THE ECONOMICS OF MARKET COORDINATION FOR THE PRE-FED CHECK-CLEARING SYSTEM: A PEEK INTO THE BLOOMINGTON (IL) NODE

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Abstract

On the basis of anecdotes centered on the alleged "circuitous routing of checks," researchers focusing on the pre-Fed check-clearing system have usually argued that it was inefficient. In this paper we study a 1910 check remittance register from the State National Bank of Bloomington, Illinois—we dissect the way the bank forwarded checks to various destinations for clearing and collection. We find that the bank followed an orderly process of check remittance according to which checks tended to move in the "right direction." This casts doubts on the alleged pervasiveness of cycling and circuitous routing of an extreme nature in the pre-Fed check-clearing process.

Keywords: Monetary systems; Pre-Fed check-clearing system; 19th-century US banking system; exchange charges; the shortest-path problem

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I. INTRODUCTION

This paper provides an example of how institutions develop to solve complex coordination problems among businesses. The example is the decentralized check-clearing system before the advent of the Federal Reserve System in the United States. We begin with the history of an interpretation of the pre-Fed system that has influenced economic and policy thinking on this subject.

Researchers who have studied the process of check clearing and collection in the pre-Federal Reserve (Fed) period have commonly described it as inefficient. Walter Spahr's *The Clearing and Collection of Checks*, published in 1926, shaped the standard view on the pre-Fed check-clearing process. Spahr opined that the pre-Fed check system had a number of "defects," including "excessive charges" and "indirect routing of checks to avoid remittance charges" (Spahr, 1926, p. 101). The "excessive charges" defect referred to charges that some banks assessed when they remitted funds in payment for checks that had been drawn on them and that other banks presented for collection. It seems that Spahr considered these charges to be excessive because, in his view, they were arbitrary and unrelated to "the actual element of cost" (Spahr, 1926, pp. 102-103). In his view, these excessive charges generated what we would describe as an inefficient outcome—in order to avoid them, banks usually sent checks for collection on "long, devious and circuitous routes" (Spahr, 1926, p. 103) In other words, too many resources were allegedly spent in clearing and collecting checks. According to Spahr, "circuitous routing" of checks originated because banks made agreements with each other to remit through the mail at par, so that "it was possible to find routes open in which there were no remittance charges" (Spahr, 1926, p. 103).

A recent literature (Weinberg, 1977; Lacker et al., 1999) has questioned this traditional view of the pre-Fed check system and of the Fed intervention. This literature finds little persuasive evidence of the existence of a market failure that prevented banks from creating the private equivalent of the Fed system by themselves if the Fed system was indeed more efficient: "Under this alternative view, pre-Fed check collection arrangements were relatively

efficient, and the complaints many observers voiced about the excessive costs of the pre-Fed system should be understood as complaints about the distribution of the system's costs rather than about its aggregate costs" (Lacker et al., 1999, p. 2).

We analyze a portion of the pre-Fed check-clearing and collection process through the historical accounting records of a financial institution, the State National Bank of Bloomington, Illinois. We focus on the bank's remittance records in 1910, a few years before the founding of the Fed, and reveal the existence of a carefully structured, three-tier network for out-of-town check clearing and collection. We describe how State National forwarded items for collection to cities and towns located in the various layers of the network and argue that no obvious waste of resources is evident in this process.

Our paper is organized as follows. In Section II we present a summary of the conflicting views on the efficiency of the pre-Fed check-clearing system. In Section III we describe our empirical findings and explain how one "node" of the pre-Fed check-clearing system functioned. In Section IV we assess the degree to which there were significant and obvious inefficiencies in the pre-Fed system. In Section V we discuss the extent to which banks had incentives to avoid (or to encourage) circuitous routing, and the extent to which the Bloomington check network that we study in this paper was truly representative of a larger phenomenon. Section VI presents our conclusions.

II. THE HISTORIOGRAPHY OF THE PRE-FED SYSTEM

We present a brief literature review before laying out our historical findings. This helps put our paper in perspective.

A. The "old" literature

The check-clearing literature of the early 20th century has three main exponents: Cannon (1900), Hallock (1903), and Spahr (1926). They agree in pointing out that the pre-Fed check clearing system was inefficient. However, there are important differences between Canon, on the one hand, and Hallock and Spahr, on the other.

In Cannon's 1900 book on clearinghouses—the original source for the traditional view of the pre-Fed check-clearing system—there is an allegation of circuitous routing, but the indirect routing is of a relatively "mild" nature. Cannon presents an example of what he considers to be the "average" country check, a check drawn on Massillon, Ohio, and deposited in New York City, that goes through Cleveland before reaching its final destination. According to Cannon, while the "typical" country check does generate a waste of resources, it involves no cycling (i.e., the check does not pass two or more times through the same city or town before reaching the paying bank). Furthermore, avoidance of exchange charges does not seem to be the reason for indirect routing—in fact, banks pay exchange charges at every step of the way and the depositing customer apparently pays charges at the beginning of the process. The check follows an indirect route because banks bundle checks headed in the same direction and send these bundles to established correspondents—this is their approach to solving the interconnection problem (Cannon, 1910, pp. 64-74).

This "soft" view of exchange charges and indirect routing starts undergoing a transformation only a few years after the publication of Cannon's book. James Hallock's 1903 book on the clearing of country checks presents the Massillon-check example once again, but this time buried among a collection of "strong" examples of circuitous routing. What for Cannon in 1900 was apparently an extreme version of indirect routing, the famous Hoboken (New Jersey) check that traveled 1,500 miles before reaching its destination in Sag Harbor (New York), tends to become the typical country check in Hallock's book. In Hallock's view, furthermore, avoidance of exchange charges was at the root of basically every episode of circuitous routing of checks (Hallock, 1903, pp. 11ff).

Finally, the Hallock view of exchange charges and circuitous routing becomes the "official" view after James Spahr publishes his book on the clearing and collection of checks in 1926. Spahr has read both Cannon and Hallock but clearly draws on Hallock much more than he does on Cannon. In fact, Spahr does not even mention the Massillon-check example that was the "typical" country check in Cannon's account. In Spahr, who writes several years after the setting up of the Fed's check-clearing system, the pre-Fed check-clearing process is synonymous with circuitous routing of the "extreme" kind—all of Spahr's examples involve

cycling. Interestingly enough, Spahr's supreme example of circuitous routing, a check drawn on North Birmingham, Alabama, that is deposited in Birmingham only a few miles away and travels 4,500 miles before coming back to Birmingham and reaching its final destination, is taken directly from a 1923 Federal Reserve pamphlet. Furthermore, the source of circuitous routing in Spahr's interpretation is, just as in Hallock's book, the existence of excessive exchange charges (Spahr, 1926, pp. 103ff).

B. The "new" literature

The more recent literature is far from homogeneous in its assessment of the pre-Fed check-clearing system. Lacker, Walker, and Weinberg (1999), for example, offer a revisionist interpretation of the Fed's entry into check clearing and of the system that the Fed attempted to displace. They do not find conclusive evidence of inefficiencies in the pre-Fed check-clearing system. They suggest that the complaints many observers voiced at the time about that system derived from dissatisfaction with the distribution of the system's costs rather with the aggregate level of those costs. In their view, the Fed's intervention in the check-clearing network produced a reallocation of the common costs of check clearing "away from collecting banks and toward small country banks and taxpayers" (Lacker, Walker, and Weinberg, 1999, p. 2).

In another camp, Gilbert (1998) raises the question as to whether the founding of the Fed improved the efficiency of the US payment system and concludes that it did. He acknowledges that the pre-Fed networks of correspondent banks "may have been efficient under the existing constraints on bank behavior and legal relationships between collecting and paying banks." In his view, however, this is not mutually exclusive with the idea that the system could be made "more efficient" through regulatory reform or government intervention (Gilbert, 1998, p. 125, note 6). One of the main pieces of evidence he presents to support his view is that, during the period when the Fed intervened in the check-clearing process, banks chartered in states that did not reduce their reserve requirements nonetheless decreased their cash to total assets ratios. He also points out that banks chose to use the Fed system for clearing checks even though they could have continued to use the old network (Gilbert, 1988, p. 137).

In a very recent paper, James and Weiman (2006) look at the evolution of correspondent banking networks in the pre-Fed period. They explain the lagged spatial diffusion of checks in light of the development of centralized payment institutions that coordinated transactions among many different banks often located very far away from one another. The key such institutions were large correspondent banks, especially those based in New York City. Based on an estimate of the "one-way mail time" for check shipments from New York banks to those located in other cities, they conclude that the highly cited cases of circuitous routing of checks were most likely the exception rather than the rule. They also point out that the Fed improved the system not because it introduced a new technology but rather because it "surmounted a fundamental organizational (…) barrier." More specifically, the Fed solved a coordination problem between numerous and geographically dispersed banks—through its clearinghouses, it concentrated key payment information and played the role of a "standards coordinator" (James and Weiman, 2006, p. 27).

C. Our paper's contribution

To the best of our knowledge, neither the "old" nor the "new" literature have made a systematic attempt to determine the extent to which circuitous-routing episodes like those described in Spahr (1926) were the exception or the rule. In his comment on Gilbert's (1998) contribution, James points out that critics of the pre-Fed system have tended to cite time and again the same examples of circuitous routing (James, 1998, p. 144). He further writes: "one might prefer to remain a bit agnostic" as to the gross inefficiencies of the system.

Our paper is an attempt to take a first step beyond this recommended agnosticism. Rather than relying on the anecdotes often cited in the literature, we take a peek at the check-clearing system through the accounting records of an Illinois bank. Our deep look into the system suggests that, as James and Weiman (2006) conclude on the basis of a completely different approach, the indirect-routing episodes (at the very least, those of an extreme nature) were likely the exception rather than the rule.

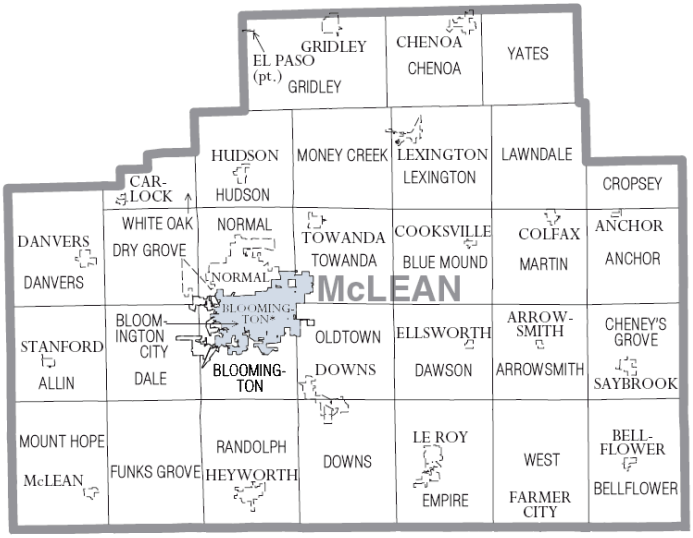
III. THE BLOOMINGTON NODE OF THE CHECK NETWORK

We analyzed check-clearing-related bank records of the early twentieth century directly. In fact, one of our main objectives was to gauge the extent to which the descriptions of check processing that we find particularly in the early commentators are truly representative of check clearing and collection in the pre-Fed world. We developed an image of one node (Bloomington, Illinois) of the check network through the study of the remittance records of the State National Bank of Bloomington.[2] See Figures 1 and 2 for maps of the relevant locations.

[2] Researching this one node was possible through a fortuitous find of extant records. After conducting research on 19th and early 20th century banking documents at various libraries, we have reached the preliminary conclusion that not many of these remittance records have been conserved, at least in Illinois.

Figure 1. Map of Illinois

Figure 2. Map of the area surrounding Bloomington, Illinois



In the early twentieth century Bloomington was a reasonably large city that served as the seat of McLean County, the largest county in the state of Illinois (US Bureau of the Census, 1913, p. 570). By 1910, Illinois had 242 cities and the distribution of the state's urban population was extremely skewed. Chicago, the largest city, had 2.2 million people. The next three, Peoria, East St. Louis, and Springfield, had roughly between 52,000 and 67,000 people. Bloomington and 7 other cities (Aurora, Danville, Decatur, Elgin, Joliet, Quincy, and Rockford) made up the next urban tier with populations between 25,000 and 50,000 (US Bureau of the Census, 1913, pp. 568-569).

McLean County was not only the largest in the state of Illinois but also one of the top counties in the nation in terms of agricultural production, focusing mostly on corn and oats. The value of all crops produced in McLean in 1910 (about $12.8 million) was the highest in the state. Farmers in McLean tended to have more land and more valuable land than the average farmer in the state—an acre of land sold, on average, for about $95 in Illinois but it sold for about $172 in McLean County (US Bureau of the Census, 1913, tables 1-4).

Among the 28 Illinois cities with populations between 10,000 and 50,000 people, Bloomington ranked 8th in terms of the number of industrial establishments—in 1910 there 107 such establishments in the city, employing roughly 2,500 people. The value of Bloomington's industrial production in 1910 (about $4.8 million) was equivalent to about 37.5 percent of its crop production (US Bureau of the Census, 1913, Table III, pp. 748-749).

By 1910, Bloomington had about 26,000 people, 8 banks, and a clearinghouse (US Bureau of the Census, 1913, p. 569; Rand McNally, 1910, Illinois section). The Bloomington banks at this time were Corn Belt Bank (with about $1.0 million in deposits), First National Bank ($900,000), German-American Bank ($870,000), McLean County Bank ($425,000), People's Bank ($1.2 million), State National Bank ($830,000), State Trust and Savings Bank ($285,000), and Third National Bank ($660,000) (Rand McNally, 1910, Illinois section).

The State National Bank of Bloomington (hereinafter, State National) was founded in 1878. In 1910, it was the fifth largest bank in Bloomington in terms of the volume of deposits. We checked the records of the Bloomington clearinghouse and found that State National was a

member of the Bloomington clearinghouse and met with other member banks periodically to exchange (or net-clear) checks drawn on each other.[3] By 1910, only one bank was not a member of the Bloomington clearinghouse—State Trust and Savings Bank, founded in 1905.

Our research is based on the original accounting records of State National, stored in the archives of the University of Illinois at Urbana-Champaign. We focused on the so-called "remittance register" for 1910, the only check-remittance ledger that has been preserved from all of State National's accounting documents.[4] The remittance registers of a bank were record books that were used to keep track of all the checks that had arrived to, or had been deposited at, that particular bank and that needed to be forwarded somewhere else for collection. Although having remittance registers for only one year precludes us from studying the dynamics of check clearing over time, we are still able to develop a picture of the bank's check clearing and collection activities at a given point in time in the pre-Fed world. The advantage of this approach (over and against a record based on anecdotal episodes) is that it allows us to construct a view of common banking practice at the time. In other words, we can develop a systematic understanding of the regular business of out-of-town check clearing and collection rather than relying on some isolated episodes with potentially exceptional characteristics.

A. Introduction to the Analysis of the Remittance Register

The bank's remittance register for 1910 contains information on checks remitted for collection between March 19, 1910 and June 14, 1910. Given that checks were remitted regularly between Monday and Saturday, the register contains information on a total of 74 days of remittances. We first used a random-number generator to draw a random sample of remittance days in order to explore whether there were daily, weekly, or seasonal patterns in terms of the volume of checks remitted. We did not find any. The mean number of checks remitted in any given day was about 60. March 28 and June 3 were the two days with the largest volume of checks remitted. March 28, a Monday, showed a total of 90 checks remitted

[3] The records of the Bloomington clearinghouse are located in the archives of the University of Illinois at Urbana-Champaign.

[4] There is also a remittance register for early 1911 but it does not contain information on the place where the checks were remitted for collection.

and so did June 3, a Friday. Furthermore, April 21, a Wednesday, also had a relatively large number (75). March 28 was, of course, toward the end of the month in the early spring. June 3 was toward the beginning of the month in the late spring. Given that nothing at this stage led us to believe that remittances were concentrated on specific days of the week, or weeks of the month, or months within the ones covered in the register, we drew another random sample (10 percent of all days) and studied the remittance patterns from this sample.

A couple of caveats are in order before proceeding. Thus far, we have referred to the bank in question as State National Bank, even though the title on the first page of the remittance register that we examined actually reads "Third National Bank." (The university archivist did not know at what point in time this title had been added to the register.) We believe the register belongs to State National for a number of reasons. First, we studied the checks that other banks in Bloomington deposited at the bank to which the register belongs and found that Third National Bank accounted for almost 25 percent of these checks. It would be very strange if the record belonged to Third National and Third National showed up as an endorser, as it does. Second, we found that, among the checks that other Bloomington banks deposited at the bank to which the register belongs, First National Bank accounted for about 21 percent of all checks, German American Bank accounted for about 2 percent, McLean County Bank accounted for about 42 percent, People's Bank accounted for about 2 percent, State Trust and Savings Bank accounted for about 2 percent, and Third National Bank accounted for about 25 percent. In other words, all banks in Bloomington were sending checks for out-of-town collection to the bank to which the register belongs with the exception of State National Bank and Corn Belt Bank. The conclusion we drew was straightforward—the remittance register belonged to either State National Bank or Corn Belt Bank. Finally, according to the 1910 *Blue Book*, the Corn Belt Bank of Bloomington had the American Trust and Savings Bank as its correspondent in Chicago, whereas State National had Corn Exchange National and National City Bank as its correspondents in Chicago (Rand McNally, 1910, Illinois section). We thus studied all the checks in the sample of the 1910 remittance register that reached the bank through Chicago, and we found that Corn Exchange National and National City Bank

combined accounted for all of them. The conclusion was obvious—the record must have belonged to the State National Bank of Bloomington.[5]

We should also note that discerning the check-flow patterns from a 1910 accounting document is essentially detective work. The pages that follow are based on a careful analysis and interpretation of the records in light of information contained in the banking documents of the time. One particularly helpful source was the 1910 *Blue Book*, which contains information on the banks that existed at the time in a wide variety of cities and towns (Rand McNally, 1910, Illinois section). Here we clearly state the assumptions that guide our interpretation of the remittance register.

The layout of the remittance register is as follows, from left to right (see Appendix A for a picture of a page from the remittance register). The first column reads "date of remittance." In general, there is no date there, however. There is a geographic location, which we interpret to be the place to which checks were remitted on a specific day. In fact, only 10 geographic locations appear in this column: Arrowsmith (IL), Danvers (IL), Heyworth (IL), McLean (IL), Pontiac (IL), Saybrook (IL), Towanda (IL), Peoria (IL), St. Louis (MO), and NYC (NY). The date of the remittance is usually recorded at the top of the page. There is no information recorded in the next two columns, "Our No." and "Date of Item." The fourth column reads "Their No. or Date of Letter." This column usually contains either an integer (e.g., 1213) or a date (e.g. 3-12). We interpret this date to be the day when the bank received the letter enclosing the check to be remitted somewhere else.

The next three columns read "Drawer," "Where Drawn," and "Drawee." We interpret the "drawer" to be the person or institution making the payment, the "drawee" to be the person or institution getting paid with a check, and "where drawn" to be the geographic location of the bank of which the "drawer" was a customer. The next two columns read "Endorser" and "Where Payable." We interpret the "endorser" to be the person or institution through which the check in question reached State National in Bloomington. The "where payable" column usually

[5] In conversations that we had with the archivists in Urbana-Champaign and Springfield, they suggested that often bank registers like the one we used in our investigation are catalogued according to what the archivist at the time considers to be the most likely source. Therefore, it is not strange to find an accounting document that has been classified as belonging to a bank when in fact it belonged to a different one.

contains the name of a bank—we interpret this to be the bank that was ultimately responsible for paying the check.

There is then a column that reads "To Whom Sent," with no information whatsoever. There is an "Amount" column that records the amount of the check. There is then a column that reads "Exge.," possibly for recording exchange charges, with no information at all. There is finally a "When Acknowledged" column, left blank, and a "Remarks" column containing an amount that is the sum of all checks remitted to a specific location on a specific date.

B. Sources of Out-of-Town Checks

In the case of State National, checks came from three different sources. First, customers of State National had been paid with out-of-town checks and had deposited those checks at the bank for collection. In the remittance record these checks have the name of a bank customer in the "endorser" column. If there is no endorser, the name of the customer appears in the "drawee" column.

Second, other Bloomington banks had customers who, in turn, had been paid with out-of-town checks. These customers had deposited these checks at their banks for collection and these banks had forwarded these checks to State National. In the remittance record these checks have the name of another Bloomington bank, for example the Third National Bank, in the "endorser" column.

Third, banks in other towns or cities had customers who, in turn, had been paid with out-of-town checks. The customers had deposited the checks at the local banks and these had then forwarded the checks to State National so that this bank would take care of the collection process. In the remittance records these checks have the name of an out-of-town bank in the "endorser" column. Often the "endorser" bank is located in a neighboring town, like Danvers or Pontiac. But a non-trivial number of checks reached State National from Chicago and Peoria as well.[6]

[6] Recall that we see in the remittance register only those checks that are to be collected out of town. Checks that are payable in Bloomington are most likely recorded in a different book.

Of all the checks that State National received in 1910 and that were recorded in the remittance register, about 70 percent were directly deposited by individual or corporate customers of State National that resided in Bloomington; about 13 percent came from other Bloomington banks; and the remaining 17 percent were forwarded to State National from banks in other cities or towns. Out of all the checks that reached State National from banks located in towns or cities other than Bloomington, 44 percent came from Chicago, 7 percent came from Peoria, and the remaining 49 percent came from seven towns, six of them very small, located no more than 40 miles away from Bloomington. These towns were Arrowsmith, Danvers, Heyworth, McLean, Pontiac, Saybrook, and Towanda. Among these towns, Pontiac was somewhat special because, unlike the others, it was not located in McLean County. In fact, Pontiac was the seat of the neighboring county of Livingston. With about 7,500 people, it was also considerably larger than the other six towns.

In short, most of the checks that reached State National for out-of-town remittance came from its own local customers. But a sizable proportion came also from other Bloomington banks or from banks outside Bloomington. State National was thus acting as a forwarding/collecting agent for its own city customers, for customers of other banks in the city, and for customers of banks situated in other cities or towns.

C. Forwarding Out-of-Town Checks for Collection

Where were all these checks drawn upon? The checks that reached State National were drawn on banks located all over the country, from Denver to Omaha to NYC. This was mostly a testimony to the fact that either Bloomington residents (individual or corporate) or residents of towns around Bloomington were conducting business with individuals or companies located across the nation.[7]

It is important to note that sometimes checks were drawn on one location but payable at another. We found checks that were drawn on, for example, a small town in Illinois but payable in St. Louis. We also found a significant number of checks that were drawn on various mid-sized cities all over the country but payable in NYC. This suggests that banks and merchants in

[7] These are also fascinating records with which to study economic trade in the United States in that era.

various parts of the country held funds on reserve at banks in large financial centers, like St. Louis and especially NYC, and used these funds to make long-distance payments.

1. Local Tier

State National's approach to forwarding/collecting out-of-town checks had three tiers. First, there were checks drawn on, and payable at, the seven neighboring towns mentioned above (Arrowsmith, Danvers, Heyworth, McLean, Pontiac, Saybrook, and Towanda). When State National received checks drawn on, and payable at, a bank located in one of these towns, it sent the check directly to that bank (if there was only one bank in town), or to one of the banks in the relevant town (if there were more than one bank). At that time, there was one bank in Danvers, one in McLean, and one in Towanda. There were two banks in Arrowsmith, two in Heyworth, and two in Saybrook. Pontiac, finally, had four banks (Rand McNally, 1910, Illinois section). This constituted what we would call the "local" tier of State National's clearing and collection network. It represented 47 percent of all checks on our sample.

2. Regional Tier

Second, there were checks drawn on, and payable at, banks located in other places in Illinois. State National remitted most of these checks to Peoria (most likely to the Commercial German National Bank) for clearing and collection. This constituted what we would call the "regional" tier of State National's clearing and collection network. It represented about 34 percent of all checks on the 1910 remittance record that we examined.[8]

[8] We found checks drawn on the following towns (counties in parentheses): Arcola (Douglas), Batavia (Kane), Bellflower (McLean), Belvidere (Boone), Cabery (Ford), Chestnut (Logan), Clinton (DeWitt), Decatur (Macon), Deer Creek (Tazewell), Delavan (Tazewell), Dewey (Champaign), Dwight (Livingston), El Paso (Woodford), Ellsworth (McLean), Essex (Kankakee), Farmer City (DeWitt), Fisher (Champaign), Galesburg (Knox), Gibson City (Ford), Herscher (Kankakee), Hillsboro (Montgomery), Hoopeston (Vermilion), Jerseyville (Jersey), Joliet (Will), Kankakee (Kankakee), Kirkwood (Warren), La Rose (Marshall), Lexington (McLean), Lincoln (Logan), Mackinaw (Tazewell), Macomb (McDonough), Magnolia (Putnam), Mahomet (Champaign), Minonk (Woodford), Newton (Jasper), Nokomics (Montgomery), Paxton (Ford), Peoria (Peoria), Petersburg (Menard), Rankin (Vermilion), Richmond (McHenry), Rock Island (Rock Island), Springfield (Sangamon), Stanford (McLean), Staunton (Macoupin), Streator (La Salle), Tremont (Tazewell), Tuscola (Douglas), Urbana (Champaign), Vandalia (Fayette), Varna (Marshall), Virden (Macoupin), Wapella (DeWitt), and Williamsfield (Knox). In most cases, there is only one check in the sample drawn on each location, although the locations closer to Bloomington show, as expected, more checks drawn upon them.

Among these checks, there were some, although not many, drawn on banks located in towns (Bellflower, Ellsworth, Lexington, and Stanford, for example) that were in McLean County. These checks represented roughly 16 percent of all checks belonging to the "regional" tier.

Sometimes State National remitted to Peoria checks drawn on locations outside of Illinois. In exploratory research we found, for example, a check drawn on Muncie, Indiana that State National remitted to Peoria. An analysis of the record revealed that the Muncie check, and checks of this nature more generally, were usually payable at a Peoria bank. Out of all the checks sent to Peoria, about 17 percent were payable in Peoria.

Furthermore, we also found a few checks drawn on one of the seven towns belonging to the "local tier" that were sent to Peoria. A study of the relevant records, however, revealed that these checks were payable at a Peoria bank.

3. National Tier

Finally, there were checks drawn on banks located in towns and cities mostly outside of Illinois. State National remitted these checks to banks in St. Louis, New York, and Chicago. We, however, did not find checks remitted to Chicago in the remittance register we examined.[9] According to the 1910 *Blue Book*, State National remitted checks to the Corn Exchange Bank and the National City Bank in Chicago, the Liberty National Bank in New York, and the Central National Bank of St. Louis (Rand McNally, 1910, Illinois section). As far as the checks that we found in the 1910 remittance register are concerned, namely those remitted to NYC and St. Louis, they made up what we would call the "national" tier of State National's clearing and collection network. This tier represented about 19 percent of all checks on our check sample.

State National remitted various kinds of checks to St. Louis and NYC. First, all checks remitted to NYC were drawn on locations mostly outside of Illinois but exclusively payable at NYC banks. This suggests that many merchants, as well as banks, held correspondent accounts at NYC banks, which they used to make long-distance payments. So, for example, an

[9] A different register might have existed for checks remitted to Chicago.

individual or company from Omaha, Nebraska, would purchase a bill of goods from a Bloomington merchant. He would give the Bloomington payee a check drawn on an Omaha, Nebraska, bank but payable at a bank in NYC. The Bloomington merchant would deposit the check at State National, and State National would then remit the check to its correspondent in NYC for collection. State National's correspondent in NYC would then collect the check through the NYC clearinghouse. Among the checks payable in NYC that appear on the State National remittance register we found checks drawn on locations in California, Illinois, Indiana, Kansas, Louisiana, New York state, North Carolina, Tennessee, Texas, Utah, and Vermont, among others.

Checks remitted to St. Louis were drawn mainly on cities and towns in Illinois, Kansas, Kentucky, and fundamentally, Missouri. Most of the checks that State National remitted to St. Louis were indeed payable in St. Louis. But we have also found, among the checks sent to St. Louis, checks drawn on various locations outside of St. Louis and payable at those locations. In preliminary research that we conducted before drawing our final sample of checks we found that State National sent to St. Louis checks drawn on, and payable at, locations in Kansas, Colorado, Missouri, Oklahoma, and Kentucky.

4. Summary of the Three-Tier System

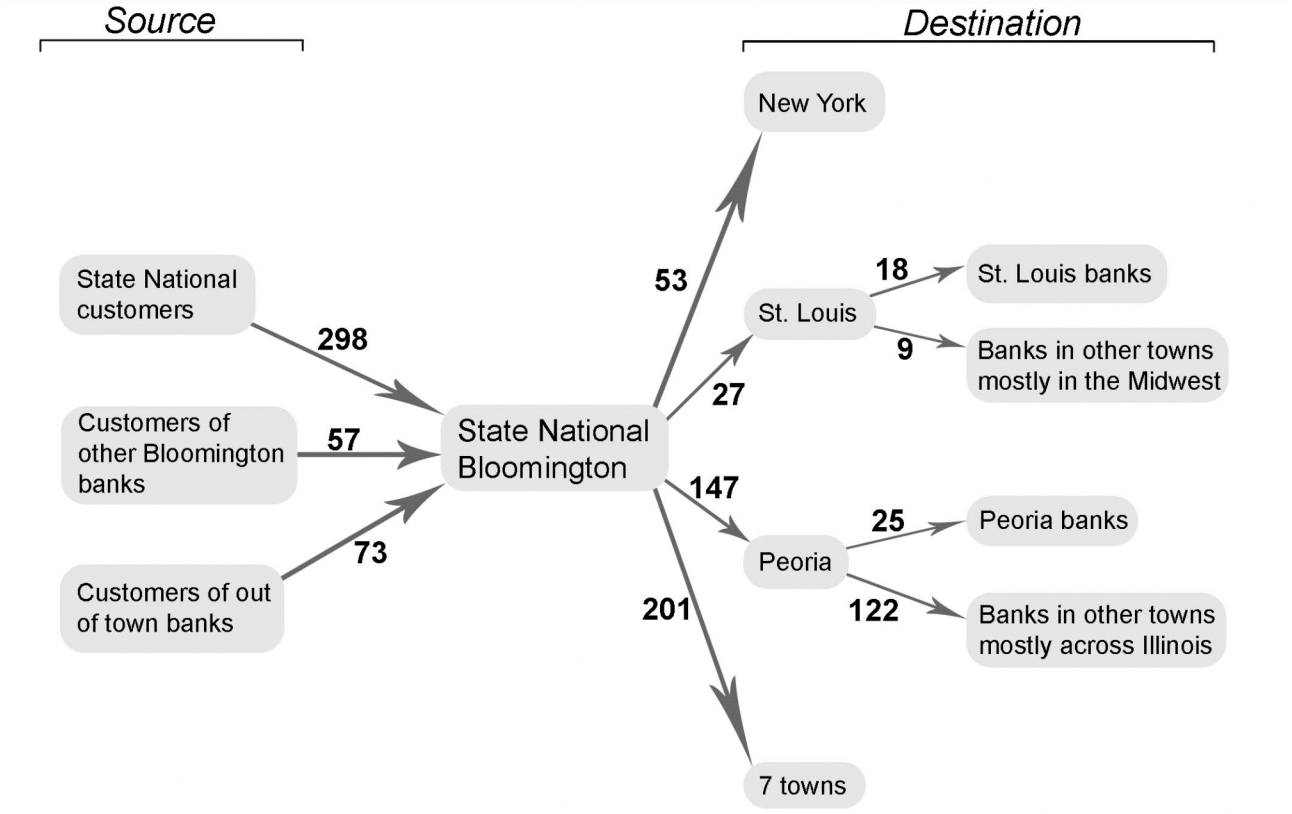
As a general principle, if a check was drawn on one location but payable at another, State National remitted it to the location where it was payable. Most of the checks that State National remitted to St. Louis were payable in St. Louis. All of the checks that State National remitted to NYC were payable in NYC.

If a check was drawn on, and payable at, one of the seven neighboring towns, State National remitted it straight to its destination. If a check was drawn on, and payable at, many other locations mostly within Illinois, State National remitted it to Peoria, from where the check would then travel to its final destination. If a check was drawn on, and payable at, some other location mostly outside of Illinois, State National remitted it to either (a) St. Louis, if the check was payable in St. Louis or payable in the location where it was drawn upon, or (b) NYC, if the check was payable at a NYC bank.

D. Driving Forces of the Three-Tier Network

Figure 3 and Table 1 provide summaries of the sources and destinations of the checks discussed above. Note that the percentages in Table 1 are conditional on the fact that we do not have information on checks headed for Chicago.

Figure 3. The State National check network, 1910



** Numbers represent the number of checks in the sample*

Table 1. Sources and destinations of checks in the State National remittance register, 1910

Sources of checks	Location to which checks were sent			
	Seven towns	***Peoria***	***NYC / St. Louis***	***Total***
Out-of-town banks	**52**	**14**	**7**	**73**
Row percent	71.23	19.18	9.59	100.00
Column percent	25.87	9.52	8.75	17.06
Bank's customers	**94**	**133**	**71**	**298**
Row percent	31.54	44.63	23.83	100.00
Column percent	46.77	90.48	88.75	69.63
Bloomington banks	**55**	**0**	**2**	**57**
Row percent	96.49	0.00	3.51	100.00
Column percent	27.36	0.00	2.50	13.32
Total	**201**	**147**	**80**	**428**
Row percent	46.96	34.35	18.69	100.00
Column percent	100.00	100.00	100.00	100.00

Notes: This table includes all checks in the sample taken from the State National 1910 remittance register. Out-of-town banks = banks located in Peoria and Chicago that remitted checks to State National. Bank's customers = State National's own customers in Bloomington. Bloomington banks = banks located in Bloomington other than State National. Note that we lack information on checks headed for Chicago.

What was at the root of this three-tier organization for check clearing and collection? Of course, the fact that banks and merchants held funds on reserve in some financial centers, like St. Louis and NYC, clearly played a role. Banks and merchants drew checks on various locations around the country but made them, say, "payable in NYC." State National remitted these checks straight to NYC.

Other than this factor, what other forces played a role in shaping State National's three-tier system? A first glance at the remittance register suggests that geography, or more precisely distance from Bloomington to the town where the checks were drawn, was certainly one determining factor. Checks drawn on, and payable at, one of the seven towns around Bloomington mentioned above were sent directly to the issuing bank or to another bank in the same town (if there were at least two). Five of these towns are no more than 22 miles away from Bloomington, and Pontiac and Saybrook are about 38 miles away. The median distance from these seven towns to Bloomington is about 18 miles. Three of them were one-bank towns

(Danvers, McLean, and Towanda), and three of them were two-bank towns (Arrowsmith, Heyworth, and Saybrook). Pontiac, finally, had four banks.

Checks drawn on, and payable at, Illinois towns other than the seven surrounding Bloomington were generally forwarded to Peoria for collection. Most of these towns were considerably farther away from Bloomington than five of the seven mentioned above, which are no more than 22 miles away from Bloomington. There were some exceptions, however, in the sense that checks drawn on certain towns that were very close to Bloomington were nonetheless also sent to Peoria for collection, even when they were not payable in Peoria. Bellflower, for example, is a town situated about 32 miles east of Bloomington. When State National received checks drawn on, and payable in, Bellflower it would send them 40 miles west to Peoria. This means that distance from Bloomington was one factor determining the three-tier structure of the check collection network, but not the only one.

What else, other than distance, played a role? We suggest one possible hypothesis after studying the remittance register—the intensity of the trade links between Bloomington and the towns where checks were drawn (and payable) was another determining factor. Of course, it could be argued that distance and trade intensity were highly negatively correlated and this is generally true. In our sample from the 1910 remittance record, we found that, among the checks that Bloomington residents deposited at State National (either directly or through other banks), there were, on average, about 29 checks per town drawn on the seven towns surrounding Bloomington but only slightly more than 2 checks drawn per town on other towns in Illinois. The median distance from the seven towns to Bloomington is about 22 miles, whereas the average distance to Bloomington from the other Illinois towns that appear in the remittance register (and whose checks State National remitted via Peoria) is about 66 miles. The following tables summarize this information.

Table 2. Checks Remitted to Peoria

City	Distance (miles)	Number of checks
Jerseyville, IL	149.99	1
Newton, IL	140.37	1
Rock Island, IL	139.88	1
Belvidere, IL	135.06	1
Staunton, IL	124.21	1
Batavia, IL	122.37	1

Table 2. Checks Remitted to Peoria (cont'd)

City	Distance (miles)	Number of checks
Urbana, IL	54.23	4
Magnolia, IL	52.83	1
Varna, IL	49.51	1
Decatur, IL	46.41	1
La Rose, IL	46.07	1
Dewey, IL	44.78	1
Gibson City, IL	44.30	1
Delavan, IL	42.85	3
Mahomet, IL	40.81	5
Fisher, IL	40.78	6
Peoria, IL	40.06	14
Tremont, IL	39.74	1
Chestnut, IL	37.42	1
Lincoln, IL	33.79	1
Bellflower, IL	32.08	1
Richmond, IL	31.67	2
Minonk, IL	30.80	2
Farmer City, IL	28.84	1
Deer Creek, IL	24.49	2
Clinton, IL	23.86	5
Mackinaw, IL	22.48	4
El Paso, IL	19.83	7
Wapella, IL	19.12	2
Lexington, IL	18.60	9
Ellsworth, IL	17.30	4
Stanford, IL	15.72	3
MEAN	***66.39***	***2.24***
MEDIAN	***57.36***	***1***
STANDARD DEVIATION	***37.20***	***2.36***

Notes: This table contains checks that reached State National from Bloomington residents and that the bank remitted to Peoria, location in Illinois where the checks were drawn, driving distance to Bloomington, and number of checks in the sample from the 1910 remittance register (sorted by distance in descending order). It includes Peoria for the sake of completeness—this raises the mean number of checks, although not the median.

Sources: State National Remittance Register and MapQuest.com.

Table 3. Checks Remitted to One of the Seven Towns Directly

City	Distance (miles)	Number of checks
Saybrook, IL	38.11	23
Pontiac, IL	38.06	22
Arrowsmith, IL	21.76	20
McLean, IL	17.96	59
Heyworth, IL	13.24	14
Danvers, IL	12.92	34
Towanda, IL	10.27	29
MEAN	***21.76***	***28.71***
MEDIAN	***17.96***	***23***
STANDARD DEVIATION	***11.76***	***14.81***

Notes: This table includes checks that reached State National from Bloomington residents and that the bank remitted to one of the seven towns directly, location in Illinois where the checks were drawn (and payable), driving distance to Bloomington, and number of checks in the sample from the 1910 remittance register (sorted by distance in descending order).
Sources: State National Remittance Register and MapQuest.com.

In the case of those Illinois towns, however, where distance to Bloomington was short and trade intensity was apparently low, State National chose to remit checks to Peoria for collection rather than sending the checks directly to the town where they were drawn. The tables above reveal that there were a number of towns in the 1910 remittance register whose checks State National remitted via Peoria and that were roughly as far away from Bloomington as any of the seven towns. Stanford, Ellsworth, Lexington, Wapella, El Paso, Mackinaw, Clinton, Deer Creek, Farmer City, Minonk, Richmond, Bellflower, Lincoln, Chestnut, and Tremont fall in this category. For this sub-sample of fifteen towns, the median distance to Bloomington is about 24 miles (whereas the median distance to the seven towns is about 18 miles). These fifteen towns, however, apparently had less intense trade links with Bloomington residents than the seven towns to which State National remitted directly. Among checks that reached State National from Bloomington residents, the median number of checks drawn on these fifteen towns was, in our sample, 2, whereas the median number of checks drawn on the seven towns to which State National remitted directly was 23. Trade intensity likely mattered because of the possibility of bundling checks. It was clearly more efficient for State National to

bundle an isolated item destined for, say, Gibson City with other checks and send the whole package to Peoria, than to send the isolated item directly to its final destination.

We explore the potential relationships among distance, trade intensity (or volume of commerce), and the direct remittance of out-of-town checks in a regression framework. There are two phenomena to be explored: first, the correlation between distance and volume of trade (measured by the number of out-of-town checks that reached State National from Bloomington residents); and second, the fact that State National sent checks directly to only a subset of Illinois towns while using its Peoria correspondents for the remaining towns. We explore the first issue in panel A and panel B of Table 4 in a simple OLS framework with robust standard errors. Panel A includes all towns in the sample, whereas Panel B excludes the 7 towns to which State National remitted directly. The left-hand-side variable is the number of checks that reached State National from Bloomington residents and that were headed for other Illinois towns for collection; the right-hand-side variables are distance from the target town to Bloomington, distance squared, and the population of the target town. Panel A (all towns) suggests that an additional 10 miles of distance to Bloomington decreased the number of checks reaching State National by about 4.5 in the period under study ($R^2 = 0.275$). Panel B (excluding the 7 towns) suggests that an additional 10 miles of distance to Bloomington lowered the number of checks by about 0.75 checks ($R^2 = 0.291$). The lower impact (i.e., flatter slope) in Panel B vis-à-vis Panel A is to be expected, since Panel A includes the 7 towns (which were very close to Bloomington and had a high volume of checks drawn on them) and Panel B does not. It should be noted, however, that the distance variables, unlike the population measure, are statistically significant in both Panel A and Panel B.

As far as the second issue (i.e., the fact that State National remitted directly only to a small subset of towns), the outcome variable is a binary variable, and we have postulated that distance to Bloomington and trade intensity mattered. Therefore, as a first approximation, the model is essentially an index model (Wooldrigde, 2007, chapter 15) of the following form:

$$P(y = 1 \mid \vec{x}) = G(\vec{x}\vec{\beta}) \equiv p(y)$$

In this model $\vec{x}$ is 1 x K, $\vec{\beta}$ is K x 1, and the first element of $\vec{x}$ is unity. Depending on the specific form of $G(z)$, this approach results in a linear probability model, a probit, a logit or some other binary choice model. Including the number of checks (as a proxy for trade intensity) on the right-hand-side of such a model is problematic since the number of checks perfectly predicts the binary outcome. Therefore, we include the same right-hand-side variables as in Panel A and Panel B. (Population plays the role of a potential determinant of trade intensity in Panel A and Panel B, and a proxy for trade intensity in Panel C.) Panel C reports the results of estimating a logit model with robust standard errors. The coefficients are the marginal effects. The table suggests that an additional 10 miles of distance from the target town to Bloomington lowered the probability of State National remitting checks directly by about 4 percentage points (Pseudo-$R^2 = 0.361$). The distance variable is significant at 10 percent and the population variable is, once again, not statistically significant.

Table 4.

Distance, volume of trade, and direct remittance of in-transit items

This can be no more than a hypothesis at this stage. We have to take into account that some form of self-selection could be at work here. If a customer of State National in Bloomington knew that State National remitted directly, say, to Arrowsmith but not to, say, Wapella, and if that customer traded heavily with individuals from both towns, she might have decided to have accounts at more than one bank in Bloomington. Her account with State National would have allowed her to send her checks directly to Arrowsmith every time she received payment via a check drawn on that town. Her account with some other Bloomington bank might have allowed her to send her checks directly to Wapella every time she received payment via a check drawn on that town. Therefore, by studying the State National remittance register we would only see part of the picture (i.e., the checks that the customer received when she conducted business with individuals from Arrowsmith).

The national tier of the State National check collection network, finally, was made up of checks drawn mostly on cities and towns outside of Illinois. These were locations that were

both considerably farther away from Bloomington and had much weaker trade links with Bloomington, at least in terms of the frequency of transactions, than the locations in the local and regional tiers.

IV. The Traditional View of the Pre-Fed System in Light of Our Historical Findings

It is thus worth raising the question of whether our historical findings for the Bloomington, Illinois, node are consistent with the Cannon view, on the one hand, or the Hallock-Spahr view, on the other, or potentially with neither one. It is worth remembering at this stage that the Cannon "average" country check is very different from the Hallock-Spahr one. The Cannon country check is one that does not go directly to its final destination but does not involve cycling. Furthermore, the Cannon check passes through one bank in Cleveland before reaching its final destination in Massillon, and Cleveland is only about 50 miles away from Massillon. The Hallock-Spahr typical check, on the contrary, passes through the same city or town more than once and wanders far away from both its origin and destination cities.

What do we observe in Bloomington? We consider various types of checks in light of where they came from (i.e., where they were deposited) and where they were going (i.e., where they were drawn or where they were payable, if the location where they were payable differed from the one on which they were drawn). The following table provides a summary.

Table 5. The State National remittance system

Deposited in	Drawn at	Payable at	Remitted to
Bloomington	Town X (one of the seven)	Town X (one of the seven)	Town X (one of the seven)
Bloomington	Town X (one of the seven)	Peoria	Peoria
Bloomington	Town Y (other Illinois)	Town Y (other Illinois)	Peoria
Bloomington	Town Y (other Illinois)	Peoria	Peoria
Bloomington	Town Y (other Illinois)	St. Louis	St. Louis
Bloomington	Town Y (other Illinois)	NYC	NYC
Bloomington	Town Z (outside Illinois)	Town Z (outside Illinois)	St. Louis
Bloomington	Town Z (outside Illinois)	NYC	NYC

Town X (one of the seven)	Town X (one of the seven)	Town X (one of the seven)	Not observed
Town X (one of the seven)	Town A (one of the seven)	Town A (one of the seven)	Town A (one of the seven)
Town X (one of the seven)	Town Y (other Illinois)	Town Y (other Illinois)	Peoria
Town X (one of the seven)	Town Z (outside Illinois)	Town Z (outside Illinois)	St. Louis
Town X (one of the seven)	Town Z (outside Illinois)	NYC	NYC
Chicago	Chicago	Chicago	Not observed
Chicago	Peoria	Peoria	Not observed
Chicago	St. Louis	St. Louis	Not observed
Chicago	NYC	NYC	Not observed
Chicago	Town X (one of the seven)	Town X (one of the seven)	Town X (one of the seven)
Peoria	Peoria	Peoria	Not observed
Peoria	St. Louis	St. Louis	Not observed
Peoria	NYC	NYC	Not observed
Peoria	Town X (one of the seven)	Town X (one of the seven)	Town X (one of the seven)

A. What we found

State National remitted checks payable at one of the seven towns surrounding Bloomington to the town where they were payable. It also remitted checks payable in Peoria to Peoria, checks payable in St. Louis to St. Louis, and checks payable in NYC to NYC. All these statements are true regardless of what the source of the check was and where the check had been drawn.

State National remitted to Peoria checks drawn on, and payable at, Illinois towns other than the seven surrounding Bloomington regardless of the source. State National remitted to St. Louis checks drawn on, and payable at, towns outside Illinois (other than NYC) regardless of the source. For example, it remitted to St. Louis checks drawn on, and payable at, locations in Kansas, Colorado, Missouri, and Oklahoma. State National remitted to NYC checks drawn on locations all over the United States (and Canada and Mexico as well) that were payable in NYC.

Thus, although it is true that not every check went directly to the location where it was payable, the routing of checks seems to have followed a rational pattern. If checks were payable at one of the seven neighboring towns, in Peoria, in St. Louis, or in NYC, State National remitted the checks directly to the place where they were payable. State National used indirect routing through a regional node (Peoria) for other locations in Illinois, and indirect routing through a national node (St. Louis, possibly Chicago) for locations in other states. Checks that went through St. Louis had usually other towns in the Midwest (but outside Illinois) as their final destination. All checks remitted to NYC were payable in NYC.

It is impossible to tell from the Bloomington data whether there was cycling of checks after they reached Peoria, St. Louis, or NYC. But it is highly unlikely that this was so, at least for checks that were payable in these cities. In 1910 there were local clearinghouses in each one of them. Checks reaching a bank in one of those cities would have reached the paying bank either through direct presentment at the counter or the local clearinghouse (if the clearinghouse cleared "country checks" at the time).

In passing, it is also worth highlighting what we did not find (see Table 4). For example, we found no evidence that checks deposited in Peoria and drawn on (and payable in) Chicago, NYC, or St. Louis, took a detour through Bloomington before reaching their destination. Similarly, we found no evidence of checks coming from Chicago and drawn on (and payable in) either Peoria or St. Louis or NYC. In other words, we found no evidence that checks that reached a Chicago bank and were headed for a regional center (Peoria) or a national one (St. Louis, NYC) were wandering around in Bloomington before reaching their final destination.

B. Anomalies

Are there episodes of check routing in the State National remittance register that stand out because they mark a departure from the orderly three-tier scheme that we have described? There are some, and we address them here.

The first observation about these potential anomalies is that, even if all of them were true anomalies, they would still represent a very small proportion of all the out-of-town checks

that State National processed. The three-tier pattern of routing that we have described above dominates the remittance register of the Bloomington bank.

There are a number of check-routing "episodes" that look like anomalies but are not. A few examples will suffice to make this point. In the exploratory investigation that we conducted before our final analysis, we found that State National remitted to NYC some checks drawn on Illinois towns close to Bloomington. A careful analysis of these records revealed that all these checks were actually payable in NYC. Similarly, we found that State National remitted to Peoria and St. Louis a few checks drawn on banks in one of the seven neighboring towns. A study of the records showed that these checks were payable either at a Peoria bank or a St. Louis bank.

Perhaps the most interesting examples of potential anomalies are those checks drawn on and payable in towns reasonably close to Bloomington that State National forwarded to Peoria. Some of these towns (Mackinaw, for example) were between Bloomington and Peoria, although closer to Peoria than to Bloomington. Remitting them to Peoria thus meant that they had to first reach the regional node and then come back a few miles to reach their final destination. Other towns were between Bloomington and Peoria although closer to Bloomington than to Peoria (Stanford, for example). Remitting them to Peoria thus meant that they had to go first all the way to Peoria and then come back almost all the way back to Bloomington. Finally, the most "extreme" cases were those towns that were located a few miles to the east or south of Bloomington (Gibson City to the east and Wapella to the south, for example). Since Peoria was located to the north and west of Bloomington, in these cases the checks went all the way to Peoria and then returned in the opposite direction past Bloomington (although they did not necessarily stop in Bloomington again).

A few observations are in order with regard to these neighboring towns to which State National remitted through Peoria. First, if anything, these are instances of "local circuitous routing." Bloomington and Peoria are only 40 miles apart. Therefore, these examples are clearly not of the same nature as those presented in Hallock and Spahr, where checks strayed hundreds of miles away from their "normal" paths. Second, as we have shown, there are relatively few checks drawn on and payable in some of these locations. And precisely the fact

that there are relatively not that many checks in this category may help account for the fact that State National remitted them via Peoria—it was more efficient for the bank to bundle them with other items than to make an isolated remittance.

C. Summary

In sum, our study of the remittance register of the State National Bank of Bloomington only a couple of years before the founding of the Fed reveals a picture that is indeed very different from the official story presented in Hallock and Spahr. The Hallock-Spahr view of the pre-Fed check-clearing world is one where checks wander around all over the country, permanently pushed away from their origin and destination cities to escape the burden of exchange charges. Our study does not deny that such episodes of extreme circuitous routing sometimes happened. But our findings suggest (although, of course, do not prove) that, if they happened, they were the exception rather than the norm.

Our peek into the system through the Bloomington node reveals a carefully structured routing system in which checks tended to flow in the "right" direction most of the time. The three-tiered approach to check routing smoothly linked the Bloomington area with the rest of the country. We do not see any obvious evidence of check cycling nor do we find checks traveling hundreds of miles in one direction and then retracing their paths backward to their destination.

If anything, our study suggests that the real world of the pre-Fed system was much closer to the Cannon view than to the Hallock-Spahr view that ended up becoming the official story. The Cannon check that reaches its Massillon destination from NYC through Cleveland is probably not very different from one of the State National checks that reached their final Bloomington-area destination through, say, Chicago and Bloomington.

V. INTERPRETATION AND CONTROVERSIES

Banks in the pre-Fed world were in a sense solving a problem that the theory of algorithms has studied carefully—the shortest path problem (Tarjan, 1983; Cormen et al, 2001). More specifically, each bank tried to determine how to route each check in such a way

that it minimized the cost (to the bank) of forwarding the check to its final destination, subject to the constraint that all checks had to be cleared. For banks, solving a "shortest-path" problem meant finding the minimum-cost way of forwarding checks, even if checks were not forwarded through what was literally the shortest path between two nodes. For a bank in, say, Bloomington, what mattered in terms of minimizing costs was not geographic distance but rather economic distance, which was a function of not only geographic distance to a city or town but also the volume of commerce between Bloomington and that city or town. Volume of commerce mattered in turn because of the possibility of bundling checks headed in a certain direction—it was more efficient for a bank in Bloomington to send to Peoria a single check headed for, say, Paxton (Il.) in a bundle with other checks headed to Peoria (or to the Peoria hinterland) than to create an isolated remittance to Paxton.[10]

A. Were there incentives for promoting circuitous routing?

Of course, other interpretations are possible. One counter-argument would be that banks actually benefited from circuitous routing since checks en route to their final destination were counted as reserves (White, 1983, p. 67). Since the allegedly roundabout system of clearing and collection allowed banks a much larger reserve than they would have had otherwise, they had no incentives to address the circuitous routing "problem." However, this argument has its own problems.

First, engaging in circuitous routing of checks of the extreme kind was potentially very costly for banks. We have identified plenty of litigation episodes in the late 19th century in which a seller (payee) receiving a check from a buyer (payer) deposited the check for collection at her local bank and, by the time the check reached the payer's bank in a different town, the check could not be honored—either because the payer's bank had failed or there were not enough funds in the payer's account to cover the check amount (see, for example, Supreme Court of Nebraska, 1893; Supreme Court of Wisconsin, 1894; and Supreme Court of Vermont,

[10] In a sense banks were solving a dynamic programming problem. When a bank in, say, Bloomington was faced with the problem of remitting a check to, say, Paxton, it basically solved the problem of how to route it efficiently to one of n intermediate locations, under the assumption that banks at the intermediate locations would then solve the problem of how to efficiently route the check to the final destination. For a general formulation of this approach see Bellman (1957); for an application to economics see Lucas and Stokey (1989).

1895).[11] In such situations both the payee and her bank were exposed to substantial losses. If the payee was not able to cash her check, she was naturally inclined to blame her bank for not processing the check as promptly as possible (i.e., for failing to exercise what the law of negotiable instruments termed "due diligence"). If the payee had taken out cash from her bank against the check, then the payee's bank lost as well since it would not be able to recover the cash (unless it tried to recover it from the payee). Frequently the dispute between the payee and her bank ended up in the court system (and potentially in several rounds of litigation), which added litigation costs to the original loss. In practice, by the late 19th century, banks that did not exercise "due diligence" in processing checks (i.e., that did not present checks for payment as quickly as possible) were very likely to become litigation targets if things went wrong. Circuitous routing of the extreme kind may have had some benefits for the banks, but it was not without its substantial costs.

Furthermore, we should not forget that banks that engaged in circuitous routing of the extreme kind ran the risk of creating substantial ill will among their customers, even when circuitous routing did not end up in litigation. In game-theoretic terms, in a hypothetical equilibrium in which all banks in a city or town engaged in circuitous routing of the extreme kind, there were strong incentives for one of the banks to defect by clearing and collecting checks promptly—such a bank would likely end up stealing most of the other banks' customers. No matter how much a bank benefited from having checks in transit counted as reserves, it could not stay in business if its clients flocked to a competitor that offered a better (i.e., faster and therefore safer) clearing-and-collection system. In other words, an equilibrium in which all banks in a town engaged in circuitous routing of the extreme kind does not seem stable.

More fundamentally, it could be argued that the very development of the network of respondents and correspondents that took place at an extremely fast pace in the late 19th century

[11] The Wisconsin case is particularly interesting since it deals with checks that cycled. The checks were deposited by the payee at his bank in New Richmond, Wisconsin, and were payable in Milwaukee; rather than going straight to Milwaukee, however, they went through Milwaukee to Chicago and then back to Milwaukee. By the time they reached Milwaukee for the second time, the paying bank had gone out of business. The court ruled that "due diligence" had not been exercised.

(Redenius, 2003; James and Weiman, 2006) was an attempt by the banks precisely to make the process of check clearing and collection more efficient (less circuitous). In fact, had they had the intention to make the process as slow and convoluted as possible, they would have avoided building the network of interrelationships that they built. Yes, the banks probably benefited from having checks in transit counted as reserves, but also took into account the fact that the probability of getting sued and generating ill will among their customers increased with the length of the check clearing-and-collection process. The fact that they chose to build an increasingly interconnected network of banks, structured around not only national but also regional banking centers (Redenius, 2003), suggests that they were better off expediting, rather than delaying, the process.

B. Was Bloomington representative?

Another caveat could be raised in connection with our study: To what extent was the Bloomington system representative of the pre-Fed check clearing-and-collection system? What if the system we have uncovered was atypically efficient?

This is indeed a possibility. In a very concrete sense our study does not "prove" that checks in the pre-Fed US always flowed in the "right" direction. "Proving" such a theory would require, at the very least, taking a random sample of regional systems (like the one we have studied for Bloomington) and conducting the kind of analysis we have carried out here. This is indeed a research agenda that goes beyond the limits of any individual paper. Furthermore, it is an agenda that would require both persistence and luck in the process of locating the right sources—from our own experience, to say that bank records like the ones that provide the foundation for this study are scarce is an understatement.

There are reasons to believe, however, that systems like the Bloomington one dissected here were indeed common in the early 20th century. Our findings on the Bloomington check-clearing network fit remarkably well with the evolution of the respondent-correspondent networks that the recent literature has reconstructed on the basis of very different sources.

Redenius (2003) points out that, even though the structure of correspondent networks was well established in the Northeast before the Civil War, it was in the post-bellum period that

it expanded with the articulation of regional networks in other sections of the country. One of the key functions of the correspondent bank was, of course, dealing with "transit" and "collection" items. Transit items were mostly checks like the ones we have described in this study. Collection items included notes, time drafts, acceptances, bills of exchange, coupons, bonds and dishonored checks (Redenius, 2003, pp. 1-6). The law of negotiable instruments established that a bank upon which a check was drawn was obligated to pay the face value of the check when presented at its counter. If the instrument was presented through the mail, however, the law allowed the paying bank to subtract an exchange charge from the face value to cover the cost of shipping cash. In this context, respondents (e.g., the banks in Pontiac and Danvers) could save money on exchange charges and postage if they arranged to collect remote checks through their correspondent in, say, Bloomington. They compensated the Bloomington correspondent by maintaining compensating balances at the Bloomington bank—the correspondent paid the respondent a very low interest rate on these balances but could lend them out at prevailing market rates. Similarly, Bloomington banks would hold balances at, say, their Peoria correspondents as compensation for the services that the Peoria banks provided in dealing with "transit" and "collection" items (Redenius, 2003, pp. 6-9).

The network we have uncovered in Bloomington fits remarkably well with the depiction that Redenius (2003) provides of the networks that spread all over the country in the late 19th century. These networks were neither strictly peer-to-peer (where every bank connected directly with every other bank) nor national-monopolistic (where every bank connected with every other bank exclusively through a set of banks in, say, New York City). They were rather hierarchical in the sense that (a) national and regional networks coexisted, and (b) banks could deal directly with correspondents in the regional and national centers or obtain access to a national network through a regional correspondent (Redenius, 2003, pp. 3-4 and Figure 1).

Redenius (2003) presents abundant evidence on at least two facts. For one, toward the end of the 19th century the respondent-correspondent networks had become pervasive, not only in the sense that they existed all over the country but also in the sense that they covered the most remote portions of many states. Furthermore, the dynamics of the networks were such that new hubs were being formed almost every year. Indianapolis, for example, had a hinterland in

central Indiana already by 1880, while at the same time maintaining connections with Chicago and Cincinnati. In later decades, however, smaller centers (Evansville, Lafayette, and Fort Wayne) gained prominence. The conclusion he draws from his careful reconstruction is that "each successive generation of new hubs formed in smaller and smaller cities, such that by 1910 a dense pattern of hubs had developed" (Redenius, 2003, p. 15).

Consider the following example. In 1910, Bloomington had about 26,000 people, 8 banks and a clearinghouse, and its banks had correspondents at least in New York, Chicago, St. Louis, Memphis, Indianapolis, and Peoria (Rand McNally, 1910, p. 133, and State National Bank remittance register). In Indiana, Lafayette had 25,000 people and 9 banks, and its banks had correspondents at least in New York, Chicago, Cincinnati and Indianapolis (Rand McNally, 1910, p. 199). Interestingly enough, a small Indiana town like Brookston, which had about 949 people at the time and was not far away from Lafayette, had two banks and they both had correspondents in at least Lafayette and Chicago (Rand McNally, 1910, p. 186). Similarly, Boswell (824 people and 2 banks), Earl Park (1,000 people and one bank), and Otterbein (1,200 people and 2 banks)—all small Indiana towns around Lafayette—had correspondents in at least Chicago, Indianapolis, and Lafayette (Rand McNally, 1910, Indiana section). Just like an Illinois check flowed from Danvers (or Pontiac or McLean) to Bloomington and then to Peoria, an Indiana check likely traveled from Brookston (or Earl Pak or Otterbein) to Lafayette and then to Indianapolis in search for its final destination.

In a strict sense, none of this evidence "proves" that the Bloomington network was typical. Taken as a whole, however, the evidence suggests that, if bank records were indeed available, we would be able to show the pervasiveness of bank networks like the one studied in this paper.

VI. CONCLUSIONS

Our empirical analysis of the Bloomington node of the pre-Fed check-clearing system suggests that the system was generally free of the extreme examples of check routing cited by Spahr and other commentators as evidence of the inefficiencies resulting from exchange charges. Our review of check clearing, as seen from the perspective of the State National Bank,

was that it appeared to operate in an orderly and efficient manner. Whether or not there were some additional efficiency gains offered by the Fed check-clearing system, after considering the costs associated with the system, is beyond the scope of the historical data available to us.

We have argued that, when faced with the responsibility of forwarding checks out of town for clearing and collection, each bank solved a version of the shortest-path problem that algorithmic theory has studied carefully. In finding the solution to this problem, geographic distance mattered as only one component of a broader concept, namely economic distance, which also included trade intensity (or volume of commerce). Trade intensity mattered in turn because of the possibility of bundling checks. Furthermore, we have argued that, even though banks may have had some incentives to encourage circuitous routing of the extreme kind, they also had strong incentives to avoid it. The fact that they built an increasingly interconnected, respondent-correspondent network for check clearing and collection suggests that the incentives to avoid circuitous routing likely became dominant at some point in time.[12] In addition, the Bloomington network that we have analyzed here fits remarkably well with the picture of the broader banking networks that the recent literature has painted.

In terms of directions for further research, we can think of two areas that are essentially unexplored. First, it would be useful to conduct studies like this one in a wide variety of regions and contexts, both in geographic areas close to a major commercial center and in areas farther away. This would allow us to better gauge the extent to which other portions of the banking network functioned as smoothly as the one we have studied here. Secondly, it would be extremely useful to conduct studies of inter-bank payment relationships in the late 19th century and early 20th century, along the lines of Weber (2003). Such a study for Illinois, for example, would shed further light on the factors that determined some of the relationships among banks that we have uncovered in this paper.

[12] Studying the evolution of check-related litigation may prove fruitful in this regard. We would expect that an increase in litigation focused on the circuitous routing of checks should have raised the cost to banks of engaging in circuitous routing, at least in probabilistic terms, thus giving them incentives to build an increasingly interconnected banking network. Furthermore, the development of an increasingly interconnected network of respondents and correspondents should have led to a decrease in check-related litigation, since a more developed and pervasive network likely expedited the check clearing-and-collection process.

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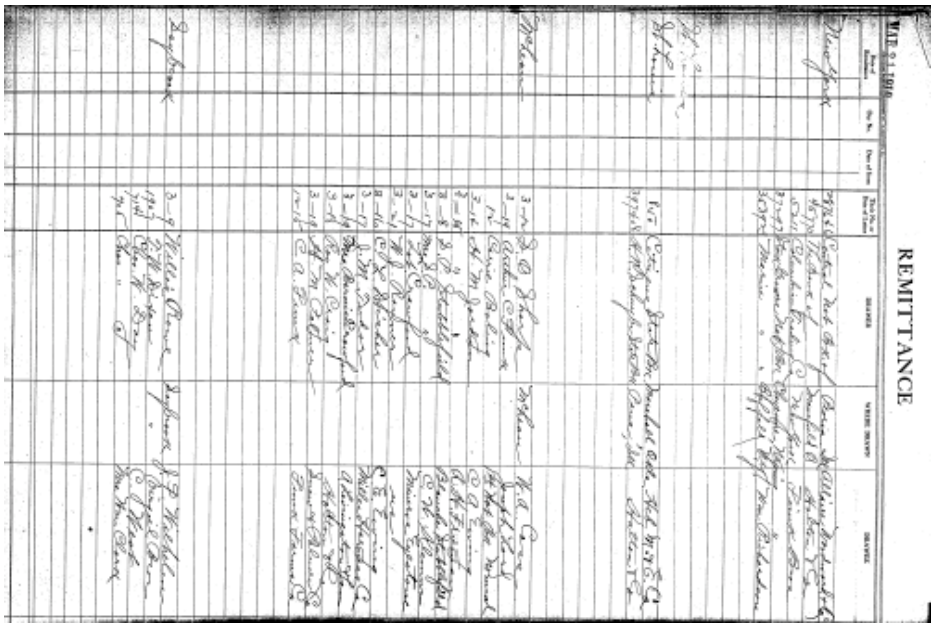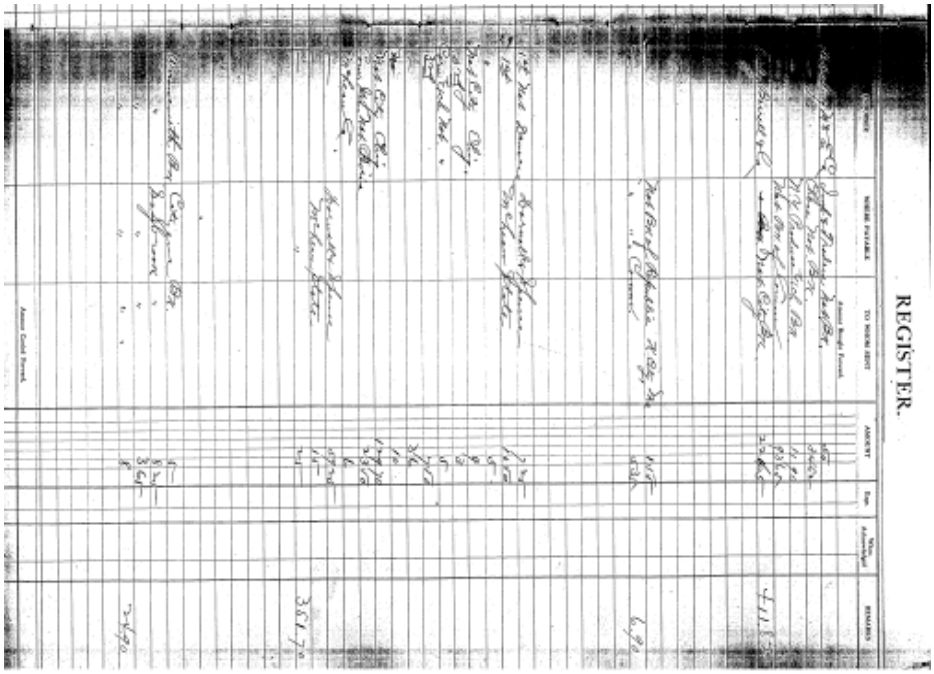
APPENDIX A