Preliminary Draft. Comments Welcome.

The Panic of 1907: JP Morgan, Trust Companies, and the Impact of the Financial Crisis

Carola Frydman*
Boston University and NBER

Eric Hilt
Wellesley College and NBER

Lily Y. Zhou
Federal Reserve Bank of New York

Abstract: The outbreak of the Panic of 1907 occurred following a series of scandalous revelations about the investments of some prominent New York financiers, which triggered widespread runs on trust companies throughout New York City. The connections between the trust companies that came under severe strain during the crisis, and their client firms, may have transmitted the financial crisis to nonfinancial companies. Using newly collected data, this paper investigates whether corporations with close ties to trust companies were differentially affected during the panic. The results indicate that firms connected to trust companies that faced severe runs performed worse in the years following 1907. The data also suggest that many of the rescue efforts organized by J.P. Morgan may have been motivated by self-interest.

* Emails: cfrydman@acs.bu.edu; ehilt@wellesley.edu; and lily.y.zhou@ny.frb.org. We would like to thank seminar participants at Columbia University and the Russell Sage Foundation for helpful comments and suggestions.

1. Introduction

Many economists have drawn parallels between the current financial crisis and the Panic of 1907. Just as the crisis of 2007 originated in runs on the "shadow banking system," a relatively new and unregulated source of lending funded by liabilities that were uninsured, the Panic of 1907 originated in runs on a newly popular form of financial intermediary, trust companies, which faced little regulation and offered deposits that were not insured. The recent financial meltdown became particularly acute following the bankruptcy of Lehman Brothers. Similarly, the Panic of 1907 was likely deepened by the sudden failure of the Knickerbocker Trust Company, the third-largest trust company in New York City. Finally, the Fed responded to the current crisis by offering extraordinary lending facilities intended to restore liquidity to credit markets. The Fed did not exist in 1907, but the most powerful private banker in the United States at that time, J.P. Morgan, organized a series of emergency loans to securities dealers and to trust companies that helped stabilize the financial system. There are of course many important differences between these two events, but their similarities as well as the importance of understanding the real effects of dislocations in the financial sector, highlight the significance of studying the consequences of the Panic of 1907.

Although the causes of the Panic of 1907 have been the subject of considerable research, the consequences of the panic have received little attention. The severe, if short-lived, disruption of credit intermediation and the functioning of the banking system is understood to have caused a deep recession, but little is known about the channels through which the crisis may have been transmitted into the real economy, whether particular firms or sectors were differentially affected, and if so, why.[1] The paucity of evidence regarding the impact of the panic is due largely to the lack of any consistent data source on the performance of individual firms or bank lending patterns. To address this problem, we construct a firm-level panel dataset with detailed financial information on all NYSE-traded industrials and railroads for the years 1901-1911.

Using these newly collected data on nonfinancial companies and their ties to financial

[1] Romer (1999) presents evidence on the relative severity of the recession that began in 1907.

institutions, this paper analyzes the consequences of the Panic of 1907 on the real economy. To identify the firms that were differentially affected by the panic, we use the presence of a director of one of the New York trust companies that came under acute pressure during the panic on the firm's board. One of the unique characteristics of bank-firm relationships in the early twentieth century was that commercial banks and investment banks would often place one of their own directors or partners on their most important clients' boards. Commercial banks and trust companies would also invite executives from nonfinancial firms to sit on their boards, in the hope of bringing in business. By collecting a comprehensive dataset of directors and partners of New York financial institutions, as well as the names of directors of NYSE-traded companies, we can identify many bank-firm ties by the interlocks between the boards of nonfinancial firms, and the boards of banks and trust companies.

Our empirical tests analyze both the stock market reaction to firms with close ties to trusts facing severe runs, and the performance of those firms subsequently. The results indicate that the shares of firms with a close relationship to one of the trust companies that came under acute pressure fell approximately 6.5 percent more than those of other firms in the weeks surrounding the panic. In the years following the panic, those firms performed worse, in that their profitability fell and their dividends on their common stock were cut. Moreover, the average interest rates paid by these firms, measured by their interest expense as a fraction of outstanding debt, rose substantially. Consistent with the notion that credit intermediation suffered following the panic, these effects were concentrated among the smaller firms in the sample and the industrials, whose collateral was regarded as more difficult to value than that of railroads.

In addition, the data on bank-firm ties reveal much about J.P. Morgan's role in the crisis and its aftermath. Morgan was a director of the National Bank of Commerce, which abruptly ended its clearing relationship with Knickerbocker Trust, a decision that helped precipitate runs on that institution. Morgan later decided to let Knickerbocker Trust fail, while working assiduously to arrange for emergency loans to a very similar institution, the Trust Company of America, on the very next day. These decisions may have been motivated by self-interest. The Trust Company of America had extensive ties to many clients of J.P. Morgan & Company, whereas the Knickerbocker

trust did not.

The results of this paper contribute to the growing literature on the channels through which financial crises impact the real economy. Following the work of Bernanke (1983), recent scholarship has emphasized the consequences of the breakdown of financial intermediation during financial crises as an important transmission mechanism independent of the monetary channel emphasized by Friedman and Schwartz (1963). Recent contributions to this literature, in the context of the Great Depression, include Calomiris and Mason (1993), Ziebarth (2012) and Mladjan (2012) and in the context of more recent crises include Kashyap, Lamont and Stein (1994), Khwaja and Mian (2008), Schnabl (2011) and Amiti and Weinstein (2009). This paper extends that literature to the study of an important crisis, the Panic of 1907, and offers a new approach to the identification of bank-firm ties that could be utilized in the study of other historical settings.

The results also contribute to the substantial literature on the Panic of 1907 itself. The macroeconomic context and the impact on the banking system have been the focus of a substantial body of research in the years immediately following the crisis (Sprague, 1910; Barnett, 1910) and more recently (Moen and Tallman, 1992, 2000; Odell and Weidenmier, 2004).[2] This paper builds upon those earlier contributions by analyzing the microeconomic impact of the crisis, and the consequences of the disruption of the financial system for the real economy. The paper also sheds light on the extent to which J.P. Morgan functioned in the crisis as a lender of last resort.

2. The Panic of 1907

The Panic of 1907 occurred following a series of economic shocks, which precipitated the onset of a recession.[3] The San Francisco earthquake and fire of 1906 had had a profound monetary and financial impact, both domestically and internationally.[4] In late April and May of 1906, nearly $50 million of gold flowed into the United States as foreign insurers paid claims on their San Francisco policies; New York financial institutions also faced reduced gold reserves resulting from

[2] Strouse (1999), Carosso (1987) and Bruner and Carr (2007) present engaging histories of the panic.
[3] The NBER identifies a business cycle peak at May 1907.
[4] Odell and Weidenmeir (2004) analyze the economic impact of the San Francisco earthquake.

their own transfers to San Francisco. In response, the Bank of England raised its discount rate from 4 to 6 percent in order to reverse the flow of gold. The German and French central banks quickly followed by raising their own discount rates. The Bank of England also acted to halt acceptances of American "finance bills," which were used to finance gold imports into the United States. This policy resulted in a significant fall in American securities markets, as the collateral for those bills was sold, and led to significant gold outflows from the United States (see Sprague, 1910, p. 241). A relatively weak cotton harvest in 1907 resulted in low export revenues, further aggravating the stress on the banking system and financial markets (see Hanes and Rhode, 2011).

The New York money market thus entered the fall of 1907 low on gold reserves and vulnerable to shocks. But the structure of the banking system itself magnified this vulnerability. National banks located outside New York City could deposit funds in "central reserve city" banks such as those in New York, which would be counted toward their required reserves. This significantly increased the deposits available to New York City banks, but exposed them to the risk of withdrawals by banks outside of the city in times of crisis. To ensure that they maintained sufficient liquid assets to cover such withdrawals, New York's national banks lent heavily in the "call money" market, which like today's repo market financed securities dealers' inventories with short-term, collateralized loans.

Another significant source of vulnerability in the banking system was created by the vast expansion of trust companies in New York.[5] Originally created to serve as fiduciaries, often in connection with life insurance companies, trust companies enjoyed broad financial powers, including the ability to invest in shares of stock and corporate debt, and to underwrite and distribute securities. Although they were not permitted to issue bank notes, they had the power to receive deposits and make loans, and competed directly with national banks.[6] Incorporated under permissive state laws, trust companies were not subject to the strict regulations of the National Banking Act. Whereas national banks located in New York City were required to hold reserves

[5] Neal (1971) analyzes the significance of the use of the trust form for financial innovation.
[6] Some state banking laws forbade trust companies from discounting commercial paper, in an effort to protect the market share of banks. However, trust companies had the power to *purchase* commercial paper, so the effect of the law was merely to change their accounting procedures. See Berryman (1907).

equivalent to 25% of their deposits in specie, New York's trust companies faced no minimum reserve requirement until 1906, when a 15% requirement was imposed. Moreover, they were permitted to hold a portion of the reserve requirement in various securities (Moen and Tallman, 1992).[7] Advocates for New York's trust companies argued that their deposits came primarily from households, whereas the deposits in the national banks in the city were to a much greater extent from other banks, and therefore subject to much greater seasonal fluctuations—making a lower level of reserves appropriate for trusts (Judd, 1907).

The advantages of the trust form were exploited aggressively in New York around the turn of the twentieth century. In the ten years ending in 1907, trust company assets in New York State had grown 244 percent (from $396.7 million to $1.364 billion) in comparison to a 97 percent growth (from $915.2 million to $1.8 billion) in the assets of national banks (Barnett, 1910, p. 235). Over time, trust companies developed a more important role in banking and financial markets, becoming major purchasers of securities and important sources of lending. Some became important underwriters of securities and offered customers a wide range of financial services, in a way that began to resemble a "universal bank." Although they rose to prominence quite rapidly, New York's trust companies were not regarded as "second-rate" institutions. Many prominent private bankers, as well as the former U.S. Treasury Secretary Leslie M. Shaw, were among their directors.[8]

The national banks of New York particularly resented the competition they faced from these less-regulated institutions, and decried the "piratical" tactics they employed to attract deposits, including "absurdly" high rates of interest on demand deposit accounts (Sprague, 1910).[9] The national banks also excluded trust companies from the New York Clearing House (NYCH), a private

[7] A special New York commission on banks found that whereas only 70.3 percent of the assets of national banks earned interest, fully 92.2 percent of those of trust companies earned interest (Barnett, 1910, p. 236).

[8] Shaw resigned from office in March of 1907 and became the President of the relatively new Carnegie Trust Company. Former Vice President of the United States Levi P. Morton was president of Morton Trust Company. Partners of investment banks such as Kuhn Loeb & Company, and J.P. Morgan & Company, sat on the boards of some New York trust companies.

[9] Concerns about the effects of banks competing for deposits through the interest rates they offer have a long history in the U.S., and ultimately led to the prohibition of interest on demand deposits in the 1933 and 1935 Banking Acts; see Friedman and Schwartz (1963, p. 443-4). Trust company industry publications representing the interests of incumbent trusts admonished new entrants in the industry not to make "undignified" appeals for accounts or be "driven to excess" in competition ("Interest Rates on Deposits," *Trust Companies*, June 1907, p. 400).

organization that facilitated clearing and that could provide emergency lending to its members, as well as issue "clearing house certificates" to serve as substitutes for currency in times of crisis. Trust companies were permitted to gain access to the NYCH system by clearing through a member bank, so long as they maintained a minimum level of cash reserves—which most of them found unacceptably high. The rapid growth of New York's trust companies occurred without the development of any institutions that could facilitate coordination or the provision mutual aid amongst them. When the panic arose, they remained outside the one institution that could help facilitate such relationships, the NYCH.[10]

Onset of the Panic

The events of the Panic of 1907 that had the most important consequences for financial markets were the widespread runs on trust companies that began in October. However, these runs were precipitated by events that had little direct connection to any trust company. The panic was triggered by a failed attempt to corner the shares of United Copper Company, a mining company that was financed by a small national bank and a few state banks. Mining entrepreneur Augustus Heinze, along with speculators E. R. Thomas and C. W. Morse, had gained control of a series of small banks, and managed to commandeer the resources of these institutions to finance their speculative ventures.[11] The losses created by the failed corner on the shares of United Copper, which was undertaken to attempt a "bear squeeze" on short sellers, were borne by the banks that financed the scheme.[12] On October 16, a run began on the Mercantile National Bank, which was under the control of Heinze, Morse and Thomas, who appealed to the NYCH for aid. The NYCH provided a loan to the Mercantile, and publicly pledged to support not only that institution but also the other banks involved in the scandal on the conditions that the entire board of directors resign from the

[10] In the aftermath of the crisis, Trust Company insiders mentioned that there was intense "pressure for cooperative action" and that the "lack of organized cohesion" between banks and trusts made the situation much more difficult (*Trust Companies*, November 1907, p. 751.)

[11] The story of Heinze's exploits in mining, his transition into banking, and the failed speculation in shares of United Copper is presented in McNelis (1968).

[12] As an illustration of the manipulations that were possible in financial markets at the time, it is worth emphasizing that the failed speculation in the shares of United Copper was undertaken in secret by the founders and controlling shareholders of the company, using loans from banks they controlled through their investments in other banks.

Mercantile. The NYCH also required that Morse, Thomas and Heinze resign from all the other clearing banks where they held directorships.[13] The very public support from the NYCH and the change in management ended the run on the Mercantile, although the institution was closed and liquidated the following January.

No trust company was directly involved in the failed United Copper corner. However, Charles Barney, president of Knickerbocker Trust and director of Trust Company of America, two of the largest trust companies in the city, was well-known to have been involved in earlier business dealings with Morse and Heinze, and held a board seat with the National Bank of North America, controlled by Morse. Moreover, Morse, Thomas, and Augustus' brother Arthur Heinz held directorships with other trust companies.

The connections between the men at the center of the United Copper speculation and various financial institutions are illustrated in Figure 1. Several trust companies were associated with the figures involved in the speculation to varying degrees. Morse, Barney, Thomas, and the Heinzes themselves held seats on the boards of five trust companies; these are identified as having a direct connection to the speculation in the figure. However, those five trust companies were, in turn, closely associated with three other trust companies, because they had at least two directors in common with those three firms. These three trust companies are identified in the figure as indirectly associated with the speculation. The degree to which the different trust companies were identified with the men at the center of the failed cornering scheme may have influenced the extent to which they faced runs during the subsequent panic.

The scandalous revelations about the uses of the funds of Mercantile National Bank and other banks controlled by Morse, Thomas and the Heinzes raised concerns among depositors about whether these men had also endangered the solvency of the trust companies with which they were affiliated. Knickerbocker Trust, which was strongly identified with its president Charles T. Barney and therefore with Morse, began to face heavy withdrawals of deposits following October 16.

[13] Contemporary newspaper articles detailing these events are compiled in Senate Committee on Banking and Currency (1912).

Knickerbocker was one of the few trust companies in the city that chose to maintain a sufficient reserve to gain access to the NYCH through a member of the clearinghouse, The National Bank of Commerce. When Knickerbocker depositors withdrew their funds by depositing checks on their accounts in other banks, the National Bank of Commerce was initially responsible for those checks. Facing a debit balance at the NYCH of $7 million, and the prospect of even larger debits if more depositors closed their accounts, on October 21 the National Bank of Commerce announced that it would no longer act as Knickerbocker's clearing agent.[14] On that same day, Knickerbocker Trust announced that it had dismissed Charles T. Barney from the office of its Presidency.

These events came as a shock to Knickerbocker's depositors. The loss of the clearing agent implied that the institution's checks would no longer be cashed by other banks in the city. More importantly, it signaled that aid from the NYCH would not be forthcoming if the institution encountered liquidity problems.[15] The dismissal of Barney, even though it was accompanied by assurances that the firm was in sound condition, signaled that Barney may have used some of the firm's resources for illegitimate purposes. A heavy run on the Knickerbocker ensued, and very quickly the run spread to the Trust Company of America. Since trust companies held a relatively low proportion of cash reserves to demandable deposits, the Knickerbocker and the Trust Company of America were particularly vulnerable to liquidity problems in the face of these heavy withdrawals.

On October 22, Knickerbocker failed, which led to a "complete demoralization" on the stock exchange and intensified runs on other trust companies, particularly the Trust Company of America.[16] Other trusts, fearing the possibility of runs, began to call in loans and liquidate assets to build up their cash reserves. These efforts severely disrupted stock and bond markets, where securities dealers faced difficulties in financing the holding of their inventories, liquidity vanished, and asset prices fell.

---

[14] These events are described in Senate Committee on Banking and Currency (1912, p. 1695).
[15] The significance of the trust companies' isolation from the NYCH is explored in Moen and Tallman (2000).
[16] "Knickerbocker Will Not Open," *New York Times*, 23 October 1907. Several studies have assessed the counterfactual history that would have followed robust aid to Knickerbocker that would have kept it from failing; see, for example, Sprague (1910) and Friedman and Schwartz (1963).

The total losses of deposits of the 38 trust companies in New York City are depicted in Figure 2, along with their assets. All of the trusts either directly or indirectly associated with the failed United Copper corner lost substantial amounts of their deposits. It is worth noting that the size of the different trusts, measured as their total assets as of June 1907, was generally uncorrelated with the percentage deposits lost.

In order to investigate the extent to which these losses were driven by depositors' fears of potential losses arising from association with the scandal, as opposed to a response to actual changes in the trusts' balance sheets, in Table 1 we present regressions analyzing the determinants of the percentage change in each trusts deposits between August and November of 1907. In column (1), we simply regress the change in deposits on indicator variables for whether the trusts were directly or indirectly connected to the United Copper speculation, as defined in Figure 1. These two variables both have large effects, and together explain about 40 percent of the variation in the dependent variable.[17] In column (3), we add several balance sheet ratios calculated from the trusts' financial statements of June 1907, including measures of the net worth, cash reserves relative to deposits, the percentage of their assets invested in securities, and their overall size. These variables each have the expected sign, with the firms' cash reserves having a particularly large effect. However, controlling for these financial characteristics in the regression does not diminish the size of the effect of the indicators for association with the scandal. Clearly the deposit runs can be regarded as in large measure a response to an association with the scandal. Some trust companies even went so far as to call attention to the fact that they had no directors with any connection to the scandal in their advertising.[18]

Finally, columns (2) and (3) include an indicator variable for the presence of a partner of J.P. Morgan & Company on the trusts' boards. (They held directorships with three trusts.) As an

[17] Trust company advertisements nearly always listed the names of the firms' directors; this information can be regarded as easily accessible and quite salient to depositors. They generally also listed the firm's paid-in capital and surplus (net worth). More detailed balance sheet information was collected by the Superintendent of Banks and frequently republished in trade publications such as *Trust Companies* magazine.

[18] For example, Bankers Trust's ad in the *New York Times* from 25 October 1907 lists its directors and their affiliation, and then says "Particular attention is called to the personal character and strength of the company's directors."

indication of the prominence of J.P. Morgan and his firm's association with institutions of strong reputations, the three trusts that had a Morgan partner as a director lost substantially fewer deposits than the others, even controlling for the condition of their balance sheets. In part, this may have been due to the prominent role of J.P. Morgan in organizing rescue efforts to halt the panic.

Rescues organized by J.P. Morgan

In response to the growing crisis, on October 19 J.P. Morgan began to organize teams of trusted bankers, and charged them with determining whether the financial institutions that came under pressure were solvent.[19] The most powerful and best-connected man in American financial markets, Morgan's own interests were so broad that it could be argued that they coincided with the interests of the markets as a whole.[20] He had, in the past, taken actions that benefited the entire market, for example by bailing out the U.S. Treasury in 1895. During the panic, Morgan coordinated a series of rescues of trust companies, securities dealers, and the City of New York that were instrumental in resolving the financial crisis.

The first institution to appeal to Morgan for aid was Knickerbocker Trust. On Monday October 21, Morgan committed to provide aid the following day only if it was determined that the institution was solvent. On October 22, with panicked depositors forming long lines outside of its branches, Knickerbocker paid out $8 million through its teller windows. Morgan's men, who examined Knickerbocker's books throughout the morning, said they were unable to determine whether the trust was in fact solvent. Therefore no aid was provided, and at 12:30 PM Knickerbocker had no choice but to close its doors.

On the afternoon of October 23, Morgan organized a series of emergency loans to the Trust Company of America, after a series of dramatic scenes in which its securities were rushed to Morgan's offices and evaluated as collateral for loans from the large commercial banks closely associated with him. These loans, as well as others that Morgan organized the following week, enabled this institution to stay open. On the night of Sunday November 3, Morgan hosted a meeting

[19] The story of Morgan's rescue efforts is detailed in Strouse (1999), Carosso (1987), and Bruner and Carr (2007).
[20] Pak and Halgin (2010) explore the social networks behind Morgan's power.

of nearly all the city's trust company presidents in his library, famously locking them inside until they collectively pledged $25 million for the aid of the failing Trust Company of America.

The run on the Trust Company of America was one of the most severe in U.S. history: The firm paid out more than $34 million in deposits in just a few weeks. But it never closed, and thanks to the various rescues organized by J.P. Morgan and his associates, the only New York City trust company to fail was Knickerbocker.[21] Morgan's ability to organize these rescues was a consequence of his firm's resources and credibility, which enabled him to stand behind the emergency loans provided by institutions like National City Bank to the Trust Company of America based solely on his men's assessment of their collateral. But it also resulted from his power and influence within financial markets. In times of panic, it is contrary to a financial institution's narrow self-interest to extend a loan to a failing competitor, even if it is in that institution's interest for the panic to be halted. Morgan's power enabled him to "dragoon" other financial institutions into taking actions that were privately costly, but beneficial for the markets as a whole (Sprague, 1910).[22]

Morgan cannot be regarded as an entirely disinterested actor in these events. Among the many rescues he organized was a rescue of the investment bank Moore & Schley, which had used a large block of stock in the Tennessee Coal & Iron Railway as collateral for loans which it suddenly needed to repay. Morgan helped arrange for U.S. Steel, a firm he had helped create and a competitor of Tennessee Coal & Iron, to purchase that block of its stock. Morgan's associates even received a special dispensation from President Roosevelt guaranteeing that the transaction would not be held in violation of antitrust laws. This transaction averted a crisis on the NYSE, but it also benefitted U.S. Steel and, therefore, J.P. Morgan.

More importantly, Morgan's decision to allow Knickerbocker Trust to fail, while working assiduously to save the Trust Company of America, may also have been motivated by self-interest.[23]

---

[21] Several state banks, and some trust companies in Brooklyn, also closed. See Williams (1909).
[22] Treasury secretary Cortelyou made a series of large deposits in national banks in New York, partly in coordination with Morgan, which ultimately helped finance the loans to trust companies.
[23] Conspiracy theories of Morgan's allies deliberately inducing the panic in order to eliminate competitors or rivals and concentrate control abounded in the following years. For example, Upton Sinclair's novel *The Moneychangers* tells the story of a banker like Morgan who engineers a panic that begins with the "Gotham Trust Company" and the "Trust Company of the Republic," and then acts to contain the damage. Late in the story, the narrator notes, "could there be any more tragic

Morgan himself was a director of the National Bank of Commerce, the institution that stopped clearing for Knickerbocker, so he could have intervened on behalf of Knickerbocker with that bank. And although Knickerbocker had few ties to clients of J.P. Morgan, the Trust Company of America did – members of its board served on the boards of several railroads and industrial firms closely associated with Morgan.[24] Thus, many of the securities held by the Trust Company of America had likely been underwritten by J.P. Morgan & Company, since the directors of financial institutions often held board seats with firms where they owned large amounts of debt. Morgan's partners may have been concerned about the consequences of liquidating the trust company's holdings of those securities, any stigma that may have been created from the association between their firms and a failed institution, or other negative consequences that may have arisen if the trust company had failed. Thus, it is possible that they were more favorably inclined towards the valuation of those securities as collateral for loans. Indeed, Morgan's associates publicly announced they would provide support for the Trust Company of America well before they were able to determine whether it was solvent, whereas aid to Knickerbocker was made contingent on establishing that trust's solvency.[25] On the other hand, Morgan may simply have miscalculated the consequences of permitting Knickerbocker to fail, and acted to save the Trust Company of America the next day in response to deteriorating conditions in banking markets.

Consequences of the Panic

The onset of the panic occurred at a time when credit markets were already under great stress, and many borrowers likely had difficulty in obtaining funds. In the spring of 1907, underwriters of high-quality debt, such as bonds of municipalities and large railroads, began to

---

irony than this, that the man – who of all men had been responsible for this terrible calamity, should be heralded before the whole country as the one who averted it?" (1908, p. 304).

[24] These included the Pere Marquette Railroad, the New York Chicago & St. Louis Railroad, U.S. Steel, General Electric, and International Mercantile Marine.

[25] On the night of 22 October, J.P. Morgan & Co. partner George W. Perkins told reporters that a syndicate of lenders would aid the Trust Company of America (Strouse, 1999, p. 577). However accounts of the following day's events do note that Morgan assessed the solvency of the institution before actually providing aid.

experience difficulty in marketing those issues, and interest rates began to rise. Many corporations "of the highest standing" were forced to resort to short-term notes for investments they would normally finance with long-term debt, and other institutions were forced to rely on bank credits to a much greater extent than usual (Sprague, 1910: p. 238).

On October 28, in the face of heavy withdrawals from out-of-town banks, the New York Clearing House issued "clearing house certificates" in order to provide liquidity to its members, and New York's banks soon after suspended the convertibility of their deposits into currency. The banks in the rest of the country soon followed, with some receiving legal sanction of their state governments. Full convertibility of deposits was not restored until January 1908. Although this suspension was limited to the of convertibility of deposits, and banks offered their customers substitutes for cash such as clearing house certificates or cashiers' checks, these measures likely made important transactions more difficult. On the other hand, the suspension likely halted the spread of the banking panic and averted a total collapse of the banking system, as in 1930-33 (Friedman and Schwartz, 1968).

The contraction of lending that occurred during the panic in New York was heavily concentrated within trust companies. Prior to the panic, the aggregate volume of New York trust company loans was similar to that of New York's national banks. However, during the panic total loans at trust companies contracted by $247.6 million, or 37 percent, between August and December (Moen & Tallman, 1992). During the same period, the loans of national banks in New York fell by only 2 percent. Contemporary observers noted the consequences: "It is obvious that every trust company is protecting itself to the full extent of its powers, and the small borrowers, however solvent, necessarily suffer at such a time."[26] In what follows, we will use the variation across trust companies in the extent to which they lost deposits to analyze the consequences of the panic for their client firms.

3. Data

Board data and ties to financial firms

[26] *Wall Street Journal*, 24 October 1907, p. 4.

We identify the connection between a trust company and a nonfinancial firm by the presence of a director of the trust on the board of directors of the nonfinancial firm. To observe these relationships, we collected the names of all directors and managers of all NYSE-listed industrials and railroads as reported in *Moody's Manuals* over several years around the panic. To identify directors of trusts, we also obtained lists of directors of commercial banks and trust companies from the *Rand McNally Bankers' Directory*. Finally, we collected the names of partners of prominent investment banking houses from stock exchange directories.

Cross-referencing the names of bankers with those of corporate directors enables us to create a detailed dataset on the presence of trust company directors on boards of non-financial firms. We match the names of corporate directors to those of bankers based on last name, first name, second initial, and suffix. A concern that arises in this procedure is that matching on names may lead to erroneous matches. Particularly worrisome is that we may overestimate the degree of interlocking across non-financials and financial institutions if, for example, two different people with the same name held a directorship in an industrial company and a trust company. However, we have implemented this same procedure for subsequent years when sources such as the *Pujo Committee Report*, which lists the directors of a substantial number of banks and nonfinancial companies around 1912, is available. Our matching procedure to produces a nearly identical outcome to the Pujo report.[27]

Table 2 displays summary statistics for the data on trust company connections to firm boards in 1907. From our 77 NYSE-traded railroads, 84% had at least one trust company representative on its board. From our sample of 109 industrial companies, 70% had a trust company representative among its directors. The prevalence of trust company directors among the directors of non-financials may to some extent reflect the desire of trusts to form alliances with important firms—that is, for the trust to invite an industrialist or a railroad manager to serve on its own board. But a substantial number of these cases were more likely the trust company directors serving on the non-financial's

[27] We are also working on verifying the accuracy of our most important matches (and non-matches) using the *Directory of Directors in New York,* a source that identifies the directorships held by prominent New Yorkers.

board.[28] Moreover, the extraordinarily high rate at which these interlocks occurred indicates that trust companies were indeed very prominent in banking and financial markets prior to the panic, as well as in the governance of many large enterprises.

An important feature of our data is that it allows us to identify the connections between specific trust companies and non-financials at the firm level through board linkages. Figure 3 illustrates the connections between the five trust companies identified as most prominently connected to the scandal of Heinze, Morse, and Barney's failed cornering scheme (those directly connected to the scandal in Figure 1), and NYSE-traded firms. Directors of these trust companies held 39 board seats with NYSE-traded firms, including many prominent railroads and industrials.

Stock Price Data

The standard datasets of stock prices, such as CRSP, do not cover the earliest decades of the twentieth century. For all firms in our sample, we use the *New York Times* to collect the closing prices of common shares traded on the NYSE at the end of each week from the end of August 1907 to December 1907.

Accounting Data

No readily available dataset of accounting information exists for early twentieth century firms. For this paper, we constructed a comprehensive dataset for all NYSE-traded industrial companies and railroad companies from *Moody's Manuals of Railroads and Corporation Securities*, which presents firm-level data for a large number of publicly traded corporations based on their annual reports. For each firm in our sample, we collected financial information for each available year from 1900 to 1911. Our panel dataset contains information on firm size, leverage, and various measures of profitability.

Unfortunately, the quality of financial reports varied considerably across firms due to the lack of financial disclosure requirements or formal accounting standards during these early years of

[28] We are currently working on separately identifying these cases by using the names of managers and officers of nonfinancial firms as listed in the *Moody's Manuals*.

the twentieth century. Railroads were the first federally-regulated enterprises, and the Interstate Commerce Commission required detailed financial disclosures from these enterprises. The accounting statements of the railroads, particularly beginning in 1905, are therefore of relatively high quality and reasonably consistent across firms. The industrials, however, are altogether a different matter. Although the NYSE required its listed firms to produce financial statements, it did not specify the contents of the required statements, and many firms took great license in their interpretation of the requirement.[29] In particular, relatively few industrial firms presented detailed income statements, and many merely reported "net income." In our empirical analysis, we therefore focus on profitability ratios where net income, something we generally do observe, is the numerator.

Table 3 presents the definitions and summary statistics for the accounting variables of interest. As the first few rows of the table make clear, the NYSE-traded railroads and industrial companies were very large enterprises, some of the largest in the United States. The average value of the total assets of railroads was about $197 million and for industrial companies, it was about $79 million. Railroad companies were much larger on average than industrial companies, which were less well-established and generally considered riskier enterprises.

The firms' leverage ratios provide an indicator of the proportion of the company's assets that are financed through long-term debt. The book-value leverage ratio of railroads was 0.45. Industrials, in contrast, financed much less of their activities, about 13 percent on average, with long-term debt. The larger borrowing capacity of railroads may be partly explained by their excellent collateral. Finally, two measures of profitability, the return on assets and return on equity, are presented in Table 3. Whereas the return on assets measures the overall profitability of a firm's operations, the return on equity measures the accounting-based rate of return earned by the firm's equity holders, which incorporates the effect of the firm's leverage. The return on assets for railroads and industrials was fairly similar, around 5 percent, but the return on equity of the railroads was higher, reflecting their higher leverage.

[29] Sivakumar and Waymire (1993), and Barton and Waymire (2004) analyze the content of early financial statements. Firms that did not trade on the NYSE mostly made no information available. Thus we restrict our sample to NYSE-traded firms.

In the empirical analysis that follows, we investigate whether firms with ties to the worst-affected trust companies suffered differentially after the panic. We define the "worst-affected" trusts as those among the top 25% in deposit losses. This corresponds to the trust companies that lost at least as much of their deposits as Standard Trust Co. in Figure 2—or all of the trusts directly or indirectly connected to the scandal, plus three others that experienced similar deposit losses.

How did firms with at least one director from our "affected trust" category compare to those that did not? Table 4 presents the characteristics of the firms in the dataset with and without affected trusts in 1907 over all the years of the sample. Firms with directors from affected trusts were considerably larger and more leveraged. This is consistent with a relationship with a trust company helping firms to obtain access to financing and grow. However, one would expect the same correlation if trusts were more likely to seek to be on boards of larger and more established firms. In terms of performance measures, firms with the directors of affected trusts were less profitable in terms of their return on assets, perhaps reflecting their greater size, but fairly similar in terms of return on equity.

As a preliminary indication of the significance of the crisis for the clients of the most hard-hit trusts, Figure 4 presents the average number of board seats held by these trusts on NYSE-traded railroads and industrials for 1907-1911. Whereas in 1907, these institutions held on average 0.9 seats on each railroad and 0.6 seats on each industrial, a remarkable indication of their prominence in corporate finance, over the ensuing years these numbers fell dramatically. In contrast, the number of seats held by major New York commercial banks rose slightly for both industrials and railroads over this same period. Evidently many of the clients of the trusts that suffered disproportionately during the crisis found it necessary to sever their relationships with those trusts, and establish new relationships with other institutions.

4. Empirical Specifications and Results

If the connections between trust companies and nonfinancial firms were established to help nonfinancial firms gain access to external financing, they may have played an important role in

transmitting the crisis to those firms. A firm that relied on financial institutions that suffered considerable losses from the crisis, as many trust companies did, would likely have been cut off from one of its usual sources of credit.

An additional, indirect channel though which connections to a failing financial institution may have affected a firm's access to credit is through the firm's reputation. If a firm was linked to a trust company that came under financial strain or collapsed, other potential lenders or investors, having imperfect information about the soundness of the non-financial company and the quality of the trust company's investments, may have associated the firm's prospects with that of its bankers. A good reputation of a banker may have provided significant weight in the valuation of a company and boosted investor confidence early in the twentieth century, since outside investors had extremely little access to firms' financial information at that time. From an investor's standpoint, a sudden negative shock to the banker's reputation may have increased the perceived risk of financing the firm's projects. It is also possible that banks and other financial intermediaries refused financing to a company with associations to financially troubled institutions, or at least that new relationships with financial institutions took some time to rebuild. Thus, in addition to a disruption to the firm's financial channels through its affiliated trust company, the firm may also have experienced difficulties in finding alternative sources of finance.

One important concern in this analysis, however, is that "bad trusts" may have simply been associated with "bad firms," or firms that were particularly vulnerable to a liquidity crunch. That is, it is possible that any correlation observed between the performance of an affected trust and a nonfinancial firm may simply have been due to selection and not *caused* by the trust's financial troubles. We will employ an approach that focuses on the differential performance of firms in the post-panic period, relative to the pre-panic period. Thus any unchanging firm-specific characteristics will not affect our estimates. Moreover, it should be noted that many of the firms affiliated with our affected trusts were also affiliated with J.P. Morgan & Company, which makes negative selection seem unlikely. However, our approach will not enable us to completely rule out the possibility that the firms connected to affected trusts were more vulnerable to the shock for reasons other than their financial connections.

Another possibility is that it could have been the case that the client firms of the affected trusts experienced difficulties before their trusts did, and effectively caused the trusts to come under pressure (reverse causation). However, the results from our regressions analyzing the determinants of deposit losses indicate that many firms faced a form of 'contagion.' Depositors responded to revelations about the associations of one of their trusts' many directors, or in some cases revelations about the directors of *other trusts* with which their own trusts had directors in common. The possibility of causation flowing from the non-financial firms to the trust companies in this context seems unlikely.

Finally, it should be noted the effects of an affiliation with an affected trust during the panic are likely to be quite heterogeneous. Firms with substantial collateral whose value was easy to verify, or with well-established reputations that were regarded in the era before securities ratings as being in the "highest standing," should have suffered less than other firms. This implies that the sample of firms in this paper, those with shares traded on the NYSE, were among those firms *least* likely to suffer as a result of the shock to the trust companies, since they were among the largest and best-established enterprises in the United States. We therefore expect any results we obtain to be biased downward in magnitude relative to those that would be obtained in an analysis of less-elite firms. However, as there was considerable variation in the size and reputation of the firms listed on the NYSE, we also expect there to be heterogeneous effects within the firms in our sample.

Results: Stock Market Outcomes

We begin by analyzing changes in the stock prices of NYSE-listed firms around the onset of the panic. If traders in these markets perceived that the connections between nonfinancial firms and trust companies were important, and that the losses of deposits and reputations at the trust companies would adversely impact their clients, the stock prices of firms tied to those trust companies should have fallen when the runs on trust companies began. To investigate this empirically, we employ a strategy similar to the event study methodology often used in finance.

In particular, for each firm *i* we calculate the abnormal capital appreciation on common stock relative to the market following the market-adjusted-return model (Campbell, Lo and MacKinlay, 1997) as:

$$r_{it} = R_{it} - R_{mt}$$

where $R_{it} = Price_{it}/Price_{i,t-1}$, and R_{mt} is the actual stock appreciation on the market, measured by all stocks included in our sample.[30] We then calculate the individual cumulative abnormal appreciation for each firm for a window of weeks [-*k*, *k*] centered around the onset of the panic by adding the abnormal capital appreciation over those weeks:[31]

$$CAA_i = \sum_{t=-k}^{t=k} r_{it}$$

It is important to note that securities markets were rather illiquid early in the twentieth century relative to the present. In a given week, we observe the capital appreciation for 37 percent of the 117 railroads and industrial firms for which we have balance sheet information. Thus, our ability to cumulate abnormal capital gains based only on observed prices would be rather limited. Instead, we assume no price changes in weeks for which prices are missing (that is, we set the capital appreciation R_{it} to 1), but we restrict the analysis to the cumulative abnormal appreciation of those firms were at least one capital appreciation $R_{it}$was actually observed during the event window [-*k*, *k*].[32]

Using these data, we estimate:

$$CAA_i = \alpha + \beta_0 Affectedtrust_i + \beta_1 Affectedtrust \times logassets06_i + \beta_2 logassets06_i + \delta X_i + \varepsilon_i$$

[30] We present results using the equal-weighted market capital appreciation. However, our regression estimates are exactly the same, except for the constant term, when using a market-weighted or a price-weighted index, or simply using the unadjusted individual returns.

[31] Our strategy diverges from the standard event study methodology in two main ways. First, we focus on capital appreciation rather than in income returns to abstract from dividend payments. We do not anticipate this restriction to alter our results since few firms paid out dividends within our window of analysis. Second, the standard methodology calculates abnormal returns as the difference between the actual return and a predicted return obtained from a market model. Our strategy is equivalent under the assumption that α=0 and β=1 for every share. Estimating a market model requires collecting weekly prices for an extended period of time other than the panic. We are in the process of relaxing both assumptions.

[32] Our results are robust (although less precise) when we focus only on the most liquid shares that are less subject to our imputation.

where *Affectedtrust* is an indicator equal to one for firms with a director from one of the trusts among the top 25 percent in deposit losses, and *logassets06* is the log level of assets at the end of the firm's fiscal year in 1906. If the presence of a director from an affected trust company on a firm's board were detrimental because of disruptions in access to credit and/or harm to its reputation, then we would expect to find a negative overall effect on the returns paid by the firm's shares. But as we expect the effects to be heterogeneous, the interaction with the log of assets in 1906 allows us to study differential effects of connections to affected trusts for firms that were small or large (prior to the onset of the panic). We expect to find that firms connected to affected trusts had lower returns during the panic $(\beta_0 < 0)$, but that the effect was more severe for smaller firms $(\beta_1 > 0)$.

Table 5 presents results for selected event windows centered on Friday October 25th, 1907. For perspective, from the beginning of October through late November, the market fell approximately 25 percent. The results in column (1) suggest that the panic had a significant and differential effect on the returns of firms connected to affected trusts in the week surrounding the onset of the panic. For an affected firm of average size, the decline in cumulative capital appreciation on the week around the panic was -0.065 (= -1.526 + [0.0788 ×18.54]), equivalent to about half of a standard deviation in cumulative stock gains. As expected, the magnitude of the effect was heterogeneous and related to the initial size of firms. A firm in the 75th percentile of the assets distribution experienced no consequence on its stock prices due to connections with affected trusts, whereas a firm at the 25th percentile experienced very large negative returns (-0.156). Finally, the effects seem to have been fairly persistent over broader windows surrounding the onset of the panic, as shown in columns (2) and (3).

One potential concern is that we may be overestimating the effect of the panic on stock prices since we center the event on October 25th, 1907, once the panic was already in full force. In column (4) of Table 4 we replicate the analysis using Oct 18th, 1907 as the event date. Although estimated on a somewhat smaller sample, the results are basically unchanged. Indeed, the estimated coefficients imply a decline in the cumulative price gains of -0.064 for the average firm.

These results indicate that especially smaller firms connected to affected trusts saw their stock prices fall differentially during the panic. Since our strategy effectively compares the cross-

sectional differences in capital appreciation, our findings thus far cannot rule out the possibility that this negative correlation was not specific to the financial crisis—perhaps these firms generally performed worse. As a "placebo" test, we replicate our analysis using an event date as early in advance of the panic as our price data allows. As shown in column (5), we find no statistical differences in the cumulative abnormal appreciation around September 13th, 1907, and the magnitudes of the estimated coefficients, both for the "Affected trust" dummy variable and for its interaction with initial firm size, are much smaller than during the panic. These results are quite reassuring as they suggest that firms connected to affected trusts did not have lower capital appreciation in general relative to the non-connected firms.[33]

Results: Firm Performance

We now turn to analyses of measures of firm performance obtained from balance sheet and income-statement data. For these annual data, we construct a panel ranging from 1903 to 1911, and estimate the differential post-panic performance of firms that were affiliated with affected trusts in 1907 in a framework with firm and year fixed effects. In particular, we estimate:

$$\pi_{it} = \alpha_i + \gamma_t + \lambda_1 Affectedtrust_i \times postpanic_t + \\ + \lambda_2 Affectedtrust_i \times postpanic_t \times logassets06_i + \delta \boldsymbol{X}_{it} + \varepsilon_{it}$$

where π_{it} is one of the measures of performance of interest for firm *i* during year *t*; α_i and γ_t are firm and year fixed effects that control for time-invariant firm unobserved characteristics and for overall macroeconomic conditions; $\boldsymbol{X}_{ijt}$ is a vector of time-varying firm characteristics, such as log assets; and $Affectedtrust_i \times postpanic_t$ is an indicator equal to one for all years for firms with a director of a trust that was differentially affected during the panic on its board multiplied by an indicator for the years 1907 and later; and $Affectedtrust_i \times postpanic_t \times logassets06_t$ is that same indicator multiplied by the log value of the firm's assets in 1906, before the crisis. In this framework

[33] We obtain similar, albeit less robust, results when performing a placebo at the end of our weekly price data, in December of 1907. However, these results are potentially more affected by any enduring consequences of the financial crisis.

the differential effect on firm performance of having an affiliation with an affected trust in 1907 for the years during and after the financial crisis is ($\lambda_1+\lambda_2 logassets06_t$.). But again, if the effect is concentrated among smaller firms, which may have been perceived as risker, then we would expect $\lambda_1 < 0$, and $\lambda_2 > 0$.

Before proceeding to the regressions, Figure 5 presents the annual differences between firms with and without affected trusts on their board in 1907 for return on assets and return on equity, in the upper panel, and firms' dividend rates and interest rates, in the lower panel. Quite reassuringly, none of the lines has any apparent trend in the years prior to the panic, indicating that the firms affiliated with affected trusts were not worsening in their performance relative to other firms over time. Thus, it is unlikely that the results from our empirical exercise could be due simply to differential time trends between firms with and without ties to affected trusts. The upper panel shows that profitability for firms affiliated with affected trusts was rising in the years prior to the panic relative to other firms, and then collapsed in 1907 and 1908, before recovering somewhat in 1909 and 1910. The lower panel of the figure provides some insight into how these firms responded to this fall in profitability. The dividend rate of rate of firms affiliated with affected trusts had been rising relative to other firms, but was cut sharply in 1908 and remained low in 1909 before recovering in 1910. In addition, the interest rates paid by firms affiliated with affected trusts relative to other firms increased substantially between 1906 and 1908, a sign that these firms resorted to more expensive sources of credit.

Turning to the regressions, we first study the effects of connections with trusts on the profitability of nonfinancial firms. Table 6 presents these results using return on assets and return on equity. All of the standard errors presented in the table are clustered at the firm level, in order to address potential problems of autocorrelation in residuals. Consistent with the notion that credit intermediation suffered in the wake of the panic, all of the specifications indicate a negative effect on profitability that was greater for smaller firms. In columns (1) and (4), the estimated difference-in-differences for firms affiliated with affected trusts in the wake of the panic is about -0.003 and -0.009 for firms with the median level of assets, and -0.007 and -0.014 for firms at the 25th percentile

of assets. The effects for the smaller firms are equivalent to around 20 percent of a standard deviation in those variables.

Columns (2) and (5) include additional controls for firm characteristics that may have influenced their degree of vulnerability to a shock, which are interacted with a post-panic indicator. These include whether or not a director from one of New York's four largest commercial banks was on the firm's board, the firm's degree of leverage, and the percentage of the firm's assets represented by cash.[34] The inclusion of all of these variables only marginally affects the main coefficients of interest. The major bank variable has a small positive coefficient that is very imprecisely estimated; perhaps as an indication that more levered firms were likely to have better collateral, the effect of leverage on profitability is positive and significant for ROA, and perhaps as an indication that riskier firms held more cash in anticipation of their future needs, the cash ratio is negative and significant for ROE. Finally, in columns (3) and (6) a time trend interacted with affiliations with affected trusts is added in order to ensure that the results obtained are not simply due to differential trends between firms with and without these affiliations; this has little effect.

We next estimate regressions with similar specifications for firms' interest rates on their debt, and their dividend rates. These results are reported in Table 7. All of the results are qualitatively similar to those presented above for firms' profitability. The estimated coefficients in columns (1) and (4) of the table imply that the difference-in-differences for firms affiliated with affected trusts in the wake of the panic is an increase in interest rates of about 0.003 and a decrease in dividend rates of -0.006 for firms with the median level of assets. For firms at the 25th percentile of assets, these values become 0.004 (or 40 basis points) and -0.009, respectively. The effects for the firms at the 25th percentile are equivalent to around 40 percent of a standard deviation in for the interest rate, and 20 percent of a standard deviation for dividend rates. Even though we are focusing on a positively selected sample, the smaller firms within the sample did indeed suffer relative to other firms if they had an affiliation with one of the differentially affected trust companies.

[34] These major commercial banks include National City Bank, National Hanover Bank, First National Bank, and National Bank of Commerce. The first two of these had assets of around $200 million, and the second two had assets around $100 million. These were the largest banks in the city by far, and dominated the NYCH and banking generally.

Robustness of the Results

The results presented above indicate that the smaller firms affiliated with affected trusts suffered differentially in the years following the Panic of 1907. An alternative way to differentiate among firms, which corresponds well to the firm characteristics relevant to the Bernanke (1983) notion of credit intermediation, is to distinguish between railroads and industrials. With their extensive land holdings, track, and rolling stock, railroads had excellent collateral whose value was relatively easy to establish. In contrast, the assets of many industrial firms were more likely to include intangibles such as patents, and the physical capital of firms in some industries such as electrical supplies was much harder to value. We would therefore expect an industrial firm with an affiliation with an affected trust to be affected much more severely than a railroad following the panic.

Table 8 presents regressions that estimate a specification where the usual *Trust×post-panic* variable is interacted with an indicator for railroads, and an indicator for industrials. Regressions for profitability, interest rates, and dividend rates are presented in the table. Consistent with the notion that firms with riskier collateral should suffer differentially following the panic, the results indicate that industrials performed worse than railroads for every measure of performance.

One additional issue of particular concern regarding the results presented above is that they may be due to a particular kind of selection: firms that were particularly vulnerable to the crisis for reasons other than their financial connections may have selected into relationships with the trust companies that were adversely affected by the panic. If, for example, firms that pursued aggressive financing strategies or undertook risky investments formed affiliations with trust companies that were also vulnerable to the panic, then the estimates obtained in the regressions above would have reflected this selection effect.

Because the vulnerability of firms reflects a latent characteristic that is only revealed once the firm is subject to a shock, it is difficult to address this issue empirically. Indeed, the inclusion of firm fixed effects controls only for time-invariant unobservable characteristics, and does not control for unobservable characteristics that become important only during a panic. However, we can use

the experience of an earlier recession and financial panic as a test of this hypothesis. In 1903 and 1904, the United States experienced a prolonged recession that included a financial panic concentrated in 1903.[35] The 1903 crisis saw a sustained decline in securities prices, and led to a significant contraction in credit markets; "even the best railways and municipalities found it difficult to borrow on their accustomed terms" (Mitchell, 1913: p. 67). Although the recession was not as severe as the one that followed the Panic of 1907, and did not result in widespread bank failures, it did produce substantial numbers of commercial failures.[36] It certainly constituted a shock to securities markets and a significant decline in demand.[37] If the firms affiliated with affected trusts in 1907 were fundamentally similar four years prior to that shock, in the sense that the degree of their vulnerability to shocks was roughly the same, and if the panic and recession that occurred can be considered reasonably similar to the panic of 1907, then the experience of firms that were affiliated with affected trusts during the years 1903-04 should provide a test of whether they are indeed a differentially vulnerable group of firms.

We test this hypothesis using data from 1900-06. In particular, we investigate whether the firms that had affiliations with affected trusts in 1907 performed differentially worse in the years 1903 and 1904, and whether any such effects were heterogeneous and related to firm size. We estimate a regression of the same form as those above, only with the dates of the different variables changed:

$$\pi_{it} = \alpha_i + \gamma_t + \lambda_1 Affectedtrust_i \times 1903/04_t + \\ + \lambda_2 Affectedtrust_i \times 1903/04_t \times logassets04_i + \delta \boldsymbol{X}_{it} + \varepsilon_{it}$$

where now the differential effect of affiliation with an affected trust during the recession is equal to

[35] The NBER dates a peak in September 1902, and a trough in August 1904. The financial crisis in 1903 was given the moniker "The Rich Man's Panic."
[36] Friedman and Schwartz (1963: p. 151-52) note that Treasury Secretary Shaw made "unprecedented efforts" to bring relief to banks, significantly increasing government deposits and waiving reserve requirements.
[37] Romer (1999) presents evidence on the relative magnitude of the output loss associated with this recession; by her measure, it was approximately 1/3 the size of the one associated with the 1907 panic.

$(\lambda_1 + \lambda_2 logassets04_t.)$[38]

The results, reported in Table 9, indicate that the firms affiliated with affected trusts did not perform differentially worse in the 1903-04 recession. The estimates reported in columns (1) and (2), for ROA and ROE, are much smaller in absolute value than those reported in Table X, and have very large standard errors. In addition, the point estimates for λ_1 and λ_2 are positive and negative, respectively – the opposite pattern found for the 1907 panic. For a firm at the 25th percentile in log assets, the effect on their ROA and ROE negative but only about one-third and one-fifth the size of the effect in 1907, respectively. In column (3), where the dividend rate is estimated, the estimates even become marginally significant, again with the opposite signs as above, and the effect for a small firm is an increase in the dividend rate of 0.2 percent. Finally, again for a small firm, the interest rate on their debt actually fell by 0.2 percent. Any interpretation of the results of this paper based on the vulnerability of the firms affiliated with affected trusts in 1907 must confront the fact that these firms did not perform differentially worse in the 1903-04 panic and recession, and moreover the smaller firms within this group, which did relatively worse after the 1907 panic, did relatively better during 1903-04. Thus, we view this as suggestive evidence that the shock to the financial sector during the Panic of 1907 transmitted to nonfinancial firms and had real consequences for individual firms.

5. Conclusion

The panic of 1907 was one of the most severe financial crises prior to the Great Depression. This paper investigates the effects of the panic by focusing on a particular channel through which the financial crisis may have been transmitted to the real economy: the affiliations between the trust companies that came under tremendous pressure, and their client firms. In the early twentieth century, financial institutions such as trust companies commonly placed one of their directors on the

[38] Ideally we would like to use the value of assets in 1902, which would not reflect any changes that occurred during the recession. However, we only observe the value of assets for 38 firms in 1902, whereas we observe them for 90 firms in 1904, which creates a much larger sample. Results using the smaller sample with the 1902 log assets interaction are substantially the same.

boards of the firms with whom they had strong ties; this very public affiliation between the trust and the firm helped cement this tie. Trust companies were major lenders, holders of securities, and providers of fiduciary services for corporations. The corporations affiliated with trust companies that failed likely faced a differential financial shock during the panic.

Using newly collected panel data on the performance of NYSE-traded firms, and the ties between trust companies and the NYSE firms, we used a difference-in-differences estimation strategy to investigate this effect. The results indicated that firms affiliated with affected trusts saw their profitability and dividends fall relative to other firms in the years following the panic. Some suggestive evidence confirming that the fall in profitability occurred due to financial constraints was found with the rise in interest rates these firms experienced. Evidence from securities markets also indicated that in the weeks surrounding the panic, the share prices of small firms closely affiliated with the affected trust companies fell by more than the shares of other firms.

The results also indicate the important role played by J.P. Morgan in the financial system generally, and in corporate finance in particular. Morgan had helped to organize a series of rescues of trust companies, through his power and influence with other financial institutions. But his actions were not those of a disinterested actor, and in particular were focused on a trust company with close ties to several of his own firm's clients. But the panic was precipitated in part by decisions to cut off certain speculators and institutions from aid from the New York Clearinghouse and its members, where Morgan and his associates had considerable influence. Morgan and his associates did take on some elements of the role of central bankers, but clearly not all of them.

Bibliography:

Amiti, Mary, and David Weinstein. 2009. "Exports and Financial Shocks," *NBER Working Paper Series*, number 1556.

Barnett, G. 1910. *State Banks and Trust Companies since the Passage of the National Bank Act.* Publications of the National Monetary Commission. Washington, DC: Government Printing Office.

Barton, Jan and Gregory Waymire. 2004. "Investor Protection Under Unregulated Financial Reporting," *Journal of Accounting and Economics*, 38(1), 65-116.

Bernanke, B. "Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression." *The American Economic Review*. Vol. 73, No. 3 (Jun., 1983), pp. 257-276.

Bernstein, Assaf, Hughson, Eric, and Weidenmier, Marc. 2010. "Identifying the Effects of a Lender of Last Resort on Financial Markets: Lessons from the Founding of the Fed." Forthcoming, *Journal of Financial Economics*.

Berryman, William L. 1907. "The Modern Trust Company," in *Trust Companies*, 4(2), p. 101.

Bordo, Michael, and Joseph G. Haubrich. 2010. "Credit Crises, Money and Contractions: An Historical View." *Journal of Monetary Economics*.57, (2010): 1-18.

Bruner, R, and Carr S. 2007. *The Panic of 1907: Lessons Learned from the Market's Perfect Storm.* New York: John Wiley & Sons, Inc.

Bullard James, Neely Christopher, and Wheelock, David. "Systemic Risk and the Financial Crisis: A Primer." Federal Reserve Bank of St. Louis *Review*, Septempber/October 2009, 91(5, Part 1), pp.403-17.

Calomiris, Charles, and Gary Gorton. 2000. "The Origins of Banking Panics: Models, Facts, and Bank Regulation," in *U.S. Bank Deregulation in Historical Perspective.* New York: Cambridge University Press.

Calomiris, Charles, and Joseph R. Mason. 1993. "Consequences of Bank Distress During the Great Depression," *American Economic Review*, 93(3), 937-47.

Campbell, John Y., Low, Andrew W., and A. Craig MacKinlay. 1997. *The Econometrics of Financial Markets.* Princeton: Princeton University Press.

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

------. 1987. *The Morgans: Private International Bankers, 1854-1913.* Cambridge: Harvard University Press.

DeLong, J. Bradford. 1991. "Did J.P. Morgan's Men Add Value? An Economist's Perspective on Finance Capitalism," in Temin, ed. *Inside the Business Enterprise: Historical Perspectiveso n the Use of Information.* Chicago: University of Chicago Press.

Eichengreen, Barry. 1992. *Golden Fetters*. Oxford, U.K.: Oxford University Press.

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

Gorton, Gary, and Andrew Metrick. 2011. "Regulating the Shadow Banking System." *Brookings Papers on Economic Activity*, Fall.

Hanes, Christopher L., and Paul Rhode. 2011. "Harvests and Financial Crises in Gold-Standard America." Working paper, Binghamton University.

Judd, Orrin R. 1907. "The New York Trust Company Reserve Law." Trust Companies, 7(1), p. 2.

Kayshap, Anil, Lamont, Owen, and Jeremy C. Stein. 1994. "Credit Conditions and the Cyclical Behavior of Inventories," *Quarterly Journal of Economics*, 109(3), pg 565-92.

Khwaja, Asim and Atif Mian. 2008. "Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market," *American Economic Review*, 98(4), pp 1413-42.

McNelis, Sarah. 1968. *Copper King At War: The Biography of F. Augustus Heinze*. University of Montana Press.

Miron, Jeffrey A. 1986. "The Nominal Interest Rate, Seasonality, and the Founding of the Fed." *American Economic Review*, 76 (1).

Mishkin, Frederic S. 1991. "Asymmetric Information and Financial Crises: A Historical Perspective." In R. Glenn Hubbard, ed. *Financial Markets and Financial Crises.* Chicago: University of Chicago / NBER.

Mitchell, Wesley C. 1913. *Business Cycles*. Berkeley: University of California Press.

Mladjan, Mrdjan. 2012. "Accelerating into the Abyss: Financial Dependence and the Great Depression." Working Paper, Universitat Pompeu Fabra.

Moen, J. and Tallman, E. 1990. "Lessons of the Panic of 1907," *Federal Reserve Bank of Atlanta Economic Review*, May/June.

------ and ------. 1992. "The Bank Panic of 1907: The Role of Trust Companies." *The Journal of Economic History*, 52(3), pp. 611-630

------ and ------. 2000. "Clearinghouse Membership and Deposit Contraction During the Panic of 1907," *Journal of Economic History*, 60(1), pp.145-163.

Neal, Larry. 1971. "Trust Companies and Financial Innovation, 1897-1914," *Business History Review*, 45(1), pp. 35-51.

Odell, K. and Weidenmier, M. 2004. "Real Shock, Monetary Aftershock: The 1906 San Francisco Earthquake and the Panic of 1907." *Journal of Economic History*, 64 (4).

Pak, Susie, and Daniel S. Halgin. 2010. "The Social Network of J.P. Morgan & Co., 1895-1940: Interlocking Directorates, Social Clubs, and Syndicates." Working Paper, St. John's Univeristy.

Redlich, F. 1951. *The Molding of American Banking: Men and Ideas*. New York: Hafner Publishing Co.

Romer, Christina. 1999. "Changes in Business Cycles: Evidence and Explanations," *Journal of Economic Perspectives*, 13(3), pp. 23-44.

Schnabl, Philip. 2011. "The International Transmission of Bank Liquidity Shocks: Evidence from an Emerging Market." *Journal of Finance*, forthcoming.

Senate Committee on Banking and Currency. 1912. *Hearings on a Bill to Provide For the Establishment of Federal Reserve Banks.* Washington: Government Printing Office.

Simon, M. 1989. "The Rise and Fall of Bank Control in the United States: 1890-1939." *American Economic Review,* Vol. 88 (5), pp. 1077-1093.

Sinclair, Upton. 1908. *The Moneychangers*. New York: B. W. Dodge & Co.

Sivakumar, K.N., and Gregory Waymire. 1993. "The Information Content of Earnings in a Discretionary Reporting Environment: Evidence from NYSE Industrials, 1905-10," *Journal of Accounting Research*, 31(1), 62-91.

Sprague, O.M.W. 1910. *A History of Crises Under the National Banking System.* Publications of the National Monetary Commission. Washington, DC: Government Printing Office.

Strouse, Jean. 1999. *Morgan: American Financier*. New York: Random House.

Wicker, Elmus. 2000. *Banking Panics of the Gilded Age*. Cambridge, U.K.: Cambridge University Press, 2000.

------. 2005. *The Great Debate on Banking Reform: Nelson Aldrich and the Origins of the Fed*. Columbus, Ohio: Ohio State University Press.

White, Eugene. 1983. *The Regulation and Reform of the American Banking System, 1900-1929*. Princeton: Princeton University Press.

Williams, Clark. 1909. *Annual Report of the Superintendant of Banks*. New York *Senate Documents*, number 6.

Ziebarth, Nicholas. 2012. "Misallocation and Productivity During the Great Depression." Working Paper, Northwestern University.

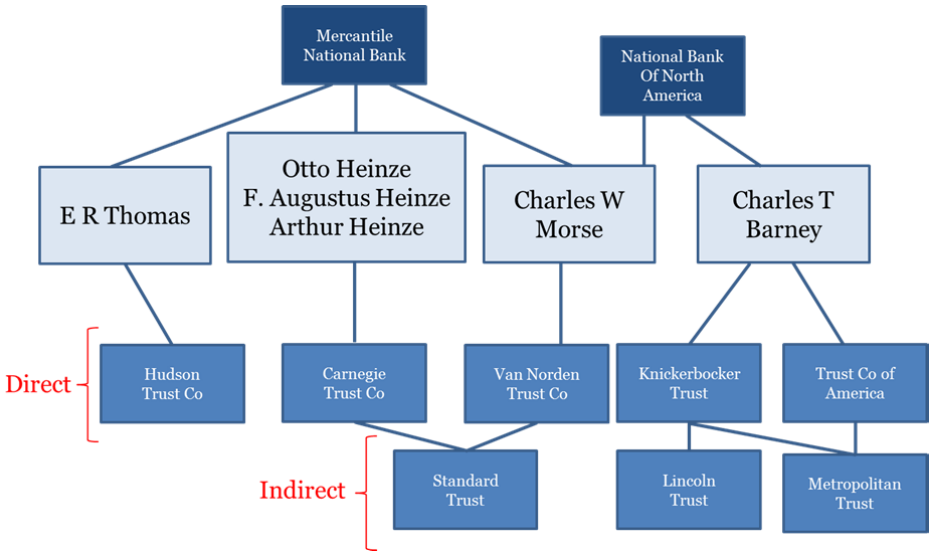

Figure 1: Connections between speculators and trust companies

Lines connecting individuals to financial institutions denote directorships. The institutions at the top of the figure are the national banks that connect the speculators to one another and to Barney; Morse, Thomas and the Heinzes also controlled several other banks, not shown. The group of trusts denoted as having an indirect connection to the speculation was defined as those with at least two directors in common with those that had a direct connection. Data on directorships collected from *Rand McNally Bankers Directory*, 1907.

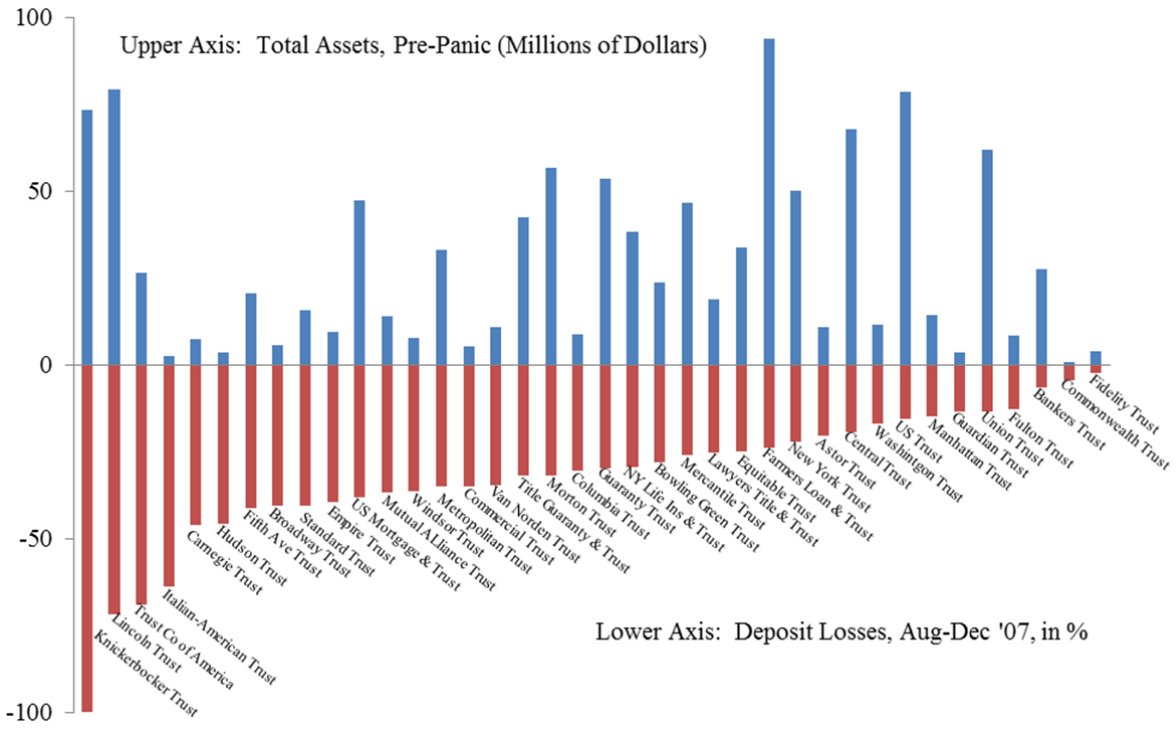

Figure 2: Assets and deposit losses at New York City trust companies

Upper axis: total assets, June 1907, in millions. Lower axis: percentage change in deposits between August 22, 1907 and December 19, 1907, in percent. Data reported to the NY Superintendent of Banks.

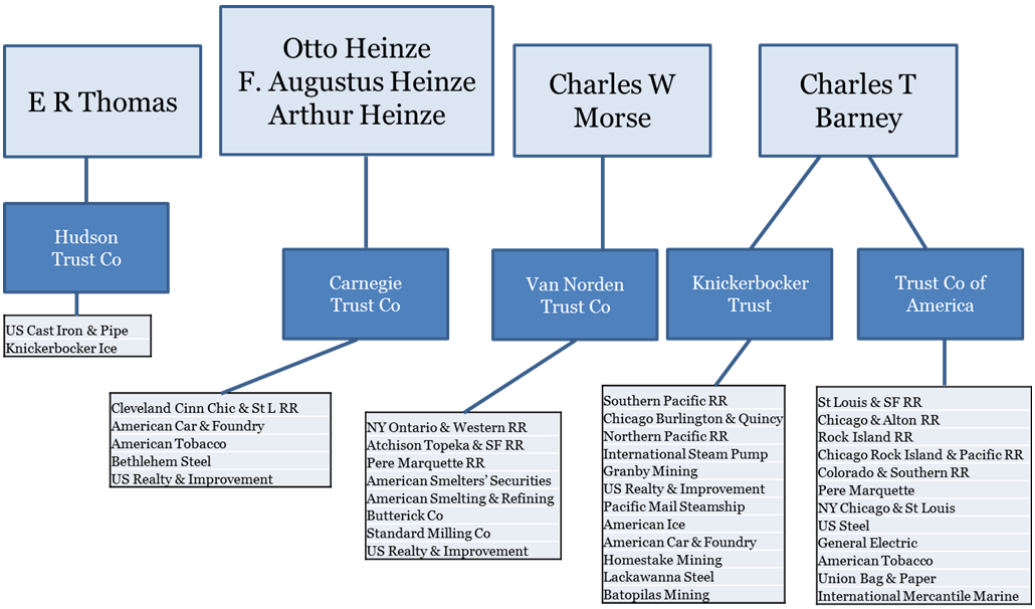

Figure 3: Connections between trust companies and nonfinancial firms

Lines connecting individuals to financial institutions denote directorships. Data on directorships collected from *Rand McNally Bankers Directory*, 1907, and *Moody's Manual of Railroads and Corporation Securities*, 1907.

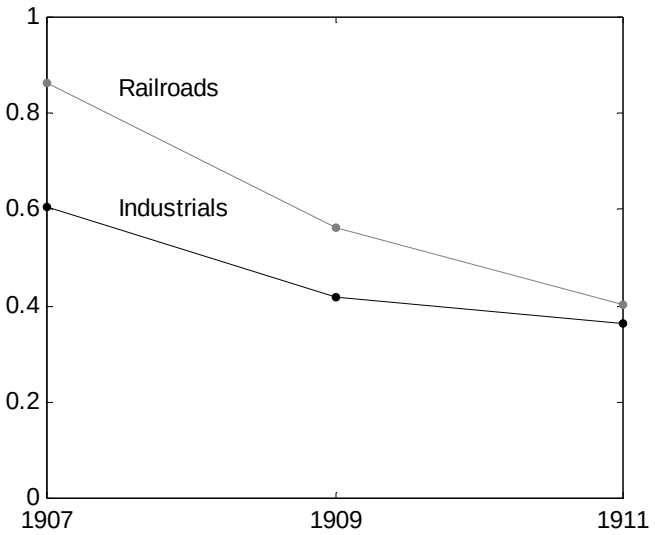

Figure 4: Board seats held by differentially affected trusts, 1907-1911

Average number of seats held by differentially affected trusts across all railroads and industrials. Data are averages per firm; the number 0.6 for 1907 for industrials implies that on average these trusts held 0.6 seats with each industrial firm. Data on directorships collected from *Rand McNally Bankers Directory*, 1907-11, and *Moody's Manual of Railroads and Corporation Securities*, 1907-11.

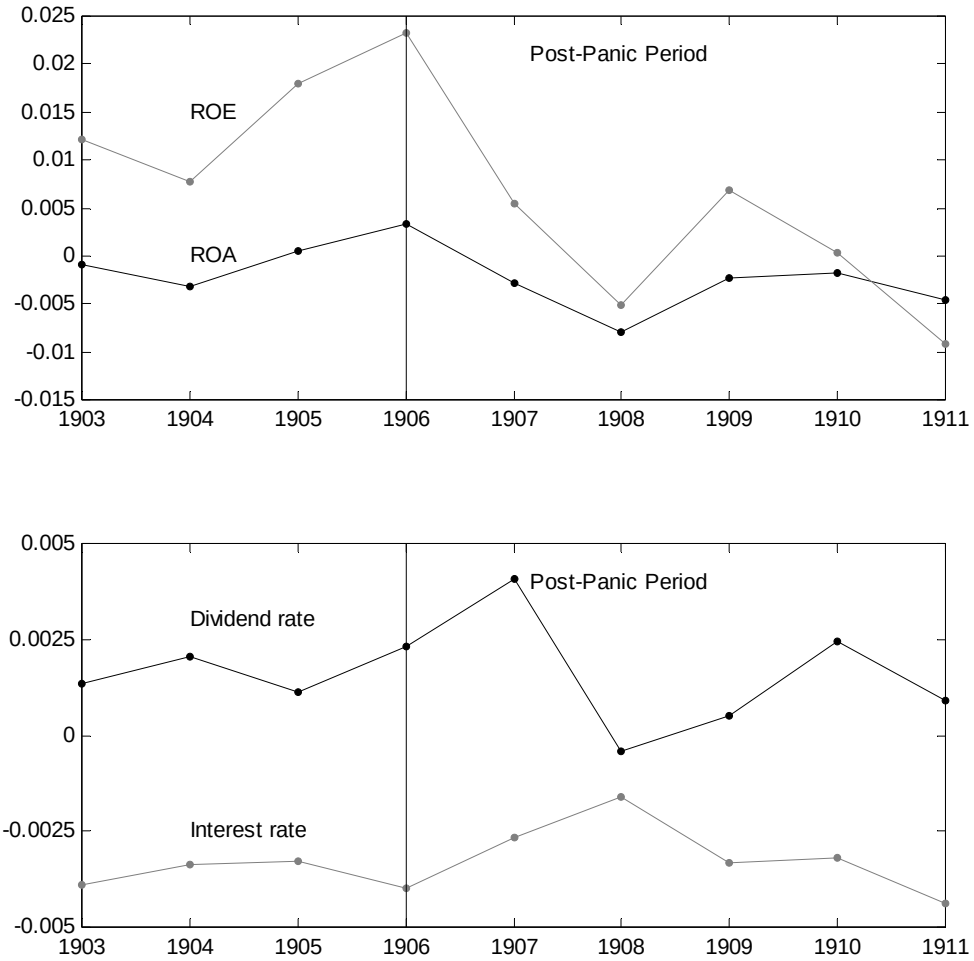

Figure 5: Annual estimated differences between firms with and without affected trusts
Each line plots the annual difference between firms with and without affected trusts on their board in 1907, as estimated in a regression that controls for firm fixed effects.

Table 1: Regressions:
Percent Change in Deposits, August-December 1907
(Mean = -0.32, SD = 0.20)

	(1)	(2)	(3)
Direct Connection to Scandal	-0.338***	-0.330***	-0.351***
	(0.113)	(0.114)	(0.1000)
Indirect Connection to Scandal	-0.223**	-0.255**	-0.243***
	(0.0927)	(0.0963)	(0.0848)
J.P. Morgan Partner on Board		0.121**	0.120*
		(0.0577)	(0.0700)
Net Worth / Assets			0.482***
			(0.174)
Cash / Checkable Deposits			4.177*
			(2.118)
Stock and Bond Investments / Assets			0.198
			(0.151)
Log(Total Assets)			-0.00745
			(0.0248)
Constant	-0.259***	-0.267***	-0.467
	(0.0244)	(0.0251)	(0.495)
Observations	38	38	38
R-squared	0.406	0.433	0.593

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 2: Trust company representation on firm boards, 1907

	Mean	SD	Min	Max
A. Railroads				
Board Characteristics				
Board Size	12.32	3.07	4	26
Trust company representation on board				
At least one trust company representative on board	0.84	--	0	1
Seats held by trust company representative	4.22	2.76	0	12
Number of different trust companies represented	5.63	3.98	0	14
B. Industrials				
Board Characteristics				
Board Size	12.53	4.56	3	28
Trust company representation on board				
At least one trust company representative on board	0.70	--	0	1
Seats held by trust company representative	2.48	2.45	0	14
Number of different trust companies represented	2.98	2.95	0	15

Table 3:
Definitions and summary statistics, accounting variables

Variable	Definition	Mean	SD	Min	Max
A. Railroads					
Assets	Total assets	196,859,711	181,115,021	5,598,323	869,643,066
Leverage ratio	Long-term debt/ assets	0.454	0.155	0	0.771
Return on assets	Net income/assets	0.046	0.02	0	0.16
Return on equity	Net income/shareholders' equity	0.144	0.08	0	0.48
B. Industrials					
Assets	Total assets	78,941,765	218,261,937	2,162,651	1,821,965,555
Leverage ratio	Long-term debt/ assets	0.132	0.14	0	0.62
Return on assets	Net income/assets	0.051	0.04	-0.024	0.23
Return on equity	Net income/shareholders' equity	0.091	0.07	-0.056	0.38

Table 4:
Characteristics of non-financials with and without affected trusts,
All firm-years, 1902-1911

	No affected trust director on board in 1907	Affected trust director on board in 1907	p-value, difference
Physical Characteristics			
Log assets	17.757	18.561	0.000
Debt and liquidity			
Book leverage ratio	0.339	0.471	0.000
Short-term liabilities ratio	0.029	0.031	0.234
Performance			
Return on assets	0.041	0.027	0.000
Return on equity	0.073	0.072	0.000

Table 5:
Stock Market Event Study

	Event date on Oct 25th, 1907			Event date on Oct 18th, 1907	Event date on Sept 13th, 1907
Event window:	k=1	k=2	k=6	k=1	k=1
	(1)	(2)	(3)	(4)	(5)
Affected trust	-1.526*	-1.727*	-1.351+	-1.249*	-0.143
	(0.600)	(0.728)	(0.680)	(0.575)	(0.409)
Affected trust×logassets06	0.0788*	0.0891*	0.0704+	0.0641*	0.00756
	(0.0317)	(0.0384)	(0.0361)	(0.0305)	(0.0221)
Logassets06	-0.0456	-0.0527	-0.0618*	(0.0305)	-0.0143
	(0.0283)	(0.0327)	(0.0277)	(0.0268)	(0.0220)
Railroad	0.100*	0.0970*	0.112**	0.0856**	0.0592*
	(0.0392)	(0.0437)	(0.0410)	(0.0302)	(0.0292)
Constant	0.830	0.998+	1.159*	0.293	0.227
	(0.510)	(0.591)	(0.502)	(0.487)	(0.393)
Observations	61	62	69	58	59
R-squared	0.297	0.241	0.155	0.373	0.100

Robust standard errors in parentheses. **, *, and + indicate significance at the 1, 5 and 10 percent level, respectively. The dependent variable in each column is the cumulative abnormal capital appreciation from k-weeks prior to the event date to k-weeks after the event date for each firm with at least one non-missing capital appreciation over the event window.

Table 6:
Regressions, firm profitability

	ROA			ROE		
	Mean: .033, SD: .031			Mean: .072, SD: .052		
	(1)	(2)	(3)	(4)	(5)	(6)
Trust×post-panic	-0.0864**	-0.0702**	-0.0714**	-0.128*	-0.121*	-0.115*
	(0.0257)	(0.0261)	(0.0261)	(0.0551)	(0.0540)	(0.0546)
Trust×post-panic×logassets06	0.00457**	0.00358*	0.00358*	0.00658*	0.00600*	0.00601*
	(0.00135)	(0.00138)	(0.00138)	(0.00293)	(0.00289)	(0.00289)
Major bank×post-panic		0.000261	0.000272		0.000734	0.000664
		(0.00282)	(0.00283)		(0.00600)	(0.00600)
Leverage06×post-panic		0.0133+	0.0133+		0.0114	0.0114
		(0.00697)	(0.00698)		(0.0136)	(0.0136)
(Cash/assets)06×post-panic		-0.0225	-0.0220		-0.102+	-0.104+
		(0.0324)	(0.0327)		(0.0558)	(0.0565)
Trust×time trend			0.000298			-0.00129
			(0.000727)			(0.00143)
Log(assets)	-0.00676	-0.00602	-0.00613	0.0286+	0.0328*	0.0332*
	(0.00654)	(0.00697)	(0.00700)	(0.0147)	(0.0154)	(0.0155)
Constant	0.158	0.142	0.143	-0.451+	-0.527+	-0.531+
	(0.119)	(0.127)	(0.126)	(0.270)	(0.281)	(0.283)
Observations	974	974	974	959	959	959
R-squared	0.852	0.854	0.854	0.799	0.800	0.801
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors, adjusted for clustering on firms, in parentheses
** p<0.01, * p<0.05, + p<0.1

Table 7:
Regressions: Interest rates, dividend rates

	Interest rate			Dividend rate		
	Mean: .047, SD: .010			Mean: .033, SD: .041		
	(1)	(2)	(3)	(4)	(5)	(6)
Trust×post-panic	0.0298*	0.0381*	0.0381*	-0.0779*	-0.0865*	-0.0802*
	(0.0143)	(0.0180)	(0.0182)	(0.0343)	(0.0364)	(0.0361)
Trust×post-panic×logassets06	-0.00148+	-0.00194+	-0.00194*	0.00398*	0.00451*	0.00453*
	(0.000767)	(0.000985)	(0.000978)	(0.00186)	(0.00196)	(0.00197)
Major bank×post-panic		0.00009	0.00009		0.00265	0.00253
		(0.00198)	(0.00199)		(0.00382)	(0.00379)
Leverage06×post-panic		0.00502	0.00502		-0.0111	-0.0110
		(0.00628)	(0.00630)		(0.00949)	(0.00949)
(Cash/assets)06×post-panic		0.0239	0.0239		0.0732	0.0699
		(0.0317)	(0.0316)		(0.0898)	(0.0905)
Affected trust×time trend			-0.000009			-0.00155
			(0.000456)			(0.00104)
Log(assets)	-0.00252	-0.00390	-0.00390	0.0111	0.00787	0.00888
	(0.00433)	(0.00441)	(0.00436)	(0.0101)	(0.0105)	(0.0104)
Constant	0.0935	0.117	0.116	-0.165	-0.106	-0.119
	(0.0803)	(0.0808)	(0.0803)	(0.184)	(0.192)	(0.191)
Observations	668	668	668	968	968	968
R-squared	0.699	0.700	0.700	0.876	0.878	0.879
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors, adjusted for clustering on firms, in parentheses

** p<0.01, * p<0.05, + p<0.1

Table 8:
Regressions, Industrials vs. Railroads

	ROA	ROE	Interest rate	Dividend rate
	(1)	(2)	(3)	(4)
Affected trust×post-panic×Industrial	-0.0120**	-0.0279**	0.00538*	-0.0118**
	(0.00441)	(0.00777)	(0.00214)	(0.00407)
Affected trust×post-panic×Railroad	0.00312	0.00288	0.00130	-0.000811
	(0.00241)	(0.00509)	(0.00183)	(0.00397)
Log(assets)	-0.00739	0.0260+	-0.00298	0.0113
	(0.00632)	(0.0138)	(0.00431)	(0.00987)
Constant	0.170	-0.403	0.102	-0.167
	(0.115)	(0.253)	(0.0799)	(0.180)
Observations	974	959	668	968
R-squared	0.855	0.805	0.699	0.877
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Robust standard errors, adjusted for clustering on firms, in parentheses

** p<0.01, * p<0.05, + p<0.1

Table 9:
Regressions, 1903-04 Recession

	(1)	(2)	(3)	(4)
	ROA	ROE	Dividend rate	Interest rate
Affected trust in 1907 × 1903-04	0.00900	0.0577	0.0479+	-0.0445
	(0.0466)	(0.117)	(0.0254)	(0.0275)
Affected trust in 1907 × 1903-04 × logassets'04	-0.000660	-0.00345	-0.00265*	0.00244
	(0.00244)	(0.00612)	(0.00133)	(0.00149)
logassets	-0.0402	-0.0267	0.000300	-0.00573+
	(0.0258)	(0.0343)	(0.0127)	(0.00311)
Constant	0.758	0.553	0.0198	0.152*
	(0.469)	(0.625)	(0.231)	(0.0580)
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	362	362	359	236
R-squared	0.902	0.853	0.898	0.880

Robust standard errors, adjusted for clustering on firms, in parentheses

** p<0.01, * p<0.05, + p<0.1