2018

The Effects of the Correspondent Banking Network on the Real Economy

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submitted to

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by

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for

Senior Thesis
Fall 2017
December 4, 2017

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Acknowledgements

Many thanks to my family and friends for their continued support. I'd also like to thank my reader, Professor Vossmeyer, for providing me with the opportunity to work for her and develop this idea.

Abstract

There is a longstanding academic debate regarding the role of financial networks. There is a tradeoff between improving the flow of funds and acting as a channel for contagion. This paper investigates the impact of banking networks on the real economy during the Great Depression. Building permit values are used as a proxy for real economic activity as implemented in previous research. A simple linear regression model estimated by ordinary least squares is used such that locational networks are differentiated from networks links to money centers and non-money centers. The results demonstrate that financial networks have both positive and negative effects on real economic activity and building permits. Positive network effects are observed when linkages to money centers are supported by strong locational networks.

I. Introduction

The Great Depression was a catastrophic period in history for the U.S. economy and is the subject of intense academic debates regarding its causes, symptoms, and effects on American life and the economy. Some scholars argue that liquidity crises forced otherwise solvent banking institutions into bankruptcy, while others advocate that insolvency was the primary cause of the multitude of banking panics that contributed to the economic conditions of 1929-1939 (Mitchener & Richardson (2013); Allen & Gale (2000)). A seldom-investigated topic related to the Great Depression is how the structure of the banking system affected the recovery of cities after banking crises. Much research has been conducted on the role of the banking system in the 1929 banking crises and the Great Depression (see for example, Carson and Wheelock (2015), Richardson & Troost (2009), and Bernanke (1983), among others), but there has been little focus on how the structure of the banking system before the depression affected real economic growth at the city level in the recovery period. In that vein, this paper intends to quantify and analyze the effect that the correspondent banking network in 1929 had on the real economy. The correspondent banking network was the primary source for reserve capital for 90% of all state-chartered commercial banks in 1929, which at the time were not Federal Reserve members (Mitchener & Richardson, 2016). The importance of the correspondent network in the determination of credit flows allows it to serve as an acceptable model of the structure of the banking system (Mitchener & Richardson, 2016). This structure has historically been difficult to measure given the lack of digitized data on the complete U.S. banking system. This paper overcomes the limitation by using a newly digitized directory of the entire U.S. banking system.

Metrics that provide an acceptable proxy for real economic activity on the city level have also been few and far between in previous research. This paper circumvents that obstacle by using building permit values during the time period, a method implemented by Leamer (2007) and Cortes & Weidenmier (2017), as a proxy for real economic activity. Building permit values, referred to interchangeably as building expenditures, are an acceptable metric by which to measure economic development at the level of an individual town or city. Using this method, it is possible to develop a new framework for evaluating the efficiency and efficacy of banking networks as they pertain to municipal growth. In a series of remarks at a 2004 conference, then-President of the Federal Reserve Bank of New York, Timothy Geithner, stressed the importance that systemic risk would play in the financial system and how the linkages between the banking system and non-bank financial intermediaries would have significant effects on the financial system and the economy. While the composition of the banking system has shifted significantly since the Great Depression, it is still of critical importance to understand how the linkages that form the financial system will impact the real economy. This paper is an attempt at a historical examination of the topic, and investigates the tradeoff between spreading contagion and improving the flow of funds that comprises the double-edged sword effect of the correspondent banking network.

The remainder of the paper is structured as follows. The next section provides historical context on the topic. The third section is a review of existing literature in the field. The fourth section describes the data used in this paper. The fifth section presents a description of the empirical strategy used in the analysis. The sixth section present the

results of the statistical analysis. The final section concludes and offers suggestions for areas of future research, as well as policy implications.

II. Historical Background

The expansion of the United States during the 1800s laid the foundation for the formation of a correspondent banking network in order for interior banks to gain access to the loanable funds necessary to continue expanding (Mitchener and Richardson, 2013). Correspondent banking is the practice by which banks establish relationships with other banks in regions outside of their areas of operation in order to facilitate capital flows between them (Naughton & Chan, 1998). In the context of this paper and in this period in United States history, the correspondent network was primarily necessary in order for banks outside of the Federal Reserve system to have a secondary depository for their reserves, and was an important lever that banks could pull when liquidity was tight and they needed access to capital (Naughton & Chan, 1998). The structure became known as the "pyramid structure," due to the way capital flowed from small country banks (the base of the pyramid) to money center banks in New York and Chicago (the tip) (Mitchener and Richardson, 2013). The pyramid structure, wherein small-town banks had access to capital in money center banks, became a permanent fixture of the financial institutions landscape with the passage of the national banking acts of the 1860s (Mitchener and Richardson, 2013).

In 1927, 14 years after the establishment of the Federal Reserve, Congress passed the McFadden Act, which restricted the ability of national banks to open branches in towns outside of their home state, as well as in towns with populations of less than 100,000 people (McFadden Act of 1927). This legislation further cemented the necessity of a strong correspondent network, and underscored the risks inherent in linking the country's banking system together in such a way. The reason behind this is that the act allowed banks to hold

a portion of their reserve capital in money center banks, which led to the accumulation of roughly two-thirds of all reserve capital in New York banks by the early 1900s (Mitchener and Richardson, 2013). The restrictions on branch banking meant that the vast majority of small towns in America relied entirely on state banks for commerce (Carson & Wheelock, 2015). It was because of this reliance on the correspondent network, along with the reluctance of banks to utilize their reserve capital in times of financial hardship, that the Federal Reserve was founded. In fact, Bordo and Wheelock (2011) find that all of the major panics during the National Banking era were caused by the widespread withdrawals of funds by the country and reserve banks from money center banks. The country needed a lender of last resort to provide liquidity to illiquid banks in order to prevent their failure. Though the Federal Reserve was successful in its stated role in mitigating bank runs, only 10% of state-chartered banks had joined the Fed system by 1929, leaving 90% of the country's state-chartered commercial banks to rely on the correspondent network in times of liquidity squeezes (Mitchener & Richardson, 2016). While this may seem like a troublingly high proportion, it must be noted that one hundred percent of national banks were Federal Reserve members.

This paper investigates the role that the correspondent network served in the development of local economies, whether positive or negative. Were these connections a positive aspect of the banking system as they facilitated the flow of funds between previously unconnected or isolated banking regions, or did they served as channels of contagion during times of economic hardship? It is the intent of this paper to quantify the effect that the correspondent network had on city development.

III. Literature Review

When examining the existing research on the correspondent banking network and real economic activity, it is possible to separate the analyses into two classes: the structure of the banking system and the function of the banking system. While there is a lot of interaction between the two classes, previous research has chosen to focus on either one area or the other. I will discuss each in turn.

Investigation of the functions of the banking system during the Great Depression era is headlined by Bernanke (1983), who investigates the role of the real cost of credit intermediation in the disruption of the financial sector. He finds that the higher cost of credit intermediation caused a higher effective cost of credit and a statistically significant effect of price shocks on economic output. This is an excellent example of the effects of the functions of the banking system on the real economy, as measured by price shocks on economic output and credit costs. Bernanke's paper is among the best at quantifying the effects of the financial system on the real economy. While Bernanke did investigate the effect of the banking system on the real economy, he used the cost of credit intermediation (CCI) rather than the correspondent network, to do so.

Richardson and Troost (2009) use comparative analytics to quantify the effects of different Federal Reserve bank policies across the St. Louis and Atlanta Federal Reserve districts. They find that the active monetary policies enacted by the Atlanta Federal Reserve had a positive effect on bank failure rates, proving that acting as a lender of last resort helped to alleviate economic stress caused by decreasing the rate of bank failure.

Shifting now to the investigation of the structure and composition of the banking system during the Great Depression era, Carson and Wheelock (2015) examine the efficacy

of the founding of the Federal Reserve on facilitating money flows. A significant finding of their analysis is that the increased liquidity demand due to bank runs caused banks to withdraw funds from their New York City correspondents simultaneously. This caused banks to institute withdrawal and payment suspensions, releasing a domino effect across the system. This relates to Richardson and Troost's (2009) findings that the failure of a majority of commercial banks to join the Federal Reserve system greatly impeded the central bank's ability to intervene in regional banking crises.

Mitchener and Richardson (2013) investigate the pyramid structure of the United States banking system. The authors find that during the 1930s banking panics, interbank deposit flows transmitted financial shocks from periphery banks to the core of the US financial system. Ultimately, they suggest that the correspondent network was a channel of contagion that spread risk throughout the entire banking system. This work is highly relevant to this paper, as I am investigating the extent to which the correspondent network affected the real economy.

Continuing with the theme of investigating the effect of the banking system structure on the real economy, Mitchener and Richardson (2016) study network contagion and interbank flows using empirical analysis of how interbank connections amplified downturns. During panics, country non-member banks withdrew from their correspondents, which responded by accessing excess reserves deposited in reserve cities, a contagion that worked its way up to Federal Reserve members at the top of the pyramid in Chicago and New York. They find an aggregate reduction in lending associated with correspondent deposit outflows of 15% during the Great Depression. Mitchener and Richardson (2016) are effective at using the correspondent network to quantify the effect

of the banking system structure on lending volumes, but their analysis does not develop a model that emphasizes the impact of the correspondent network on the real economy. This paper will bridge the gap between the financial system and the real economy in a historical context that has not been investigated before.

In a more recent investigation of the effects of the structure of the correspondent network on the economy, Allen and Gale (2000) analyze the causes of financial contagion based on the completeness of the structure of the banking system. The authors find that if interbank markets are complete and each region is connected to all other regions, the initial impact of a financial crisis in one region may be lessened, but the opposite is true in the case of incomplete systems. While discussed in other terms in this paper, the completeness of the banking system is a primary concern of this paper, insofar that completeness serves as a boost to real economic development. While Allen & Gale (2000) study the effects of structure of the banking system on the beginning of a crisis, this paper will contend with the role of the correspondent network in driving municipal growth during a recovery period. In this case, however, the authors' research does not touch upon the impact on the real economy.

It is evident that past research has focused heavily on the role of the banking sector and the correspondent network in the propagation of financial crises, but to the best of my knowledge, no past study has investigated the impact of the banking network on municipal growth in that time period. As Leamer (2007) postulates, the building cycle is the most important predictor of economic downturns, and it therefore makes sense to investigate how the structure of the banking system impacts building expenditures as a measure of the real economy. It has been well documented that the pyramid structure of the banking

system is responsible for spreading the contagion of bank failures through constant runs on banks (see, for example, Mitchener & Richardson, (2013) and Bernanke (1983)), but there does not appear to be any research that has examined the role that this system played in the development of individual cities.

It is important to understand how the prevalent banking structure of the time contributes to changes in construction in the American economy. To recognize how these cities were resuscitated after the worst financial crisis in history is an important tool in understanding the impact that banking networks have on city development. In order to more fully comprehend the effect that financial linkages between institutions have on the economy, one must first understand the origins of the current system. It is absolutely critical that the impact of linkages between financial institutions is understood and its impact on the real economy can be measured in order to direct policymaking geared towards recovery from a crisis.

IV. Data Review

The data used in this investigation comes from two sources. The first data source is Dun and Bradstreet's Review which includes raw building permit data for the year 1934. The monthly economic review includes facts and figures on a wide range of topics including economic conditions, industries, commodities, agriculture, and finance (Library of Congress). Weidenmier & Cortes (2017) use building permits from the same source as a forward-looking indicator of economic activity. The building permit data is used to construct total building permit value, which is used as a proxy for real economic activity, as outlined by Leamer (2007) and implemented by Weidenmier & Cortes (2017).

The second data source is a proprietary dataset compiled from Rand McNally Bankers' Directory.[1] It details micro-level data on the U.S. banking system that has not previously been digitized. It includes, for each bank in the U.S. system, full balance sheet data (capital, surplus, undivided profits and reserves, deposits, and other liabilities on the liabilities sides, and cash, U.S. government securities, other securities, loans and discounts, and other resources, on the assets side), along with town name, town population, map coordinates, routing number, individual correspondent connections, Federal Reserve member status, and state or national charter status. The data is reformatted to show city level aggregates for correspondent connections and town assets and is then merged with the data from Dun and Bradstreet's Review. The sample of banking system data is restricted to cities included in Dun and Bradstreet's Review and further restricted to cities in the "East Central," "South Central," "West Central," and "Mountain" regions (as delineated by Dun and Bradstreet's

[1] As part of a study conducted by Dr. Angela Vossmeyer of Claremont McKenna College

Review). The restrictions result in a sample size of 45 cities in 12 states that are mapped below. A full list of cities included can be found in Table 4 in the appendix.

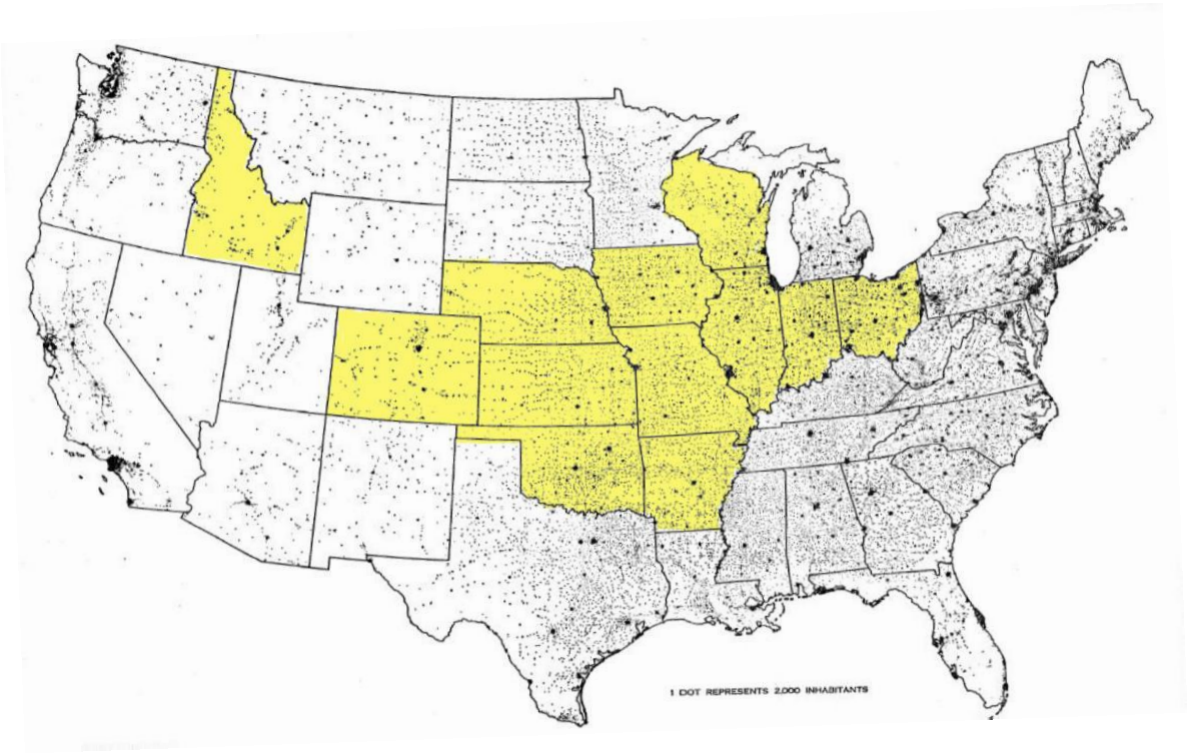

Figure 1: Highlighted Map of Selected States with Population Density, 1940. Source: U.S. Census Bureau

The outcome variable of this analysis is total amount of building permit value by city for 1934. Monthly building permit values from Dun & Bradstreet's review were summed to create the total building permit value for the year. Cities totaled on average $885,138 of building expenditures, while the compound aggregate growth rate over 1934 was, on average, 9.47%. This represents a positive level of city growth during one of the worst economic crises in the history of the country. The raw data for the outcome variable as well as selected independent variables can be found in Table 4 in the appendix and is useful in order to gain some context on cities included in this study.

Summary statistics for the outcome variable as well as all independent variables can be found in Table 1 below, and provide an interesting overview of the structure of the U.S. banking system and the state of municipal development during the time period.

Variable	Mean	Standard Deviation	Minimum	Maximum
Total Building Permit Values	881,486.8	1047151	41315	5332824
Growth Rate (Jan.-Nov., 1934)	0.095	0.111	-0.159	0.396
MCLINKS	26.33	19.94	1	80
LINKS	55.26	36.58	2	157
POP	148,565	211,392.6	517	1,201,455
BANKS	15.13	10.8	1	47
ASSETS	$1.12E^{08}$	$1.9E^{08}$	510,910	$1.20E^{09}$
MKTSHR	.351	.148	.15	1

Table 1: Summary Statistics

The variable MCLINKS is the total number of correspondents located in New York City or Chicago, or "money center" banks, that each city was linked to. It was chosen as a measurement of a city's exposure to the "pyramid structure" of the Federal Reserve system, and also as a measure of a city's access to capital in those money centers. Each city had an average of 26 linkages to U.S. money centers, though some had as few as one while others had as many as 80, indicating a broad difference in levels of access to money-center capital between cities. The variable LINKS is the total number of correspondent linkages each city had, including money-center banks and non-money center banks. Total correspondent linkages was chosen as a way to measure a city's total access to geographic liquidity as well as the magnitude of counterclaims that could be made against the bank. Often times, a large proportion of a city's non-money center linkages were to banks in the

same state as the city. The average city had roughly 54 total linkages around the world. Again, though, there is a broad disparity between the most connected city with 157 correspondents, and the least connected with only two. The variable POP is the population of each city in the sample in 1929. In some cases, city population data was not available, so county population was used as a rough estimate. The average city in the dataset had a population of 148,565, though that result was skewed by the presence of a few large cities with populations greater than one million. The variable BANKS is a discrete measurement of the total number of banking institutions operating within each city in the sample. It captures the strength of the locational network of an individual city as measured by the size of a city's local banking system. The average number of banks in these cities was almost 15, though clearly skewed by the town with one bank (in Boise, ID), and Kansas City, Missouri, with 47 banks.

The variable ASSETS is the sum of loans and discounts, bond securities, miscellaneous assets, and cash exchanges on each city bank's balance sheet. Average assets in these cities were $113,000,000. Finally, the variable MKTSHR is the calculation of each city's largest bank's total assets divided by the amount of total assets in the city. Interestingly, the largest bank in each city had an average of 35% market share by assets. This means that the largest bank in the average town controlled 35% of aggregate city assets, compared to 65% for all of the other banks in the city. This could be due to the quality of banking services provided by the largest town bank, in that the institution was more skillfully managed at allocated loanable capital than other banks in the town. One important caveat for this variable is that the banking data are for the year 1929, while the building permit expenditure data is from the year 1934. While this mismatch may be a potential source of complication, it allows

for the investigation of how the correspondent network before the banking crises of the 1930s affected the recovery of cities after the crises had ended.

V. Empirical Strategy

In order to examine the effect of the correspondent network on municipal growth, I estimate a linear regression model as follows.

$$y_i = x_i'\beta + \varepsilon \text{ for cities } i = 1, \dots, n \qquad (1)$$

where y_i is the total building permit expenditures in city i for the year 1934. The vector x_i includes variables for the interbank network, location network, market concentration, and city characteristics for each city. Specifically, the control variables are: city population (POP), total amount of bank assets in the city (ASSETS), number of banks in the city (BANKS), market share of the largest bank in the city (MKTSHR), total number of correspondent linkages to money centers (MCLINKS), total number of correspondent linkages (LINKS), and an interaction between total linkages and number of banks in the town (LINKBANK).

The particular covariates of interest are the total linkages, money center linkages, and number of banks in the town, because these variables capture both the interbank network and locational network. The interbank network is the previously described correspondent network, while the locational network can be defined as the structure of each individual town's banking system with regard to the number of banks in the town. The interplay between interbank and locational networks is one of the main features of this analysis, and the importance of both with regards to economic performance cannot be understated. Of interest is also the interaction variable which captures how locational networks modify interbank network effects on real economic activity. The hypothesis is such that banks located in small towns with few banks may experience higher contagion risk given their lack of local networks, whereas in larger cities with a larger locational network will

experience a boost to real economic output due to the locational support for the interstate banking network.

VI. Results

The model in Equation (1) is estimated by OLS. White's test for heteroscedasticity is performed and the results fail to reject the null hypothesis of constant variance, indicating that the typical OLS standard errors are appropriate. While the raw data is useful for understanding general characteristics of the banking system, many variables take large numbers. Since OLS is sensitive to outliers, log-transformations are implemented for a number of variables. The results of Equation (1) are explained below and can be found in Table 2 below.

	Coefficient	**Std. Error**	**R^2**
MCLINKS	.902**	.4318567	0.7358
LINKS	-.973**	.4207504	
BANKS	-1.952***	.6341808	
POP	-.066	.1149503	
ASSETS	.492***	.1497491	
MKTSHR	.326	1.046476	
LINKBANK	.404***	.1160988	
CONSTANT	6.83	2.078068	

Table 2: Results of the Primary Regression

A town's population (POP) does not have a statistically significant effect on total building permit expenditures, indicating that a town's population size has no effect on its real economy. Instead, it is the financial size of a town that impacts its real economy, as shown by the statistically significant effect of total assets (ASSETS) on building permit expenditures. All else equal, a one percent increase in the log of total assets is expected to

produce a 0.492% increase in building permit expenditures. This is evidence that it is the size of a town's banking system, rather than its population, that affects its municipal development. From a logical perspective, this makes sense. A town with a large population but a relatively small banking system will have fewer loanable funds than one with a small population but a large banking system. In reality, however, the above scenarios are rare.

While the effect of a town's financial size (measured in total assets) clearly does impact its municipal growth (measured in total building permit expenditures), it turns out that the composition of the market share of its system does not. MKTSHR does not have a statistically significant impact on building permit expenditures. This result indicates that the effect of market share is not statistically different from zero. This is counterintuitive to what was expected of this variable. It could be expected that, under the principles of good bank management, banks with larger market share are more efficient at allocating capital. Because the bank's management is good at their jobs, their bank steadily increases market share as the bank is continuously successful. In the case of this regression, however, this is not true.

The effect of MCLINKS on building expenditures is statistically significant at conventional levels. This indicates a positive effect of money center linkages on building expenditures. This could be an indication that linking to money center banks increases the amount of loanable capital, and increases the chances that the capital will be allocated to building expenditures. Meanwhile, total correspondent linkages (LINKS) has a statistically significant negative impact on city growth. This points to the inefficient allocation of capital and bank mismanagement by non-money center banks, as well as the fact that non-money center banks can serve as a channel of contagion. This contagion effect during times

of crisis has been proposed by Mitchener & Richardson, 2013; 2016, and Allen & Gale (2000), and now the effect has been corroborated in times of recovery as well. The effect of contagion will be more thoroughly investigated with the interaction variable.

There have been a number of studies into the effect of portfolio mismanagement in the role of bank failures. Esbitt (1986) finds that poorly-managed banks that failed in 1931, lending some credibility to the theory that poorly managed correspondent banks were partially responsible for the negative effect of increasing total correspondent linkages on total building permit expenditures. If a bank held claims against a failed institution, its deposits would be lost, and therefore unavailable for lending. This is a fairly robust explanation of why non-money center banks have a negative effect on building permit expenditures.

The interaction variable captures how locational networks modify correspondent network effects on real economic activity. In essence, the variable measures how the effect of correspondent networks on real economic activity is modified by the size of the banking system in each town (as measured by BANKS). It could be expected that towns with few banks may experience higher contagion risk given their lack of local networks, whereas larger cities with a larger locational network will experience a boost to real economic output due to the locational support for the interstate correspondent network. In order to separate the effects of total linkages and money center linkages, the derivative of building permit expenditures with respect to total linkages is taken, which results in

$$\frac{\Delta y}{\Delta total\ linkages} = -0.973 + \log(BANKS) * (.404). \qquad (2)$$

This can be interpreted as the effect that an additional one percent increase in non-money center linkages has on building permit values. -0.973 is the coefficient of LINKS and

represents the intercept for a town with one bank. 0.404 is the coefficient of the interaction term.

The effect of money center linkages on total building permit expenditures is:

$$Money\ Center\ Effect = -0.07 + \log(BANKS) * 0.404 \quad (3)$$

where -0.07 is the sum of the coefficients on MCLINKS and LINKS (as an additional money center link also increases total linkages) and 0.404 is the coefficient of the interaction. The magnitude of this effect for various town sizes can be found in Table 3 below.

Number of Banks in the Town	Money Center Link Effect	Non-money Center Effect
1 (min)	-0.07%	-0.973%
15	0.405%	-0.498%
47 (max)	0.606%	-0.297%

Table 3: Decomposed Network Effects

For small towns, money center linkages have a negative effect on building permit expenditures until a banking system size of three or more. After three banks the effect becomes positive, meaning that an additional money center correspondent in a town's network has a positive effect on city growth as measured by total yearly building expenditures. As there is only one city in the sample with fewer than three banks, this effect can be disregarded, and the results interpreted as money-center links have a positive effect on real economic activity and building permit values. There is the presence of an increasing marginal effect of adding a money-center bank to a town's correspondent network. For Kansas City, MO, the city with the most number of banks in its locational network, each

additional increase of 1% in money center banks yields a 0.606% increase in total building permit value. The source of this effect is explained in Calomiris and Mason (2003), which indicates that banks with interbank deposits at reserve city banks had greater liquidity in times of crisis, which enabled them to operate more normally than banks without deposits at reserve cities. Because the time horizon investigated by this paper falls towards the end of a crisis period and the beginning of the recovery, it would appear that larger cities with more money center correspondents had a better liquidity position than smaller cities with money center connections and were therefore better equipped to handle increased withdrawal volume over time. This effect shows that cities of any size need locational support as well as strong money-center connections in order to contain the contagion effect that is propagated by non-money center banks.

In regard to the non-money center effect, Equation (2) derived above shows a marginally decreasing negative effect of adding non-money center banks to a town's correspondent network. Table 3 shows that at all banking system sizes, the marginal effect of adding a non-money center bank to the network is negative, meaning that a one percent increase in non-money center banks decreases total building permit expenditures in a town. For the smallest town with only one bank, a one percent increase in non-money center banks is expected to decrease total building expenditures by 1.08%. For a mid-size town with 15 banks, the addition of a non-money center bank is expected to decrease total building expenditures by 0.53%. For the largest town, whose local network contains 47 banks, building permit values are expected to decrease by 0.336% for each non-money center bank added.

Calomiris & Mason (2003) provide a partial explanation for this effect. They find that failures of nearby banks increase the probability that a bank fails, showing the impact of the locational network. At the same time, Mitchener & Richardson (2016) provide support for the impact of the correspondent network. When a correspondent is added, there is additional withdrawal pressure in times of crisis. This pressure is greater on smaller banking systems, which typically have less liquidity than larger systems with more robust balance sheets. The lack of a strong locational network causes greater stress on small systems than it would on larger systems. Therefore, it makes sense that the marginal effect diminishes as the town's banking system gets larger. The withdrawal pressure from downstream correspondents is less intense and less damaging to larger systems than it is to small systems that have less ability to rely on their locational networks in times of need. The above theory might also help explain why the effect of non-money center additions to a network is negative. Downstream withdrawal pressures from non-money center correspondents will be much greater than withdrawal pressures from money center correspondents. This is a fundamental aspect of the pyramid structure of the Federal Reserve system, wherein withdrawal pressure is greatest at the bottom of the period. As such, when small towns need liquidity, they look directly upstream at slightly larger correspondents to provide that liquidity. This means that as a town adds a non-money center correspondent, they are increasing the riskiness of its own banking system via future or expected withdrawal pressures.

These results support the conclusion that the correspondent banking network had both positive and negative effects on the real economy. For cities with a large enough locational network, additional money center correspondents provided a boost to municipal growth,

while additional non-money center correspondents were shown to have a negative impact on growth. Cities with a small locational network also received a boost in growth from additional money center correspondents, although in a lesser magnitude than large cities. The growth of small cities was also impeded by the additional of non-money center correspondents, and to a greater degree than in large cities. This is evidence that both good and bad network effects are observable in the period after the 1930s banking crises, and provide insights that can be useful to policymakers in the modern era.

VII. Conclusion

This paper addresses the impact of the correspondent network on the real economy. For the first time in history, digitized, bank-level data in the Great Depression era are available, which provides an invaluable resource for the analysis of the correspondent network. This paper's main goal was to provide some measurement of the effect of the correspondent network on the real economy in order to satisfy questions regarding how the primary structure of the banking system during the Great Depression era affected the real economy after the Great Depression. Data sources used in the analysis include Rand McNally's Bankers' Directory, which was used to collect banking system data including bank correspondents, bank balance sheets, and population information for 1929, as well as Dun & Bradstreet's Review, from which monthly building expenditures were taken and used to construct total building expenditures for 1934.

I use a linear regression model of several variables (including money center linkages, total linkages, town population, number of banks in a town, total assets in a town, market share of the largest bank in the town, and the interaction between total linkages and number of banks) on total building permit expenditures per town in order to measure the correspondent network effect on the real economy. When addressing the nature of the impact of the correspondent network on the real economy, a few observations can be extracted from the regression analysis. Towns with small locational networks that link to money-center banks will see city growth benefit as a result, but the magnitude of the benefit is far less than that realized by cities with large locational networks. Overall, establishing new money-center correspondents can be viewed as a definite benefit to economic growth in municipalities, though the same cannot be said for non-money center correspondents.

Cities with small locational networks experience a greater decline in marginal building expenditures when a non-money center correspondent is added than cities with large locational networks do, though both large and small cities experience negative effects. The cause of this can be found in the strength and size of a town's locational network. Total town assets had a positive effect on total building expenditures, indicating that a town with a large locational network that contains a large pool of assets will see higher building permit values than a town with a small locational network and a small pool of assets. A large locational network signifies that banks in the town have more local support in times of crisis, while a small locational network is more vulnerable to the financial health of large money center correspondents, a claim supported by Mitchener & Richardson (2016). The modified effect of locational networks on the impact of interbank networks on the real economy shows that a strong interstate correspondent network must be supported by a strong locational network.

These results can be applied to modern thinking on network effects and contagion and used to offer different types of assistance to towns with different circumstances. The revival of local economies was a major focal point after the great recession, and this analysis allows for the effect of the local banking system to be taken into account when determining stimulus and recovery measures. Broadly, this analysis signals the need for present-day analysis of the effect of the banking system on the real economy, which is a question that could shape municipal development for generations to come. Similar methods could be used to quantify the impact of the shadow banking system on the real economy, as well as measure how the failure of a systemically important financial institution might affect local economies. It can be used provide targeted support to individual banks and

communities based on the unique characteristics of each situation. If it is possible to better understand how the financial system impacts changes in the real economy, it is possible to build a framework to guide how that system develops, in order to provide a better-managed and more prosperous growth regime in the future.

Appendix

City	State	34 Building Permit Expenditur	Growth Rate	MCLINKS	LINKS	BANKS
Grand Rapids	OH	$435,295.00	11%	1	2	1
Huntington	IN	$220,200.00	14%	6	11	3
Fort Smith	AR	$208,022.00	3%	5	18	4
Muskogee	OK	$41,315.00	-10%	5	16	4
Boise	ID	$320,443.00	20%	7	32	4
Pueblo	CO	$156,565.00	5%	16	46	5
Lima	OH	$116,094.00	36%	7	21	5
Dubuque	IA	$149,178.00	17%	12	19	6
Newark	OH	$61,935.00	8%	6	20	6
Springfield	OH	$189,484.00	36%	5	13	6
Racine	WI	$155,325.00	0%	14	24	7
Zanesville	OH	$60,648.00	15%	9	28	7
Hammond	IN	$235,925.00	-16%	14	21	7
Superior	WI	$300,401.00	40%	11	25	8
Colorado Springs	CO	$545,080.00	18%	17	44	8
Green Bay	WI	$355,649.00	10%	18	30	9
Terre Haute	IN	$687,709.00	13%	17	30	9
Canton	OH	$368,164.00	15%	22	53	11
Oklahoma City	OK	$1,625,146.00	-1%	21	62	12
Cedar Rapids	IA	$1,415,974.00	5%	26	44	12
Columbus	OH	$819,750.00	12%	29	61	12
Dayton	OH	$802,904.00	-1%	13	31	12
Madison	WI	$476,119.00	19%	23	39	13
Akron	OH	$931,753.00	6%	26	66	13
Little Rock	AR	$386,282.00	11%	30	89	14
Youngstown	OH	$430,526.00	16%	19	46	14
Toledo	OH	$2,368,425.00	3%	30	65	15
Gary	IN	$181,996.00	-7%	24	37	15
Lincoln	NE	$469,546.00	0%	21	44	16
Fort Wayne	IN	$360,039.00	-4%	32	58	16
Tulsa	OK	$942,423.00	-8%	27	54	17
Sioux City	IA	$1,085,618.00	21%	36	70	17
Evansville	IN	$818,082.00	4%	28	53	17
South Bend	IN	$221,375.00	10%	37	48	18
Davenport	IA	$321,589.00	14%	24	60	19
Denver	CO	$2,518,524.00	11%	47	105	19
Kansas City	KS	$260,128.00	-4%	24	76	20
Des Moines	IA	$1,119,549.00	19%	33	66	26
Omaha	NE	$1,917,867.00	5%	52	86	26
Wichita	KS	$642,256.00	9%	25	79	26
Cleveland	OH	$2,902,925.00	9%	65	138	26
Topeka	KS	$299,715.00	11%	26	71	27
Cincinnati	OH	$5,332,824.00	8%	68	124	27
Milwaukee	WI	$2,707,892.00	17%	73	132	45
Indianapolis	IN	$2,830,533.00	13%	80	128	45
Kansas City	MO	$1,751,200.00	5%	80	157	47

Table 4: Raw data, ordered by number of banks in the city

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