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WHEN UNCLE SAM INTRODUCED MAIN STREET TO WALL STREET:
LIBERTY BONDS AND THE TRANSFORMATION OF AMERICAN FINANCE

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When Uncle Sam Introduced Main Street to Wall Street: Liberty Bonds and the Transformation
of American Finance
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ABSTRACT

We study the effects of the liberty bond drives of World War I on financial intermediation in the
1920s and beyond. Using panel data on U.S. counties we find that higher liberty bond
subscription rates led to an increase in the number of investment banks, stronger local
competition between investment banks and commercial banks, and a relative contraction in
commercial bank assets. We also find that individuals residing in states with higher liberty bond
subscription rates were more likely to report owning stocks or bonds in the late 1930s. Finally,
we find that this shift in financial intermediation away from commercial banks was correlated
with slower growth in the number of manufacturing enterprises and farms at the county level.
Although they were conducted to support the American effort in World War I, the liberty loan
drives reshaped American finance.

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1. Introduction

The first three decades of the twentieth century witnessed a transformation of American financial markets. Whereas commercial bank loans had long been the dominant instrument through which financial intermediation occurred in the United States, during the 1920s securities markets became increasingly important. This growth in securities markets was accompanied by an expansion in the number of American investment banks, which totaled more than 6,000 in 1929 and competed aggressively with commercial banks for the savings of businesses and households. The expansion of securities markets was also accompanied by an even more substantial expansion of securities ownership; the total number of individuals owning corporate stock in the United States grew from less than one million in 1910 to more than 10 million by the early 1930s.[1] Financial historians have long suggested that the liberty loan drives of World War I played an important role in these changes, but the lack of disaggregated data has prevented direct tests of their effect. Using unique county-level data, we provide the first empirical analysis of this hypothesis.

The liberty loan drives enlisted millions of volunteer salespeople, as well as the entire commercial and investment banking industries, and were supported by massive propaganda campaigns, parades, and rallies. At least 23 million Americans subscribed to the bonds, and in doing so, most of them were introduced to security ownership for the first time. In addition to teaching households about bond investing, the campaigns taught investment banking firms how to market bonds and other securities to middle-income households. In the 1920s the industry used what it learned to expand into new locations, and market securities using new methods, including print advertising campaigns and sponsored radio programing. As William Z. Ripley's (1927: vi-vii) *Main Street and Wall Street* argued, "without the Liberty Loan campaigns leading to the great increase of popular investment," the rise of "very widely held" corporations in the 1920s would not have occurred on the same scale.

Arguments such as these have been repeated frequently in the literature, but no study to our knowledge has empirically analyzed the effects of liberty bonds on American financial development. Typically, such claims are backed by little more than references to aggregate data or scattered anecdotal evidence. A careful empirical analysis, however, is important as a number of other nation-wide factors also likely contributed to the deepening of financial markets and the expansion of shareholding during the 1920s. According to Means (1930: 591), tax policies introduced during World War I drove firms that had

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[1] No comprehensive data on corporate shareholding exist for this period, and definitive counts of total numbers of U.S. shareholders should be treated with skepticism, as they are generally unsubstantiated. Several scholars, including Warshow (1924), Means (1930), Berle and Means (1932), and Bernheim and Schneider (1935), have produced reasonable estimates of the total number of shareholdings from samples of public corporations. Rutterford and Sotiroupolos (2017: 500) use those data to estimate that there were 0.81 million shareholders in 1907, and 10 to 12 million in 1932.

previously relied on wealthy investors to search out "persons of moderate means." And as Nicholas (2008) notes, a number of public companies in the 1920s produced new revolutionary consumer goods such as radios, mechanical refrigerators, and nylon. It would not be unreasonable to imagine that the securities of those enterprises may have been particularly attractive to ordinary households. To the taxation and technology-driven explanations, one might add another one based purely on returns. O'Sullivan (2016) argues that the war effort provided a stimulus to manufacturing companies, producing rapid growth and strong dividends in the 1920s. And then beginning around 1927, the entire stock market offered extraordinary returns, potentially drawing in many new investors (Galbraith 1954; Nicholas 2008; White 1990). In order to assess the role that the liberty bond drives played in the changes in American financial markets, one must isolate their effects from such other factors.

This paper provides a quantitative analysis of the role of the liberty loan drives in the transformation of American finance in the 1920s and beyond. We use panel data on U.S. counties and a difference in differences design to estimate the effects of liberty bond subscriptions on the commercial and investment banking industries. This approach enables us to isolate the effects of the liberty bonds from those of other changes that would have been felt nationally, such as tax policy changes, the proliferation of listed high-tech firms, and the high returns offered by the stock market. It also enables us to investigate whether the changes we observe in counties with high liberty bond subscription rates were the product of pre-existing county conditions or trends.

The results indicate that the liberty bond drives were an important factor in the transformation of American finance. We find that higher liberty bond subscription rates led to a relative contraction in the growth of commercial bank assets and an increase in the number of investment banks in a county during and after the liberty bond campaigns. We also find that the effect of the presence of investment banks on the assets of commercial banks in the same county dramatically increased in size during and after the liberty bond campaigns. We then use survey data from the late 1930s, the earliest available samples of households containing information on securities ownership, to analyze the effects of the liberty loan campaigns on the rates at which households owned stocks and bonds. Our estimates indicate that individuals residing in states with higher liberty bond subscription rates were more likely to report owning those assets, even conditional on a broad range of household and economic characteristics.

Finally, we analyze the effects of this shift in financial intermediation using census data on agriculture and manufacturing. We use liberty bond subscriptions to instrument for the change in commercial bank assets in a county between 1920 and 1929. Our estimates imply that the decline in the growth of commercial bank assets produced by the liberty bonds led to a contraction in the number of manufacturing enterprises and farms at the county level. Although the growth in securities markets in the

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1920s aided the development of large, public companies, the shift away from local commercial banks likely reduced the availability of loans to smaller enterprises.

A source of concern regarding these results could be that counties with high liberty bond subscription rates differed from other counties in characteristics that may have contributed to their subsequent financial development. We use several different approaches to address this concern. First, in all of our analysis we control for a variety of time-varying county characteristics that were correlated with liberty bond subscription rates, and use county-fixed effects and Federal Reserve District-by-year effects to sweep out unchanging differences across counties as well as differential trends across districts. Second, and more importantly, we explicitly test for differential trends across counties with different liberty bond subscription rates, and find no evidence of such trends in any of the outcomes we study using our county panel data. Finally, we analyze the most plausible effects resulting from unobserved county characteristics, and find that they typically bias our estimates in the opposite direction of the effects we observe.

The results of this paper confirm the importance of financial literacy and trust for participation in financial markets. The liberty bond drives can be thought of as massive interventions aimed in part at shaping households' attitudes toward investing in securities and providing information that increased financial literacy. Through speeches, rallies, and ubiquitous advertisements, households were presented with messages indicating that investing in government bonds was safe and appropriate not just for speculators, but for all citizens (Ott, 2011). The campaigns enlisted women and children, and trained them as sales agents with materials that included basic facts about bonds as well as the principles of interest calculation and thrift. Exposure to holding liberty bonds also gave tens of millions of individuals first-hand experience with securities investing, and likely increased their willingness to invest in other securities as their bonds matured. Studies of modern data have shown that financial knowledge reduces barriers to investing in the stock market (Haliassos and Bertaut, 1995; Vissing-Jorgensen, 2004; Van Rooij, Lusardi, and Alessie, 2011) and encourages planning for the future (Lusardi, 2004; Lusardi and Mitchell, 2007, 2008; Ameriks, Caplin and Leahy, 2003; Van Rooij, Lusardi, and Alessie, 2012). Other work has shown that trust influences stock market participation (Guiso, Sapienza and Zingales, 2008). We advance this literature by analyzing the effects of a major historical campaign that sought to provide financial knowledge and inculcate a feeling of trust in financial markets in American households.

Our analysis also contributes to the literature on competition between commercial banks and financial markets (Allen and Gale, 1997; Song and Thakor, 2010). Studies of modern data have found that increases in the level of households' participation in the stock market reduces the demand for bank deposits, and that this decline in deposits reduces the availability of bank loans (Lin, 2020). We show that this effect occurred on a large scale in the 1920s, as households became more interested in participating in securities markets after being exposed to the liberty loan campaigns, and that the resulting decline in

commercial bank assets contracted local economic activity. Despite the different empirical framework and source of variation, these latter results are generally consistent with other analyses of the effects of banks that focus on historical periods (e.g., Jaremski, 2014; Fulford, 2015; Rajan and Ramcharan, 2015, 2016; Carlson, Correia and Luck, 2020) and modern data (e.g., King and Levine, 1993; Jayaratne and Strahan, 1996; Cetorelli and Gambera, 2001; Beck and Levine, 2004; Chodorow-Reich, 2014; Gilje, Loutskina, and Strahan, 2016; Brown and Earle, 2017; Gertler and Gilchrist, 2018).

Our results also contribute to the literature on the participation of ordinary households in securities markets in the 1920s (e.g., Warshaw, 1924; Means, 1930; Edwards, 1938; Haven, 1940; Friend et al., 1958, 1967; Calomiris, 1995, 2002; Baskin and Miranti, 1997; Calomiris and Raff, 1995; Mitchell, 2007; O'Sullivan, 2007, 2016; Rutterford and Sotiropoulos, 2017; and Calomiris and Oh, 2018). Several of these works have argued that the liberty loan campaigns created the pre-conditions for the proliferation of securities ownership over subsequent years. The most detailed presentation of this argument is Ott's (2011), who focused on the ideological content of the campaigns, and argued that they changed Americans' perceptions of investing, and contributed to the emergence of employee stock purchase plans and other changes that expanded shareholding. We advance this literature by giving empirical content to this hypothesis, and distinguishing the effects of the loan campaigns from other explanations of the changes that occurred in the 1920s. We also go well beyond the arguments advanced in those works, and explore the effects of the loan drives on the commercial banking system, on the growth and competitiveness of investment banks, and on local access to finance.

Finally, the results of this paper present an example of the role that wars have played in the financial development of nations (Saint-Paul, 1996). England's financial revolution, for example, was a product of the demands of war finance (Dickson, 1967), and the War of Independence and Civil War led to significant changes in the financial markets and institutions of the United States (Sylla, 2002; Thomson, 2016). The analysis of this paper suggests that the American effort in World War I introduced millions of households to bond ownership, and in doing so, contributed to the expansion of the investment banking industry and securities investing in the 1920s that likely helped fuel the large-scale expansion in American industry of the mid-twentieth century.

2. The Liberty Loan Campaigns

The American effort in World War I led to a 25-fold increase in federal government expenditures, presenting an unprecedented challenge for the Treasury. Economists and financiers offered divergent views regarding the optimal mix of taxation and borrowing to produce the needed revenues, but ultimately

Treasury Secretary McAdoo decided to fund most of the cost of the war with borrowing (see Garbade, 2012; Kang and Rockoff, 2015; Sutch, 2015; and Hall and Sargent, 2019). In addition to avoiding the imposition of extraordinarily high tax rates, McAdoo believed that borrowing offered another advantage: selling government bonds to the public would give ordinary Americans a financial stake in the war effort. McAdoo (1931: 378) even likened the bond sales campaigns to a military operation, arguing that those "who could not serve in the trenches in France might nevertheless serve in the financial trenches at home."

Rather than selling bonds continuously, the liberty loan campaigns consisted of four distinct bond drives from May 1917 through October 1918, and an additional victory loan drive conducted following the end of the war in April and May 1919. These campaigns, with specific deadlines and goals for the amount of subscriptions to be obtained, were designed to generate interest in the press, and enthusiasm among the public. The Treasury delegated management of the loan drives to the Federal Reserve Banks, with each supervising the drives within their districts. The Federal Reserve Banks' liberty loan committees then created various sub-committees, including those to head the sales effort in particular states, which in turn selected local notables to comprise county- and city-level organizations. Essentially all of civil society was enlisted by these committees, and diverse groups such as fraternal societies, religious organizations, the boy scouts, and women's clubs contributed to the effort.

The conduct of the campaigns was focused on the dual goals of raising the necessary funds, and obtaining subscriptions from the largest possible share of the population, in order to strengthen public support for the war effort. In pursuit of the former goal, pressure was applied directly to wealthy individuals and financial institutions.[2] Many liberty loan committees sent letters to financial institutions with specific quotas for the amounts of subscriptions they were expected to generate, from their own accounts and from their customers. In total, the liberty loans raised about $22 billion for the federal government, equivalent to more than $5 trillion today (as a constant share of GDP).

In order to achieve the broadest possible participation in the bond drives, massive rallies and parades were held, which were led by celebrities, politicians, and members of the military; war exhibit trains brought relics from the battlefields of France to far-flung American cities and towns; retailers were encouraged to create patriotic displays and large businesses created payroll deduction programs for

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[2] For example, the New York Liberty Loan Committee formed a "Large Investors Committee," which compiled a confidential a list of wealthy individuals, estates, and corporations from whom large subscriptions were to be solicited. The list was probably created from the securities underwriting records of the investment bankers on the committee. (Box 13, Folder 3, Second District Subscriptions, Liberty Loan Committee Records (MC 089), Mudd Manuscript Library, Princeton University.) It is likely that the subscriptions obtained from a relatively small number of large financial institutions and wealthy individuals accounted for the majority of the funds raised. For example, for the second liberty loan in the 2nd (New York) district, the largest 1,168 subscriptions accounted for 54 percent of the $1.55 billion raised; the subscriptions raised from 2.2 million other individuals and institutions accounted for the remaining 46 percent of the total. ("Analysis of Subscriptions in Second Federal Reserve District," Correspondence and Circulars Re Liberty Bond Campaigns, Benjamin Strong Papers, Federal Reserve Bank of New York Archives.)

subscriptions; tens of thousands of canvassers went door-to-door soliciting subscriptions; and an enormous amount of advertising was produced for magazines and newspapers. It is likely that these were some of the very first advertisements for investments in financial assets that appeared in some publications. Even the design of the bond issues, and the fulfillment of subscriptions, reflected the goal of attracting as many unique subscribers as possible. For example, the bonds were sold with par values as low as $50, and subscriptions could be fulfilled through installment plans. In addition, all of the issues were oversubscribed, and the Treasury weighted allotments toward small investors, in order to ensure the broadest possible participation in the drives.

A summary of the different loan drives is presented in Table 1. The Treasury collected separate totals for the subscribers of each issue, but did not attempt to determine the number of households or individuals who subscribed to at least one liberty bond. The number of subscribers to the largest loan, the fourth—22.8 million—therefore represents the minimum possible number of total liberty loan subscribers, and the true total was likely higher. This represented a substantial portion of the adult population (i.e., there were about 66.4 million individuals aged 18 or older in 1920), and the proportions are even larger when considering the proportion of households that purchased a bond. Indeed, a survey by the Bureau of Labor Statistics in 1918-19 found that nearly 70 percent of urban, middle-income households had subscribed to a liberty bond within the past year (authors' calculations from data in Olney 1995). Given how uncommon the ownership of financial assets was before the war, it is quite likely that for most subscribers, their liberty bonds were the first financial assets other than a checking or savings bank account that they had ever owned.

2.1 Effects on Financial Institutions

Financial institutions were enthusiastic participants in the liberty loan drives, and their efforts were critical to the campaigns' success. Yet the loan drives had many significant short- and long-term consequences for those institutions.

Commercial banks benefitted in the short run. Subscriptions to the loans could only be submitted to the Treasury through one of those institutions, and the funds received for subscriptions were typically left on deposit until needed by the Treasury. The Treasury and Fed quickly learned that it was necessary to permit subscribers to buy the bonds on credit to raise the required sums, and in response, the "borrow and buy" program was created, which operated through commercial banks, and in a sense created a new line of business for them. A circular distributed to commercial banks in 1917 explained the program:

> It has not been the custom of the average banker to solicit loans, but it is his patriotic duty
> to go to his customers and offer to make loans to them against purchases of Liberty
> Bonds. This action on the part of the banker will enable every community to liberally

subscribe and of course if necessary with such loans, accompanied by the 90-day note of the borrower, may in turn be rediscounted with the Federal Reserve Banks.[3]

The Federal Reserve banks discounted such loans at favorable rates, making them an attractive business opportunity for commercial banks.

Yet these lending opportunities were abruptly curtailed by the Federal Reserve in the post-war years. The expansion of Federal Reserve credit through rediscounts contributed significantly to the increase of the money supply during the war years, and in the spring of 1920, total indebtedness of member banks to the Federal Reserve was $2.5 billion, an historically unprecedented amount regarded as alarming by Fed officials (Wicker, 1966). In an effort to restrict these credits and induce a period of contraction and deflation, the Federal Reserve Banks raised their discount rates substantially in 1919 and 1920, with some districts imposing "progressive discount rates" that made the rate applied to rediscounts an increasing function of the amount borrowed (Friedman and Schwartz, 1963; Rieder, 2019). This resulted in a significant contraction in member bank borrowing from the Federal Reserve.

With investment banks, the effects of the liberty loan drives was likely the opposite. Leading investment bankers coordinated the sales campaigns; the Federal Reserve Bank of New York's liberty loan committee, which consisted of many of that city's most prominent financiers, was the most influential body in the national sales effort.[4] But the Treasury did not pay commissions on the sales of liberty bonds, despite investment banks devoting considerable time and resources to the bond drives. Prominent investment banks also stopped marketing some of their regular securities in order to encourage more people to purchase liberty bonds. In addition, because subscriptions were fulfilled through commercial banks, the investment bankers' efforts to market the liberty bonds did not immediately produce any new accounts for their firms.

Many prominent investment bankers, however, perceived that the industry would enjoy a longer-term benefit from its participation in the loan drives. "The only commercial reward in view," said Charles Mitchell, the President of National City Company, "is that which may come from the development of a large, new army of investors in this country, who have never heretofore known what it means to own a coupon bond and who may in the future be developed into savers and bond buyers."[5] The incoming president of the Investment Bankers Association of America, Warren S. Hayden, even observed "the

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[3] "Read And Act Immediately: To The Banks of America," 12 October 1917, Correspondence and Circulars Re Liberty Bond Campaigns, Benjamin Strong Papers, Federal Reserve Bank of New York Archives.
[4] The committee was formed during the first loan campaign, and subsequently expanded. Its membership included, among others, J.P. Morgan, of J.P. Morgan & Co.; Jacob H. Schiff, of Kuhn Loeb & Co.; Frank A. Vanderlip, of National City Bank; George F. Baker, of First National Bank; Seward Prosser, of Bankers' Trust; Charles H. Sabin, of Guaranty Trust Company; and Allen B. Forbes, of Harris Forbes & Co.
[5] "Sound Inflation," *Magazine of Wall Street*, 296, June 9 1917. National City Company was the securities affiliate of National City Bank.

activities of investment banking have been paused …but it remains true that in respect to thrift, and bonds as a form of investment, the government will have done in a year or two what our private enterprise as it was before the war could not have done in decades."[6] The investment bankers also gained unique insight into marketing as they were able to observe which households and institutions subscribed for large amounts of liberty bonds. In essence, their lists of liberty bond subscribers constituted a natural base of potential customers they could later approach with offers of corporate bond and stock issues.

In the post-war years, the investment banking industry found the American public receptive to its marketing efforts.[7] Their involvement in the liberty loan drives had taught them how to mass market securities, and they began to advertise in popular magazines, and even sponsor weekly radio shows (Quinn, 2019: 114). Some of the private bankers who had been involved in the liberty loan committees founded new retail-oriented investment banks in the post-war years. The Federal Securities Corporation, a major investment banking firm with an extensive branch network, for example, was founded in Chicago in 1919 by some of the bankers who had led the liberty loan campaigns there (Peach, 1941: 33). That firm directly targeted new investors by creating both a women's department and a department that specialized in selling securities to foreign-born investors (Carosso, 1970: 236).

Commercial banks, by contrast, were generally restricted by their charters from engaging in many of the transactions involved in investment banking. As securities markets expanded, however, commercial banks particularly in large cities allocated a growing share of their assets to loans with securities as collateral—typically, call loans.[8] But these loans did not build up their deposit base the way a commercial loan typically would, and security loans primarily represented an outlet for funds that were not lent to commercial customers (Meeker, 1930: 284). Some commercial banks, particularly those that had been heavily involved in the liberty loan campaigns, also incorporated legally separate firms known as securities affiliates that functioned as investment banks.[9]

With the substantial expansion of the investment banking industry in the 1920s and growing interest in securities markets, many households and institutions allocated a smaller proportion of their savings to deposit accounts in order to invest in bonds or stocks. Commercial bankers had anticipated this

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[6] Investment Bankers Association of America, *Proceedings of the Sixth Annual Convention of the Investment Bankers Association of America*, 1917: 205-208.

[7] At the Annual Convention of the Investment Bankers Association of America in 1920, it was argued that "the spirit of investment is growing among the people. Liberty bond investment has taught many of the people to invest who have never before considered this matter.…All of this individual investment should break the ground for your work and make it easier in the future to bring about the wide distribution of this class of securities which is very desirable" (1920: 143).

[8] Edwards (1938: 224) notes that security loans rose from 22.5 percent of national bank loans and discounts in 1921 to 36.2 percent in 1928.

[9] For example, the Guarantee Trust Company of New York, a large state-chartered bank, stated that its involvement in the liberty loan campaigns "paved the way" for the creation and operation of its highly successful securities affiliate, Guaranty Company, which created a national branch network (Peach, 1941: 33).

consequence of the liberty loan drives, and expressed apprehension that "the drawing of so many millions out of the banks would reduce their deposits and diminish their resources…"[10] Even before the loan drives, commercial bankers had been concerned that securities purchases reduced their deposits.[11] This concern was reflected in the terms of many states' so-called Blue Sky Laws; Mahoney (2003) finds that states with larger numbers of small commercial banks were more likely to give a state authority absolute power over approving the securities that could be issued in the state, thus potentially limiting their issue.[12] The liberty loan drives, therefore, likely intensified the competition for savings between commercial banks and securities markets.

2.2 Effects on Securities Ownership

Mindful of the fact that very few American households had ever owned a bond, the sales campaigns conducted as part of the liberty loan drives included a fair amount of information regarding what was termed "the facts" of the bonds, providing a basic education in fixed income investing. For example, the famous Four Minute Men, the wartime volunteers who gave millions of short speeches in public places, were given pre-written talks containing financial information on bonds and investing during the loan drives.[13] Hearing these messages may alone have made households more likely to become investors in later years; modern research, such as Van Rooij, Lusardi, and Alessie (2011), indicates that people with greater knowledge of financial markets are much more likely to be investors.

The campaigns also associated purchases of government bonds with notions of citizenship, potentially dispelling the view that investing in financial assets was a form of speculation inappropriate for prudent, honest people. "In the investor democracy figured in the War Loan drives," in Ott's (2011:62) words, "investment conferred economic freedom in the form of self-restraint, economic stability, social mobility, and individual security." This may have made middle-income households more open to investing in other financial assets in later years, and the borrow and buy program may have made them willing to do so via margin loans (O'Sullivan, 2016: 351).

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[10] *Proceedings of the Forty-Fourth Annual Convention of the American Bankers' Association*, 1918, p. 335.
[11] For example, the Bank Commissioner of Kansas, J.N. Dolley, argued in a 1912 edition of the *American Banker* that of the millions of dollars of securities purchased in Kansas before 1911, "98 [percent] of it was either borrowed from the banker or taken from his deposits." After the passage of Kansas' Blue Sky Law, he boasted that deposits in Kansas state banks had increased dramatically due to the exodus of blue sky speculators.
[12] It is important to note that by the end of the war, most of the power given to state authorities had been limited through lawsuits and lobbying by the Investment Banking Association of America (Macey and Miller 1991).
[13] For example, the pamphlet "The Second Liberty Loan," distributed to the Four Minute Men during that campaign includes detailed financial information, and four pre-written speeches, which contain statements such as "Four percent on a fifty dollar bond means money doubled in fifteen years; one hundred dollars back to you, a net gain of fifty dollars" (Committee on Public Information, Four Minute Men, Bulletin Number 17, October 8, 1917).

The liberty loan campaigns may even have made some Americans vulnerable to the depredations of unscrupulous or even fraudulent securities promoters. "As soon as industrial workers concluded payments on their liberty bonds…the stock slicksters stepped into the picture," argued one critic.[14] In response, industry associations and chambers of commerce formed the Investors' Vigilance Committee, to provide financial education and expose financial "frauds, fakes, swindles and bamboozlements" (*Magazine of Wall Street*, 24 November 1923: 125). The importance these campaigns attached to the liberty bond drives suggests that their architects viewed those campaigns as having had a powerful effect on American households' willingness and ability to invest in financial assets.

Yet other factors that were not directly related to the liberty bond drives may also have contributed to the growth in shareholding in the 1920s. Figure 1 presents monthly data for an index of share prices from Shiller (2000) in red, and also the volume of shares traded on the NYSE, in blue, for 1910-29. These data clearly show the rising equity values over the 1920s, which accelerated dramatically around 1927. The extraordinary returns offered in the stock market produced something of a mania for stocks, which Galbraith famously described as a "speculative orgy" (1954:11). It is almost certainly the case that this episode attracted many households into the stock market. Consistent with that, trading volumes on the NYSE rose alongside stock prices. Although rising volumes do not necessarily reflect increases in the number of individuals trading, they do suggest that interest in the market was growing.

In what follows, we will attempt to distinguish the effects of the liberty bond drives from the effects of rising share prices and other changes that would have been felt by all households by focusing on the relationship between liberty bond subscription rates in particular places and the rate at which households in those places owned stocks.

3. Data

To study the effect of the liberty bond drives on the financial system, we assemble data on subscription rates in the loan drives, on commercial banks, and on investment banks, all at the county level. Our liberty bond subscription data were collected from pamphlets published by the Federal Reserve Banks' liberty loan committees, as described in Hilt and Rahn (2020). Those sources reported total numbers of subscribers by county, and following Hilt and Rahn, we calculate subscription rates by dividing those totals by county populations as reported in the 1920 census. Our measure of loan subscriptions is for the Fourth Liberty Loan, the largest issue, and the one for which there were data for the

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[14] "Discovered: That Industrial Workers are Human!" *Magazine of Wall Street*, 18 August, 1923. The article argues that American workers "need the same strenuous education that characterized the sale of liberty bonds."

greatest number of counties.[15] Not every Federal Reserve district published county-level subscription data, however, and our measure of loan subscriptions is only available for the Richmond, Cleveland, St Louis, Minnesota, and San Francisco Federal Reserve districts plus Iowa, which published their own reports.[16]

Figure 2 presents a map of our county subscription rate data. Our sources cover at least some counties from every census division except New England. The map shades counties by subscription rate, and reveals that rates tended to be higher in the North and West, and lower in the South. These regional patterns present a challenge for our analysis, in that any changes in the financial system that varied by region will be correlated with loan subscription rates. We address this heterogeneity in our empirical framework by using Federal Reserve District-by-time fixed effects, but as shown in the appendix, the results are not sensitive to dropping individual districts.

Our commercial bank data consist of annual county-level balance sheet information from 1910 to 1929. The data were obtained from *Annual Report of the Comptroller of the Currency* and reports published by each state's banking departments. The Comptroller published balance sheets for every national bank annually, but many states did not publish balance sheets for their state-chartered banks and trust companies (see Mitchener and Jaremski, 2015). Our data include the counties of every state for which (1) data on state-chartered banks were published throughout the period and (2) liberty bond subscription data were available. These restrictions create a sample of 869 counties in 17 states.[17]

Our investment bank data come from *Investment Banks and Brokers of America*, a directory of investment banks in the United States published beginning in 1914. This appears to be the most comprehensive source available for these firms during the period under study, and claimed to list all the "firms, individuals and banks that do an active investment business." Its entries include many partnerships, corporations, and a small number of individuals, some of which operated as branches of firms from other cities. The directory reveals that by the mid-1920s, many securities firms had developed large regional or even national branch networks; there were more than 25 different firms with branches in at least 10 cities

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[15] The fourth loan had the highest subscription rates of all the loans, and the subscription rate for that loan provides a reliable indicator for the minimum extent to which the county participated in the liberty bond drives. The approach also prevents double counting of individuals who subscribed in multiple campaigns. It is also worth noting that, for the limited subset of counties where subscription data were available for the other liberty loans, the correlation rates with subscriptions to the fourth loan were quite high: the correlation between subscription rates for the second and forth loans was 0.77; for the third and fourth, 0.83; and for the victory loan and the fourth, 0.84.

[16] The Reserve Banks that did not publish county-level subscription data for their districts included those located in the country's largest financial centers: New York, Chicago, Philadelphia and Boston.

[17] These states are: Iowa, Idaho, Illinois, Maryland, Michigan, Missouri, Mississippi, Montana, North Carolina, Ohio, Oregon, South Carolina, South Dakota, Virginia, Washington, Wisconsin, and West Virginia. We drop California because the state did not report data for branches and the massive branching that occurred during the 1920s would throw off the county-level statistics. For the few gaps in reporting, we fill the missing values using a linear interpolation so as to obtain a balanced panel. We also drop the few observations for counties where no commercial banks were present.

in 1925.[18] We designate each listing in the directory as an investment bank. As these firms were not required to publicly report information on their balance sheets or customer accounts, the information in the directory enables us only to observe the number of investment banks in a county-year and their names, and little else. We digitized the data from the 1914, 1916, 1918, 1919, 1920, 1922, 1923, 1925, and 1929 editions.[19]

We obtain data on the securities ownership of households in the 1930s from surveys conducted by the Gallup organization.[20] George Gallup conducted five polls in 1937 and 1938 that asked Americans about their financial assets in the form of the question: "Do you happen to own any stocks or bonds at this time?" In order to achieve sufficient samples for some of the smaller US states, we pooled the five individual polls, resulting in a combined sample size of 14,805 respondents. These polls were not based on random samples, but instead quota-controlled samples in which interviewers were instructed to target a predetermined number of respondents from particular segments of American society in order to achieve a final, "representative" sample of the US public. Fortunately, the political scientists Adam Berinksy and Eric Schickler have produced weights for these polls that compensate for the deficiencies in their sampling methods. These procedures used to generate these weights are described in Berinsky (2006), and Berinsky and Schickler (2011). The weights are available along with the data files for the Gallup polls at the Roper Center for Public Opinion Research at Cornell University via their polling archive, iPOLL. Our analysis is weighted using ranked weights based on gender, race, phone ownership, and 4-category Census region.

Finally, we utilize county-level census information from Haines (2004).[21] These data enable us to control for various county characteristics that may have influenced both liberty bond subscription and changes in the structure of a county's financial services industry. These include measures of the size of the market, such as total population and urbanization, as well as the composition of the market such as the fraction of the population that was non-white and the number of farms in the county. When combined with

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[18] These firms included securities affiliates of commercial banks (Guaranty Company, National City Company, Harris Forbes), investment banks organized as corporations (Halsey, Stuart & Co., Inc.), and investment banks organized as partnerships (Lee, Higginson & Co.; Paine, Webber & Co.).

[19] These are the only volumes that have we have been able to find through the Library of Congress and other archives and libraries across the world.

[20] In 1935, George Gallup founded the American Institute of Public Opinion and began publishing a weekly column, *America Speaks!*, distributed through leading newspapers, about the findings from his nationwide polls of the American public (Moore, 1992). Pollsters first specified population segments (such as gender, race or region) thought to be of particular relevance to political divisions within the public, creating mutually exclusive subpopulations, or strata. The number of individuals sampled within these designated strata was then allocated in proportion to the final desired sample size. Gallup's polls typically included quota-controlled numbers of respondents based on region (south or non-south), gender, and economic status. In addition, while the number of respondents to target in the various strata was fixed in advance, interviewers had considerable discretion in achieving their quotas once they were in the field. Interviewers preferred to work in safer areas and to target people who seemed more approachable, potentially yielding samples skewed towards the better-off (Berinsky, 2006).

[21] We aggregate counties to their 1910 boundaries so as to have consistent county definitions over time. Values in between each Census observation are filled with a linear trend.

annual crop prices from Carter et al. (2006), these data also allow us to control for the run up in agricultural prices during World War I and the collapse of those prices after the war. Following Jaremski and Wheelock (2020), a crop price index is calculated as the value of a basket of the county's crops at market prices in a given year normalized by the value of that same basket of crops at their pre-war prices, where the fixed basket is defined by the county-specific crop output shares in 1910.

 Summary data for our sample counties are presented in Table 2**.** On average the liberty bond subscription rate was equivalent to 16 percent of the county population, and the standard deviation of the subscription rate was 10 percent. In columns (2) and (3) in the table, we compare county characteristics between those with above-median subscription rates with those with below-median rates. Unsurprisingly, those with higher subscription rates were more urban (i.e., locations having more than 2,500 people), less agricultural, had larger commercial banking sectors, and were more likely to have an investment bank.[22] This presents a challenge for our analysis, as any changes in counties related to these characteristics will be correlated with liberty bond subscription rates. We address this issue directly by including many of these county characteristics as time-varying controls in our regressions as well as by controlling for time-invariant county fixed effects and Fed district-by-time fixed effects.

4. Empirical Analysis

4.1 Changes in the Structure of the Financial System, 1910-29: National Data

 We begin by analyzing the broad changes that occurred in the financial system during our sample period. Figure 3 presents data on the commercial banking sector, at the top, and on the investment banking sector, at the bottom, for the country as a whole, during the 1910-29 period.

 The number of commercial banks in the United States rose gradually from 1910-1921, and that growth rate generally did not accelerate during the period of the liberty loan drives. Then after peaking in1921, the total number of commercial banks gradually began to fall, as declines in commodities prices led to significant exit and consolidation in the commercial banking sector in rural areas in the 1920s (see Jaremski and Wheelock, 2020). The growth of the total assets of the commercial banking sector per county (in red) clearly accelerated during the liberty loan drives, and then there was a significant contraction in 1921, likely in response to the Federal Reserve's policy changes intended to curtail rediscounts. But after that decline, bank assets quickly rebounded and continued to expand over the rest of the decade, a period

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[22] Using newly collected data from Kitchens and Rodgers (2020), we find no strong correlation between the liberty bond subscriptions and the proportion of WWI enlistments among adult males at the county-level. Including the interaction between the rate of adult male enlistment and time fixed effects in our model does not qualitatively or quantitatively alter our results.

of economic growth. By encouraging thrift and saving in general, the liberty bond campaigns may have contributed to the growth of commercial banks. Yet the loan campaigns may also have encouraged individuals to divert more of their savings towards securities and investment accounts rather than commercial bank deposits. The size of the commercial banking sector as a whole clearly grew throughout our period of study, but the aggregate data could mask differential changes across banks and locations.

Among investment banks, in the bottom figure, the patterns were different. In a reflection of the relative lack of barriers to entry in that industry, the total number of those institutions (in blue) was much more volatile. It grew from 1914—the first year for which we have data—to 1918, and then collapsed in 1919. The rapid drop in 1919 may indicate that the war years and commission-free liberty loan drives were quite disruptive to that industry. The number of investment banks bounced back in 1920, and then remained high throughout the rest of the 1920s, with a smaller decline occurring in 1923. The red line in the panel, which presents the number of counties with at least one investment bank, shows relatively stable growth up to 1919, and then a large, discrete increase from 1919 to 1920. The year 1920 saw not only a large increase in the number of investment banks, but a 60 percent increase in the number of counties in which investment banks were present, reflecting a significant expansion in the industry's geographical reach which persisted throughout the rest of the 1920s.

In order to identify the contribution of the liberty bond campaigns to these changes, we next turn to our county-level data. Focusing on variation across counties allows us to control for the effects of changes that were felt at the national level, such as the emergence of new public companies and technologies, as well as the high returns offered by the stock market during the 1920s. In this way, our analysis will not identify the overall effect of the liberty bond drives, but instead will compare U.S. counties that were otherwise similar except for their subscription rates.

4.2 Changes in Commercial Banking, 1910-29

We begin with an analysis of commercial banks. If the liberty bond campaigns led households to reallocate or diversify more of their savings into investments in securities such as stocks and bonds, then the commercial bank sector should have grown more slowly than it would have in the absence of those campaigns. We primarily measure the size of the commercial banking sector in a county as the logarithm of assets, which is the best measure of the total size of a bank, but we also show that the effects are similar for total deposits, which more directly reflect individual behavior.[23]

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[23] In the appendix, we show that the results are not sensitive to using other measures of liberty bond subscriptions such as an indicator variable for counties above the median rate (Figure A1), to scaling the data up to the state-level and using data for the entire country (Figure A2), to separately excluding each Fed district (Figure A3) or to excluding any county that had a city of more than 25,000 at any time during the sample period (Figure A4).

Our commercial bank data are organized as a balanced panel of counties from 1910 to 1929. In order to investigate the impact of the liberty bonds on the commercial banking sector, we utilize a difference-in-differences design, and focus on interactions between county liberty bond subscription rates and a full set of year-fixed effects, in the context of a model with county-fixed effects and standard errors clustered by county. The interactions provide a test of whether higher liberty bond areas were different than low liberty bond areas in a given year compared with the difference in 1910 (the excluded year). In this way, we can determine not only whether the liberty bond drives had an effect on commercial bank behavior, but also precisely when the effect occurred. This will enable us to understand whether the effects we observe represented the continuation of an ongoing trend in counties with high liberty bond subscription rates, or whether they emerged as would be expected in the period during and after the liberty loan drives.

Rather than assume that counties with different high liberty bond subscription rates were the same, we take steps to control for other factors that could have influenced both liberty bond subscription rates and financial and economic development. Figure 2 revealed some regional patterns in liberty bond subscription rates. In addition, at the time, the individual Federal Reserve Districts held significant autonomy over the conduct of monetary policy, and could set their own discount rates (Wicker, 1966). We thus include Fed district-by-year fixed effects in our model in order to eliminate the effects of these regional differences from our analysis. We also include various county characteristics as controls, in order to address concerns related to the differences in county characteristics that may have been systematically related to liberty bond subscription rates seen in Figure 2. These include the logarithm of population, the logarithm of the number of farms, the fraction of the population living in a location over 2,500 people, the fraction of the population that was non-white, and the crop price index. Finally, we include an indicator for whether or not there was a Federal Reserve Bank or Branch within a county and interact it with the time-fixed effects, to account for the differential effect the presence that those institutions may have had on liberty bond subscriptions, commercial banks, and investing behavior over time.

The model we estimate is:

$$Assets_{c,t} = a + \beta_1 Liberty_c * t_t + \beta_2 X_{c,t} + FedDistrict_c * t_t + \gamma_c + e_{c,t}, \qquad (1)$$

where $Assets_{c,t}$ is the logarithm of total commercial bank assets for county c in year t; $Liberty_c$ is the subscription rate for the fourth liberty loan of county c, in percentage points; $X_{c,t}$ is a vector of county characteristics including the Census controls as well as interactions between an indicator variable for whether county c contained either a Federal Reserve Bank or Branch and the year-fixed effects;

$FedDistrict_c$ is a set of indicator variables for the Fed districts; t_t is a vector of year-fixed effects; γ_c is a vector of county-fixed effects, and $e_{c,t}$ is the error term, clustered by county.[24]

The estimated coefficients of equation (1) along with two-standard-error bands are presented in the top panel of Figure 4. The figure reveals that counties with high liberty bond subscription rates experienced a significant relative decline in commercial bank assets during and after the liberty bond drives compared to other counties. A 10 percentage point (about a 1 standard deviation) increase in liberty bond subscription led to a 7.3 percent decrease in commercial bank assets by 1920 and a 9.7 percent decrease by 1929, relative to other counties. We also find no strong mitigation of the effect over the 1920s and if anything, there was an increase in the negative effect during the decade. These estimates imply that there was a large and sustained relative decrease in commercial bank activity that corresponded to the cross-section distribution of liberty bond subscription, even after controlling for the general effect of the war and constant county characteristics and changing regional differences. Moreover, recalling Figure 3, these effects actually work against the overall positive trend in bank assets during the period.

Perhaps just as importantly, we find no difference in commercial bank assets across locations related to the liberty bond subscription rates *before* the drives took place. Indeed, the coefficient on liberty bonds does not become statistically significant until 1917 (the year of the first and second bond drives) and does not become consistently significant until 1919. The insignificance of 1918 could be the result of banks scaling up lending in that year to help place the liberty bonds with the public. The lack of any pre-liberty bond effect confirms that areas with high liberty bond subscription were not evolving along substantially different trends relative to areas with low liberty bond subscription prior to the campaigns.

Yet the possibility remains that some unobserved county characteristic that was associated with higher liberty bond subscription rates may also have shaped the evolution of the commercial banking sector of counties in the 1920s. We argue that the county characteristics associated with higher liberty bond subscriptions would also likely have been correlated with differential *increases* in commercial bank assets. A higher subscription rate meant that a larger fraction of the population had the financial resources to purchase a bond, and also likely meant that there was a higher level of social capital, as reflected in the civil society institutions conducting the loan campaigns. Higher wealth and social capital, all else equal, should have led to the creation of more commercial banks, and stronger growth of the assets of the banking sector. The most likely sources of bias in our analysis go in the opposite direction of our estimates.

The timing of the changes exhibited in the figure also help rule out the concern that the decline in commercial bank activity we attribute to the liberty bonds was instead due to the post-war decline in production and prices in agricultural areas. Although we explicitly control for each county's specific crop

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[24] The results throughout the paper hold if we cluster our standard errors by state rather than county.

price index, the decline in income during the early 1920s, which we cannot observe directly, could have been responsible for the decline in bank activity. Yet the significant decline in commercial bank assets in counties with high liberty bond subscription rates between 1917 and 1919 moves against the substantial *increase* in crop prices and incomes through 1919 that expanded bank balance sheets (Jaremski and Wheelock, 2020). Moreover, as shown in Appendix Figure A5, counties with high liberty bond subscription rates did not suddenly experience a decline in the number of banks in the late 1910s or early 1920s.[25] Combined with the lack of an effect before 1917, the timing strongly indicates that the effect on commercial banks was driven by the liberty loan campaigns, rather than activity before the war, the economic slowdown after the war, or a sudden collapse of banks.

Further evidence consistent with our interpretation of these effects is presented in the lower panel of Figure 3. The mechanism leading to the contraction in bank assets we propose is that while household savings were rising in general, depositors more exposed to the liberty bond drives chose to invest more of their funds in securities and investment accounts rather than deposit them in commercial banks. A necessary implication of this mechanism is that commercial bank deposits should have increased more slowly in high liberty bond areas relative to other areas, and by similar magnitudes as the fall in bank assets. The effects visible in the figure are not exactly the same, but they do not need to be: the liberty loan drives may have impacted other sources of bank funding. But the effect on deposits was quite similar to the effect on bank assets.

4.3 Changes in Investment Banking, 1910-29

We next study the effects of the liberty loan drives on investment banks. Because data on investment banks' assets or accounts were not reported to any state or federal regulators, we must limit our analysis to the number of investment banks across counties. Of course, changes in the number of investment banks will be an imperfect indicator for the level of demand for securities in a county. Nevertheless, entry into investment banking was not restricted by many legal or other barriers, so we would expect it to be responsive to changes in local demand.[26] In addition, many investment banks had sales staffs that actively solicited investments, so that changes in their numbers likely increased the number of local securities owners.

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[25] Indeed, we would not expect individuals purchasing more bonds and stocks to force commercial banks out of business, as individuals still had use for deposit accounts.
[26] The Blue Sky Laws of states often imposed registration requirements and other regulations on individuals and firms in the securities industry. However, these regulations were typically far less restrictive than those imposed on commercial banks, which typically included significant minimum capital requirements as well as extensive regulations on their operations and disclosure requirements.

In what follows, we test whether liberty bond subscription rates influenced the number of investment banks in a county. We start by examining the determinants of the number of investment banks in 1914, 1916, 1918, 1919, 1920, 1922, 1923, 1925, and 1929—the years for which data are available. The models are essentially the same as those used in the context of commercial banks, and take the form:

$$InvBanks_{c,t} = a + \beta_1 Liberty_c * t_t + \beta_2 X_{c,t} + FedDistrict_c * t_t + \gamma_c + e_{c,t}, (2)$$

where $InvBanks_{c,t}$ is the logarithm of the number of investment banks in county c in year t, and the rest of the variables retain their previous definitions.[27]

The results of equation (2) are presented in Figure 5, which plots the point estimates and two standard error bars by year, relative to the excluded year of 1914. Reassuringly, there was no significant effect of liberty bond subscription on the number of investment banks in the year 1916, indicating that there was no ongoing differential growth of investment banks in the counties with high liberty bond subscription rates prior to the war. There was also no effect in 1918, perhaps because the liberty loan campaigns did not create any profit-making opportunities for investment banks, and in fact likely made that industry less profitable in the short-run. But then in 1919, there was a positive effect on the number of investment banks, even though the industry itself contracted significantly in that year (Figure 3). The effect then grew in size in 1920 and 1922, as the industry expanded, and then persisted at a somewhat lower level throughout the rest of the 1920s. Overall, these estimates are consistent with the notion that the liberty loan campaigns changed American households' attitudes towards investing, and that investment banks sought to capitalize on the opportunities this created for their industry by moving into counties where subscription rates had been high.

These estimates also help rule out the concern that the relative decline in commercial bank assets in counties with high liberty bond subscription rates after 1917 was due to a general contraction in financial markets or the post-war slump in agricultural areas. Instead, the negative effect we document among commercial banks was isolated to that class of institutions. Investment banks expanded in the same counties where commercial banks grew more slowly, and one would not expect that to have been the case if economic conditions were deteriorating.

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[27] We add 1 and take the logarithm of the number of investment banks because while most counties do not have a single investment bank a couple of counties (e.g., those that encompass St. Louis and Baltimore) had more than 80 investment banks. The results are similar if we drop out these urban counties that had 25,000 people at any time during the sample period (Appendix Figure A4), estimate a binary variable for whether or not there was at least one investment bank in a county during the year (Appendix Figure A6), or separately exclude each Fed district (Appendix Figure A3).

4.4 Changes in Competition Between Investment Banks and Commercial Banks, 1910-29

  If the liberty loan drives taught Americans that securities ownership could be an attractive choice for their savings, and if they also taught investment bankers that the savings of ordinary households were an attractive source of business, then they would have intensified competition between investment banks and commercial banks for the savings of middle-income Americans and small businesses.[28] Relative to the period before the liberty loan drives, the presence of an investment bank in a county should have had a stronger effect on commercial bank assets in the years after 1918, as competition between commercial banks and investment banks for the savings of local households and businesses became more intense.

  To test for these effects, we take two approaches. The first examines whether the presence of an investment bank influenced the amount of commercial bank assets in the same county in the same year. This approach enables us to observe whether the effect of investment banks on local commercial banks became stronger after the liberty bond drives. Yet a concern regarding this model is that any unobserved county characteristic that was associated with both the presence of investment banks and a decline in the assets of commercial banks in the 1920s would bias the estimated effects.[29] To address this potential concern, we utilize a second model, which focuses only on investment banks that entered during or immediately following the liberty bond drive years (1916-1920). These investment banks were most likely induced to enter by the liberty bond drives, which revealed which counties were promising locations for investment banks through high participation rates, and which were unlikely to have signaled that the commercial banks in the county would decline. We construct an indicator variable for counties gaining an investment bank during that period and, similar to the previous approach, we investigate whether those counties experienced differential growth of commercial bank assets after 1920, and whether they were already seeing declines prior to World War I.[30]

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[28] There were potential complementarities between investment banking and commercial banking; lending to brokers to finance margin loans to customers became an important line of business for commercial banks in the 1920s (Edwards, 1938). But those loans may not have originated locally, particularly if the investment bank was a branch of a larger firm headquartered in a financial center such as New York or Chicago and obtained credit there.

[29] Of course, one might expect that county characteristics associated with financial development such as higher levels of income, wealth, or industrialization would affect both commercial banks and investment banks in the same direction. If investment banks were more likely to be present in counties where conditions were more favorable to the growth of the commercial banking sector, then our estimates would understate the impact of investment banks on commercial banks.

[30] In Appendix Figures A10 through A13, we show that both models are robust to excluding any county that had a city of more than 25,000 people at any time during the sample period or to separately excluding each Fed district. The results are also similar if we were to use a linear trend to fill in the years when investment bank data are unavailable. While unreported, the results are robust to other variable choices including instead using an indicator for having an investment bank in 1916, in 1918, 1919, or in 1920 or using an indicator for counties that gained a bank 1914-1920.

The first model, in which the investment bank indicator can vary over time, takes the form:

$$Assets_{c,t} = a + \beta_1 I(InvBanks > 0)_{c,t} * t_t + \beta_2 X_{c,t} + FedDistrict_c * t_t + \gamma_c + e_{c,t} , (3)$$

where the $I(InvBanks > 0)_{c,t}$ is an indicator variable that takes a value of 1 if county c had at least one investment bank in year t and the rest of the variables retain their definitions.

The estimates of equation (3) are presented in Figure 6, which plots the point estimates and two standard error bars by year. The effect of investment banks is positive before 1918, it begins to decline in 1918 and becomes significantly negative by 1920 and remained so for the rest of the 1920s. A county that had an investment bank would have had 7.4% *more* commercial bank assets in 1916, but 9.5% and 8.6% less commercial banks assets in 1920 and 1925, respectively. The competitive relationship between investment banks and commercial banks changed with the liberty bond drives.

The model looking at counties that gained an investment bank 1916-1920 is:

$$Assets_{c,t} = a + \beta_1 I(\Delta InvBanks_{1916-20} > 0)_c * t_t + \beta_2 X_{c,t} + FedDistrict_c * t_t + \gamma_c + e_{c,t} , (4)$$

where $I(\Delta InvBanks_{1916-20} > 0)_c$ is an indicator variable that takes a value of 1 if the county gained at least one investment bank between 1916 and 1920 and the rest of the variables retain their definitions.

Figure 7 presents the point estimates for counties that gained an investment bank between 1916 and 1920 along with two standard error bands by year, relative to the excluded year of 1910. These results are similar but larger than those in Figure 6. Counties that gained an investment bank during the liberty bond drives had only mild differences in commercial bank assets prior to 1917, and the difference becomes consistently negative and declined steeply during the years of the liberty loan drives. A county that gained an investment bank is expected to have had an insignificant 4.8% less commercial bank assets in 1916, but a significant 17.5% and 18.8% less commercial banks assets in 1920 and 1925 respectively, relative to 1910. Even controlling for pre-trends and any potential omitted factor in the 1920s driving additional investment bank entry, the effect of investment banks became considerably stronger immediately during the liberty bond drives rather than before the war (i.e., 1910-1913) or during the early parts of the war (i.e., 1914-1915).

Taken together, these results suggest that there was a structural shift in the effect of investment banks coinciding with the liberty bond drives in 1917-1919, and not necessarily just the start of WWI in 1914 or the entry of new technology and high stock returns of the 1920s. The liberty loan campaigns reshaped local financial markets, and led investment banks to compete much more aggressively for the savings of households and businesses. Yet it is important to note that the effect of investment bank entry

cannot account for the entire effect of liberty bonds on commercial bank assets. Although investment banks entered many new cities and counties, they were present only in a relatively small portion of the sample counties. If we include liberty bonds as a separate control in either equation (3) or (4), the liberty bond interactions remain negative and statistically significant after 1918 as well. This suggests that the effects of the liberty bonds on commercial bank assets were not solely due to the presence and entry of investment banks, and that instead, the effect of investment banks on commercial banks was due in part to the liberty bond drives themselves.

4.5 Determinants of Individuals' Ownership of Financial Assets, 1930s: State-level Data

Our results have shown that high liberty bond subscription rates were associated with entry by investment banks, which would almost certainly have led to higher securities ownership rates. But it is important to directly quantify the effects on securities ownership rates, and also to investigate whether the effects of the bond drives and the expansion of the investment banking industry they helped stimulate persisted beyond the 1920s.

The earliest available sources that record whether or not households owned financial assets are surveys conducted by Gallup in the mid-1930s. We use these surveys to determine whether the ownership rates of financial assets were higher in places where liberty bond subscription rates had been higher, conditional on individual survey respondents' characteristics such as occupation, age, and various markers of wealth and social status, such as whether or not they owned an automobile or a telephone. As we observe financial asset ownership nearly 20 years after the liberty bond drives, this analysis will reveal whether the many different mechanisms through which liberty bonds may have led to greater levels of security ownership had persistent effects. Yet the limitations of the data will prevent us from being able to distinguish among those different potential mechanisms.

The main limitation of the data is that the geographical identifiers indicate only the state in which the respondent resided. The surveys did record whether or not the respondent resided in a large city or a small town, but not the identity of the city or town. We are therefore unable to utilize the variation across counties within states in liberty bond subscription rates, and instead focus on state-level liberty bond subscription rates, as reported by the U.S. Treasury (1920).

As we have large numbers of households within states, we estimate the following model:

$$FinAsset_{i,s,j} = a + \beta_1 Liberty_s + \beta_2 Z_i + \delta_j + e_{i,s,j}, (5)$$

where $FinAsset_{isj}$ is an indicator variable equal to one if survey respondent i residing in state s reported that they owned either stocks or bonds in survey wave j; $Liberty_s$ is the subscription rate for the fourth

liberty loan in the state in which respondent i resided; δ_j are fixed effects for each of the five survey waves; and Z_i is a vector of characteristics of respondent i such as age, gender, race, proxies for income, and locational characteristics. $e_{i,s,j}$ is the error term, clustered by state. We estimate (5) using a logistic regression.

The estimates, presented in Table 3, imply that liberty loan subscription rates were strongly correlated with financial asset ownership, even conditional on a broad range of individual characteristics. In column (1), only the survey-wave fixed effects are included, and in column (2), controls for age, gender, race, and whether or not the respondent resided in a small town or on a farm are added. This diminishes the magnitude of the estimate of the liberty bonds parameter slightly, but it remains large and statistically significant. The marginal effect implied by the logit coefficient reported in column (2) indicates that a percentage point increase in the state subscription rate led to a 0.3 percentage point increase in the likelihood that an individual owned financial assets. In columns (3) and (4), controls for occupation and social class and wealth are included, and the effect remains unchanged. Finally, in column (5) we add controls for other state characteristics. The additional controls do reduce the estimated magnitude of the effect, but it remains statistically and economically significant.

A potential source of concern regarding these results is that, since they only represent cross-sectional differences from the years after the liberty loans, any estimated effect of liberty bonds on securities ownership rates in 1930s may simply be a consequence of persistent differences across states that were correlated with liberty bond subscription rates. Yet the low rate of securities ownership among households in the years prior to the liberty loan drives suggests that it is implausible that these differences could explain our results. In Appendix Figure A15, for instance, we show that these results are not due to the effect of outlier states with particularly high or low levels of liberty bond subscription rates.

4.6 Changes in Real Outcomes, 1920-29

Investment banks and commercial banks created alternative pathways for financial intermediation. Commercial banks utilized deposits to fund loans, while investment banks solicited funds for brokerage or asset management services that would ultimately channel savings into securities markets. But the lending of commercial banks was local, whereas securities markets were regional or national. In the highly segmented commercial banking markets of the early twentieth century, if households and businesses reallocated their savings out of commercial bank deposits and into securities markets, this would have caused a contraction in the availability of external finance locally, while increasing it regionally or

nationally.[31] Here we investigate the impact of that local contraction on economic activity at the county level.

We adopt two approaches to this analysis. In the first, we instrument for the growth of commercial bank assets with the liberty bond subscription rates in that county, and use the instrumented values to predict changes in economic outcomes, obtained from the census. In this framework, the regressions presented above showing the effect of liberty bonds on commercial bank assets (Figure 4) have the interpretation of the first-stage relationship, and the IV estimates show the local average treatment effects of the changes in commercial bank assets on economic activity induced by the liberty bond drives.

This approach utilizes the changes in commercial bank assets induced by the liberty bonds to estimate the effects of commercial banks on local economic activity. It requires that liberty bond subscription rates satisfy the exclusion restriction that they only influenced economic outcomes through their effect on the commercial banking system. For example, securities purchases made by the residents of a county in the 1920s, or the entry of an investment bank in a county, must not have influenced local economic activity except by drawing deposits away from commercial banks. We discuss this assumption in detail below and show that when we delete counties where violations seem most likely, the results do not change. Yet it is always possible that the liberty bonds could have influenced economic activity through some channel other than commercial banks.

We therefore adopt a second approach in which we estimate the relationship between local economic outcomes and liberty bond subscription rates directly. The validity of this approach does not depend on the effects of the liberty bonds operating through any specific channel. This second approach has the interpretation of the reduced-form version of the first approach.

We analyze the effect of the liberty bond subscriptions on the growth of county-level aggregates between 1919 and 1929 from the federal census, in a framework that controls for each county's 1919 characteristics. We focus on five outcome variables, two for manufacturing and three for agriculture, all in logarithms: the number of manufacturing establishments, manufacturing output, the number of farms, the value of crop output, and total farm values. Each of these outcomes should have been positively related to the availability bank credit.

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[31] We verify that total loans declined in counties with higher liberty bond subscription rates in Figure A14. In the localized and segmented commercial banking markets of the period, it is unlikely that loans from banks in other counties would have offset these declines.

We estimate our models in first differences. The first approach uses 2SLS, as follows:

$$\Delta y_{c,1919-29} = a + \beta_1 \Delta \widehat{Assets}_{c,1918-29} + \beta_2 X_{c,1919} + \beta_3 y_{c,1919} + \beta_4 FedDistrict_c + e_c,$$

$$\Delta \widehat{Assets}_{c,1918-29} = a + \delta_1 Liberty_c + \delta_2 X_{c,1919} + \delta_3 y_{c,1919} + \delta_4 FedDistrict_c + e_c, \quad (6)$$

where $\Delta y_{c,1919-29}$ is the change in the outcome variable between 1919 and 1929 for county c, $\Delta \widehat{Assets}_{c,1918-29}$ is the predicted change in the log of total bank assets in a county from 1918 to 1929, $y_{c,1919}$ is the level of the outcome variable in 1919 to control for any convergence effects, $X_{c,1919}$ is a vector of county-level control variables in 1919, e_c is the error term clustered by state, and the rest of the variables retain their definitions from above.

The results of (6) are presented in Table 4, with OLS estimates presented next to the 2SLS results for comparison. Columns (2) and (4) indicate that the growth in commercial bank assets in a county had strong positive effects on the growth in the number of manufacturing establishments and farms. As the liberty bond campaigns reduced the growth of commercial bank assets, the effect of the liberty bonds on these outcomes was negative. The OLS estimates in (1) and (3) are both smaller than the corresponding IV estimates, suggesting that the bias corrected by 2SLS was negative. This could be consistent with a selection effect operating in the opposite direction—banks choosing to expand in areas with more concentrated economic activity, and slower growth in the number of manufacturing enterprises and farms. Columns (6) and (8) present estimates of the effect of the growth of commercial bank assets on the manufacturing and crop output; here the patterns are similar, but the positive estimates of the effects of commercial bank asset growth are not statistically significant. Finally, in columns (11) and (12), the effect on farm values is estimated, and found to be positive.

A source of concern regarding these results could be that the exclusion restriction would be violated if the liberty loan campaigns induced households to make investments that directly affected economic activity. Among the most plausible examples of this would be that households who learned about investing from the loan campaigns made investments in local firms; this could have impacted our economic outcomes independently of any effect on commercial banks. The counties in which investments in local firms were most accessible, and arguably violations of the exclusion restriction were most likely, were those containing large population centers where firms that accessed national securities markets were located. In those counties, investments in some local firms could be made through securities dealers. Yet in Appendix Table A1, we show that when we delete all counties with cities of 25,000 or more from the sample, the results remain essentially unchanged.

Of course it is possible that the liberty bonds could have influenced economic activity through other channels. In our second approach to this analysis, we simply regress the change in the county outcomes on the liberty bond subscription rate, as follows:

$$\Delta y_{c,1919-29} = a + \beta_1 Liberty_c + \beta_2 X_{c,1919} + \beta_3 y_{c,1919} + FedDistrct_c + e_c, \qquad (7)$$

The results are presented in Table 5. The estimates are generally negative: counties with higher liberty bond subscription rates had slower growth in their numbers of manufacturing establishments and farms, lower output, and lower farm values, although most of these effects are imprecisely estimated. It is worth noting that the most plausible violations of the exclusion restriction in (6) would suggest a positive relationship between liberty bonds and economic outcomes.

Taken together, these estimates suggest that the liberty loan campaigns' impacts on household finance and financial intermediation had significant consequences for the composition of economic activity at the county level. By helping to divert a larger share of household savings into securities markets, the liberty loan campaigns led to a relative contraction in the availability of bank loans in the 1920s, and fewer small manufacturing establishments and farms.

5. Conclusion

This paper analyzes the effects of the liberty loan campaigns of World War I, and provides a quantitative assessment of their role in reshaping American finance. During the 1920s, American securities markets expanded, as the investment banking industry grew, securities ownership proliferated, and the commercial banking industry declined in relative terms. Financial historians have long argued that the liberty bond drives contributed to these changes, but their effects have never been analyzed systematically.

Using unique county level data, we find that that higher liberty bond subscription rates led to an increase in the number of investment banks, a contraction in commercial bank assets and a stronger competitive effect of investment banks on commercial banks. We also find that individuals residing in states with higher liberty bond subscription rates were more likely to own financial assets such as stocks and bonds in the mid-1930s. Finally, we show that these changes had significant effects on the composition of economic activity at the county level, and resulted in fewer manufacturing enterprises and farms.

Many other factors contributed to the changes in American financial markets that occurred in the 1920s. The low rates of securities ownership among households in the United States at that time, and the focus of the investment banking industry on wealthy individuals and institutions would almost certainly have slowly changed in the absence of the liberty loan campaigns during the prosperous 1920s. Yet our

estimates imply that the contribution of the liberty loans was significant. In the absence of the liberty loans, there would have been 22.3 percent fewer investment banks in 1929, and commercial bank assets would have been 19.8 percent greater in 1929, relative to 1916. This contraction in the growth of commercial bank assets reduced the number of manufacturing firms and farms in our sample counties significantly. We cannot assess the overall welfare effects of these changes, but it is almost certainly the case that in the absence of the liberty bonds, American stock and bond markets would have been smaller. The costs at the local level were likely offset at least partly by the benefits at the national level.

Although they were conducted to raise funds and generate political support for the war effort, the liberty loan drives also led to a significant shift in financial intermediation. By introducing millions of households to bond ownership, they contributed to the expansion of the investment banking industry and securities investing in the 1920s that likely helped fuel the large-scale expansion in American industry of the mid-twentieth century. The results of this paper thus confirm the importance of financial literacy and trust for participation in financial markets. The liberty bond drives can be thought of as massive interventions that sought to shape households' attitudes toward investing in securities and to provide information that increased financial literacy.

References

Allen, Franklin, and Douglas Gale. 1997. "Financial Markets, Intermediaries and Intertemporal Smoothing," *Journal of Political Economy* 105(3): 523-546.

Ameriks, John, Andrew Caplin, and John Leahy. 2003. "Wealth accumulation and the propensity to plan." *Quarterly Journal of Economics* 118.3: 1007-1047.

Balloch, Adnan, Nicholae, Anamaria, and Dennis Philip. 2015. "Stock Market Literacy, Trust and Participaiton," *Review of Finance* 19: 1925-63.

Baskin, Jonathan Barron, and Paul J. Miranti, Jr. 1997. *A History of Corporate Finance*. Cambridge: Cambridge University Press.

Beck, Thorsten, and Ross Levine. 2004. "Stock markets, banks, and growth: Panel evidence." Journal of Banking & Finance 28: 423-442.

Berle, Adolf A., Jr., and Gardiner C. Means. 1932. *The Modern Corporation and Private Property*. New York: Macmillan.

Berinsky, Adam. J. 2006. "American Public Opinion in the 1930s and 1940s: The Analysis of Quota-Controlled Sample Survey Data." *Public Opinion Quarterly* 70(4):499-529.

Berinsky, Adam J. and Eric Schickler. 2011. The American Mass Public in the 1930s and 1940s [Computer file]. Individual surveys conducted by the Gallup Organization [producers], 1936-945: Roper Center for Public Opinion Research, University of Connecticut [distributor], 2011.

Bernheim, A. L., and M. G. Schneider, eds. 1935. *The Securities Markets.* New York: Twentieth Century Fund.

Brown, J. David, and John S. Earle. 2017. "Finance and growth at the firm level: Evidence from SBA loans." Journal of Finance 72: 1039-1080.

Calomiris, Charles W. 1995. "The Costs of Rejecting Universal Banking: American Finance in the German Mirror, 1870-1914," in *The Coordination of Economic Activity Within and Between Firms*, N. Lamoreaux and D. Raff, eds., 257-312. Chicago: University of Chicago Press.

Calomiris, Charles W. 2002. "Banking and Financial Intermediation," in *Technological Innovation and Economic Performance*, Benn Steil, David G. Victor, and Richard R. Nelson, eds., 285-313, Princeton: Princeton University Press.

Calomiris, Charles W., and Elliot Oh. 2018. "Who Owned Citibank? Familiarity Bias and Business Network Influences on Stock Purchases, 1925-1929." *NBER Working paper* No. w24431.

Calomiris, Charles W., and Daniel M.G. Raff. 1995. "The Evolution of Market Structure, Information, and Spreads in American Investment Banking," in *Anglo-American Finance: Financial Markets and Institutions in 20th-Century North America and the U.K.* R. Sylla and M. Bordo, eds., 103-160. Business One Irwin.

Carlson, Mark, Correia, Sergio and Stephan Luck. 2020. "The Effects of Banking Competition on Growth and Financial Stability: Evidence from the National Banking Era." Working Paper, Federal Reserve.

Carosso, Vincent P. 1970. *Investment Banking in America: A History*. Cambridge: Harvard University Press.

Carosso, Vincent P. 1979. *More than a Century of Investment Banking: the Kidder, Peabody & Co. Story.* New York: McGraw Hill.

Carter, Susan, Gartner, Scott, Haines, Michael, Olmstead, Alan, Sutch, Richard, and Gavin Wright. 2006. *Historical Statistics of the United States, Millennial Edition*. New York: Cambridge.

Cetorelli, Nicola, and Michele Gambera. 2001. "Banking market structure, financial dependence and growth: International evidence from industry data." Journal of Finance 56: 617-648.

Chodorow-Reich, Gabriel. 2014. "The Employment Effects of Credit Market Disruptions: Firm-level Evidence from the 2008-9 Financial Crisis." *Quarterly Journal of Economics* 129: 1-59.

Dickson, P.G.M. 1967. *The Financial Revolution in England: A Study in the Development of Public Credit, 1688-1756.* New York: St. Martin's Press.

Edwards, George W. 1938. *The Evolution of Finance Capitalism*. New York: Longmans Green & Co.

Friedman, Milton and Anna J. Schwartz. 1963. *A Monetary History of the United States, 1867–1960.* Princeton: Princeton University Press.

Friend, Irwin, G. Wright Hoffman, Willis J. Winn, Morris Hamburg, and Stanley Schor. 1958. *The Over-the-Counter Securities Markets.* New York: McGraw Hill.

Friend, Irwin, James R. Longstreet, Morris Mendelson, Ervin Miller, and Arleigh P. Hess, Jr. 1967. *Investment Banking and the New Issues Market*. New York: World Publishing.

Fulford, Scott. 2015. "How Important are Banks for Economic Development? National Banks in the United States, 1870-1900," *Review of Economics and Statistics* 97(5): 921-38.

Garbade, Kenneth D. 2012. *Birth of a Market: The U.S. Treasury Securities Market from the Great War to the Great Depression*. Cambridge, Mass: MIT Press.

Galbraith, John Kenneth. 1954. *The Great Crash: 1929*. New York: Houghton Mifflin.

Georgarakos, Dimitris, and Giacomo Pasini. 2011. "Trust, Sociability and Stock Market Participation," *Review of Finance* 15(4): 693-725.

Gertler, Mark and Simon Gilchrist. 2018. "What Happened: Financial Factors in the Great Recession." *Journal of Economic Perspectives:* 3-30.

Gilje, Erik P., Elena Loutskina, and Philip E. Strahan. 2016. "Exporting liquidity: Branch banking and financial integration." Journal of Finance 71: 1159-1184.

Guiso, Luigi, Sapienza, Paola and Luigi Zingales. 2008. "Trusting the Stock Market," *Journal of Finance* 63(6): 2557-2600.

Haines, Michael R. 2004. *Historical, Demographic, Economic, and Social Data: The United States, 1790-2000*. ICPSR Study 2896. Ann Arbor, MI: Inter-university Consortium for Political and Social Research.

Haliassos, Michael, and Carol C. Bertaut. 1995. "Why do so few hold stocks?." the *Economic Journal* 105.432: 1110-1129.

Hall, George J., and Thomas J. Sargent. 2019. "Complications for the United States from International Credits: 1913-1940," in Dabla-Norris, ed., *Debt and Entanglements Between the Wars*. Washington, DC: International Monetary Fund.

Haney, Lewis. 1914. "Farm Credit Conditions in a Cotton State." *American Economic Review* 4-1: 47–67.

Haven, T. Kenneth. 1940. *Investment Banking under the Securities and Exchange Commission*, Ann Arbor: University of Michigan.

Hilt, Eric, and Wendy M. Rahn. 2020. "Financial Asset Ownership and Political Partisanship: Liberty Bonds and Republican Electoral Success in the 1920s," *Journal of Economic History*, 80(3).

Jaremski, Matthew. 2014. "National Banking's Role in U.S. Industrialization, 1850-1900" *Journal of Economic History* 74:109-140.

Jaremski, Matthew, and David Wheelock. Forthcoming. "Banking on the Boom, Tripped by the Bust: Banks and the World War I Agricultural Price Shock" *Journal of Money, Credit, and Banking.*

Jayaratne, Jith, and Philip E. Strahan. 1996. "The finance-growth nexus: Evidence from bank branch deregulation." *Quarterly Journal of Economics* 111: 639-670.

Kang, Sung Won and Hugh Rockoff. 2015. "Capitalizing Patriotism: The Liberty Bonds of World War I." *Financial History Review* 22: 45–78.

King, Robert G., and Ross Levine. 1993. "Finance and growth: Schumpeter might be right." Quarterly Journal of Economics 108: 717-737.

Kitchens, Carl, and Luke Rodgers. 2020. "Were Children Always Normal? Historic Evidence from the WWI Agricultural Boom and Bust." Working Paper.

Lin, Leming. 2020. "Bank Deposits and the Stock Market," *Review of Financial Studies* 33: 2622-2658.

Lusardi, Annamaria. 2004. "Saving and the effectiveness of financial education". In: O. Mitchell and S. Utkus (eds.), *Pension Design and Structure: New Lessons from Behavioral Finance*, Oxford University Press, 157-184.

Lusardi, Annamaria, and Olivia Mitchell. 2007. "Baby boomers retirement security: The role of planning, financial literacy and housing wealth." *Journal of Monetary Economics* 54: 205-224.

Lusardi, Annamaria, and Olivia Mitchell. 2008. "Planning and financial literacy: How do women fare?" *American Economic Review* 98: 413-417.

Macey, Jonathan, and Geoffrey Miller. 2001. "Origin of the blue sky laws." *Texas Law Review* 70: 347-397.

Mahoney, Paul. 2003. "The origins of the Blue-Sky Laws: A test of competing hypotheses." *Journal of Law and Economics* 46: 229-251.

McAdoo, William G. 1931. *Crowded Years: The Reminiscences of William G. McAdo*o. Boston: Houghton Mifflin Company.

Means, Gardiner C. 1930. "The Diffusion of Stock Ownership in the United States," *Quarterly Journal of Economics* 44: 561-600.

Meeker, J. Edward. 1930. *The Work of the Stock Exchange*. New York: Ronald Press.

Mitchell, Lawrence E. 2007. *The Speculation Economy: How Finance Triumphed Over Industry.* San Francisco: Berrett-Koehler.

Mitchener, Kris James, and Matthew Jaremski. 2015. "The Evolution of Bank Supervisory Institutions: Evidence from American States." *Journal of Economic History* 75: 819-859.

Moore, David M. 1992. *The Super Pollsters*. New York: Four Walls Eight Windows Publishing.

Nicholas, Tom. 2008. "Does Innovation Cause Stock Market Runups? Evidence from the Great Crash," *American Economic Review*, 98(4): 1370-96.

Olney, Martha L. 1995. *Saving and Dissaving of 12,817 American Households, 1917-1919*. Amherst, MA: Martha L. Olney, University of Massachusetts [producer], 1993. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor]. http://doi.org/10.3886/ICPSR06276.v1

O'Sullivan, Mary. 2007. "The Expansion of the U.S. Stock Market, 1885–1930: Historical Facts and Theoretical Fashions," *Enterprise and Society* 8(3): 489-542.

O'Sullivan, Mary. 2016. *Dividends of Development: Securities Markets in the History of US Capitalism, 1866-1922*. New York: Oxford University Press.

Ott, Julia C. 2011. *When Wall Street Met Main Street: the Quest for an Investors' Democracy*. Cambridge, Mass.: Harvard University Press.

Peach, W. Nelson. 1941. *The Securities Affiliates of National Banks.* Baltimore: Johns Hopkins.

Quinn, Sarah L. 2019. *American Bonds: How Credit Markets Shaped a Nation.* Princeton: Princeton University Press.

Rajan, Raghuram and Rodney Ramcharan. 2015. "The Anatomy of a Credit Crisis: The Boom and Bust in Farm Land Prices in the United States in the 1920s." *American Economic Review* 105: 1439-77.

Rajan, Raghuram, and Rodney Ramcharan. 2016. "Local Financial Capacity and Asset Values: Evidence from Bank Failures." *Journal of Financial Economics* 120: 229-251.

Rider, Kilian. 2019. "Should Monetary Policy Lean Against the Wind? Quasi-Experimental Evidence from Federal Reserve Policies in 1920-21," Working paper, Austrian National Bank.

Ripley, William Z. 1927. *Main Street and Wall Street*. Boston, Little, Brown, and Company.

Rutterford, Janette, and Dimitris P. Sotiropoulos. 2017. "The Rise of the Small Investor in the United States and United Kingdom, 1895 to 1970." *Enterprise and Society* 18(3): 485-535.

Saint-Paul, Gilles. 1996. "Demand-Driven Financial Development," in Hermes and Lensink, eds., *Financial Development and Economic Growth*. London: Routledge.

Shiller, Robert. 2000. *Irrational Exuberance*. Princeton, New Jersey, Princeton University.

Sobel, Robert. 1965. *The Big Board: A History of the New York Stock Market.* New York: Free Press.

Song, Fenghua and Anjan V. Thakor. 2010. "Financial System Architecture and the Co-Evolution of Banks and Capital Markets," *Economic Journal*, 120 (547): 1021-1055.

Sutch, Richard. 2015. "Financing the Great War. A Class Tax for the Wealthy, Liberty Bonds for All." BEHL working paper no. 2015–09.

Sylla, Richard. 2002. "Financial Systems and Economic Modernization," *Journal of Economic History* 62(2): 277-292.

Thomson, David K. 2016. "Like a Cord through the Whole Country: Union Bonds and Financial Mobilization for Victory" *Journal of the Civil War Era* 6(3): 347-75.

United States Treasury. 1920. *Annual Report of the Secretary of the Treasury on the State of the Finances for the Fiscal Year Ended June 30, 1919*. Washington: Government Printing Office.

Van Rooij, Maarten, Annamaria Lusardi, and Rob Alessie. 2011. "Financial literacy and stock market participation." *Journal of Financial Economics* 101: 449-472.

Van Rooij, Maarten, Annamaria Lusardi, and Rob Alessie. 2012. "Financial literacy, retirement planning and household wealth." *Economic Journal* 122.560: 449-478.

Vissing-Jorgensen, Annette. 2004. "Perspectives on behavioral finance: Does "irrationality" disappear with wealth? Evidence from expectations and actions." In: M. Gertler and K. Rogoff (eds.), *NBER Macroeconomics Annual* 2003, Cambridge, MIT Press.

Warshow, H.T. 1924. "The Distribution of Corporate Ownership in the United States," *Quarterly Journal of Economics* 39: 15-38.

Wicker, Elmus R. 1966. "A reconsideration of Federal Reserve policy during the 1920–1921 depression." *The Journal of Economic History* 26.2: 223-238.

White, Eugene N. 1990. "The Stock Market Boom and Crash of 1929 Revisited," *Journal of Economic Perspectives*, 4(2): 67-83.

FIGURES AND TABLES

Table 1:
Liberty Loan Characteristics and Subscriptions, by Loan

	First	Second	Third	Fourth	Victory
Subscription Period	May-Jun 1917	Oct 1917	Apr-May 1918	Sept-Oct 1918	Apr-May 1919
Coupon rate	3.50%	4.00%	4.25%	4.25%	3.75% or 4.75%
Maturity (years)	30	25	10	20	4
Total Subscriptions (Bill. $)	2.000	3.809	4.177	6.959	4.500
Number of subscribers (Mill.)	4	9.4	18.4	22.8	11.8

Notes: The first and second loans could be converted into subsequent loans bearing higher coupon rates. Their init
reported here. The dual coupon rates for the victory loans reflected the fact that investors could choose whether or
bonds were tax free; tax free bonds paid the lower rate. All liberty bonds were issued at par, so their yield to matur
was equal to their coupon rate.
Sources: Annual Reports, U.S. Treasury; Garbade (2012).

Table 2:
County Characteristics

	All Counties	Above-Median Liberty Bonds	Below Median Liberty Bonds
	(1)	(2)	(3)
Liberty Bond Subscription Rate, in Percentage Points	16.524	25.298	8.013
	[10.230]	[6.354]	[4.446]
Ln(County Population) in 1910	9.868	9.875	9.861
	[0.728]	[0.887]	[0.532]
Fraction Black in 1910	0.138	0.038	0.236
	[0.211]	[0.098]	[0.244]
Fraction Urban in 1910	0.161	0.242	0.082
	[0.214]	[0.251]	[0.128]
Ln(Number of Farms) in 1910	7.555	7.399	7.707
	[0.689]	[0.715]	[0.626]
Fed Reserve Bank or Branch In County	0.009	0.019	0
	[0.096]	[0.137]	[0]
Ln(Commercial Bank Assets) in 1910	14.135	14.767	13.522
	[1.348]	[1.237]	[1.154]
Number of Commercial Banks in 1910	7.704	10.443	5.046
	[6.485]	[7.387]	[3.953]
Number of Investment Banks in 1914	0.394	0.780	0.021
	[4.302]	[6.018]	[0.158]

Notes: this table presents means and standard deviations [in brackets] of county characteristics. Column (1) presents data for all counties, column (2) for counties with above-median subscription rates, and column (3) for counties with below-median rates. For definitions and sources, see text.

Table 3:
Effects of Liberty Loan Subscriptions on Financial Asset Ownership, 1930s

	(1)	(2)	(3)	(4)	(5)
State Subscription Rate	0.035***	0.029***	0.031***	0.027***	0.015***
	[0.006]	[0.006]	[0.005]	[0.006]	[0.006]
Survey Wave F.E.s?	Yes	Yes	Yes	Yes	Yes
Demographic Controls?	No	Yes	Yes	Yes	Yes
Occupation Controls?	No	No	Yes	Yes	Yes
Social Class Controls?	No	No	No	Yes	Yes
State Controls?	No	No	No	No	Yes
Observations	13,393	13,393	13,393	13,270	13,270

Notes: This table presents cross-sectional logistic regressions of the determinants of individual-level ownership of stocks and bonds as ascertained in five Gallup polls from 1935-38. Each model includes indicator variables for the specific polls. Data are weighted (see text). Demographic controls include the respondent's age, age squared, indicator variables for women and for African-Americans, and an indicator variable for a respondent living on a farm or in a small town. Occupation controls include indicator variable for a professional occupation, and an indicator variable for the respondent being unemployed. Social class controls include indicators for the ownership of a telephone, and for the ownership of an automobile. State controls include the urbanization rate for 1920. Robust standard errors clustered by state presented in parentheses below the coefficients. * denotes significance at 10%; ** at 5% level and *** at 1% levels.

Table 4:
Effects of Liberty Loan Subscriptions on County Growth, 1920-30: IV Estimates

	ΔLn(# of Mfg. Estab.)		ΔLn(# of Farms)		ΔLn(Mfg Output)		ΔLn(Crop Output)		ΔLn(Farm Value)	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ΔLn(Bank Assets) 1918-29	0.282**	0.631*	0.042*	0.244**	0.778*	0.808	0.065	0.206	0.138***	0.329**
	[0.096]	[0.353]	[0.022]	[0.077]	[0.362]	[1.990]	[0.051]	[0.370]	[0.025]	[0.161]
County Controls in 1920?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Value of D.V. in 1920?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fed City Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap F	--	12.45	--	13.15	--	13.57	--	13.29	--	7.32
Observations	849	849	849	849	849	849	849	849	849	849

*Notes*: Table presents the results of OLS and 2SLS regressions of Equation (6). The dependent variables are described in the column headings. The sample spans all states that had both (1) data on state banks published from 1910 to 1929 and (2) liberty bond subscription data. We drop counties without any commercial banks in a given year. The sample contains observations in 1920 and 1930. "County Control Variables" includes the logarithm of population, the logarithm of the number of farms, the fraction of the population living in a location over 2,500 people, the fraction of the population that is non-white, and the crop price index. Robust standard errors clustered by county are presented in brackets below the coefficients. * denotes significance at 10%; ** at 5% level and *** at 1% levels.

Table 5:
Effects of Liberty Loan Subscriptions on County Growth, 1920-30: Reduced Form

	ΔLn(# of Mfg. Estab.)	ΔLn(# of Farms)	ΔLn(Mfg. Output)	ΔLn(Crop Output)	ΔLn(Farm Value)
	(1)	(2)	(3)	(4)	(5)
Liberty Bond Subscription Rate	-0.009	-0.004**	-0.012	-0.002	0.002
	[0.007]	[0.002]	[0.032]	[0.004]	[0.004]
County Controls in 1920?	Yes	Yes	Yes	Yes	Yes
Value of Dependent Variable in 1920?	Yes	Yes	Yes	Yes	Yes
District Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Fed City Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Observations	849	849	849	849	849

Notes: Table presents the results of Equation (7). The dependent variable is described in the column headings. The sample spans all states that had both (1) data on state banks published from 1910 to 1929 and (2) liberty bond subscription data. We drop counties without any commercial banks in a given year. The sample contains observations in 1920 and 1930. "County Control Variables" includes the logarithm of population, the logarithm of the number of farms, the fraction of the population living in a location over 2,500 people, the fraction of the population that is non-white, and the crop price index. Robust standard errors clustered by county are presented in brackets below the coefficients. * denotes significance at 10%; ** at 5% level and *** at 1% levels.

Figure 1:
Stock Prices and NYSE Trading Volumes, 1910-29
This figure presents monthly data on the volume of shares traded on the NYSE, in blue, and scaled by the left axis, and Robert Shiller's (2000) share price index, in red and normalized to January 1910 = 100, scaled by the right axis.

35
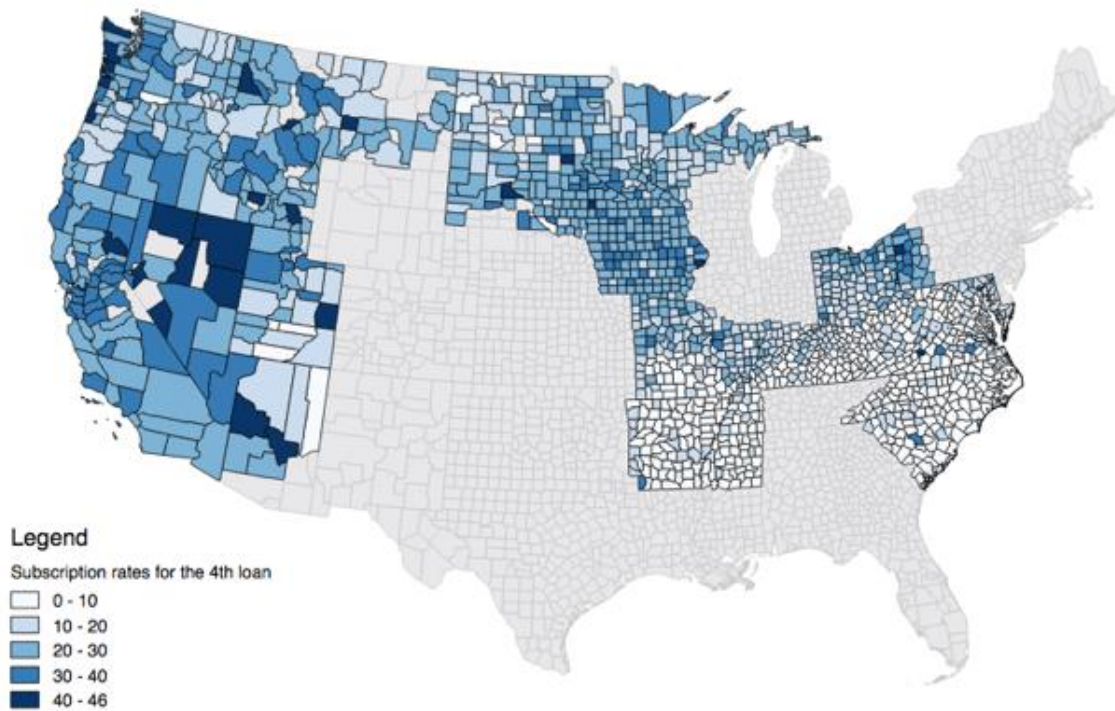
Figure 2:
Subscription Rates, Fourth Liberty Loan
Source: Hilt and Rahn (2020)
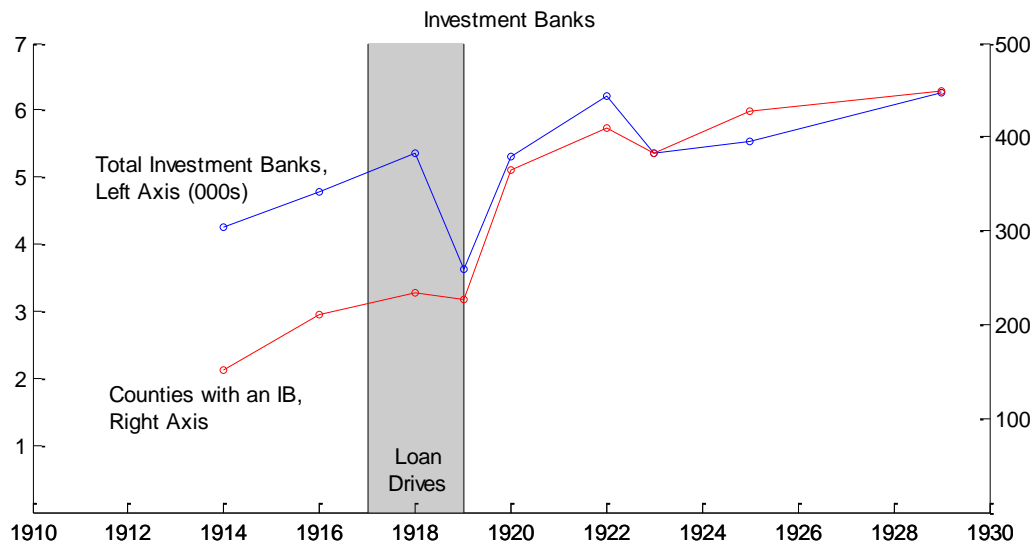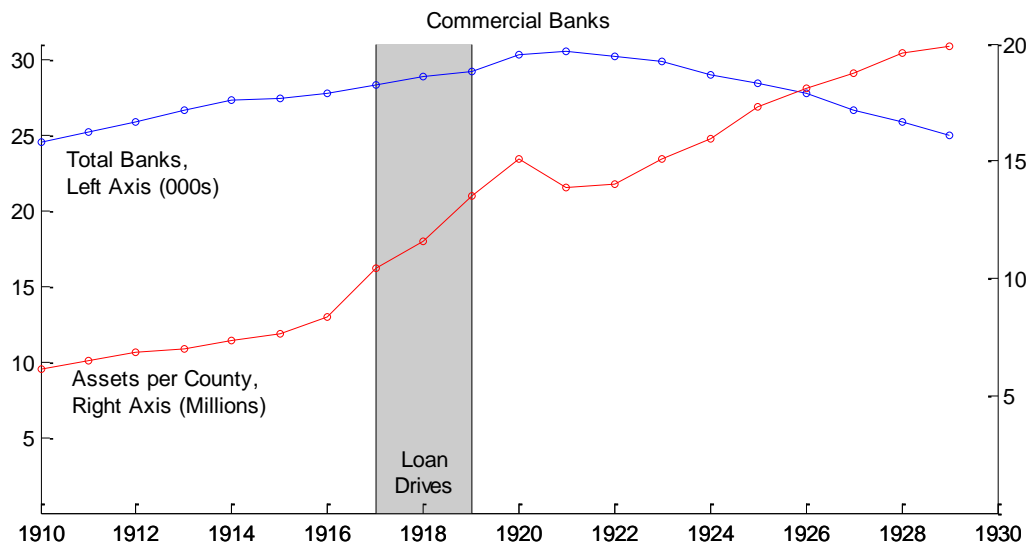
Figure 3:
Changes in Commercial Banks (Top) and Investment Banks (Bottom), 1910-29
The top panel of this figure shows the total number of commercial banks in the United States, in blue, and the value of commercial bank assets per county, in red. The shaded grey area represents the period of the liberty loan drives. The bottom panel shows the total number of investment banks, in blue, and the number of counties with an investment bank, in red.
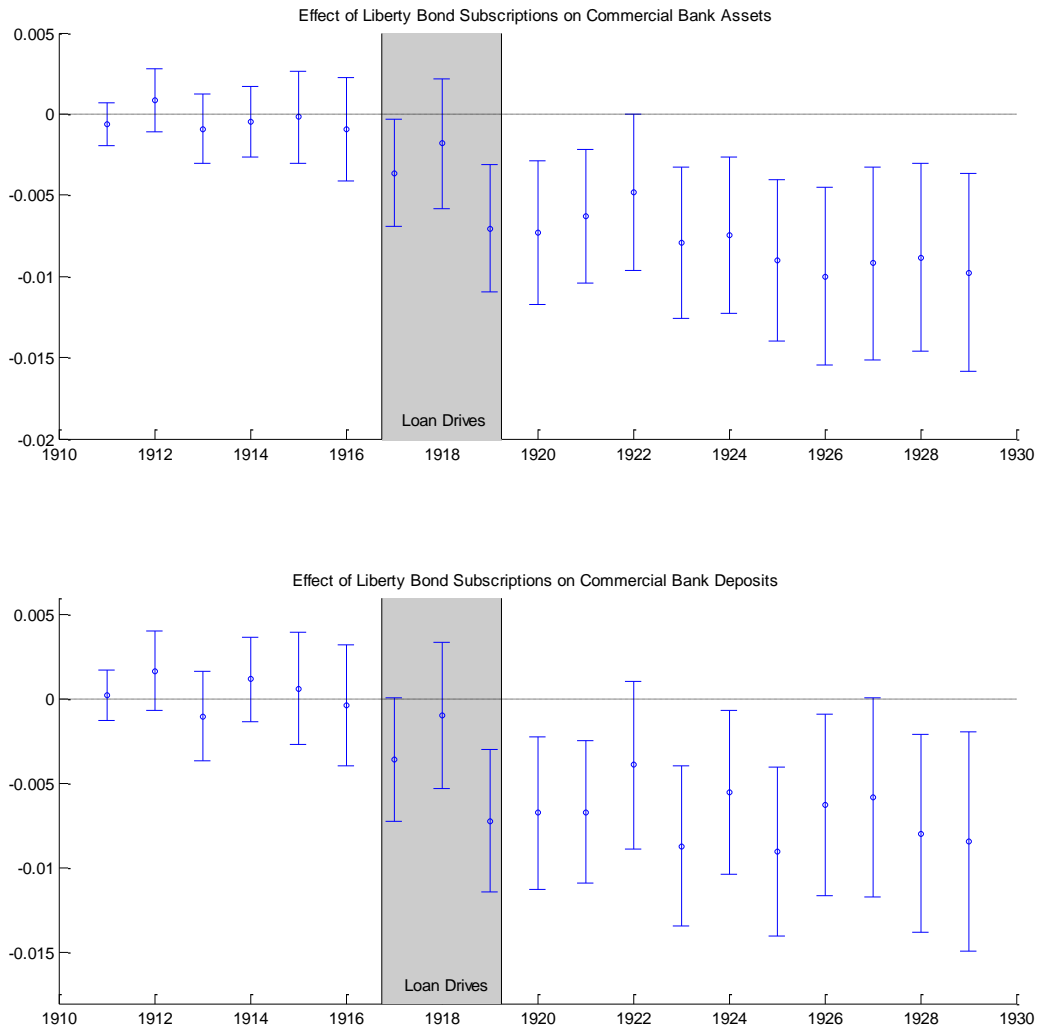
Figure 4:
Effect of Liberty Bonds on Commercial Bank Assets (Top) and Deposits (Bottom), 1910-29
Notes: The top panel of this figure shows the annual effect, relative to 1910, of liberty bond subscription rates on county commercial bank assets, as estimated from equation (1). The lower panel shows the effects on commercial bank deposits. The shaded grey area represents the period of the liberty loan drives.
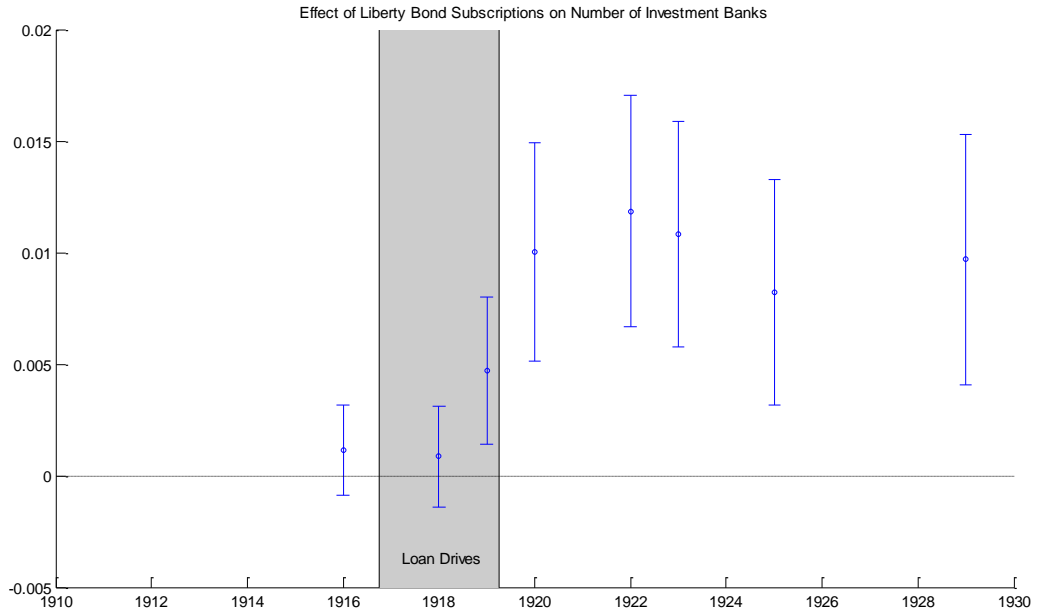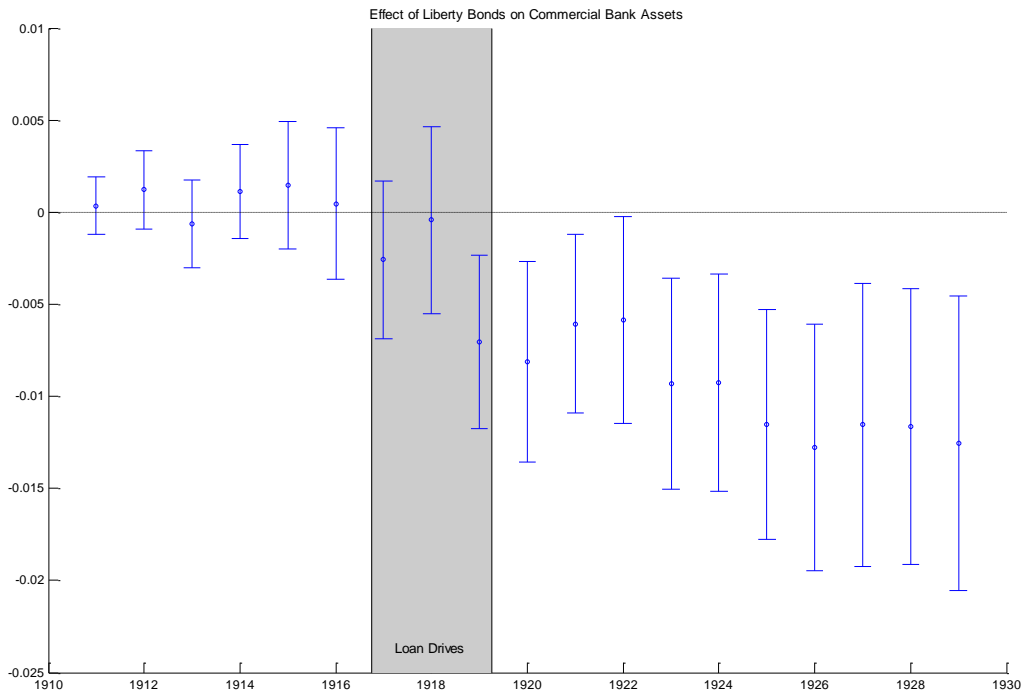
Figure 5:
Effect of Liberty Bonds on Investment Banks, 1914-29

Notes: This figure shows the annual effect, relative to 1914, of liberty bond subscription rates on the number of investment banks in a county, as estimated from equation (2). The shaded grey area represents the period of the liberty loan drives. The odd pattern of dates reflects the available years of data.

Effect of the Presence of an Investment Bank on Commercial Bank Assets
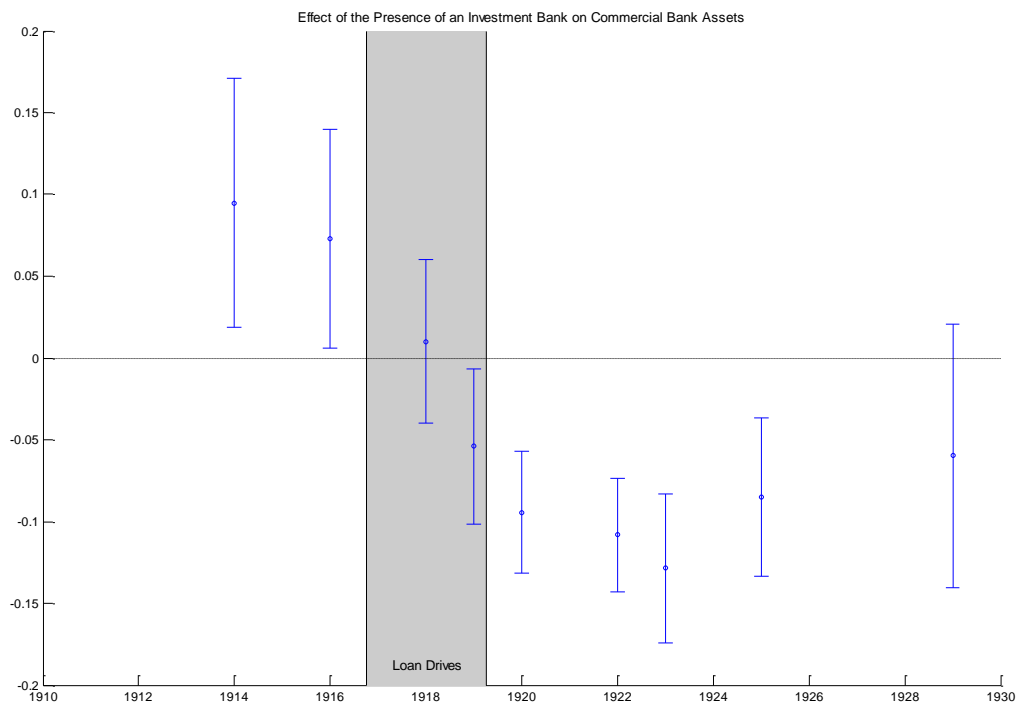
Figure 6:
Effect of the Presence of an Investment Banks In Year on Commercial Bank Assets, 1914-29
Notes: This figure shows the annual effect of having an investment bank during the year on commercial bank assets, as estimated from equation (3). The shaded grey area represents the period of the liberty loan drives. The odd pattern of dates reflects the available years of data.
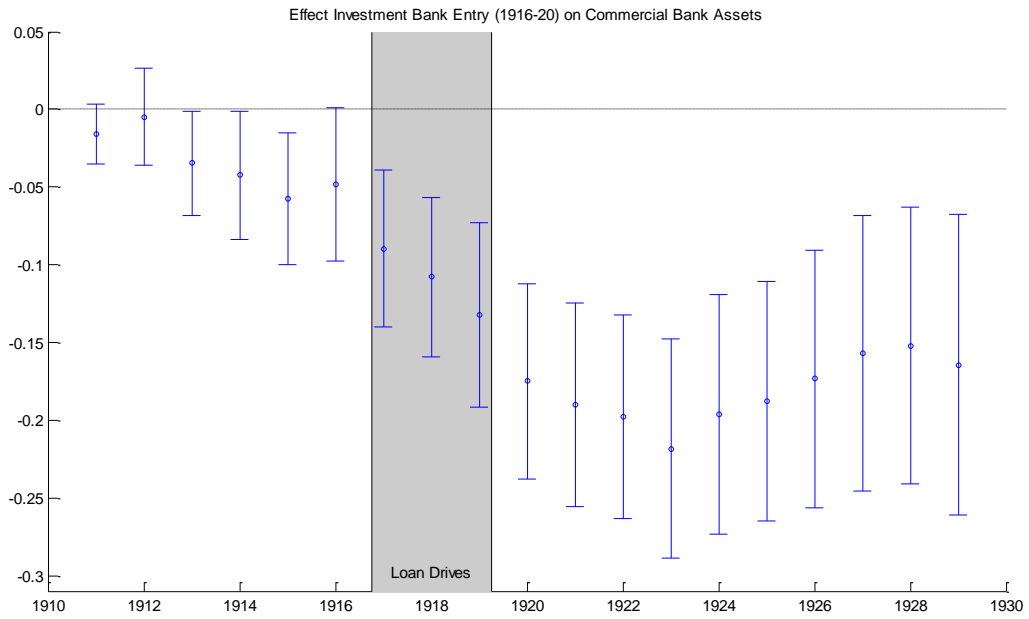
Figure 7:
Effect of Gaining an Investment Bank 1916-20 on Commercial Bank Assets, 1914-29
Notes: This figure shows the annual effect, relative to 1910, of having gained at least one an investment bank during 1916-1920 on commercial bank assets, as estimated from equation (4). The shaded grey area represents the period of the liberty loan drives. The odd pattern of dates reflects the available years of data.
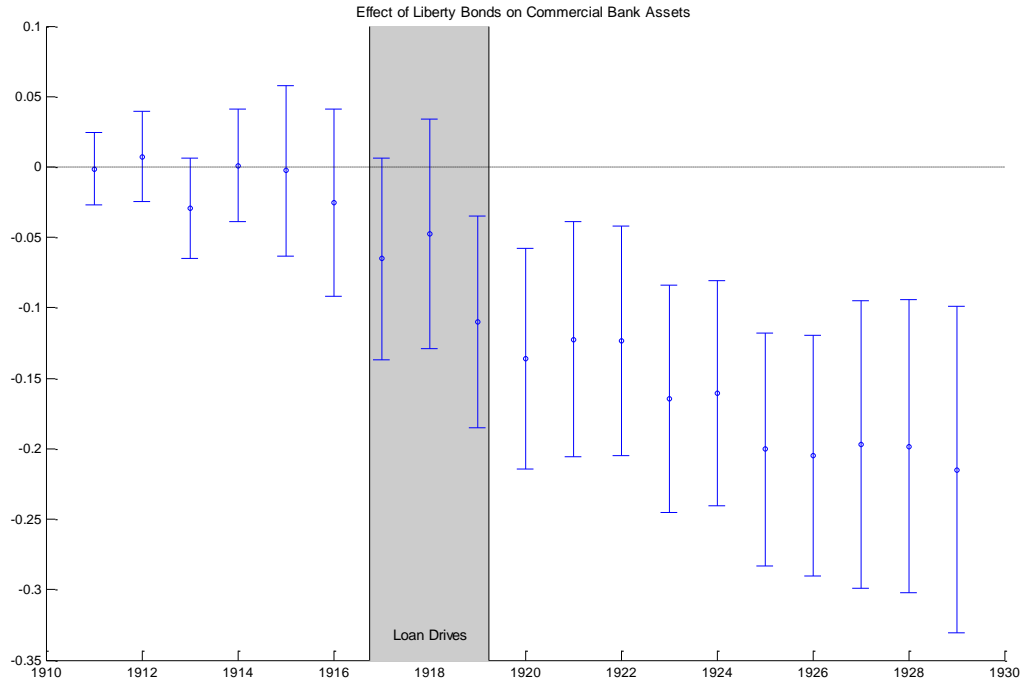
Figure A1:
 Effect of Above Median Liberty Bonds Subscriptions on Commercial Bank Assets, 1910-29
Notes: The figure shows the annual effect, relative to 1910, of an indicator for counties with an above median liberty bond subscription rates on commercial bank assets, as estimated from equation (1). The shaded grey area represents the period of the liberty loan drives.
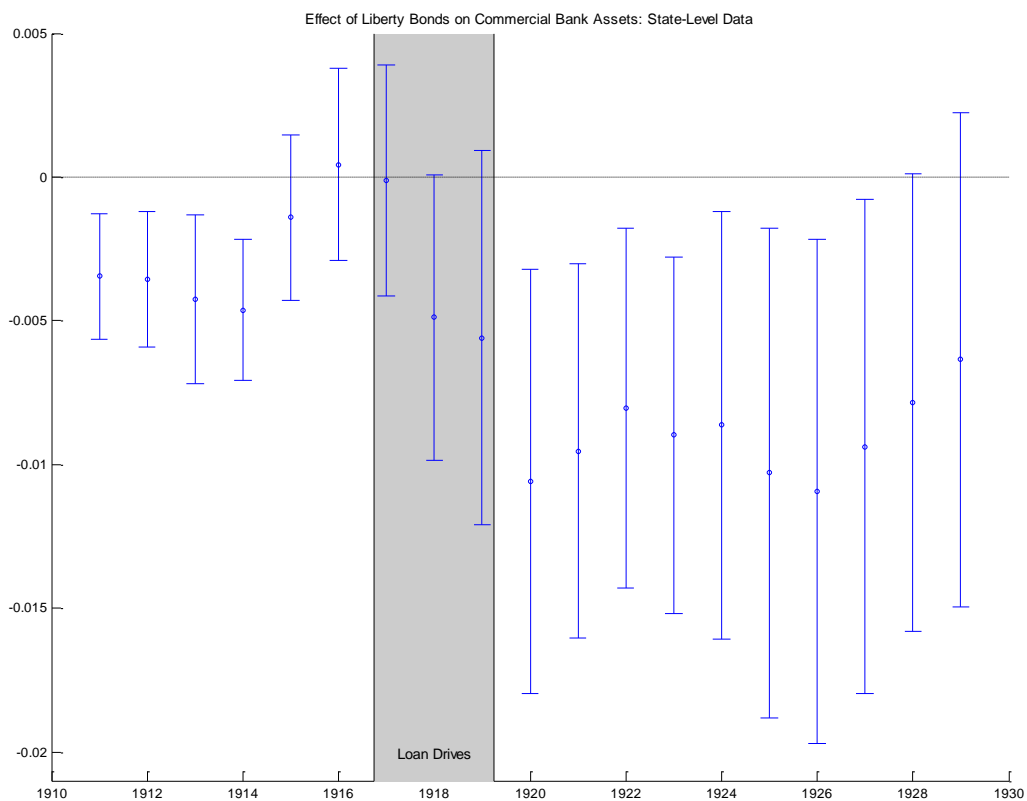
Figure A2:
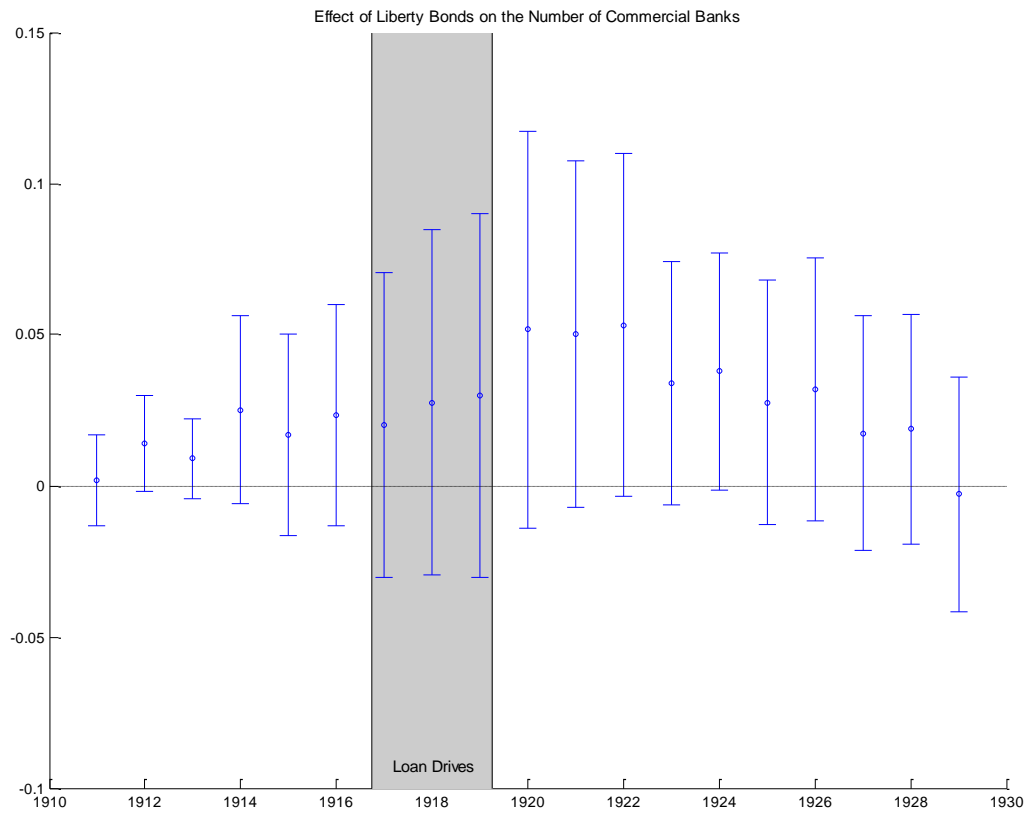**Effect of Liberty Bonds on Commercial Bank Assets at State-Level, 1910-29**
Notes: The top panel of this figure shows the annual effect, relative to 1910, of liberty bond subscription rates on state-level commercial bank assets, as estimated from equation (1). The shaded grey area represents the period of the liberty loan drives.
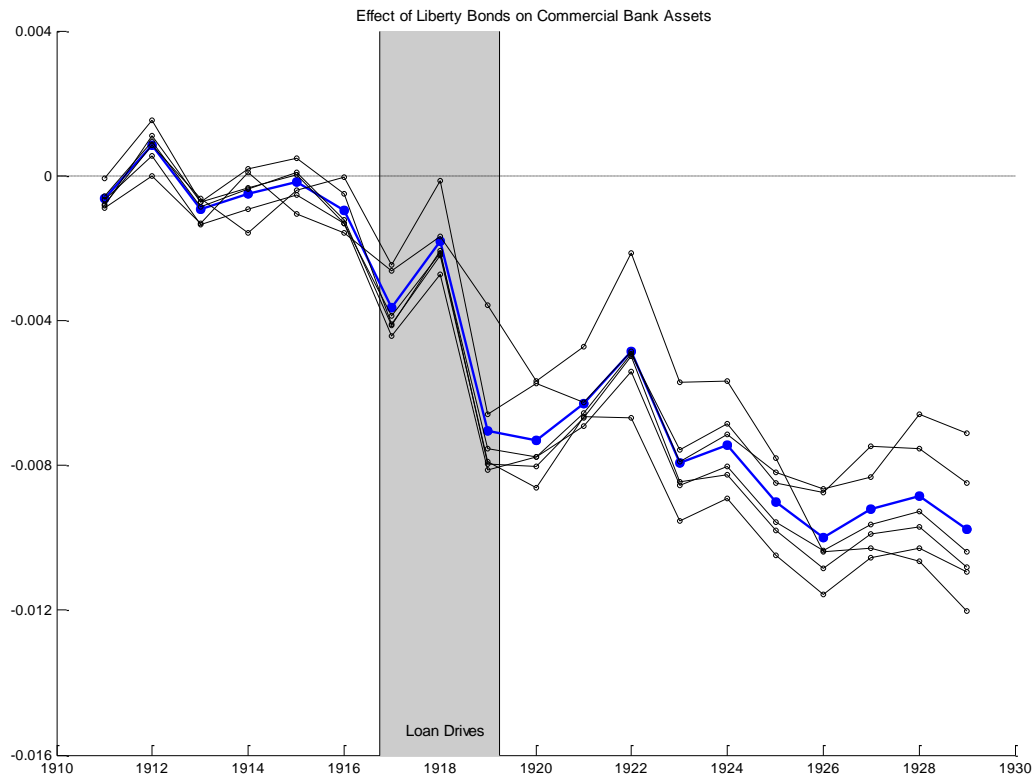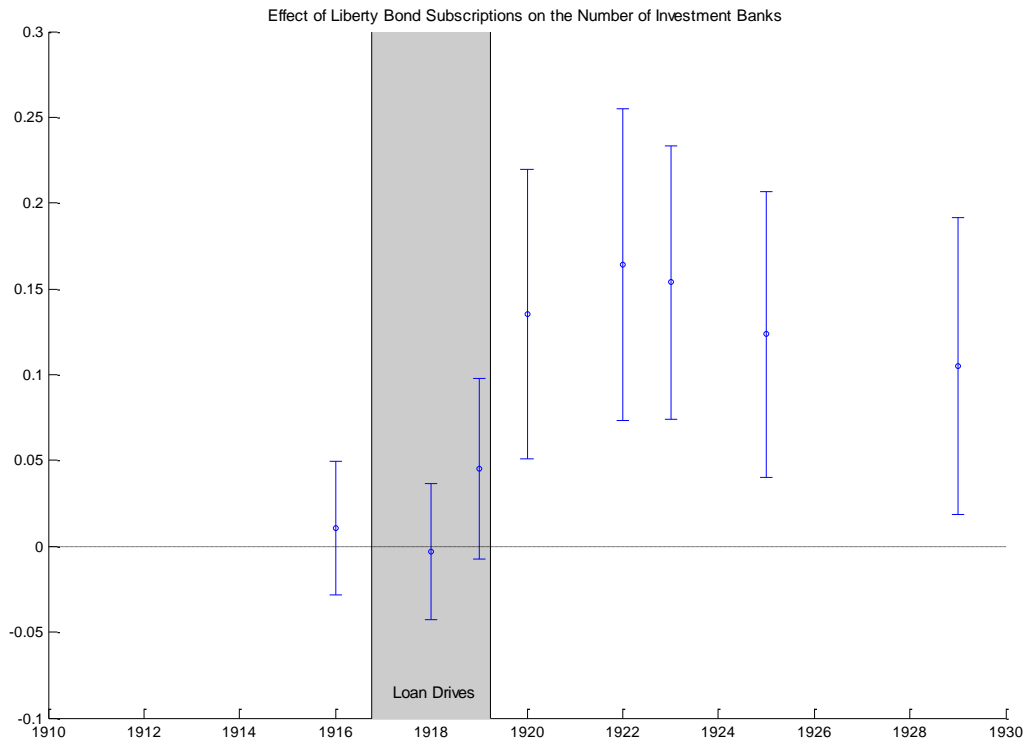
Figure A3:
Effect of Liberty Bonds on Commercial Bank Assets-Dropping Fed Districts, 1910-29
Notes: The figure shows the annual effect, relative to 1910, of liberty bond subscription rates on county commercial bank assets, as estimated from equation (1). The blue line represents the effect for the entire sample, while the other lines represent when each Fed district is dropped separately. The shaded grey area represents the period of the liberty loan drives.

Effect of Liberty Bonds on Commercial Bank Assets

Figure A4:
Effect of Liberty Bonds on Commercial Bank Assets-Dropping Urban Areas, 1910-29
Notes: The figure shows the annual effect, relative to 1910, of liberty bond subscription rates on county commercial bank assets, as estimated from equation (1). The sample only contains counties that did not have a city of more than 25,000 people in any period. The shaded grey area represents the period of the liberty loan drives.

Figure A5:
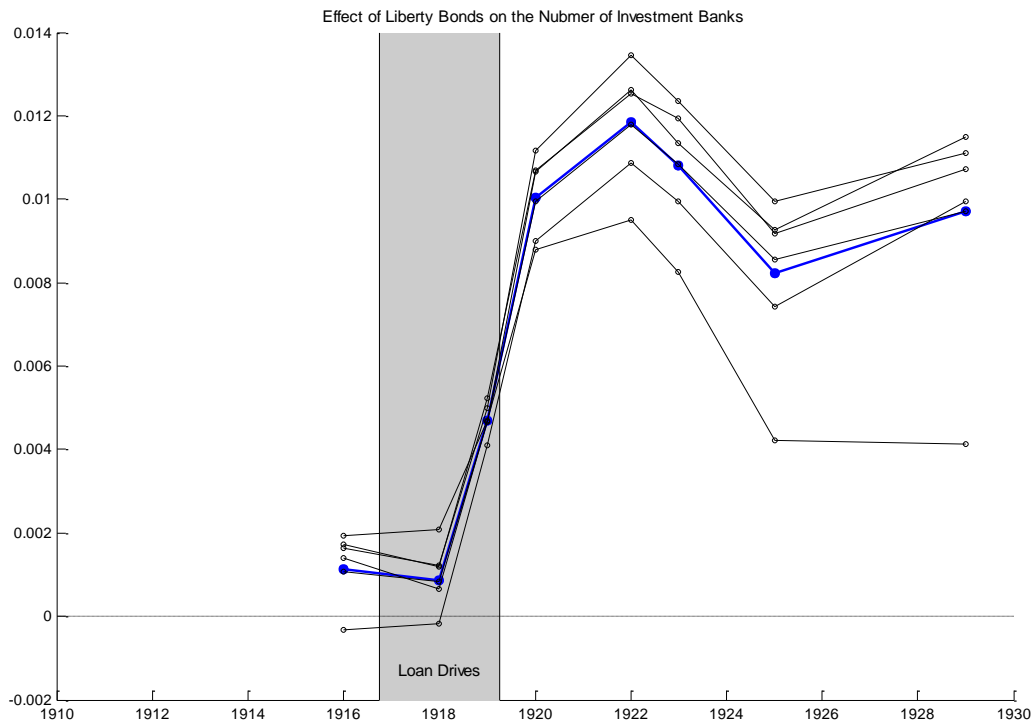**Effect of Liberty Bonds on Number of Commercial Banks, 1910-29**
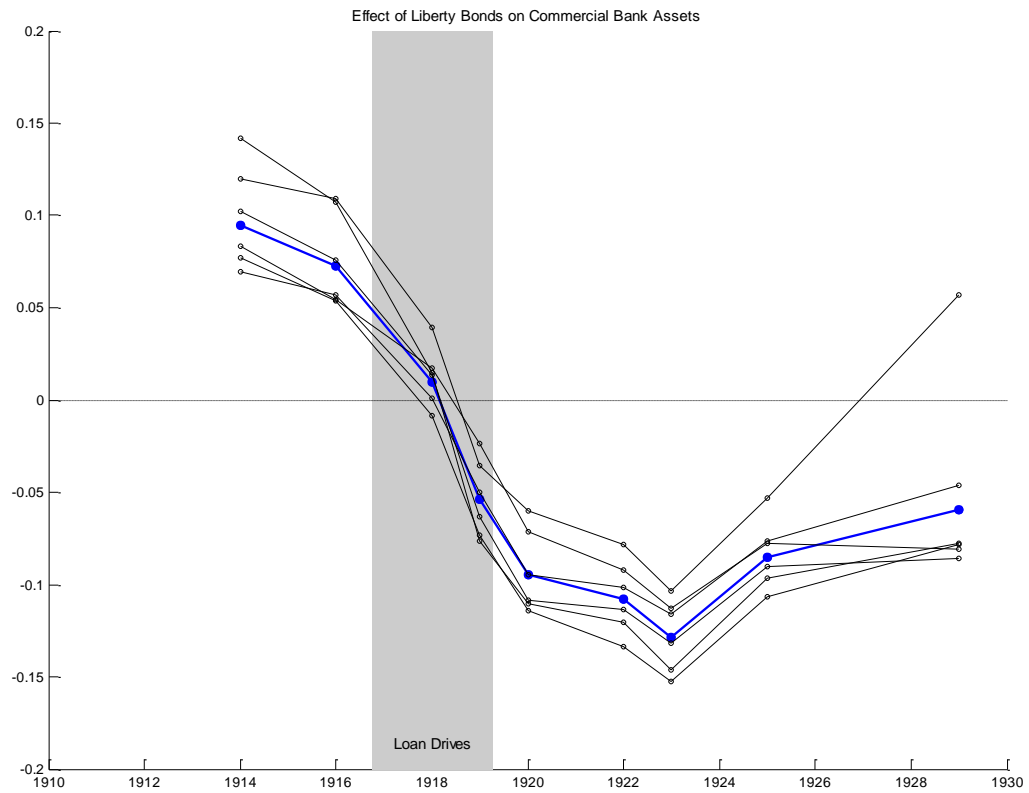*Notes:* The figure shows the annual effect, relative to 1910, of liberty bond subscription rates on the number of commercial banks, as estimated from equation (1). The shaded grey area represents the period of the liberty loan drives.

Effect of Liberty Bond Subscriptions on the Presence of an Investment Bank
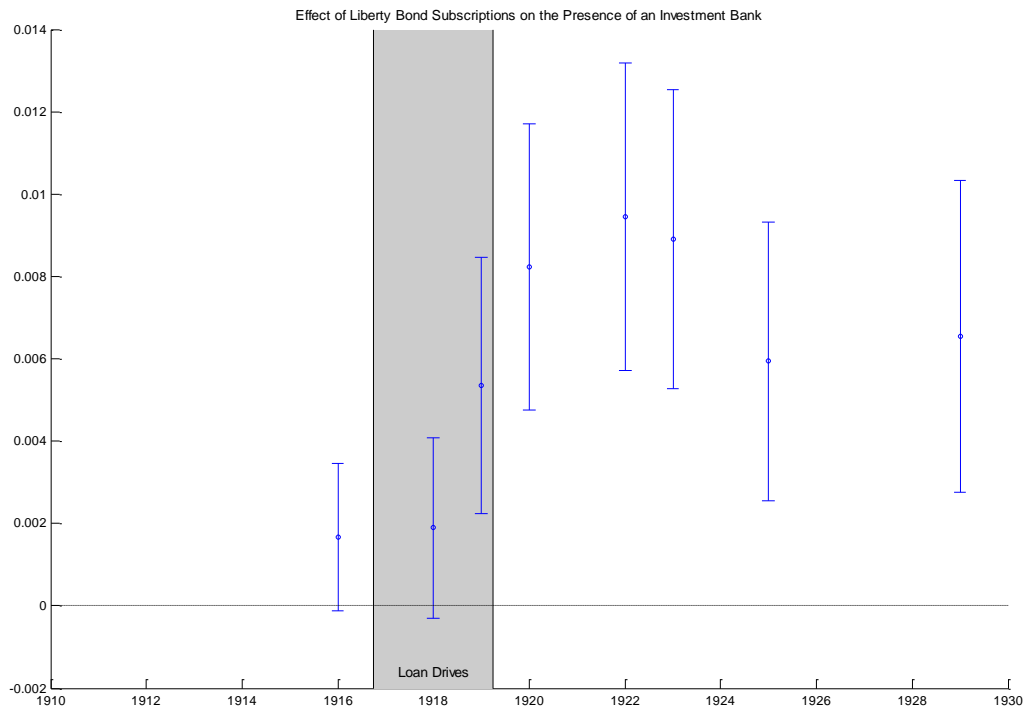
Figure A6:
Effect of Liberty Bonds on Presence of an Investment Bank, 1914-29
Notes: This figure shows the annual effect, relative to 1914, of liberty bond subscription rates on an indicator for the presence of at least one investment banks in a county, as estimated from equation (2). The shaded grey area represents the period of the liberty loan drives. The odd pattern of dates reflects the available years of data.

Figure A7:
Effect of Above Median Liberty Bonds Subscriptions on Investment Banks, 1914-29
Notes: This figure shows the annual effect, relative to 1914, for counties with an above median liberty bond subscription rates on the number of investment banks in a county, as estimated from equation (2). The shaded grey area represents the period of the liberty loan drives. The odd pattern of dates reflects the available years of data.

Figure A8:
Effect of Liberty Bonds on Investment Banks-Dropping Fed Districts, 1910-29
Notes: The figure shows the annual effect, relative to 1910, of liberty bond subscription rates on the number of investment banks in a county, as estimated from equation (2). The blue line represents the effect for the entire sample, while the other lines represent when each Fed district is dropped separately. The shaded grey area represents the period of the liberty loan drives. The odd pattern of dates reflects the available years of data.
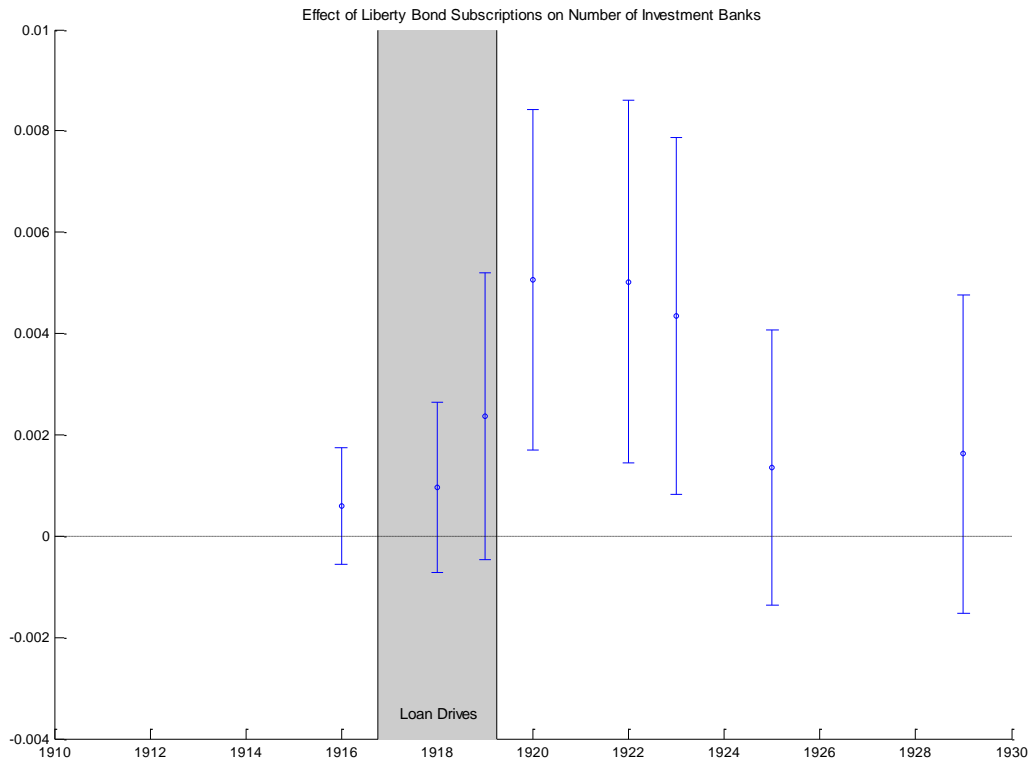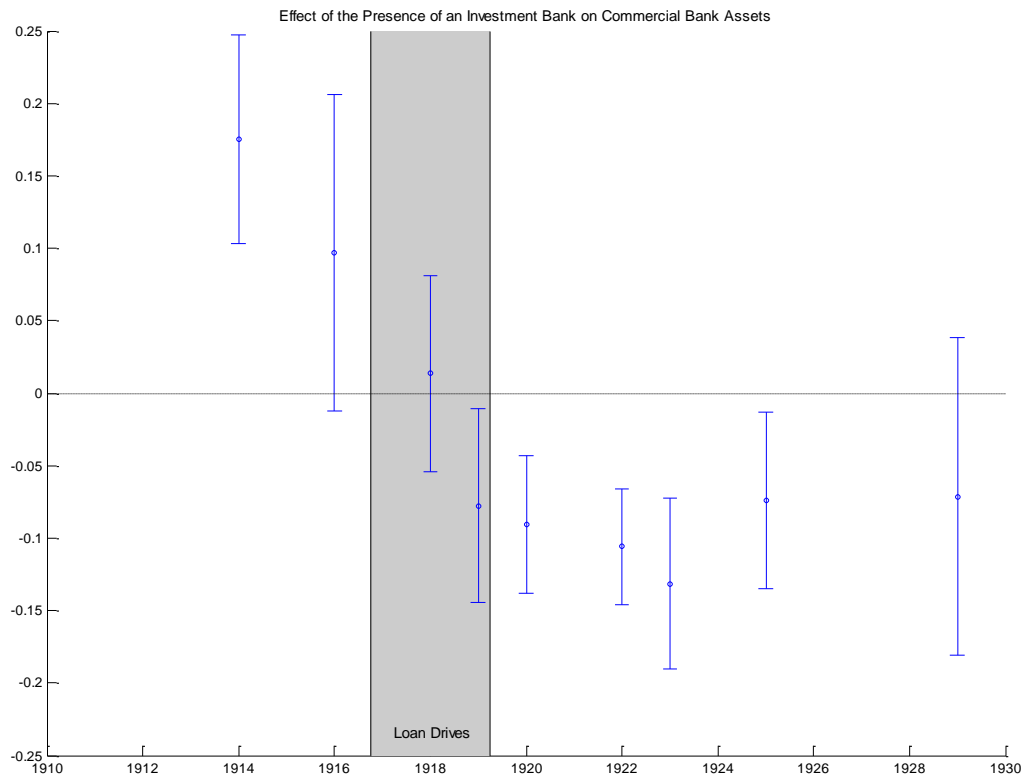
Figure A9:
Effect of Liberty Bonds on Investment Banks-Dropping Urban Areas, 1910-29
Notes: The figure shows the annual effect, relative to 1910, of liberty bond subscription rates on the number of investment banks in a county, as estimated from equation (2). The sample only contains counties that did not have a city of more than 25,000 people in any period. The shaded grey area represents the period of the liberty loan drives. The odd pattern of dates reflects the available years of data.
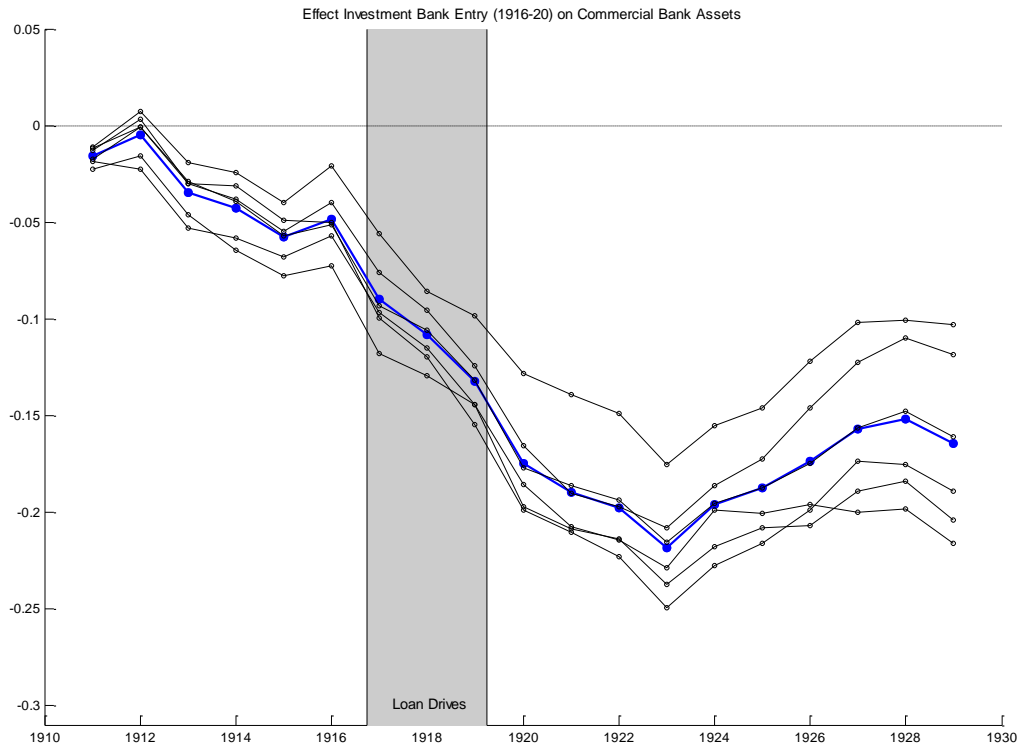
Figure A10:
Effect of the Presence of an Investment Banks In Year on Commercial Bank Assets-Dropping Fed Districts, 1914-29

Notes: This figure shows the annual effect of having an investment bank during the year on commercial bank assets, as estimated from equation (3). The blue line represents the effect for the entire sample, while the other lines represent when each Fed district is dropped separately. The shaded grey area represents the period of the liberty loan drives.

Effect of the Presence of an Investment Bank on Commercial Bank Assets
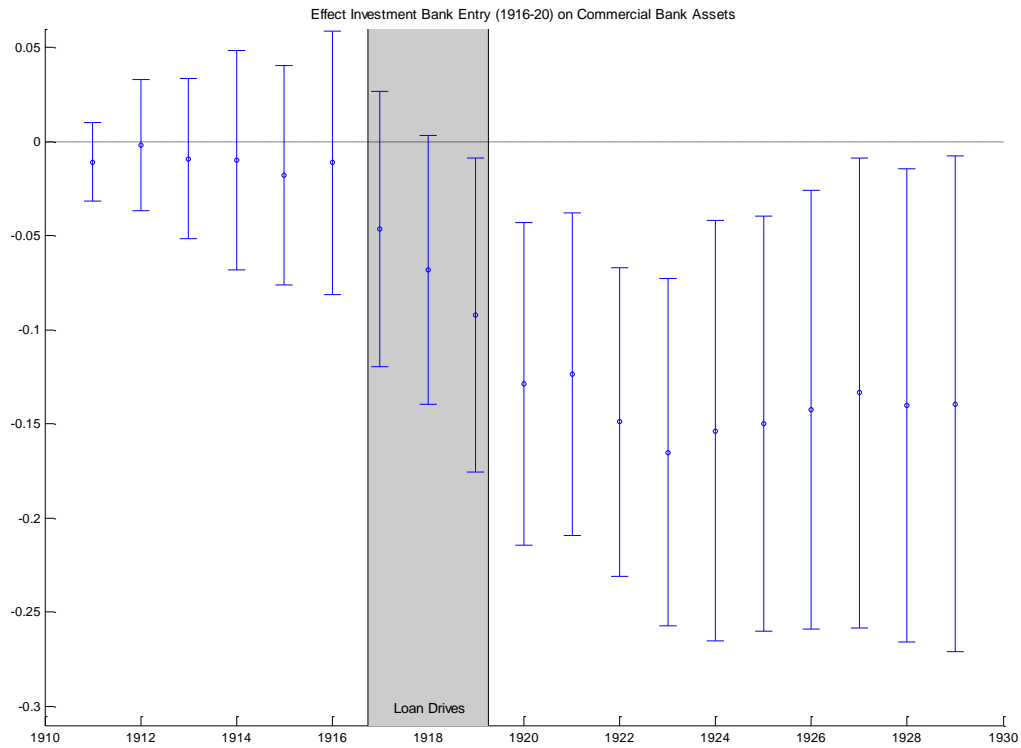
Figure A11:
Effect of the Presence of an Investment Banks In Year on Commercial Bank Assets-Dropping Urban Areas, 1914-29

Notes: This figure shows the annual effect of having an investment bank during the year on commercial bank assets, as estimated from equation (3). The sample only contains counties that did not have a city of more than 25,000 people in any period. The shaded grey area represents the period of the liberty loan drives. The odd pattern of dates reflects the available years of data.

Figure A12:
Effect of Gaining an Investment Bank 1916-20 on Commercial Bank Assets-Dropping Fed Districts, 1914-29
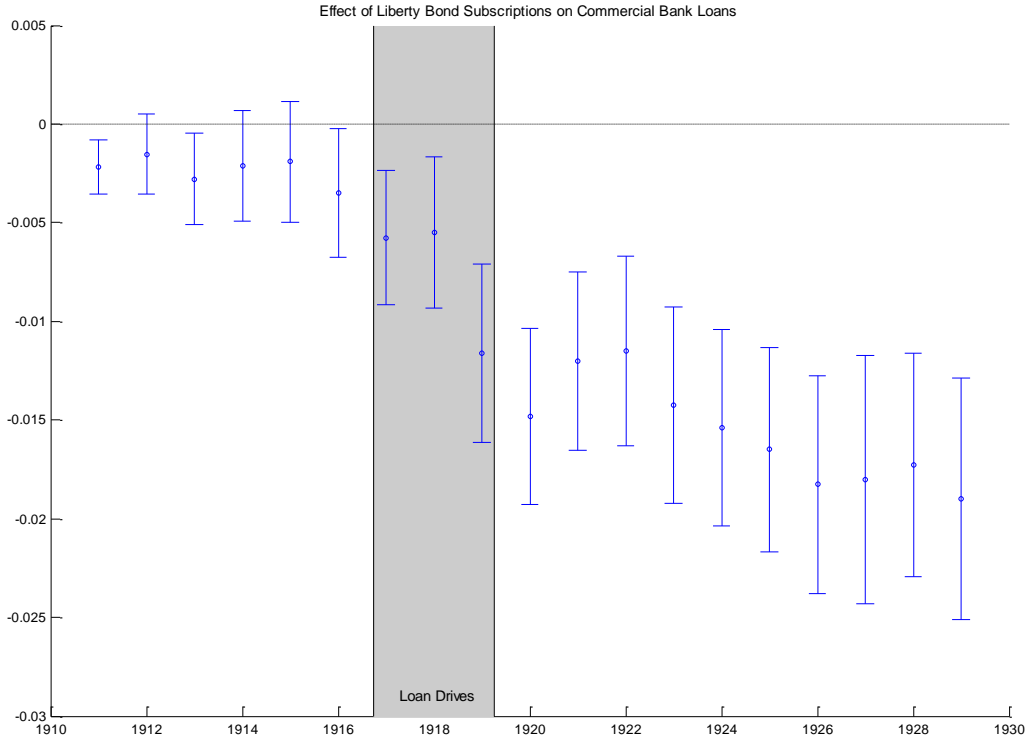
Notes: This figure shows the annual effect, relative to 1910, of having gained at least one an investment bank during 1916-1920 on commercial bank assets, as estimated from equation (4). The blue line represents the effect for the entire sample, while the other lines represent when each Fed district is dropped separately. The shaded grey area represents the period of the liberty loan drives.

Figure A13:
Effect of Gaining an Investment Bank 1916-20 on Commercial Bank Assets-Dropping Urban Areas, 1914-29
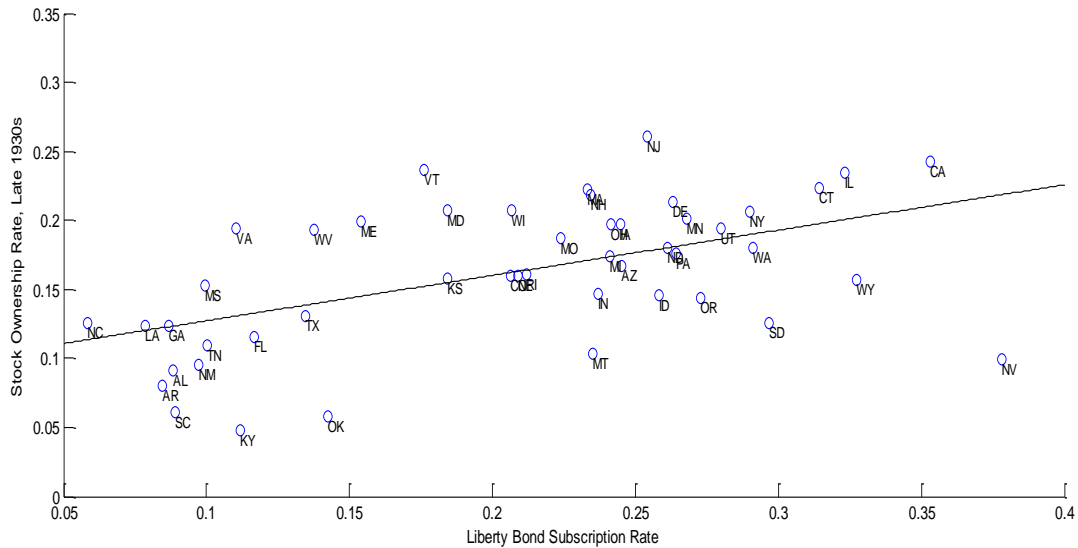
Notes: This figure shows the annual effect, relative to 1910, of having gained at least one an investment bank during 1916-1920 on commercial bank assets, as estimated from equation (4). The sample only contains counties that did not have a city of more than 25,000 people in any period. The shaded grey area represents the period of the liberty loan drives.

Figure A14:
Effect of Liberty Bonds on Commercial Bank Loans, 1910-29
Notes: The figure shows the annual effect, relative to 1910, of liberty bond subscription rates on county commercial bank loans, as estimated from equation (1) with loans as the dependent variable. The shaded grey area represents the period of the liberty loan drives.

Figure A15:
State-Level Relationship Between Stock Ownership in the Late 1930s
and Liberty Bond Subscription Rates

Notes: This figure shows the average stock ownership rate by state, as calculated from the Gallup poll data from the late 1930s, plotted against the state-level liberty bond subscription rate, as reported by the U.S. Treasury (1920). This relationship is clearly not driven by the effect of outliers. The figure includes a regression line; the estimated coefficient on liberty bond subscriptions is 0.841 (S.E. 0.188). The individual-level results shown in the main text are robust to dropping important states such as New York and California.

**Effects of Liberty Loan Subscriptions on County Growth, 1920-30: IV Estimates,
Excluding Counties With Cities of 25,000**

	ΔLn(# of Mfg. Estab.)		ΔLn(# of Farms)		ΔLn(Mfg Output)		ΔLn(Crop Output)		ΔLn(Farm Value)	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ΔLn(Bank Assets) 1918-29	0.277**	0.683*	0.041*	0.233**	0.792*	0.523	0.084	0.209	0.138***	0.411**
	[0.099]	[0.347]	[0.023]	[0.085]	[0.397]	[2.018]	[0.050]	[0.380]	[0.026]	[0.168]
County Controls in 1920?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Value of D.V. in 1920?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fed City Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap F	--	11.22	--	10.68	--	10.65	--	10.49	--	6.84
Observations	776	776	776	776	776	776	776	776	776	776

Notes: Table presents the results of OLS and 2SLS regressions of Equation (6), with counties containing cities of 25,000 excluded. The dependent variables are described in the column headings. The sample spans all states that had both (1) data on state banks published from 1910 to 1929 and (2) liberty bond subscription data. We drop counties without any commercial banks in a given year. The sample contains observations in 1920 and 1930. "County Control Variables" includes the logarithm of population, the logarithm of the number of farms, the fraction of the population living in a location over 2,500 people, the fraction of the population that is non-white, and the crop price index. Robust standard errors clustered by county are presented in brackets below the coefficients. * denotes significance at 10%; ** at 5% level and *** at 1% levels.