{i,t}$ is the error term. We expect a negative coefficient on the log of initial income due to the tendency for growth rates to converge across countries and over time. In some regressions we include an additional variable often found in this literature, the ratio of international trade (the sum of imports and exports) to GDP, which we expect to have a positive coefficient.[7]

We then augment the baseline with binary indicator variables for deepening episodes, financial crises, and their interactions with M2/GDP. We turn on the deepening indicator for a given country and five-year period if at least one of the years in the third column of Table 1 (financial deepening indicated by an increase in the M2/GDP ratio of at least 30% over 10 years) falls within the period, and set the indicator for financial crises similarly using years in the second column of Table 1. Thus, each five-year period can be characterized as a crisis period, a deepening period, both a deepening episode and crisis period, or a period of neither deepening nor crisis. A little more than half of the five-year periods in the sample see a deepening and/or

[7] The five-year periods are 1880-84, 1885-89, 1890-94, 1895-1900, 1900-04, 1905-09, 1910-14, 1915-19, 1920-24, and 1925-29. The sample includes at least seven and up to ten observations for each of the 17 countries. The missing five-year observations due to insufficient data for computing deepening episodes are: Argentina 1880-84, 1885-89, 1890-94; Australia 1880-84; 1885-89; Brazil 1880-84, 1885-89; France 1915-19, 1920-24, 1925-29; Germany 1880-84, 1885-89, 1915-19, 1920-24, 1925-29; Japan 1880-84; Portugal 1880-84, 1885-89; and Spain 1880-84.

crisis; crisis periods account for one-quarter of all five-year observations, and are about evenly divided between those associated with an episode of financial deepening and those that are not.

Table 5 presents instrumental variables estimates of equation (1), where we instrument the average ratios of M2 and international trade to GDP in each five-year period by their values in the initial year of the period. The two-stage least squares estimates in effect extract the components of M2/GDP and trade/GDP that can be explained by their own past values and the other exogenous variables and then insert these fitted values into the actual (second stage) regression. We augment the baseline specification (column 1) with specifications where the binary variables for financial deepening episodes and financial crises enter directly (columns 2-7). The baseline indicates a positive coefficient for the initial value of the M2/GDP ratio that is significant at the one percent level. This is consistent with earlier findings by Rousseau and Sylla (2003), and relates a 10 percentage point increase in M2/GDP with a 0.3 percentage point increase in the rate of annual GDP growth. Column (2) indicates that financial crises have a direct and negative effect on growth that is statistically significant at the five percent level, with a financial crisis relating to a decline in annual per capita growth of 1.3 percentage points. Columns (3) and (4) find no significant direct effect of our deepening indicators on output growth. Columns (5) and (6) indicate that financial crises occurring during episodes of financial deepening have even more severe effects on growth than those occurring outside of them (compare to the crisis coefficient in column (2)). Columns (4) and (6) indicate that episodes of financial deepening that occur without crisis have a positive effect on annual growth of about 0.4% although the effects are barely larger than their standard errors. Finally, column (7) shows that the results are robust to the inclusion of the ratio of international trade (the sum of exports and imports) to GDP as an additional regressor, which turns out to be not statistically significant.

The lack of direct explanatory power for the financial deepening episodes in our sample indicates that any effects on growth are likely to be indirect. The proposition that these deepening episodes act through the M2 ratios themselves is reasonable because we might expect episodes of financial deepening to improve the efficacy of the finance-growth relationship so long as they are not excessive. We therefore turn next to specifications in which our binary variables are interacted with the M2 to GDP ratio.[8]

Table 6 reports instrumental variables regression results with interaction terms included. Column (1) repeats the baseline regression. But this time, column (2) adds an interaction of M2/GDP (instrumented by its initial value) with the crisis dummy. The coefficient on M2/GDP rises to more than four in this case, and the coefficient on the interaction term is negative and statistically significant at the one percent level. This suggests that financial crises also have negative effects on growth that operate through the finance-growth nexus. Specifically, the results in column (2) indicate that a 10 percentage point increase in M2 as a percent of GDP is associated with 0.43 percentage point increase in the annual growth rates for a country that avoids financial crisis and just 0.14 percentage points (0.43–0.29) otherwise.

Columns (3) and (4) address episodes of financial deepening. Column (3) includes results with interactions of the deepening variable with M2/GDP and finds a positive coefficient that is not statistically significant. This might be expected as the dummy variable is turned on for all deepening episodes, including those associated with a financial crisis. When we remove those episodes associated with a financial crisis in column (4), the potential for rapid and beneficial financial deepening to enhance growth becomes clear with a coefficient on the interaction term that is significant at the five percent level. The coefficient indicates that the additional impact of

[8] Rousseau and Wachtel (2011) show the effects of both financial crises and liberalizations on the strength of the finance-growth nexus with panel data for the period 1960-2004.

a 10 percentage point increase in the M2 to GDP ratio on the annual growth rate is 0.14 percent when a country experiences an episode of deepening without a crisis. That is, the effect of a 10 percentage point deepening on annual growth is 0.39 percentage points (0.25+0.14) for crisis-free deepening episodes and 0.25 percentage points otherwise.

Column (6) of Table 6 shows that the effects of crisis-free deepening episodes persist even when we control for deepening episodes that end in a crisis, though the coefficient on the interaction term is now significant at only the 10 percent level. A ten percentage point deepening episode has a differential effect on growth in crisis-free and non-crisis-free booms; it is 0.39 percentage points higher in crisis-free booms (the difference between 0.11 and –0.28). Finally, column (7) indicates that the results are robust to the inclusion of the ratio of international trade (i.e., imports plus exports, instrumented by its initial values) to GDP in the specification.

Tables 7-8 repeat the analysis in Tables 5-6, but use 20 percentage point increases in M2 as a percent of GDP to define episodes of financial deepening. Even with this reduced set of deepening episodes (see Table 1), the findings are qualitatively very similar to those related to the broader 30 percent criterion.

Our regression results provide strong support for the finance-growth nexus among the 17 economies in our sample starting in 1880.[9] Indeed, the results are very similar to those found with much larger groups of countries with data that begin about a century later. Many countries in our historical data experienced periods of rapid financial sector growth, particularly around the turn of the 20th century. In addition, financial crises were common occurrences, with each

[9] The findings are nearly identical when we estimate with ordinary least squares using initial values of M2/GDP and trade/GDP as explanatory variables in place of their contemporaneous five-year averages.

county having on average three crises in the 60 year period from 1870-1929. We find that the effects of credit deepening on growth are enhanced during credit booms that are not associated with crisis and diminished in crisis-boom periods compared to other periods. Thus, episodes of credit deepening are beneficial except when they are associated with financial crisis.

4. Financial Deepening and Financial Crises

In this section, we discuss the relationship between financial development and the incidence of crises and booms in several of the countries in our sample. We characterize the historical record and show that it is often consistent with the broad picture suggested by our econometric findings. That is, deepening episodes are associated with economic growth though the relationship is often muted by crises.

For the United States, Rousseau and Sylla (2005) offer evidence for a financial revolution in the half-century following the ratification of the Constitution in 1789 that changed the trajectory of growth in the initial years of the republic. Yet the econometric evidence for finance-led growth in the U.S. from 1870 to 1929 is even stronger than this (Rousseau and Wachtel 1998). The literature on the National Banking period often focuses on the System's deficiencies and the extent to which it left the nation vulnerable to financial crises, and indeed there were well-documented crises in 1873, 1884, 1893, and 1907. But the periods of financial deepening that we identify are no less striking. The resurgence of state banks outside of the National Banking System and the shift toward deposit banking after 1880 led to rapid increases in the money stock and the amount of available credit over years between the disturbances of 1884 and 1893 and then again in 1894-1895. By most accounts the 1884 crisis was mild by 19th century standards, and the nation quickly rebounded from the crisis in 1893. Overall, the period from 1870-1914 in the United States may have been punctuated by several financial crises, but

the deepening that accompanied these episodes relates closely to the rapid growth that the nation experienced as the path of industrialization continued to press forward.

Canada took a somewhat different route to financial development than the United States, but the rise of its banking system and assets held by its financial intermediaries exhibits similar albeit somewhat muted trends over the same period. The key difference usually cited between the Canadian and U.S. systems is that Canadian banks were fewer in number but allowed multiple branches rather than the unit system that characterized banks in the United States from the start. Consolidation also led a decline in the number of Canadian banks from 70 in 1870 to only 13 by 1935. Did branching and consolidation reduce competition and lower efficiency? Bordo, Rockoff, and Redish (1994) show that Canadian banks actually achieved higher profit rates than U.S. banks over the period, but also observe that the profits were accompanied by higher shares of loans to total assets. They proceed to point to Canada's banking stability as evidence that its more productive banks could promote growth while avoiding the negative consequences of financial crises.

Our lists of crises and episodes of financial deepening make it difficult to challenge this view. Even though Canada experienced some discomfort in 1873, 1907, and 1923, these events were not systemic crises and certainly were not comparable to the disturbances experienced by the United States in 1873 and 1907. Canada also had an extended episode of financial deepening in the 1890s that is among the longest in the sample, and achieved a 3.7 percent growth average rate of per capita output over that episode. Annual growth averaged two percent in other years, and even that compares favorably with the 1.6 percent average growth rate achieved by the United States from 1880 to 1929. Remaining relatively crisis-free as a banking system develops no doubt has its advantages.

The United Kingdom was the world's first great financial power, building upon early 17th century Dutch innovation to launch a financial revolution with the founding of the Bank of England in 1694. The monopoly granted to the Bank on note issue, coupled with restrictions on the formation of banks as corporations with limited liability until 1825, produced a banking system that was likely sub-optimal in terms of size and the diffusion of banking services. But the system improved upon these earlier deficiencies and by the late 19th century had established many more banks and a host of other intermediaries (Sheppard 1971). As the most mature financial system in our sample, the United Kingdom was crisis-free from 1880 until the Great Depression, but it is perhaps not surprising that it also experienced few episodes of financial deepening according to our criterion. This is consistent with Cameron (1963), who argued that financial development is most effective in the earlier stages of a transition to modern growth.

The restoration of the Meiji dynasty in 1868 is often credited with ushering in the start of financial reforms that put Japan on a modern growth trajectory. Much of the credit for the sea change should probably go to Masayoshi Matsukata, Japan's finance minister at the time. Matsukata commuted rents traditionally paid in rice to the feudal nobility in favor of long-term government bonds in 1872, and then much like the United States some 90 years earlier, allowed the bonds to be tendered as capital for shares in the Bank of Japan when it was formed in 1879. Combined with a nationalization of banking in 1876 along the lines of the U.S. National Banking System, these innovations generated markets to trade the government's debt and shares of the central bank, and a system of banks to lodge the new monetary balances. The rise of development banks such as the Yokahama Specie Bank followed quickly. The credit boom generated by this activity apparently jump-started economic growth (Rousseau 1999), but also ended in a spectacular inflation and crash in 1882. But with the seeds of modern markets in

place, the nation was able to expand financially once again, with a continuous episode of financial deepening (according to our dating technique) from 1904-1915 that is among the longest in our sample. The fact that this deepening was actually punctuated by financial crises in 1907 and 1913 indicate just how resilient the burgeoning financial sector was to temporary disturbances. As such, Japan stands as a classic example of a financial revolution characterized by boom and bust cycles, yet this tumultuous path led the way to economic modernization.

One view of Swedish financial development is that mid-19th century Sweden was a poor country with a sophisticated financial system, much like the United States at the start of the century. In this view, the financial system along with a high level of education enabled the economy to take off rapidly in the second half of the century. Another view is that the banking system did not develop until commercial bank lending began to replace Riksbank credit after mid-century (Hansson and Jonung 1997). In this view, two significant financial sector developments towards the end of the century were contemporaneous with economic growth. Specifically, the Riksbank developed modern central banking functions and the commercial banks replaced merchant banking houses as a source of credit. This latter interpretation is consistent with our data which indicates a period of financial deepening in the late 1880s while the only 19th century crisis occurred in 1878. Another distinguishing feature of Swedish financial sector development around the turn of the century was the emergence of strong links between banks and their industrial customers which strengthened over time. In this sense the dominant role of bank credit may have been destabilizing and Sweden experienced systemic crises in 1907 and 1921 (though the latter was the consequence of the post-World War I fall in output and ensuing deflation).

German economic growth in the three decades following political unification in 1871 was

remarkable; the only comparable experience might be the growth of China in the last 30 years. Some of the institutions that support growth were in place prior to unification (e.g. railroads, the transportation infrastructure; education and the craft system) but finance was not one of them. A uniform currency was introduced in 1873 and the central bank, the Reichsbank, was established three years later. A liberal discounting policy by the Reicshbank led to the rapid growth of universal commercial banks and an explosion of credit. By our criterion, Germany was experiencing a credit boom in all but 6 years in the period from 1880 to 1911. The banks grew from trade financing institutions into universal banks with large deposit bases that provided both short and long term financing to German industry, particularly the rapidly growing capital intensive manufacturing firms. Thus it is not surprising that the banks developed the close ties to industrial firms that characterize the German economy to this day. Banks often maintained an equity interest in firms and bank representatives served on supervisory boards voting the shares of the bank as well as those that other shareholders had deposited with the bank.[10]

The link between financial deepening and crisis in Germany is weak. The country experienced a major crisis in 1873, just a few years after unification and before our econometric analysis begins. The young banking institutions had substantial exposures to securities and were affected by the business cycle downturn and falling asset prices. Interestingly, there were no major banking crises in the following years of rapid credit expansion even though Germany had a largely free banking structure throughout this period. The crises on the list were either minor (e.g., the 1891 crisis was due to bank failures caused by fraudulent management) or caused by international shocks (e.g., 1907).

[10] It is a matter of controversy whether Germany is an example of bank-led economic growth or whether the banking expansion occurred in response to demand from the industrial sector; see Burhop (2006) and Fohlin (2007).

Argentina and Australia are two countries in our sample with similar experiences (see McLean (2006)). Table 1 indicates that both experienced one financial crisis, 1890 in Argentina and 1893 in Australia. These crises were both similar and related. Investment booms were fueled by foreign investment which dried up when asset prices fell. Further, the situation in Australia was affected by emerging markets contagion from the Argentine crisis that preceded it. Argentina rebounded quickly from its crisis while Australia experienced a very slow recovery. The post-crisis boom in the M2 to GDP ratio shown for Australia is due to the fall in GDP rather than a rise in credit. Episodes of credit deepening did occur in both countries in the first decade of the 20th century but this occurred simultaneously with more rapid growth.

Brazil's enormous land mass and strong ocean currents left it fragmented and isolated over much of its modern history, and its lack of financial development can be traced to a weak central government that emerged from these unfavorable initial conditions (Calomiris and Haber 2014). The government's regular practice of expropriating banking resources at times of need throughout its history rendered it difficult to raise banking capital or deposits, and inflationary finance was a ready tool when outright expropriation failed. A lack of a coordinated banking system was the result, and led to a tumultuous boom and bust in the early 1890s that ended in yet another crisis in 1900. By the end of our sample period the nation's financial system consisted primarily of a state-owned bank that directed much of their credit flows to the treasury and a declining share to private businesses (Musacchio 2009). Our 30 percent criterion identifies two episodes of financial deepening after 1914 (one in 1917-18 and the other from 1921-23). Part of this identification is surely due to the lack of depth of financial intermediation, M2/GDP in 1910 was only 0.24, making a 30 percent increase to 0.31 over ten years not too great a feat, yet it is

also interesting to observe that Brazil experienced robust growth in real per capita output of nearly 5.5 percent between 1915 and 1925.

While the discussions above are only suggestive and necessarily brief, they are largely consistent with our econometric finding that episodes of financial deepening are beneficial to growth when they are not associated with financial crises.

5. Conclusion

The role of financial deepening in economic growth is thought to be a dynamic process that acts through the expansion and increased intensity of banking and other financial services, yet modern cross-country studies do not capture this dynamic explicitly. We examine evidence of it in a sample of 17 economies over the period from 1870 and 1929 – a time when many nations in our group might still be considered emerging markets. By identifying specific episodes of financial deepening in individual countries, we reach beyond standard relationships between initial financial conditions and subsequent growth to link the deepening episodes themselves to smoother operation of the finance-growth nexus. We find that episodes of financial deepening, if not taken to the excesses that end in financial crises, enhance links between the level of financial development and growth, thereby revealing the role for dynamics described by theory. An examination of financial crises and episodes of financial deepening in the broader context of historical narratives offers further evidence of the plausibility of the mechanisms we uncover.

Financial crises are indeed costly and well deserving of the emphasis they have recently received in the economics literature. At the same time, our chapter aims to serve as a timely reminder that crises and output losses are not the only outcomes associated with credit expansions. Rather, the other side of the coin – robust economic growth – is much brighter, and the past only reinforces its luster.

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Table 1. Financial crises and episodes of financial deepening

Country and start of credit data	Systemic financial crises, 1870-1929	Episodes of financial deepening to 1929	
		30 percent increase over last 10 years	20 percentage point increase over last 10 years
Argentina (1884)	1890	1905 1910-1911 1922	
Australia (1880)	1893	1894-96 1899-00	
Brazil (1880)	1891 1900	1890 1918 1921-23	
Canada (1870)		1885 1892-1901 1917	
Germany (1880)	1873 1891 1901 1907	1890-92 1894-95 1898 1900 1902-04 1906-11	
Denmark (1850)	1877 1885 1908 1921	1860 1862-64 1875-90 1910 1918	1881 1886-89 1918
Spain (1875)	1883 1890 1913 1920 1924	1885-1901 1917-19 1921-26	1918
Finland (1862)	1878 1900 1921	1872-76 1886-90 1892-04 1911 1915	1873-74 1889 1895-1904 1908 1910-11 1914-18
France (1851)	1882 1889	1861-78 1909	
Italy (1872)	1873 1887 1893 1907 1921	1883-84 1887-89 1892 1919	

Japan (1878)	1882 1900 1904 1907 1913 1927	1899 1902 1904-15 1917-18 1923 1929	1906 1910-11 1917-18 1923 1928-29
Netherlands (1850)	1893 1907 1921	1860-61 1867-69 1872-73 1875-81 1883-84 1897-1902 1917-18	1898 1918
Norway (1865)	1899 1922	1878-88 1890 1901-10 1918 1921-23 1925-26	1903-04 1906 1908-1909 1918 1921-27
Portugal (1880)	1890 1920 1923	1914-15 1917-23	
Sweden (1870)	1878 1907 1922	1887-88 1909	1909
USA (1850)	1873 1884 1893 1907 1929	1871-72 1874 1887-92 1894-95 1906	
UK (1870)		1909 1921	1909

Note: See text for definitions of financial crises and deepening episodes. The years that data begin for broad money appear in parentheses in the first column, and episodes of financial deepening can be identified 10 years afterward. Country *i* experiences an episodes in year *t* when the ratio of M2 to GDP rises by more than 30 percent (third column) or 20 percentage points (fourth column) over the previous 10 years.

Table 2. Financial crises and deepening episodes by decade

Decade	Crises	Episodes of financial deepening (30 percent over last 10 years)	Episodes of financial deepening (20 percentage points over last 10 years)
1860s	--	5	0
1870s	6	7	1
1880s	7	8	3
1890s	10	13	2
1900s	12	11	7
1910s	2	14	8
1920s	12	8	3

Note: Data are not available to compute episodes of financial deepening for all countries in the 1860s, 1870s, 1880s, and 1920s. Crises are observed after 1870.

Table 3. The incidence of financial crises and deepening episodes, 1870-1929

Country	Crises with deepening	Deepening without crisis	Crises without deepening
Argentina	0	3	0
Australia	1	1	0
Brazil	1	2	1
Canada	0	3	0
Germany	3	3	0
Denmark	2	2	2
Spain	3	0	2
Finland	1	3	2
France	0	2	2
Italy	2	2	2
Japan	3	4	1
Netherlands	0	5	3
Norway	1	6	1
Portugal	2	1	1
Sweden	0	2	3
USA	3	2	2
UK	0	2	0
TOTAL	22	43	22

Note: Table 3 uses only those years where data are available to identify both financial crises and deepening episodes. Deepening episode are defined with the 30 percent criterion (third column of Table 1).

Table 4. Average real GDP growth in five-year periods, 1880-1929

	Deepening with crisis	Deepening without crisis	Crises without deepening	Other (no crisis or deepening)	All periods
Growth rate in period	0.93	1.75	1.75	1.62	1.58
Growth rate in next period	2.92	1.59	1.67	1.06	1.83
Number of periods	21	52	16	62	151

Note: A country experiences a "deepening" if in any year within a given five-year period it records an increase of more than 30 percent in M2/GDP over the previous 10 years. A country is defined to experience a "crisis" if it experiences a financial crisis at any time in a given five-year period. Includes observations for which growth data are available and sufficient credit data to determine deepening episodes. Due to data availability there are only 131 observations included in the second row.

Table 5. Instrumental variables growth regressions, 1880-1929.

Dependent variable: Five-year average growth rate of real per capita GDP (%)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log real GDP p.c. (USD)	–0.678**	–0.846***	–0.688**	–0.660**	–0.907***	–0.882***	–0.882***
	(0.314)	(0.316)	(0.324)	(0.313)	(0.316)	(0.317)	(0.318)
Ratio M2 to GDP	3.000***	3.412***	3.021***	2.967***	3.497***	3.447***	3.438***
	(1.091)	(1.086)	(1.115)	(1.087)	(1.083)	(1.081)	(1.119)
Crisis		–1.318**					
		(0.525)					
Deepening			–0.061				
			(0.451)				
Deepening– Crisis				0.526		0.399	0.400
				(0.348)		(0.343)	(0.345)
Deepening x Crisis					–1.870***	–1.772***	–1.768***
					(0.641)	(0.646)	(0.660)
Ratio int'l trade to GDP							0.013
							(0.439)
Period dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.129	0.166	0.129	0.143	0.179	0.187	0.187
Observations	151	151	151	151	151	151	151

Note: The table shows coefficients from instrumental variables regressions with data from available five-year periods between 1880-1929 with standard errors in parentheses. Five-year averages of M2/GDP and trade/GDP are instrumented by their values in the initial year of each period. "Deepening" is a binary variable set to unity if any year within a given five-year period sees an increase of more than 30 percent in M2/GDP over the previous 10 years. "Crisis" is a dummy variable set to unity if a country experiences a financial crisis in a given five-year period. *, ** and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

Table 6. Instrumental variables growth regressions with interaction terms

Dependent variable: Five-year average growth rate of real per capita GDP (%)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log real GDP p.c. (USD)	–0.678**	–0.841***	–0.670**	–0.597**	–0.893***	–0.805**	–0.805***
	(0.314)	(0.308)	(0.331)	(0.311)	(0.314)	(0.316)	(0.317)
Ratio M2 to GDP	3.000***	4.282***	2.941**	2.498**	4.129***	3.606***	3.584***
	(1.091)	(1.136)	(1.319)	(1.101)	(1.136)	(1.172)	(1.221)
M2/GDP x crisis		–2.858***					
		(0.905)					
M2/GDP x deepening			0.071				
			(0.857)				
M2/GDP x (deepening–crisis)				1.416**		1.104*	1.107*
				(0.638)		(0.638)	(0.641)
M2/GDP x crisis x deepening					–3.134***	–2.767**	–2.753**
					(1.064)	(1.076)	(1.100)
Ratio int'l trade to GDP							0.028
							(0.435)
Period dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.129	0.192	0.129	0.165	0.181	0.203	0.203
Observations	151	151	151	151	151	151	151

See note for Table 5.

Table 7. Robustness of IV growth regressions to 20 percentage point episodes of financial deepening, 1880-1929

Dependent variable: Five-year average growth rate of real per capita GDP (%)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log real GDP p.c. (USD)	–0.678**	–0.846***	–0.720**	–0.677**	–0.832***	–0.823***	–0.824***
	(0.314)	(0.316)	(0.332)	(0.312)	(0.319)	(0.318)	(0.319)
Ratio M2 to GDP	3.000***	3.412***	3.303**	2.556**	3.917***	3.471***	3.407***
	(1.091)	(1.086)	(1.357)	(1.127)	(1.177)	(1.222)	(1.261)
Crisis		–1.318**					
		(0.525)					
Deepening			–0.325				
			(0.749)				
Deepening–crisis				0.710*		0.644	0.644
				(0.421)		(0.419)	(0.421)
Deepening x crisis					–2.306**	–2.194**	–2.162*
					(1.096)	(1.093)	(1.108)
Ratio trade to GDP							0.087
							(0.436)
Period dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.129	0.166	0.129	0.148	0.154	0.170	0.170
Observations	151	151	151	151	151	151	151

Note: The table shows coefficients from IV regressions using data averaged over five-year periods from 1880-1929, with standard errors in parentheses. The estimations are the same as in Table 5 except here "Deepening" is a binary variable set to unity if any year within a given five-year period sees an increase of more than 20 percentage points in M2/GDP over the previous 10 years. As before, "Crisis" is a dummy variable set to unity if a country experiences a financial crisis in a given five-year period. *, ** and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

Table 8. Robustness of IV growth regressions with interactions to 20 percentage point episodes of financial deepening

Dependent variable: Five-year average growth rate of real per capita GDP (%)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log real GDP p.c. (USD)	–0.678**	–0.841***	–0.712**	–0.601*	–0.832***	–0.746**	–0.746**
	(0.314)	(0.308)	(0.338)	(0.311)	(0.317)	(0.318)	(0.319)
Ratio M2 to GDP	3.000***	4.282***	3.278**	2.347**	4.070***	3.374***	3.281**
	(1.091)	(1.136)	(1.504)	(1.132)	(1.188)	(1.254)	(1.297)
M2/GDP x crisis		–2.858***					
		(0.905)					
M2/GDP x deepening			–0.313				
			(1.046)				
M2/GDP x (deepening–crisis)				1.470**		1.272*	1.284*
				(0.691)		(0.694)	(0.697)
M2/GDP x crisis x deepening					–2.839**	–2.490*	–2.438*
					(1.278)	(1.280)	(1.296)
Ratio int'l trade to GDP							0.117
							(0.436)
Period dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.129	0.192	0.128	0.163	0.159	0.185	0.185
Observations	151	151	151	151	151	151	151

See note to Table 7.