Relationship Lending and the Great Depression: Measurement and New Implications

Jon Cohen
University of Toronto

Kinda Hachem
Chicago Booth and NBER

Gary Richardson
Federal Reserve Bank of Richmond, University of California at Irvine, and NBER*

Abstract

The Great Depression remains ground zero for determining the non-monetary effects of financial crises. Despite the abundant scholarship on the period, lack of disaggregated data on lending activities has constrained our ability to measure the impact on the real economy of a collapse in long-term lending relationships. We propose here a novel price-based method of extracting relationship lending from geographically aggregated financial statements. We find, among other things, substantial heterogeneity in the intensity of relationship lending across and within districts in the 1920s. Such heterogeneity is also found to weaken the correlation between conventional indicators of financial and economic growth, making proper measurement of relationship lending critical for grasping the link between banking and the real economy. Finally, combining our price-based indicator with an appropriately defined quantity-based indicator reveals that jurisdictions with high relationship lending in the 1920s were among the most active in forging new lending relationships in the wake of the devastation caused by the Depression. This finding sheds light on both the location and time to recover in the 1930s.

Keywords: Relationship lending, monetary policy, Great Depression

JEL Codes: E44, G01, G21, L14, N22

---

* March 25, 2016. Cohen: jon.cohen@utoronto.ca. Hachem: kinda.hachem@chicagobooth.edu. Richardson: garyr@uci.edu. Daniel Tracht provided invaluable research assistance. Hachem gratefully acknowledges financial support from Chicago Booth. The views in this paper are the authors' and not necessarily those of the Federal Reserve Bank of Richmond or the Federal Reserve System.

1. Introduction

The 2007-2009 financial crisis provides a stark reminder, if one were needed, that disruptions to the banking system are likely to matter a great deal for the real economy, even if they do not reduce the money supply and generate deflationary shocks like those described by Friedman and Schwartz (1963) and Fisher (1933). As Bernanke (1983) showed in his pioneering article on the Great Depression, a large contraction in the availability of credit brought on by a series of banking crises between 1930 and 1933 disrupted the lending process and contributed significantly to the severity of the downturn.[1] The large body of literature that has since emerged largely confirms this insight. Calomiris and Mason (2003a), for example, find that bank distress at the state and county level between 1930 and 1932 led to a drop in the supply of bank loans that in turn resulted in a falloff in economic activity in the affected jurisdictions. In a similar vein, Carlson and Rose (2015), relying on responses to a 1934 Federal Reserve survey of banks and chambers of commerce, argue that the destruction of banks raised the cost of intermediation, reduced the availability of credit, and thus exacerbated the severity of the Great Depression.

Underpinning all of these papers is the assumption – sometimes articulated, sometimes implicit – that banking crises have real effects because they destroy or, at the very least, prevent the immediate redeployment of some critical input into the bank lending process that keeps the cost of credit down. A natural candidate for this input is the soft information that banks acquire about the quality of their borrowers during multi-period lending relationships. Empirical analyses of relationship lending, typically making use of microdata at the bank-firm level, rely on indicators such as the physical distance between the firm and the bank, the duration of the relationship, and the number of other banks the firm borrows from to measure the strength of a relationship.[2] Since this type of matched microdata does not exist for a representative sample of banks and firms in the 1920s and 1930s, it is impossible to use such indicators to capture the decline in relationship lending during the Great Depression and thus to determine its impact on economic activity. As a fall back, most of those who have attempted to evaluate the Bernanke hypothesis have been forced to assume that Depression-era bank loans involved a high degree of this kind of lending. If a non-trivial share of bank loans during the period were not of the

[1] See Wicker (1996) for more on the dating of each crisis.

[2] See, for example, Berger and Udell (1995), Ongena and Smith (2001), Elsas (2005), Chodorow-Reich (2014), Gobbi and Sette (2015), and the references therein.

relationship type, this approach may inadvertently misrepresent its significance. To overcome this difficulty, we need a way, using macroeconomic data, to isolate relationship lending.

The first part of this paper does exactly that. In it, we propose a new way to identify relationship lending from geographically aggregated financial statements. Our methodology is guided by Hachem (2011)'s theoretical study of how relationship lending changes the transmission of monetary policy. She shows that, on average, the loan rates charged by relationship lenders are less responsive to changes in bank funding costs than the loan rates charged by non-relationship lenders. We translate this prediction into an elasticity test for the presence of relationship lending. We use data from the consolidated balance sheets and income statements of national banks in the 1920s and 1930s – reported by the Comptroller of the Currency at a semi-annual frequency for each of the twelve Federal Reserve districts – to infer the weighted average loan rate in each district at each point in time. We then calculate the elasticity of the loan rate with respect to the discount rate in each district. The twelve Federal Reserve Banks at the time had enough latitude to operate largely independent discount windows so there was variation in discount rates across districts, particularly at the onset of the Great Depression (Richardson and Troost, 2009). To control for district-specific differences in rates of return, we also calculate the elasticity of securities returns with respect to the discount rate in each district and net it out from the loan rate elasticity. We contend that districts with less elastic loan rates were districts where relationship lending was more common.

While, following Bernanke and others, we focus sharply on the Great Depression in this paper – perfectly reasonable since it remains ground zero for determining the non-monetary effects of financial crises – the value of our methodology transcends resolution of data limitations of the 1920s and 1930s. Policymakers working in real time, often in crisis situations, usually have only aggregate data to provide them with information about what is happening at more disaggregated levels. Our method permits them to use the aggregate information they have to extract this more detailed information.

To summarize briefly our results, we find the following. First, our price-based measure of relationship lending – price-based since the elasticity test is based on interest rates – makes it possible to distinguish, relying solely on aggregate data, between relationship and non-relationship intensive jurisdictions in the 1920s. The results are robust to the introduction of various control variables and to changes in specification. We are able as well to obtain consistent results using an appropriately defined quantity-based indicator. Second, our results reveal a sizeable amount of heterogeneity in the intensity of relationship lending in the 1920s. We show that more such heterogeneity weakens the correlation between conventional indicators of financial and economic growth, making proper measurement of relationship lending critical for grasping the link between banking and the real economy. Third, employing the same methodology and indicators, we find that relationship lending declined sharply during the Great Depression across all jurisdictions. However, the consistency between the price-based and quantity-based indicators vanishes during the 1930s, a change that we demonstrate indicates efforts by banks to build new relationships. Since such rebuilding does not happen overnight, the destruction of existing lending relationships contributes to slow recovery in the affected jurisdictions.[3]

The rest of the paper proceeds as follows: Sections 2 and 3 describe our methodology and data, Section 4 reports baseline results for our price-based indicator of relationship lending, Section 5 shows how the Great Depression affected the intensity of relationship lending as measured by both price-based and quantity-based indicators, Section 6 explores the economic implications of heterogeneity in relationship lending, and Section 7 concludes.

2. Methodology

The theory developed in Hachem (2011) provides the key insight that the returns on relationship loans are less responsive to changes in bank funding costs than the returns on non-relationship (i.e., transactional) loans. This finding motivates our use of cross-district differences in loan returns to pinpoint differences in banking practices. The intuition underlying the finding is as follows. Lenders garner, through repeated interactions, private information about their borrowers' abilities. This decreases the informational asymmetry between a lender and his borrower but introduces one between the lender and competing banks. The presence of

[3] While Cole and Ohanian (1999, 2004) argue that recovery from the Depression was anemic because of industrial policies, they concede that the lack of direct measures of informational capital makes it hard to unequivocally reject banking shocks as an explanation of slow recovery. Our approach, relying on new theories of bank lending practices, allows us to generate direct measures of relationship lending and, in consequence, to show that banking shocks had a profound impact on the real economy in the U.S. in the 1930s.

competing banks limits somewhat (but not totally) the informed lender's monopoly power over his borrower. The outcome of all this is that informed lenders use their privileged information to (i) retain only sufficiently good borrowers and (ii) induce higher repayment rates by sharing surplus with some of the borrowers they retain. Crucially, this surplus-sharing takes the form of policy-invariant loan rates over intermediate ranges of the policy rate, where the policy rate moves bank funding costs. As we illustrate in the Appendix, Hachem's surplus-sharing mechanism can also be summarized as an elasticity result, a particularly useful translation since elasticities are amenable to measurement. In short, then, according to Hachem's model, the elasticity of the average loan rate with respect to the policy rate is lower in a world with relationship lending than in a world without relationship lending.

With this in mind, we calculate the elasticity of loan returns with respect to the discount rate, which we take to be the cost of funds to banks. We could, as an alternative, use the deposit rate. While we run robustness checks to ensure that the results are insensitive to choice of rate, conceptually, the discount rate is a more compelling measure of bank funding costs for two reasons. First, given that loans have a longer maturity than deposits, banks are more likely to worry about the average deposit rate they face over the life of their loans than the current deposit rate. As long as the discount rate is indicative of future deposit rates, the former contains all the cost information that banks require to set their lending rates. Second, since loans not made on securities (essentially relationship loans as described in more detail below) were discountable at the Fed, the discount rate can be thought of as the marginal cost of funding another loan.

Low elasticity of loan returns indicates relationship lending while high elasticity of loan returns indicates transactional lending. Since we ultimately want to compare elasticities across regions, we need a way to control for any cross-regional heterogeneity excluded from the model. To this end, we make use of the elasticity of securities returns with respect to the discount rate. The rationale for this is as follows. Free-rider problems in financial markets imply that less information is acquired when lending occurs through bond or stock purchases than when it occurs through a non-traded loan contract. As a result, security purchases by banks can be thought of as a form of transactional lending and the elasticity of securities returns with respect to the discount rate can be regarded as a reasonable proxy for the elasticity of loan returns on transactional lending.[4]

Formally, the elasticities come from estimating equations of the form:

$$ReturnOnLoans = f(DiscountRate, Controls, DistrictID, DistrictID \times DiscountRate) + \varepsilon$$

$$ReturnOnSecurities = f(DiscountRate, Controls, DistrictID, DistrictID \times DiscountRate) + \varepsilon$$

The coefficients on the discount rate are then converted to elasticities using the standard identity. For each unit of observation, we can then define "net elasticity" as the elasticity of loan returns minus the elasticity of securities returns so that a negative net elasticity indicates relationship loans are present. These differences are distributed according to the F-statistic so an F-test will indicate whether we can reject the null hypothesis that the elasticities are equal.

The elasticity approach to measuring the intensity of relationship lending – what we refer to as our price-based measure – is, as far as we know, an entirely new way to identify relationship lending. It is also possible to make statements about the intensity of relationship lending by looking at the amounts outstanding of different types of loans – that is, to construct quantity-based indicators of relationship lending. Although quantity-based indicators are more common in the literature, Figure 1 shows that it is important to disaggregate the loan book when developing such indicators because not all loans are created equal. While loans made on securities were a sizeable share of bank lending, contemporary observers unequivocally viewed such loans as information-lite. For this reason, they considered, as we do, the "all other loans" category – described in more detail in Section 3 – as the appropriate way to capture the quantity of relationship lending. Briefly, these other loans tended to be sequences of short-term loans that were used to finance longer-term projects. This sequencing allowed the bank to incorporate information acquired during the initial loan period into the credit terms of future periods, including, of course, the possibility of discontinuing the lending relationship. In short, these loans provide a perfect example of relationship lending. We can, therefore, construct a quantity-

[4] During this period, the Fed expressed concern about banks using discount loans to invest in securities, suggesting that the discount rate was also a relevant cost of funds for security holdings by banks.

based indicator of the intensity of relationship lending using the ratio of "all other loans" (henceforth relationship loans) to bank assets.

To the best of our knowledge, the academic literature on the Great Depression has failed to distinguish between the types of loans that appear on bank balance sheets. To understand more fully why this distinction is crucial to developing an accurate picture of the impact of changes in relationship lending on the fortunes of local businesses, consider the following. In the literature, regressions of the form $Y_{local\ business} = B_{s+r}(L_s+L_r)$, where L_s is lending on securities and L_r is relationship loans, tend to be run. However, to identify correctly the effect of relationship lending on local business, one should run $Y_{local\ business} = B_r(L_r)$. As we can see from Figure 1, L_s and L_r are highly correlated, especially from 1929 to 1933, so B_{s+r} is statistically significant. However, B_{s+r} is a downwardly biased estimate of B_r. This is easy to see in the extreme case where $L_s + L_r = 2L_r$. Then the t-statistics for B_{s+r} and B_r are identical and $B_r = 2B_{s+r}$. In words, the importance of relationship lending will be understated. As will become clear in Section 5, our two-pronged (price and quantity) approach to detecting relationship lending yields new and dramatic insights into bank lending practices over the course of the inter-war period.

3. Data

Our paper analyzes a series of related data panels, all of which were constructed from original micro-data sources, many of which no longer exist. This section explains the construction of those panels and issues necessary to understand the way in which we conduct our analysis and robustness checks. We focus on explaining the construction of the panel at the level of the Federal Reserve district, and then explain the differences involved in constructing the panel aggregated at other levels.

Bank Balance Sheets Data on commercial banks comes from the Annual Reports of the Comptroller of the Currency. These reports contain tables that indicate the balance sheets of commercial banks with national charters aggregated by Federal Reserve district, state, and major municipalities (principally financial centers then termed reserve cities). Bank assets fall into several key categories. Earning assets include loans used to purchase securities, all other loans, government bonds, and other securities. The category "all other loans" consists primarily of commercial loans (hence the term commercial bank); these were loans to business maturing in less than a year, typically less than 180 days, and in the case of outstanding balances drawn from lines of credit, repayable on demand. These loans typically served as working capital, financing goods in the process of production, processing, shipment, and sale (Currie, 1931). All loans eligible to be used as collateral at the Fed's discount window appeared in this category. The category "loans on securities" consisted largely of call loans to brokers and also some call loans directly to firms and individuals.

Bank Income Statements The Comptroller of the Currency also published earnings and expense statements of nationally chartered banks aggregated at the district, state, and city level twice each year. One table reports data for the months of January through June. The other table reports data for the months of July through December. These tables enable us to calculate average earnings on loans and on securities semi-annually. To the best of our knowledge, the literature has done little with the income statements from this period.

We calculate the lending rate by dividing earnings for a period by the stock of loans at the end of that period. Ideally, we would like to use only the earnings on relationship loans and the stock of relationship loans but the Comptroller's report does not break interest income down by type of loan for any of the dates in our sample. Therefore, we can only use total interest earned on loans relative to total loans to calculate loan returns. However, this will tend to overstate the elasticity of loan returns and bias the elasticity test results against us.[5]

We calculate the securities rate in the same manner as the loan rate (i.e., dividing earnings for a period by securities holdings at the end of that period). Prior to 1926, however, the Comptroller reports only the sum of earnings on loans and securities. Therefore, for 1921 through 1925, we estimate earnings on securities by multiplying market yields on securities (reported in trade publications) by the stock of securities. We also estimate interest earned from balances at other banks. We then subtract these two estimates from the total interest income reported in the Comptroller's report (also removing interest on Fed securities) to get our estimate of loan income. As shown in Figure 2, applying this procedure to data from 1926 to 1929

[5] We will see an indication of this in Table 3: taking brokers' loans out of NYC leads to a more negative net elasticity for NYC. Loans on securities and brokers' loans have enough in common that interest rates for loans on securities should bare more resemblance to interest rates for broker's loans than interest rates for relationship loans. One approach for future work is to use the market interest rate on brokers' loans (scaled by the relative interbank deposit rate for each district) to estimate the interest earned by banks from loans on securities.

delivers predictions that line up very well with actuals. This gives us confidence in our estimates, especially since the securities portfolio of banks becomes less complicated as we move earlier into the 1920s. Section 4 will present results without the pre-1926 estimates. Section 5, which discusses the differences between the 1920s and 1930s, will make use of the estimates.

Policy Rates Market interest rates and Federal Reserve policy rates appear in Banking and Monetary Statistics, 1914 to 1941. This tome recapitulates information previously published in annual and monthly reports of the Federal Reserve Board and Fed District Banks as well as trade publications such as the Commercial and Financial Chronicle and Wall Street Journal. Our principal policy rate is the discount rate charged by each Federal Reserve Bank. These rates often changed during six-month-periods comprising the time units in our panel. When the rates changed within the period, we calculate an average time-weighted rate in effect for the period. This weighted rate is the sum of the interest rate in effect multiplied by number of days in which it was in effect divided by the total number of days in the period.

Economic Outcomes Indicators of economic activity aggregated at the district, state, and city level come from several sources. Richardson and Park (2012) report the index of department store sales by month and Federal Reserve district. This index serves as a measure of semi-durable and durable purchases and appears to be a contemporaneous economic indicator. We calculate the level of consumption in each period as the average of the index over all months. We calculate change in consumption in period *t* by dividing the level of the index in period *t* by the level of the index in the preceding period. Construction contracts awarded and business failures by Federal Reserve district come from the Federal Reserve Bulletin. The former serves as a leading and the latter as a lagging indicator. We calculate contracts and failures in period *t* by summing the monthly value for all months in the period. We calculate change in period *t* in contracts and failures by dividing the level in *t* by the level in the preceding period.

4. Elasticity Test Results

This section reports the results for the period 1926-41 as a whole, focusing sharply on our elasticity (price-based) measure of relationship lending to show how it works. In Section 5, we compare the price-based and quantity-based measures in the 1920s and 1930s to study changes in relationship lending during the Great Depression.

Table 1 presents the baseline elasticity test results at the district level. We find that loan returns are generally less elastic than securities returns, consistent with the notion that loans have a relationship lending component. Table 2 reveals that this result survives the addition of various controls to the estimating equation. In Table 3, we report the results of three additional robustness checks, none of which overturn our main message. In the first of these checks (column 1), we use the deposit rate instead of the discount rate as the cost of funds. In the second (column 2), we separate the main central reserve cities (New York City and the city of Chicago) from their districts.[6] In the third (column 3), we remove brokers' loans since they are, for the most part, anonymous and thus do not involve much relationship lending.

It should be noted that the city of Chicago passes our elasticity test, as does New York City once brokers' loans are removed. This is an interesting result. It is well appreciated that reserve city banks engaged in transactional lending, taking reserves/deposits from other banks and investing in money markets. It is much less appreciated that relationship lending occurred in reserve cities, which is what our results indicate. This is confirmed by our state and city elasticity tests to which we now turn.[7]

"City" aggregates the banks in a reserve city. "State" aggregates all other banks (e.g., country banks) in the state. Some states are split across two districts, in which case we have two points for that state (one for each district) whenever the data permits us to back out this split. More precisely, some districts have only one split state which means we can subtract the city-level data and the state-level data for the states that are fully contained in that district from the district-level data to isolate the part of the split state contained in the district. We can then subtract the part we isolated for this state from the state's total in order to ascertain the part of the state that rolls up into the other district. As long as the other district does not have more than two split states, we can repeat the process to back out any additional splits in the other district. For some districts, there are too many split states to be fully identified by this iterative procedure so

[6] This shortens the sample a bit since data for the reserve cities is only available until 1938.

[7] The other cities that pass the state/city elasticity tests are: Brooklyn and Bronx, Cincinnati, Columbus, Pittsburgh, Baltimore, Jacksonville, Peoria, Sioux City, St. Louis, Minneapolis, St. Paul, Denver, Topeka, Wichita, Kansas City, Lincoln, Omaha, Tulsa, Dallas, Fort Worth, Houston, Los Angeles, San Francisco, and Salt Lake City. The other cities that do not pass the state/city elasticity tests are: Boston, Philadelphia, Nashville, St. Joseph, Oklahoma City, Galveston, San Antonio, and Waco. Of these, Nashville and St. Joseph have more elastic loan returns than securities returns in a statistically significant sense (for the rest, we cannot reject the hypothesis that the elasticities are the same).

we define district remainders to absorb those cases. The remainders are treated as observations at the state/city level.

Figure 3 summarizes the results from the elasticity tests at the state/city level. The significance on the vertical axis equals one minus the p-value for the test that the net elasticity is different from zero. Each point in Figure 3 is a geographic observation. Of the 87 points in total, 76% have negative net elasticities (indicating that in these jurisdictions the loan rates are less responsive to changes in the policy rate than are rates on securities) and 24% have positive net elasticities. Of the negative net elasticities, 71% are significant at the 5% level. This amounts to 54% of the states/cities having negative and significant net elasticities. Of the positive net elasticities, 43% are significant at the 5% level. This amounts to only 10% of the states/cities having positive and significant net elasticities. In short, we accept that loan returns are less elastic than securities returns for 54% of the regions, similarly elastic for 36%, and more elastic for 10%. While the state/city results are, on the whole, consistent with those at the district level in indicating that bank loans have a relationship lending component, they also display more heterogeneity than was observable at the district level. This is an important finding because it suggests that working solely with district level measures may give a misleading account of the nature of actual lending relationships within the district and thus confound both the measurement of changes in relationship lending and its impact on economic activity.

We will return to heterogeneity and its implications for the real economy in Section 6. In the meantime, heterogeneity in the intensity of relationship lending is also important because it allows us to better understand the nature of relationship lending. In particular, does relationship lending add value or does it simply represent a subtle form of crony capitalism – in effect, dishing out loans to obtain social or political favors? To address this question, we went through the list of failed banks in the 1929 Comptroller's report and counted (i) the number of bank failures by state and (ii) the number of these failures that bank examiners attributed to either bad management or dishonesty. We counted from the first failure in 1920 until October 31, 1929 which is when the 1929 report ends. There were 526 failures, 246 of which were what we will call "bad failures" in that they were attributed at least partly to bad management or dishonesty. The five states with the most failures were Iowa, Minnesota, South Dakota, North Dakota, and Oklahoma. They accounted for 14%, 11%, 9%, 7%, and 6% of the 526 failures respectively.

They also accounted for 12%, 11%, 8%, 5%, and 6% of the 246 bad failures respectively. The elasticity tests associated with these states do not indicate relationship lending outside of some of the reserve cities (Sioux City, Minneapolis, St. Paul, and Tulsa) and these four reserve cities accounted for only one of the bad failures. This is at the very least suggestive and, as it happens, encouraging: those areas where one might be concerned about cronyism do not pass our elasticity test for relationship lending. For the most part then, relationship lending would appear to add value, not curry favor.

5. Changes in Relationship Lending: 1920s vs 1930s

We show in this section that the Great Depression altered the landscape of relationship lending, first by establishing how separating the 1920s from the 1930s changes the net elasticities (the price-based indicator) and, second, by demonstrating how the separation alters the fraction of bank assets going into relationship loans (the quantity-based indicator). In both cases, the results suggest that relationship lending was destroyed. However, relative movements in the two indicators also suggest that jurisdictions which were relationship-intense in the 1920s attempted to forge new lending relationships in the 1930s as existing relationships were destroyed. Time to rebuild is thus an important candidate for understanding time to recovery.

The sample we have used up to this point starts in 1926, the earliest year for which income statements separate interest income on loans from interest income on investments. Prior to 1926, we only have total interest income. To compare the 1920s and 1930s, we would like a longer time series for the 1920s. The procedure we use to separate loan returns from securities returns prior to 1926 is as described in Section 3 and validated in Figure 2.

Figure 4 summarizes how the elasticity test results at the state/city level change if we separate the 1920s from the 1930s. The top left panel plots the net elasticity results estimated using only 1930s data against those estimated using both the 1920s and 1930s. The line of best fit has a slope of less than one, suggesting that relationship lending was less intense in the 1930s than in the 1920s. The top right panel in Figure 4 attempts to determine if this decrease in intensity was driven by more elastic loan returns or less elastic securities returns. As long as the former is part of the story, relationship lending was a casualty of the Great Depression. The line of best fit for the elasticity of loan returns (red line) has a slope very close to one and a small but positive intercept. This suggests somewhat more elastic loan returns in the 1930s. In contrast, the line of best fit for the elasticity of securities returns (blue line) has a positive intercept and a slope of less than one. This indicates some convergence in the elasticities of securities returns over time (i.e., jurisdictions with low securities elasticities in the whole sample had somewhat higher elasticities in the 1930s while jurisdictions with high securities elasticities in the whole sample had somewhat lower elasticities in the 1930s).[8] Overall then, the intensity of relationship lending as measured by our price-based indicator was weaker in the 1930s than in the 1920s.

We turn now to the quantity-based measure of relationship lending. Figure 5 first shows how the asset composition of banks changed from the 1920s to the 1930s. Banks switched from loans to securities, particularly U.S. federal government securities, in the 1930s. This is consistent with arguments in the literature that banks wanted to make their portfolios more liquid as the banking crises unfolded.[9] Figure 5 also shows that the switch away from loans involved a switch away from relationship loans, although it appears that regions where relationship lending was more prevalent in the 1920s (as measured by a more negative net elasticity of loan returns) maintained somewhat higher ratios of relationship loans to bank assets than other areas in the 1930s.

Figure 6 shows that the consistency between the price-based and quantity-based indicators of relationship lending changed from the 1920s to the 1930s. As we can see, in the top panel, regions with higher net elasticities (less relationship lending according to our price-based measure) in the 1920s also tended to have lower ratios of relationship loans to bank assets. In other words, in the 1920s, the price-based and quantity-based indicators of relationship lending tell the same story. It is worth highlighting another feature of this result. If we were to use the ratio of total loans to bank assets as our quantity-based indicator, the correlation with net elasticity in the 1920s switches from negative to positive. In other words, as we noted earlier, not all loans are created equal. On the other hand, in the 1930s, even if we use the ratio of relationship loans to bank assets, the bottom panel of Figure 6 shows that the correlation with net elasticity is not negative. This indicates that the Depression not only weakened the intensity of

[8] Another way to present these scatterplots is to plot the 1930s results against only the 1920s results (instead of the results for the full sample). This alternative presentation is shown at the bottom of Figure 3.

[9] See Calomiris and Mason (2003b), Calomiris and Wilson (2004), and Richardson and Mitchener (2016) among others.

relationship lending as measured by our net elasticity tests but it also undermined the consistency of the price-based and quantity-based indicators. Thus, even in those jurisdictions where existing lending relationships remained sufficiently robust to generate negative net elasticity of loan returns, banks decreased the fraction of their balance sheets devoted to such loans.

Figure 7 adds an interesting layer of complexity to these results. It reveals that the correlation between the fraction of relationship loans in the 1930s and the *change* in the net elasticity from the 1920s to the 1930s is positive. In other words, jurisdictions that had the biggest increases in net elasticity also kept more of their assets in relationship loans during the Depression. The correlation increases slightly for the first half of the 1930s if calculated using only jurisdictions that had sizeable negative net elasticities in the 1920s. The question, of course, is what are these results telling us? Although tentative at this point, they are consistent with the idea that banks were in the process of forging new lending relationships. The argument runs as follows. Loan rates charged in the middle of a lending relationship (i.e., once the lender has gathered otherwise private information about the borrower and is engaging in surplus-sharing to induce higher repayment rates) are less elastic than the loan rates charged at the beginning of a relationship (i.e., when lenders are competing for new borrowers and the potential of future relationship profits).[10] In other words, in those regions which had a history of relationship lending and where, it would appear, enough of these lenders survived, they were ready and willing to start again as soon as they could.

If this interpretation is correct – that is, if higher net elasticity of loan returns in the 1930s reflects a movement by relationship lenders from existing relationships to new ones rather than a movement towards transactional lending – then we would also expect a lower average age of borrowing firms in the 1930s in those jurisdictions where the increases in net elasticity were larger, particularly if the net elasticity was sizably negative in the 1920s. Since data on borrower age is not readily available, we can try to get some preliminary insight into this issue through the lens of business formation. The assumption is that areas with a lot of new businesses will also be areas with a high fraction of first-time borrowers. The Statistical Abstract of the United States reports the number of concerns in business (essentially the total number of businesses) and the

[10] The theory behind this argument comes from Hachem (2011). The general observation is also corroborated by contemporary observers. See, for example, Ford (1928).

number of business failures by state for each year. A simple indicator of new business activity in state s during the 1930s can be constructed by taking the total number of businesses at the beginning of 1938, subtracting the total number of businesses at the beginning of 1929, and adding the total number of business failures from 1929 to 1937. To allow comparison across states, the result would then be expressed as a fraction of the total number of businesses at the beginning of 1929. One problem with this indicator is that it will understate new business activity because it does not account for business consolidation through mergers and acquisitions. To address this problem, we define $scale_{s,t}$ to be the number of wage earners per manufacturing establishment in state s at time t. These data are also reported in the Statistical Abstract based on the Biennial Census of Manufactures. We then adjust the simple indicator by multiplying the total number of businesses at the beginning of 1938 by $\frac{scale_{s,1937}}{scale_{s,1929}}$ if $scale_{s,1937} > scale_{s,1929}$. For the set of states not split into finer geographic units in the Comptroller's report, the correlation between this adjusted indicator of new business activity and the change in the net elasticity from the 1920s to the 1930s is 0.31. Importantly, and consistent with our hypothesis, this correlation increases to 0.59 if calculated using only states that had sizeable negative net elasticities in the 1920s.[11]

6. Heterogeneity in Relationship Lending

The results so far have revealed substantial heterogeneity in the intensity of relationship lending at the state/city level in the U.S. We now argue that the degree of state/city heterogeneity in relationship lending *within* Federal Reserve districts is important for understanding how well district-level indicators of banking health explain district-level indicators of business health.

The first step is to confirm that there is indeed within-district heterogeneity in the intensity of relationship lending. Starting with our price-based measure of relationship lending and using the full sample (including predicted return data prior to 1926), Table 4 and Figure 8 summarize the heterogeneity in net elasticities at the state/city level grouped by district. The last two columns of Table 4 also summarize the heterogeneity in net elasticities when the sample is

[11] If we also include states that are split in the Comptroller's report by averaging over the net elasticities associated with each one of those states, then the correlations are 0.21 and 0.42 respectively. Using minimums instead of averages, the correlations are 0.17 and 0.22 respectively. Using maximums instead of averages, the correlations are 0.19 and 0.56 respectively.

split into 1920s versus 1930s. District 12 (San Francisco) is shown in gray because the rapid and geographically unrestricted rise of branch banking in California in the 1920s confounds the coefficient of variation for the net elasticity measure. We will therefore exclude this district from what follows. With the exception of Atlanta, St. Louis, and Dallas, Table 4 reveals that within-district heterogeneity in the price-based measure of relationship lending was higher in the 1920s than in the 1930s.

Within-district heterogeneity in the ratio of relationship loans to bank assets (the quantity-based measure of relationship lending) is plotted in Figure 9. Districts 3 (Philadelphia) and 8 (St. Louis) are shown as dotted lines because the part of the Comptroller's report that separates loans on securities from all other loans has only two useable states/cities for each of these districts. Within many districts, we observe more heterogeneity in the ratio of relationship loans to bank assets as the Great Depression unfolds. Some of this increased heterogeneity dissipates in the second half of the decade but, overall, within-district heterogeneity in the quantity-based measure of relationship lending was lower in the 1920s than in the 1930s.

Figure 10 shows how the correlation between heterogeneity in the price-based and quantity-based measures changes over time. The blue line uses the net elasticity results for the 1920s as the price-based indicator. The red line uses the net elasticity results for the 1930s as such. The periods on the horizontal axis date the quantity-based indicator. There is a high positive correlation between the dispersion in our two indicators in the early 1920s and late 1930s. The low correlation in the intervening years reflects the fact that dispersion in the price-based indicator falls from the 1920s to the 1930s while dispersion in the quantity-based indicator rises. This is consistent with the Great Depression destroying lending relationships and bringing surviving banks back to square one, so to speak. As discussed in Section 5, the net elasticity of loan rates will be less negative at the beginning of a lending relationship than in the middle of it. Therefore, at square one, differences between relationship and transactional lenders are less pronounced when using our price-based measure of relationship lending. The differences are more pronounced, however, when using our quantity-based measure as lenders in historically relationship-intense jurisdictions try, as much as possible, to keep assets allocated towards relationship loans in order to establish new relationships.

Having documented the existence of within-district heterogeneity in the intensity of relationship lending, Table 5 shows that it matters. In particular, total loan growth – a variable which the literature tends to use as an indicator of financial health – is better correlated with indicators of economic/business growth in districts that had less dispersion in relationship lending in the 1920s (as measured by dispersion in the price-based measure). We do not find consistently strong results in this direction when using dispersion on other dimensions, for example dispersion in average bank size in the 1920s or dispersion in relationship lending in the 1930s. Proper measurement of relationship lending is thus crucial for grasping the link between banking and the real economy.

7. Conclusion

This paper has proposed a novel price-based method of extracting relationship lending from geographically aggregated financial statements. Our results reveal substantial heterogeneity in the intensity of relationship lending in the 1920s and, in districts with more such heterogeneity, we find the correlation between conventional indicators of financial and economic growth to be weaker. Looking at our price-based indicator together with an appropriately defined quantity-based indicator, we also find evidence that jurisdictions with high relationship lending in the 1920s attempted to forge new lending relationships as existing relationships were destroyed during the Great Depression. Time to rebuild is thus an important candidate for understanding time to recovery.

References

Berger, A. and G. Udell. 1995. "Relationship Lending and Lines of Credit in Small Firm Finance." *Journal of Business*, 68(3), pp. 351-382.

Bernanke, B. 1983. "Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression." *American Economic* Review, 73(3), pp. 257-276.

Calomiris, C. and J. Mason. 2003a. "Consequences of Bank Distress During the Great Depression." *American Economic Review*, 93(3), pp. 937-947.

Calomiris, C. and J. Mason. 2003b. "Fundamentals, Panics and Bank Distress During the Depression." *American Economic Review*, 93(5), pp. 1615-1647.

Calomiris, C. and B. Wilson. 2004. "Bank Capital and Portfolio Management: The 1930s 'Capital Crunch' and Scramble to Shed Risk." *Journal of Business*, 77(3), pp. 421-455.

Carlson, M. and J. Rose. 2015. "Credit Availability and the Collapse of the Banking Sector in the 1930s." *Journal of Money, Credit, and Banking*, 47(7), pp. 1239-1271.

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

Cole, H. and L. Ohanian. 1999. "The Great Depression in the United States from a Neoclassical Perspective." *Federal Reserve Bank of Minneapolis Quarterly Review*, 23(1), pp. 2-24.

Cole, H. and L. Ohanian. 2004. "New Deal Policies and the Persistence of the Great Depression: A General Equilibrium Analysis." *Journal of Political Economy*, 112(4), pp. 779-816.

Currie, L. 1931. "The Decline of the Commercial Loan." *Quarterly Journal of Economics*, 45(4), pp. 698-709.

Elsas, R. 2005. "Empirical Determinants of Relationship Lending." *Journal of Financial Intermediation*, 14(1), pp. 32-57.

Fisher, I. 1933. "The Debt-Deflation Theory of Great Depressions." *Econometrica*, 1(4), pp. 337-356.

Ford, A.W. 1928. "Country Banking Practices in Northern Texas." *Journal of Business*, 1(4), pp. 468-484.

Friedman, M. and A. Schwartz. 1963. A Monetary History of the United States, 1867– 1960. Princeton, NJ: Princeton University Press.

Gobbi, G. and E. Sette. 2015. "Relationship Lending During a Financial Crisis." *Journal of the European Economic Association*, 13(3), pp. 453-481.

Hachem, K. 2011. "Relationship Lending and the Transmission of Monetary Policy." *Journal of Monetary Economics*, 58(6-8), pp. 590-600.

Mitchener, K. and G. Richardson. 2016. "Network Contagion and Interbank Amplification during the Great Depression." FRB Richmond Working Paper 16-03.

Ongena, S. and D. Smith. 2001. "The Duration of Bank Relationships." *Journal of Financial Economics*, 61(3), pp. 449-475.

Park, H. and G. Richardson. 2012. "Retail Trade by Federal Reserve District, 1919 to 1939: A Statistical History." *Research in Economic History*, 28(1), pp. 151-231.

Richardson, G. and W. Troost. 2009. "Monetary Intervention Mitigated Banking Panics During the Great Depression: Quasi-Experimental Evidence from the Federal Reserve District Border in Mississippi, 1929 to 1933." *Journal of Political Economy*, 117(6), pp. 1031-1073.

Wicker, E. 1996. *The Banking Panics of the Great Depression*. Cambridge: Cambridge University Press.

Appendix

Consider a simplified version of Hachem (2011) with only two periods. Normalize the population of borrowers to one and let ψ denote the fraction of second period borrowers (i.e., borrowers whose quality is known by their relationship lenders). Second period loan rates are:

$$R_2 = \begin{cases} r/q & if \quad \omega \in [0, \widetilde{\omega}] \\ \overline{R}(\omega) & if \quad \omega \in (\widetilde{\omega}, \widehat{\omega}) \\ r/q & if \quad \omega \in [\widehat{\omega}, 1] \end{cases}$$

See Hachem (2011) for a full explanation of the notation. Of particular importance are ω (borrower type) and r (policy rate). The cutoff types $\widetilde{\omega}$ and $\widehat{\omega}$ are implicitly defined by:

$$p(\widetilde{\omega})\overline{R}(\widetilde{\omega}) = r$$

$$q\overline{R}(\widehat{\omega}) = r$$

Where:

$$\overline{R}(\omega) = \frac{p(\omega)\theta_1 - q\theta_2}{p(\omega) - q}$$

We can then write the average second period loan rate as:

$$R_2 = \int_0^{\widetilde{\omega}} \frac{r}{q} d\omega + \int_{\widetilde{\omega}}^{\widehat{\omega}} \overline{R}(\omega)\, d\omega + \int_{\widehat{\omega}}^1 \frac{r}{q} d\omega$$

The elasticity with respect to the policy rate is therefore:

$$e_2 = \frac{dR_2}{dr}\frac{r}{R_2} = \frac{1 - \widehat{\omega} + \widetilde{\omega} + \left[1 - \frac{q}{p(\widetilde{\omega})}\right] r \frac{d\widetilde{\omega}}{dr}}{1 - \widehat{\omega} + \widetilde{\omega} + \frac{1}{\overline{R}(\widehat{\omega})} \int_{\widetilde{\omega}}^{\widehat{\omega}} \overline{R}(\omega)\, d\omega}$$

First period loan rates are:

$$R_1 = \overline{R}(\xi)$$

Where:

$$\left[q\xi + \int_\xi^1 p(x)\, dx\right] \overline{R}(\xi) + \beta(1-\mu)\left[\int_{\widetilde{\omega}}^{\widehat{\omega}} p(x)\overline{R}(x)\, dx - \left[1 - \widetilde{\omega} - \int_{\widehat{\omega}}^1 \frac{p(x)}{q} dx\right] r\right] = r$$

The second term on the left-hand side is the continuation value of the relationship (in expectation). We can now write the average loan rate in the relationship lending model as:

$$R_{rl} = (1-\psi)\,\overline{R}(\xi) + \psi\left[\int_{\widetilde{\omega}}^{\widehat{\omega}} \overline{R}(x)\,dx + [1-\widehat{\omega}+\widetilde{\omega}]\,\frac{r}{q}\right]$$

Setting $\psi = 0$ and $\mu = 1$ eliminates relationship lending. The average loan rate without relationship lending is simply:

$$R_{no} = \overline{R}(\eta)$$

Where:

$$\left[q\eta + \int_{\eta}^{1} p(x)\,dx\right]\overline{R}(\eta) = r$$

The elasticity with respect to the policy rate in the absence of relationship lending is therefore:

$$e_{no} \equiv \frac{dR_{no}}{dr}\frac{r}{R_{no}} = \frac{\left[q\eta + \int_{\eta}^{1} p(x)\,dx\right]\overline{R}'(\eta)}{\left[q\eta + \int_{\eta}^{1} p(x)\,dx\right]\overline{R}'(\eta) - [p(\eta)-q]\,\overline{R}(\eta)}$$

If ψ is high, then the elasticity of R_{rl} with respect to the policy rate will be dominated by e_2. The denominator of e_{no} is positive (this is proven in the online appendix of Hachem (2011)) so $e_2 < e_{no}$ would require:

$$\begin{aligned} &\left[q\eta + \int_{\eta}^{1} p(x)\,dx\right]\overline{R}'(\eta)\left[\frac{[p(\widetilde{\omega})-q]\,\overline{R}(\widetilde{\omega})}{p'(\widetilde{\omega})\,\overline{R}(\widetilde{\omega}) + p(\widetilde{\omega})\,\overline{R}'(\widetilde{\omega})} - \frac{1}{\overline{R}(\widehat{\omega})}\int_{\widetilde{\omega}}^{\widehat{\omega}} \overline{R}(\omega)\,d\omega\right] \quad (1) \\ < \;& [p(\eta)-q]\,\overline{R}(\eta)\left[1-\widehat{\omega}+\widetilde{\omega} + \frac{[p(\widetilde{\omega})-q]\,\overline{R}(\widetilde{\omega})}{p'(\widetilde{\omega})\,\overline{R}(\widetilde{\omega}) + p(\widetilde{\omega})\,\overline{R}'(\widetilde{\omega})}\right] \end{aligned}$$

Use $q\theta_2 = p(0)\theta_1$ as in Hachem (2011). To simplify the exposition, we will also assume that $p(\omega)$ is linear in ω. Condition (1) can now be rewritten as:

$$\begin{aligned} &\frac{p(\widetilde{\omega})\,\widetilde{\omega}^2}{[p(1)-p(0)]\,\widetilde{\omega} + p(\widetilde{\omega})\,\frac{p(0)-q}{p(\widetilde{\omega})-q}} - \frac{1}{p(1)-p(0)}\frac{q}{\theta_1}\int_{\widetilde{\omega}}^{\widehat{\omega}} \left[\overline{R}(\omega) - \overline{R}(\widetilde{\omega})\right]d\omega \quad (2) \\ < \;& \frac{[p(\eta)-q]\,\eta^2}{p(0)-q}\left[1-\widehat{\omega}+\widetilde{\omega} + \frac{[p(\widetilde{\omega})-q]\,\overline{R}(\widetilde{\omega})}{p'(\widetilde{\omega})\,\overline{R}(\widetilde{\omega}) + p(\widetilde{\omega})\,\overline{R}'(\widetilde{\omega})}\right] + \frac{q(\widehat{\omega}-\widetilde{\omega})\,\widetilde{\omega}}{p(\widetilde{\omega})-q} \end{aligned}$$

Next, rearrange $p(\widetilde{\omega})\bar{R}(\widetilde{\omega}) = q\bar{R}(\widehat{\omega})$ as defined above to isolate:

$$\widehat{\omega} = \frac{p(0) - q}{\frac{q}{p(\widetilde{\omega})} \frac{p(\widetilde{\omega}) - q}{\widetilde{\omega}} - [p(1) - p(0)]}$$

This allows us to rewrite (2) as:

$$\begin{aligned}
& -\frac{\left[p(\widetilde{\omega})^2 - q^2\right][p(1) - p(0)]\,\widetilde{\omega}^2 \widehat{\omega}}{p(\widetilde{\omega})\left[[p(1) - p(0)]\,\widetilde{\omega} + p(\widetilde{\omega}) \frac{p(0) - q}{p(\widetilde{\omega}) - q}\right]} - \frac{p(0) - q}{p(1) - p(0)} \frac{q}{\theta_1} \int_{\widetilde{\omega}}^{\widehat{\omega}} \left[\overline{R}(\omega) - \overline{R}(\widetilde{\omega})\right] d\omega \\
< \; & [p(\eta) - q]\,\eta^2 \left[1 - \widehat{\omega} + \widetilde{\omega} + \frac{[p(\widetilde{\omega}) - q]\,\overline{R}(\widetilde{\omega})}{p'(\widetilde{\omega})\,\overline{R}(\widetilde{\omega}) + p(\widetilde{\omega})\,\overline{R}'(\widetilde{\omega})}\right]
\end{aligned}$$

Which is true since the left-hand side is negative (note $p(0) > q$ and $p'(\cdot) > 0$) and the right-hand side is positive. ■

Tables

Table 1: Baseline Elasticity Test Results

		P<0.01			P<0.05			P<0.1
Elasticities 1926-1941								
On Loans			On Securities			Difference		
District	Elasticity	Prob>Chi2	District	Elasticity	Prob>Chi2	District	Elasticity	Prob>Chi2
Boston	0.321	0.000	Boston	0.527	0.000	Boston	-0.206	0.000
New York	0.273	0.000	New York	0.567	0.000	New York	-0.294	0.000
Philadelphia	0.206	0.000	Philadelphia	0.389	0.000	Philadelphia	-0.182	0.000
Cleveland	0.191	0.000	Cleveland	0.466	0.000	Cleveland	-0.275	0.000
Richmond	0.191	0.000	Richmond	0.422	0.000	Richmond	-0.232	0.000
Atlanta	0.335	0.000	Atlanta	0.387	0.000	Atlanta	-0.052	0.123
Chicago	0.474	0.000	Chicago	0.722	0.000	Chicago	-0.248	0.000
St. Louis	0.378	0.000	St. Louis	0.469	0.000	St. Louis	-0.092	0.003
Minneapolis	0.416	0.000	Minneapolis	0.493	0.000	Minneapolis	-0.078	0.044
Kansas City	0.280	0.000	Kansas City	0.559	0.000	Kansas City	-0.280	0.000
Dallas	0.243	0.000	Dallas	0.368	0.000	Dallas	-0.125	0.002
San Francisco	0.210	0.000	San Francisco	0.476	0.000	San Francisco	-0.267	0.000

Table 2: Baseline with Controls

Elasticity Test Results with Controls (Difference between elasticities of loan and security returns w.r.t discount rate; Colors indicate significance level)										
District	GNP	GNP Growth	Retail Sales	Construction Contracts	Change in Construction Contracts	Business Failures	Change in Business Failures	Failed Business Liabilities	Change in Failed Business Liabilities	Discount Volume
Boston	-0.188	-0.198	-0.116	-0.185	-0.204	-0.176	-0.206	-0.176	-0.206	-0.260
New York	-0.252	-0.264	-0.200	-0.247	-0.290	-0.296	-0.293	-0.281	-0.302	-0.289
Philadelphia	-0.181	-0.174	-0.157	-0.164	-0.179	-0.183	-0.183	-0.180	-0.181	-0.191
Cleveland	-0.281	-0.262	-0.259	-0.258	-0.269	-0.234	-0.275	-0.255	-0.274	-0.308
Richmond	-0.203	-0.212	-0.215	-0.226	-0.228	-0.193	-0.232	-0.227	-0.233	-0.274
Atlanta	-0.011	-0.028	-0.016	-0.047	-0.049	-0.064	-0.051	-0.018	-0.052	-0.009
Chicago	-0.258	-0.220	-0.208	-0.223	-0.236	-0.177	-0.249	-0.214	-0.244	-0.232
St. Louis	-0.101	-0.084	-0.035	-0.077	-0.092	-0.089	-0.092	-0.092	-0.088	-0.087
Minneapolis	0.005	-0.037	-0.122	-0.095	-0.080	-0.084	-0.079	0.002	-0.081	-0.076
Kansas City	-0.296	-0.247	-0.266	-0.260	-0.278	-0.157	-0.284	-0.178	-0.282	-0.202
Dallas	-0.083	-0.109	-0.085	-0.134	-0.117	-0.147	-0.121	-0.137	-0.125	-0.042
San Francisco	-0.210	-0.248	-0.251	-0.298	-0.319	-0.217	-0.266	-0.208	-0.265	-0.283

Table 3: Alternative Specifications at District-Level

District	Baseline with Deposit Rate as Cost of Funds	Baseline with Major Cities Separated	Baseline with Brokers' Loans Removed
Boston	-0.132	-0.160	-0.107
New York	-0.215	-0.224	-0.215
Philadelphia	-0.154	-0.182	-0.170
Cleveland	-0.214	-0.266	-0.261
Richmond	-0.159	-0.200	-0.208
Atlanta	-0.032	-0.005	0.003
Chicago	-0.120	-0.169	-0.218
St. Louis	-0.062	-0.079	-0.047
Minneapolis	-0.043	-0.037	-0.044
Kansas City	-0.142	-0.286	-0.304
Dallas	-0.048	-0.099	-0.129
San Francisco	-0.244	-0.168	-0.144
New York City	n/a	-0.104	-0.287
City of Chicago	n/a	-0.583	n/a

Table 4

District	District-Level Net Elasticity	Average from State/City	Std. Dev. from State/City	|CVNE|	|CVNE20|	|CVNE30|
Boston	-0.206	-0.228	0.085	0.374	1.537	0.756
New York	-0.294	-0.277	0.070	0.251	1.388	0.187
Philadelphia	-0.182	-0.223	0.146	0.653	4.207	1.652
Cleveland	-0.275	-0.272	0.127	0.467	3.323	0.735
Richmond	-0.232	-0.104	0.241	2.320	7.416	2.910
Atlanta	-0.052	-0.023	0.216	9.372	1.619	12.390
Chicago	-0.248	-0.250	0.256	1.024	9.978	0.584
St. Louis	-0.092	-0.058	0.309	5.294	3.575	10.647
Minneapolis	-0.078	-0.093	0.197	2.127	2.955	0.639
Kansas City	-0.280	-0.290	0.248	0.855	1.164	1.063
Dallas	-0.125	-0.076	0.206	2.728	3.417	5.246
San Francisco	-0.267	-0.174	0.185	1.065	61.659	1.180

Notes: CV is coefficient of variation and NE is net elasticity. NE20 is net elasticity estimated using only 1920s data. NE30 is net elasticity estimated using only 1930s data.

Table 5

District	Correlation between Loan Growth and Growth in X			
	X = Retail Sales	X = Contracts	X = Failures	X = Failure Liabilities
Boston	0.76	0.63	-0.24	-0.18
New York	0.65	0.59	-0.22	-0.37
Philadelphia	0.48	0.40	-0.10	-0.10
Cleveland	0.51	0.57	-0.16	-0.17
Richmond	0.56	0.49	0.02	-0.12
Atlanta	0.47	0.31	-0.15	-0.31
Chicago	0.52	0.38	-0.16	-0.22
St. Louis	0.65	0.56	-0.13	-0.12
Minneapolis	0.48	0.43	-0.20	-0.14
Kansas City	0.62	0.63	-0.24	-0.32
Dallas	0.46	0.35	-0.33	-0.30
Correlation with CVNE20	-0.30	-0.38	0.50	0.40
Correlation with CVNE30	-0.17	-0.39	0.14	-0.05
Correlation with Disp20	0.52	0.25	0.09	0.20

Notes: Disp20 is the average coefficient of variation for average bank size in the 1920s.

Figures

Figure 1

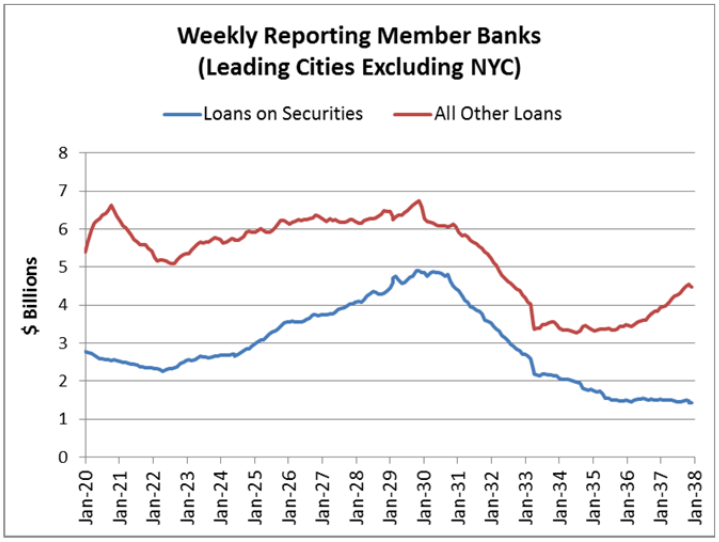


Figure 2

Predicted versus Actual for State/City Data Prior to December 1929

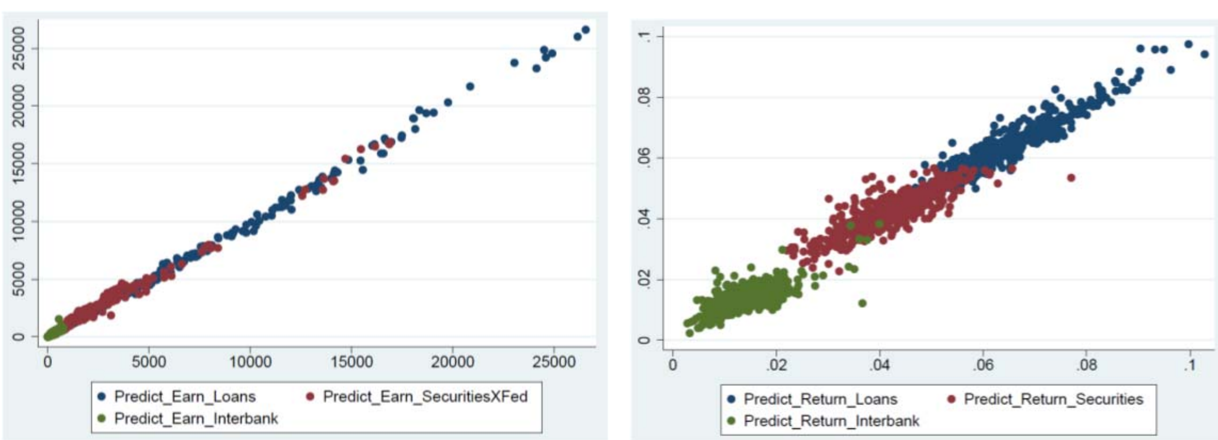


Figure 3

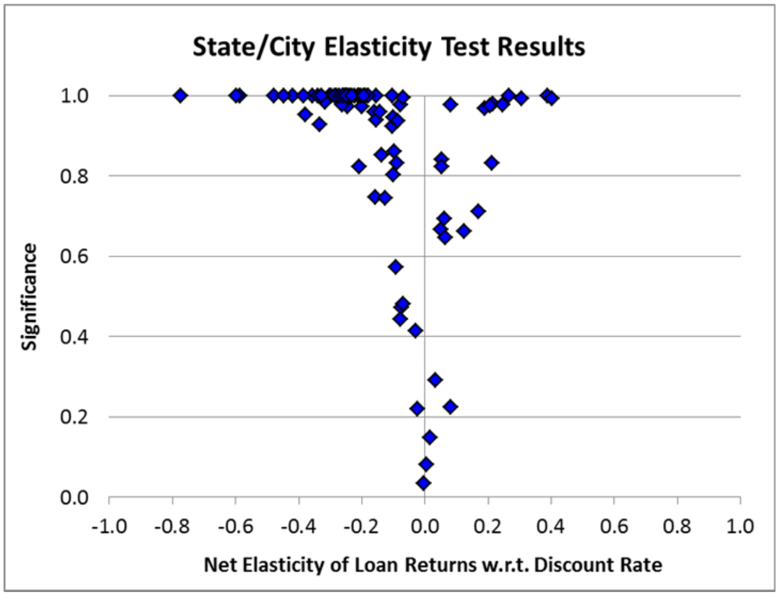


Figure 4

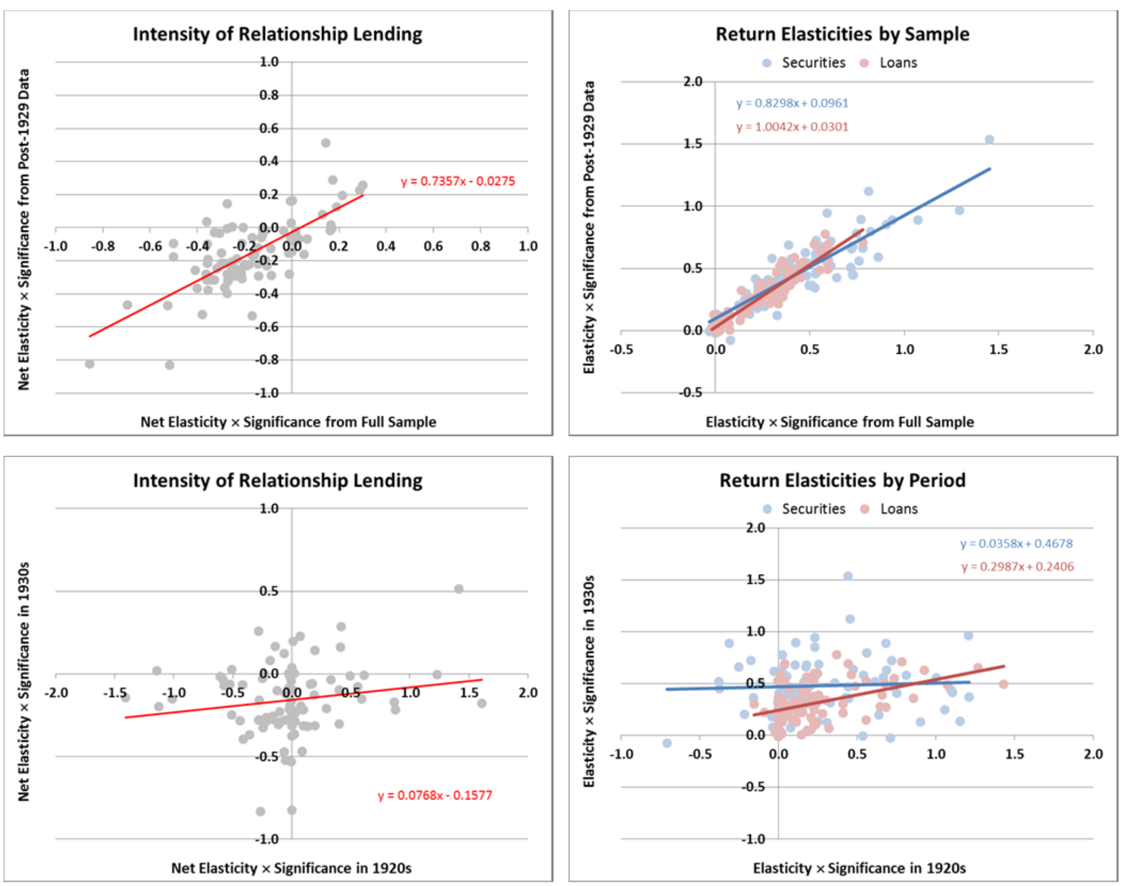
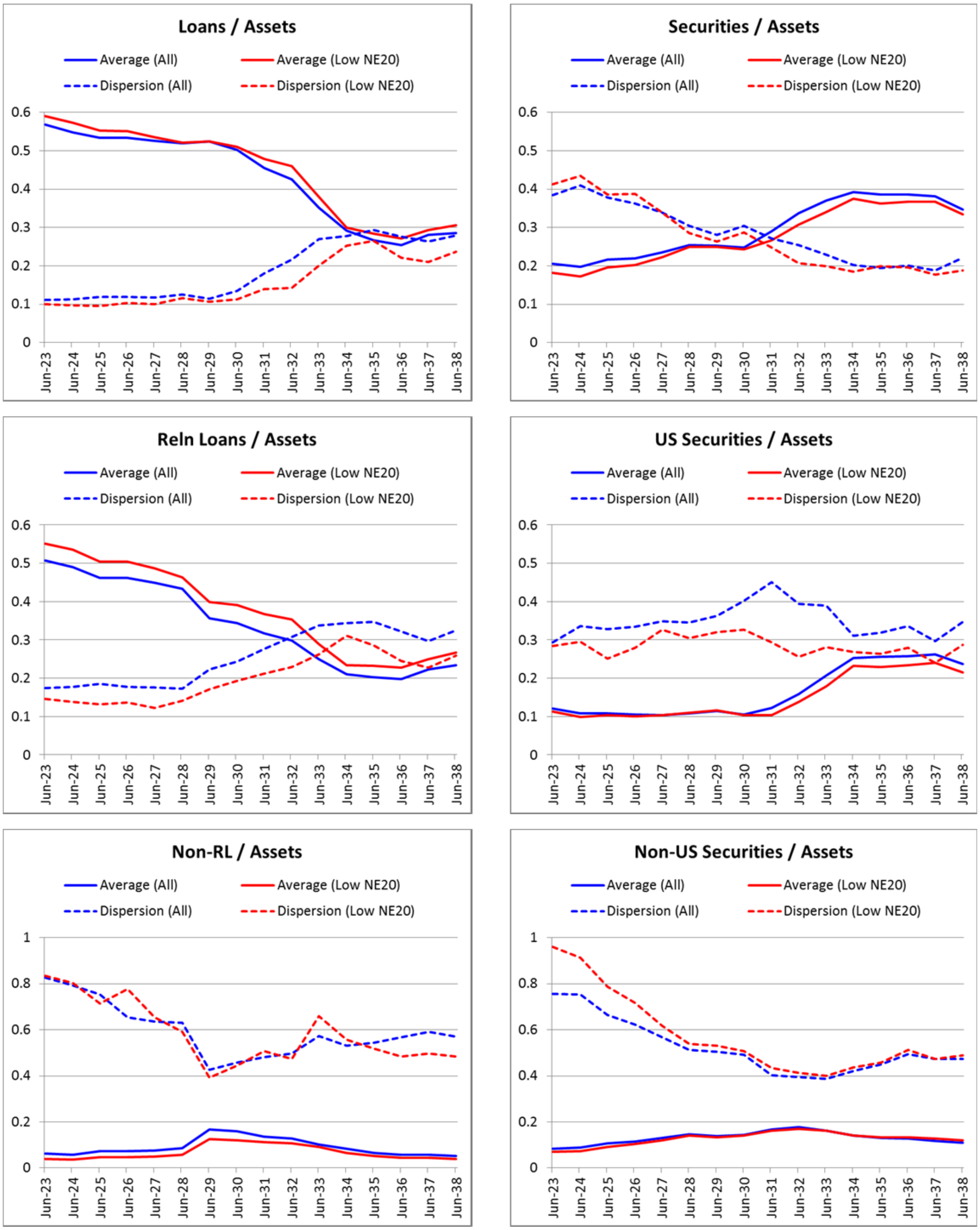


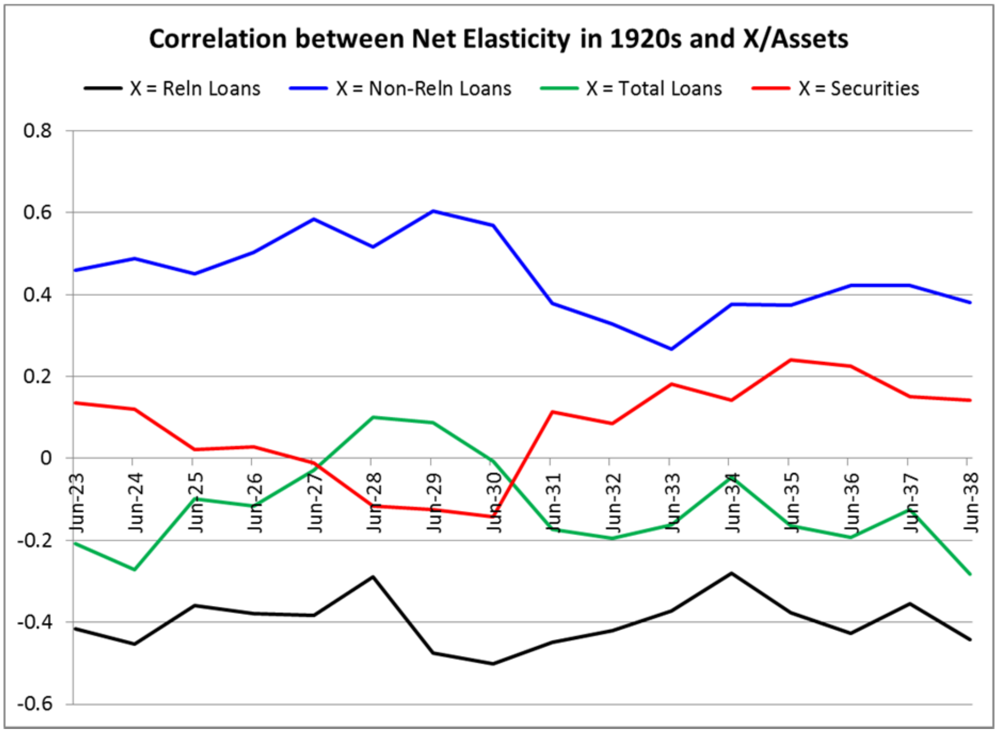
Figure 5

Changes in Asset Composition



Notes: NE20 refers to net elasticity estimated using only 1920s data

Figure 6


Correlation between Net Elasticity in 1920s and X/Assets
X = Reln Loans
X = Non-Reln Loans
X = Total Loans
X = Securities
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Jun-23
Jun-24
Jun-25
Jun-26
Jun-27
Jun-28
Jun-29
Jun-30
Jun-31
Jun-32
Jun-33
Jun-34
Jun-35
Jun-36
Jun-37
Jun-38

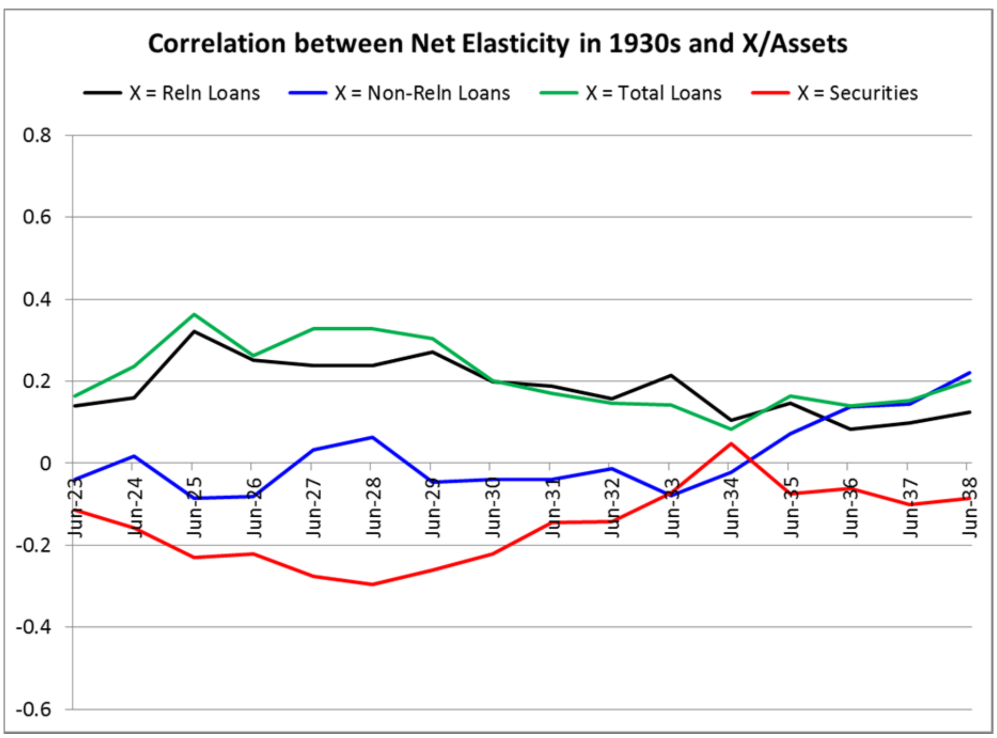

Correlation between Net Elasticity in 1930s and X/Assets
X = Reln Loans
X = Non-Reln Loans
X = Total Loans
X = Securities
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Jun-23
Jun-24
Jun-25
Jun-26
Jun-27
Jun-28
Jun-29
Jun-30
Jun-31
Jun-32
Jun-33
Jun-34
Jun-35
Jun-36
Jun-37
Jun-38

Figure 7

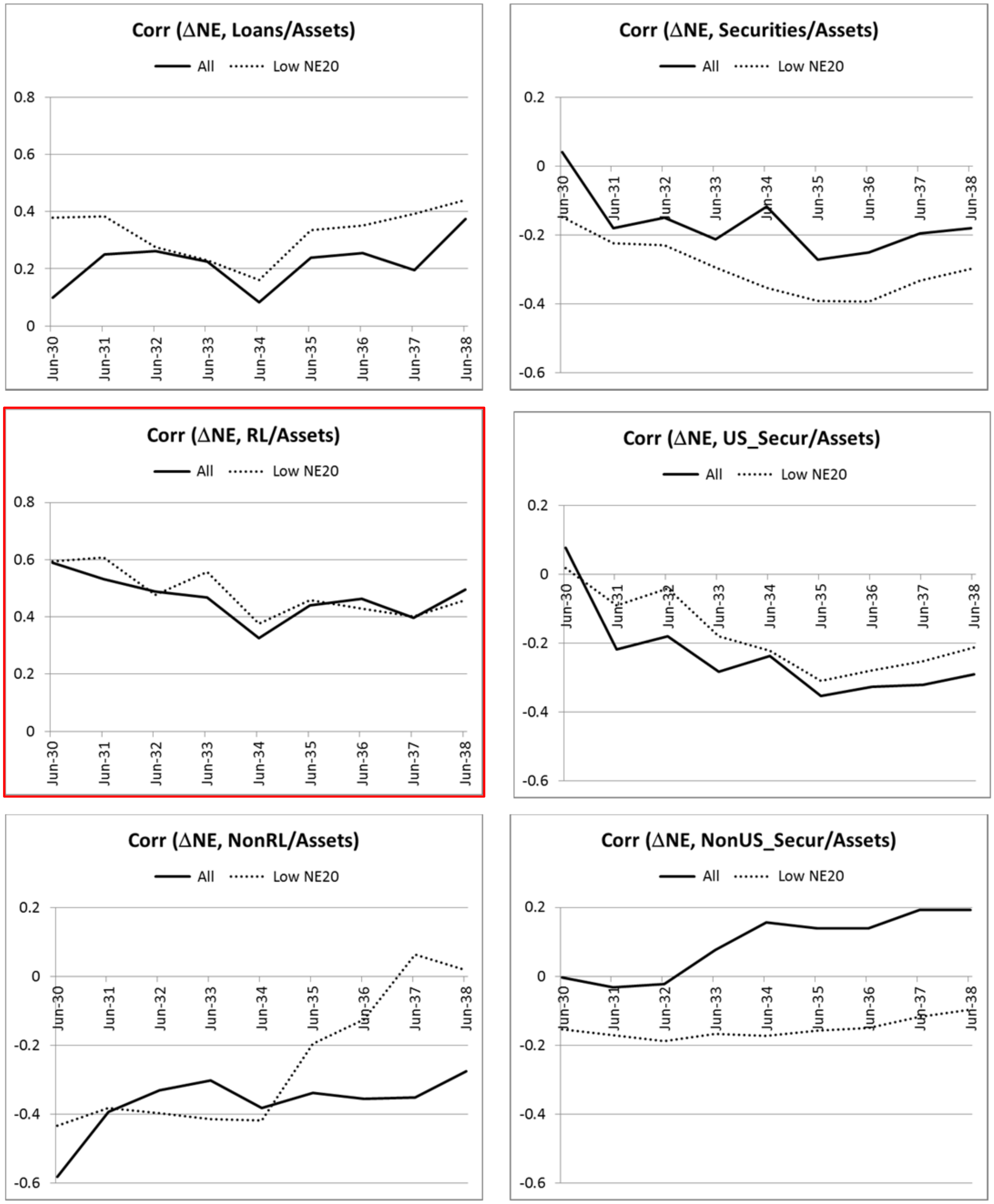
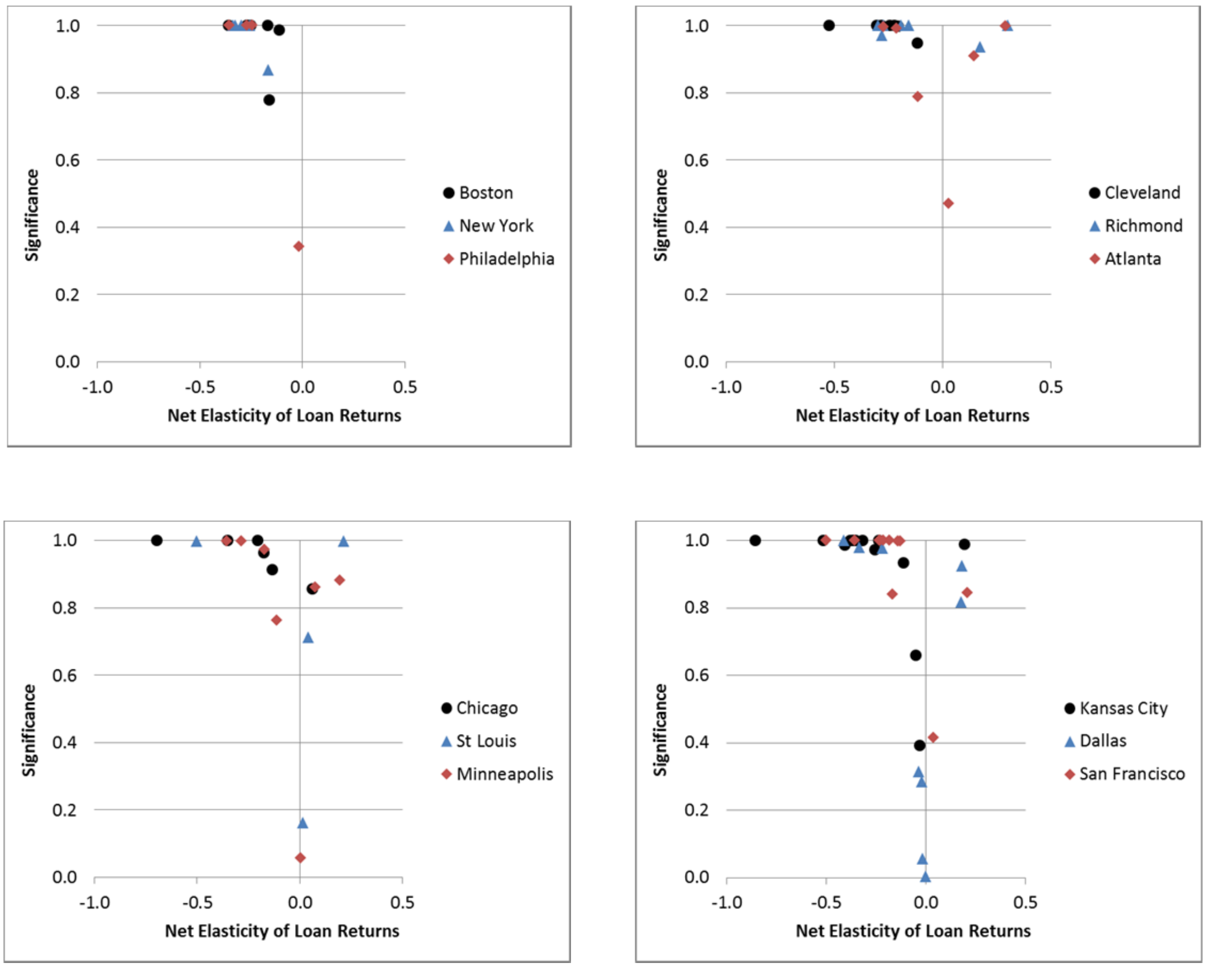

Corr (ΔNE, Loans/Assets)
All
Low NE20
0.8
0.6
0.4
0.2
0
Jun-30
Jun-31
Jun-32
Jun-33
Jun-34
Jun-35
Jun-36
Jun-37
Jun-38
Corr (ΔNE, Securities/Assets)
All
Low NE20
0.2
0
-0.2
-0.4
-0.6
Corr (ΔNE, RL/Assets)
All
Low NE20
Corr (ΔNE, US_Secur/Assets)
All
Low NE20
Corr (ΔNE, NonRL/Assets)
All
Low NE20
Corr (ΔNE, NonUS_Secur/Assets)
All
Low NE20

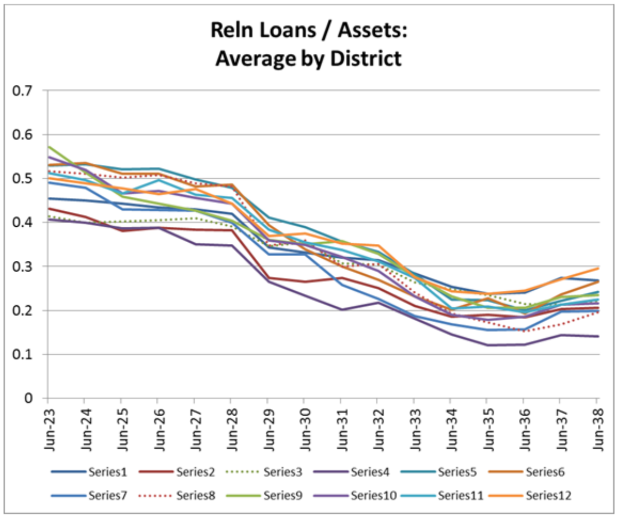
Figure 8

State/City Elasticity Test Results Grouped by Federal Reserve District



Notes: Data used to calculate elasticities includes pre-1926 return estimates.

Figure 9



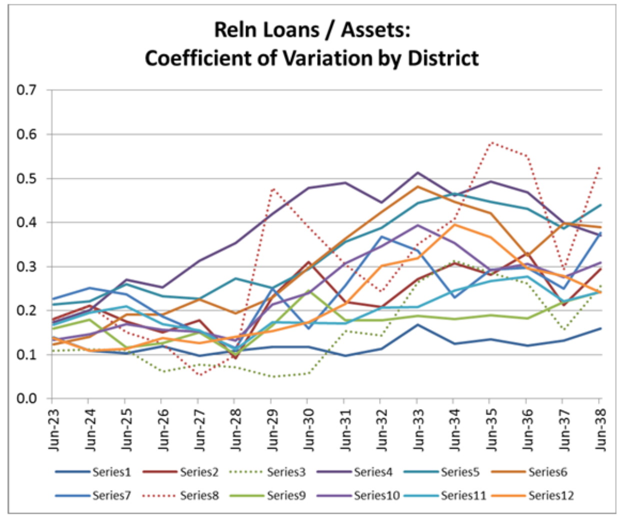


Figure 10