Friends during Hard Times: Evidence from the Great Depression*

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Abstract

Using a novel dataset of over 3500 public and private firms, we construct the network of firm connections through executives and directors on the eve of the 1929 financial market crash. We find that more connected firms have 17% higher 10-year survival rates on average. Consistent with a role in facilitating access to working capital, the results are particularly strong for small firms, private firms, cash-poor firms, and firms located in counties with high bank suspension rates during the crisis. Moreover, connections to cash-rich firms that increase their accounts receivable during the peak of the crisis are most important for survival. Our results suggest that network connections can play a stabilizing role during a financial crisis by easing the flow of capital to constrained firms.

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1. Introduction

How do the network connections of a firm's executives and directors to other companies affect firm value? Network connections could affect firm value through a number of channels. Connections could increase value by alleviating various impediments to the efficient operation of markets. For example, connections could reduce the frictions that impede the flow of information to corporate decision-makers if there are information asymmetries or costs to information acquisition. Or, they could reduce information or search frictions in the labor market, resulting in higher quality management teams. On the other hand, network connections could destroy value by facilitating herding or imitation in corporate policies. For example, executives with reputational concerns might mimic investment policies they observe in companies to which they are connected. Or, they might raise compensation in conjunction with connected companies to avoid falling behind their peers. Several recent studies find compelling evidence that network connections lead to commonality in policies across firms (Shue, 2013; Fracassi, 2017). However, the implications for firm value are less clear. A potential reason is that the relation between value and connections during normal times captures the net effect of the information and herding channels, which are not mutually exclusive. To sidestep this challenge, we test whether network connections are a positive driver of firm value in bad times. Information is likely to be more valuable following shocks to the macroeconomic environment that could disrupt the existing equilibrium. Moreover, the desire to preserve the firm for the long run is likely to take precedence over short-term incentives to extract rents when the firm is in crisis. Thus, the positive component of network ties should comprise a larger portion of the net effect on firm value when the firm is at risk of failure.

To identify this effect, we construct the network of connections among the executives and directors of industrial firms in 1928, just prior to the onset of the Great Depression. To measure network centrality, we count the total number of first-degree connections that a firm has through managerial positions or directorships that its own managers and directors hold in other industrial firms. We find that connections are associated with higher 10-year survival probabilities. Economically, a firm with more connections than the median firm has a probability of failure that is roughly 3.4 percentage points lower during the Depression years than a firm with fewer connections than the median firm – a 17% decrease from the mean exit rate of 20%.

We focus on the Great Depression for several reasons. First, the Depression is the largest negative economic shock to U.S. markets during the time period for which we can collect comprehensive data on industrial firms from Moody's Manuals.[1] In our data, we observe significant failure rates during the Depression – roughly 20% of industrial firms over ten years – confirming that survival is a relevant consideration for firms' executives. Second, we observe large subsamples of publicly traded and privately held firms for which the outcome of interest – firm failure – is directly comparable. Private firms, which comprise roughly 60% of our sample, appear to be more similar in size to publicly traded firms than we typically observe in recent data.[2] Thus, it is more credible to make cross-group comparisons to determine the effect of additional sources of finance. Moreover, public listing does not entail the same bundle of additional disclosure requirements as it does today. For example, the independence requirements in regulations such as the Sarbanes Oxley Act of 2002 could constrain the ability of firms to construct optimal networks. If this is the case, historical data can allow us to study the stabilizing effects of network conditions

[1] Peak U.S. unemployment was roughly 25% during the Great Depression with unemployment exceeding 10% throughout the 1930s. By contrast peak unemployment during the 2009 Financial Crisis peaked under 10%.

[2] See, e.g., Asker, Farre-Mensa, and Ljungqvist (2015) for a recent sample that allows comparisons across publicly traded and privately held firms. In our sample, the median publicly traded firm in 1928 has assets that would place it at the 85th percentile among private firms. Conversely, the median private firm has assets that would place it at the 20th percentile among publicly traded firms. Thus, as in recent data, private firms are smaller than public firms; however, the overlap of the size distributions appears to be more substantial.

in a setting in which firms are not bound by these constraints.[3] By contrast, we cannot observe the appropriate counterfactual in modern data without making cross-country comparisons. Thus, our analysis provides unique evidence on the attractiveness of alternative policy regimes in the context of a major financial shock. Of course, intertemporal differences in regulatory regimes could have many other effects, including a potential increase in agency costs in good times. Our goal is not to analyze the broader tradeoffs between the costs and benefits of governance regulations.

A challenge for all analyses of network effects is that network ties are not randomly assigned. Our analysis of differential outcomes following the 1929 financial shock addresses some sources of concern. In particular, it is unlikely that firms create the connections we observe in 1928 in anticipation of the coming Depression. Thus, to the extent that highly connected and less connected firms are otherwise similar, conditional on a battery of controls that includes state and industry fixed effects, we can interpret the ex ante differences in connections as exogenous for the purposes of identifying the effect of connections on responses to the shock. The remaining concern is that there is an omitted, unobservable factor that positively correlates with network connections and also predicts heightened survival odds during the Depression.

An advantage of testing our main hypothesis using Depression-era data instead of modern data is that the greater segmentation of markets creates plausibly exogenous local variation that we can exploit for identification. First, we build on the approach from Nanda and Nicolas (2014), who exploit county-level variation in bank distress rates. Because of restrictions on interstate branching, local banks were a predominant source of financing in the 1920s and 1930s, even for

[3] It is not the case that firms were entirely unconstrained in their director choices during our sample period. The Clayton Act of 1914 prohibited firms from choosing directors who were already serving on the boards of competing companies. The standard for "competing companies," was two companies that would violate antitrust criteria by merging. The data suggest that the interpretation of this standard for enforcement purposes was not very aggressive; shared directorships between companies in the same broad industry groups were quite common.

the largest firms. Thus, we can use variation in the distress rate of local banks to measure variation in the intensity of the financial shock faced by firms. We find a stronger positive effect of network connections on firm survival among firms that are located in areas with more local bank distress between 1930 and 1933. This result addresses the omitted variable concern under the plausible assumption that counties with more bank distress are not also counties that are home to firms of (unobservable) ex ante higher quality. Second, we exploit the local nature of director markets in the 1920s and 1930s. We construct an instrument for network ties that isolates variation in the demand for directors' services in other local firms due to variation in the average sizes of the boards of in-state firms in their industry, conditional on the total number of in-state, in-industry firms (and other measures of local market activity). We find a positive relation between the instrumented number of network connections to other firms and a firm's likelihood of survival. The results provide a causal interpretation under the assumption that small average board sizes in a state-industry pair, conditional on a wide set of controls including the firm's own board size, affect firm survival only through their positive correlation with network connections.

As a third way to address the endogeneity concern, we measure heterogeneity in the effect of connections in the cross-section of firms. Under a causal interpretation, connections should provide the most assistance during the crisis to firms that would otherwise be more prone to fail, such financially as constrained firms or firms with poor access to information about changing fundamentals. We indeed find that the effect of connections is concentrated among small, private, cash-poor, and rural firms, characteristics that generally predict heightened failure rates during the Depression. For these firms, the magnitude of the effect of connections on survival probabilities is two to three times our baseline estimate. Thus, to explain our results, an omitted factor would not only need to positively correlate with connections and survival probabilities, but also have its primary influence among the most constrained firms.

As a final step, we provide evidence to distinguish among several economic channels through which network connections could aid firms during the crisis. First, we test whether firms use their network links to access credit from connected firms. Consistent with this channel, we find that the effect of network connections on survival derives primarily from connections of financially constrained to cash-rich firms. Moreover, we find that it is connections to cash-rich firms that increase their accounts receivable during credit crunch from 1929 to 1933 that matter the most, suggesting that firms use trade credit as a mechanism to extend finance to connected trading partners. Second, we test whether connections increase the odds that firms survive the crisis by facilitating price coordination (i.e., softening competition) in product markets. Consistent with this channel, we find that connections to within-industry peers matter more for survival than out-of-industry links. However, we also find that those within-industry links matter more when they are to out-of-state firms than to in-state firms. Because such firms are less likely to compete in the same product markets, this evidence is perhaps more consistent with the extension of trade credit along a vertical supply chain than with product market collusion. Third, we test whether connections between firms are due to the presence of commercial bankers who sit on multiple boards and ease access to credit during the crisis by mitigating information asymmetries. We find that the effect of connections remains when we purge all potential bankers from our sample of connected directors. More generally, we find that our results exist even among firms that did not have outstanding bank debt at the outset of the crisis. Thus, while connections to banks likely do assist troubled firms (Frydman and Hilt, 2017), our analysis uncovers a distinct mechanism. Finally, we test whether firms with more connections attract more equity investments from other industrial firms. We find that connected firms are indeed more likely to become acquisition targets during the crisis; however, the effect is not concentrated in the same types of firm (small, cash poor) in which we observe heightened survival probabilities. Overall, our results suggest that networks have their largest effect by facilitating access to capital from other, less constrained industrial firms, though the mechanisms we consider are not mutually exclusive.

Our analysis makes several contributions to the literature. First, we provide new insight into how corporate cash holdings mitigate the effects of frozen capital markets. Our results confirm the existence of a direct precautionary savings channel, consistent with Opler et al (1999) and Alemdia, Campello, and Weisbach (2005), among others. Firms with larger cash holdings at the time of the 1929 shock are more likely to survive. However, we also find evidence of a novel indirect effect, facilitated by director network connections. As in Barrot (2016), cash-rich firms can extend credit to financially constrained firms through favorable trade credit terms. At the same time, trading partners are likely to be more willing to extend trade credit to cash-rich firms that are lower default risks, enabling them to intermediate the flow of credit to constrained firms. In turn, the information flow from network connections can help the firm to distinguish between firms in economic and financial distress during the market downturn so that they can preserve viable trading relationships that would be costly to replace. Thus, a theory of cash that only accounts for the direct benefits to the firm during hard times is likely to understate its value and, thus, the incentive for firms to hold cash despite its tax disadvantages.

The economic channel we propose is also a novel contribution to the literature on executive and director networks. Many existing papers focus on either the implications of network ties for corporate governance (Fracassi and Tate, 2012; Hwang and Kim, 2009; Nguyen, 2012; Schmidt, 2015) or the correlation of corporate policies such as investment and compensation across firms

(Fracassi, 2017; Shue, 2013). Work that links networks with access to financial capital typically focuses on connections to financial institutions (Guner, Malmendier, and Tate, 2008; Engelberg, Gao, and Parsons, 2012; Frydman and Hilt, 2017). We instead show that the information that flows through director networks can facilitate the flow of credit between industrial firms.

Our results also contribute to our understanding of how financial shocks affect the corporate sector. Much of the literature on the Financial Crisis of 2009 focuses on identifying the effect of the shock on corporate policies. Campello, Graham, and Harvey (2010), Almeida et al (2012) and Duchin, Ozbas, and Sensoy (2010) provide evidence that financially constrained firms at the time of the crisis plan and execute investment cuts, among other policy changes. Our focus is instead on how preexisting network connections help to mitigate the effects of the financial shock. Chodorow-Reich (2014) finds that firms with banking relationships to less healthy banks at the time of the 2008 crisis make larger cuts to employment. Huang, Jiang, and Lie (2012) find evidence that connected firms among the S&P 1500 have stronger operating performance around the 2008 financial crisis. They also find that firms in financial distress between 1998 and 2009 have a lower probability of filing for bankruptcy when they have a personal connection to their lender. Unlike these studies, our sole focus is on network links among industrial firms – not links to financial institutions – and the ways in which they facilitate the survival of vulnerable (i.e., small, private, cash-constrained) firms.

Finally, our construction of the network connections between more than 3,000 industrial firms in 1928 and analysis of their real effects on firm outcomes contributes to the economic history literature. A number of recent papers examine traditional corporate finance questions using historical data, including Graham, Kim and Leary (forthcoming) who study the relation between CEO tenure and board independence over a time series that exceeds 80 years and Graham, Leary and Roberts (2015) who study a long time series of capital structure choices. By taking a broader perspective, this growing set of work provides important insights into the robustness of empirical patterns that have been largely established using small time series of recent data. The networking literature, in particular, focuses almost exclusively on BoardEx data from the post-2000 period. An exception is a limited literature in sociology that examines the long-term evolution of board interlocks among the largest U.S. corporations (e.g., Mizruchi, 1982; Mizruchi, 1983). However, that literature generally focuses on characteristics of the network itself rather than its consequences for corporate outcomes. Moreover, we consider a much larger cross-section of firms.[4] Our analysis also contributes to our understanding of the economics of the Great Depression. Early research focused on the decisions made by the Federal Reserve during the 1930s and the supply of money (Friedman and Schwartz, 1963, Calomiris, 1993). Many papers also focus on the banking sector due to its fragility during this time period (Calomiris and Mason, 2003a, 2003b, Richardson, 2007, Richardson and Troost, 2009, Carlson, Mitchener and Richardson, 2011, Mitchener and Richardson, 2013). Our contribution is closer to the more recent literature looking at non-financial firms, i.e. the manufacturing, retail and industrial side of the economy (Fishback, Horrace, and Kantor, 2005; Zeibarth, 2013). Graham, Hazarika and Narasimhan (2011) and Benmelech, Frydman and Papanikolaou (2019) examine the effect of firm debt during the Great Depression on firm-level outcomes. We instead highlight the effect of director network connections in facilitating the flow of trade credit to constrained firms and, therefore, their importance for firm survival.

2. Data

To conduct our analysis of the effect of network ties on firm survival probabilities, we use the 1928 volume of the Moody's Industrial Manual to construct a novel mapping of the links

[4] For example, Mizruchi (1983) analyzes a sample of 167 large firms.

between directors and executives of industrial firms. We collect information on the executives and directors of all firms in the manual, including both public and private firms, but excluding foreign firms and subsidiaries. Here we outline the basics of the data collection and variable construction. For a more detailed description, see the Data Appendix. We obtain a final dataset of 3,753 firms between which we measure network links based on the presence of either a common director or an executive in one company who serves as a director in the other. To our knowledge, our sample provides the broadest coverage of firms from the era in the existing literature.

We also collect a variety of financial information for each company from the 1928 manual. The manual contains fairly detailed accountings of firms' financial liabilities as of the end of the last fiscal year to end prior to the manual's publication. We record the total value of each firm's outstanding debt and the identity of the stock exchanges on which it is listed. We also record the value of firms' cash holdings and total assets. Compared to balance sheet information, the information on income statement items in the manuals, such as sales or net income, tends to be less standardized across firms and is also less often available. Where available, we record the bottom line of firms' income statements and refer to it as "net income."[5] We also obtain unusually rich information on the geography of firms from the manuals: for each firm we record the locations of all the firms' offices. Finally, though we do not observe standardized industry codes such as SIC or NAICS codes, we use information on the nation's "basic industries" contained in the manual to construct an industry classification. Our approach to measuring industries is similar in

[5] We also record the top line of firms' income statements and refer to it as "sales." In general, we use these variables sparingly in our analysis. The measures are noisy. For example, though some firms directly report sales, many others report only gross profit or another accounting item that is already adjusted from top-line sales. They are also often missing: Net income information is available for roughly 70% of the sample, and sales data for only 60%, severely reducing our power. Moreover, the data is more often missing for small firms, which are of particular interest in our analysis. Though sales/assets provides a better measure of ROA than net income/assets, we typically use the latter when we require a performance measure because it is more often available. In all cases we directly control for leverage differences that could make the measure difficult to compare across firms.

spirit to the approach of Hoberg and Phillips (2016). We retrieve key words from the description of each industry in the manual and then search for the key words in the description of each firm. We use the relative frequencies of the key words from each industry to assign sample firms to industries, allowing the possibility that firms match to multiple industries.[6] In the Data Appendix, we provide additional details on the construction of our industry measures. We also validate the classification by showing that our industry groups have significant explanatory power for the cross-section of leverage above and beyond standard controls. (Data Appendix Table 1 shows that the increment to adjusted R^2 from adding industry fixed effects ranges from five to eight percentage points, an effect similar in magnitude to what we observe in cross-sections of Compustat data from 1980 and 1990 using Fama-French 30 industry classifications.)

We use information from the 1938 manual to construct our dependent variables: (1) an indicator variable that is equal to one if a firm fails by 1937 and (2) an indicator variable that is equal to one if a firm is acquired or merges with another firm by 1937.[7] The manual contains a list of companies that were included in the 1928 to 1937 manuals, but that are not included in the 1938 manual, and the reason for their exclusion. We use this list to construct the dependent variables. We do not count name changes as failures. We also do not count firms that are acquired as failing since our economic hypothesis makes opposite predictions for the relation between the two outcomes and connections.

An advantage of using firm survival as our main outcome measure is that it is consistently measured and directly comparable across firms. However, because we use firm survival as our

[6] Though we allow firms to have multiple industry classifications, we typically require the frequency of industry key words as a fraction of the total frequency of industry key words across all industries to be greater than 25% to limit noise in the classification scheme.
[7] Cases in which the firm is the target of an acquisition vastly outnumber cases in which the firm merges with another firm: out of 326 firms that exit due to M&A activity 17.8% of firms are merged into another firm and 82.2% are acquired.

outcome measure, we must be particularly cautious about making general welfare claims. Survival is in the private interests of the firm's claimholders, but could be socially inefficient. Nevertheless, in the context of network ties, such an outcome would require inefficient investment choices by outsiders to whom the firm's executives and directors share connections. An alternative approach could be to study differences in accounting variables such as asset or sales growth. However, our interest is in the effect of network connections around a major negative shock. If there are significant differences in firm survival rates across treated and untreated firms, then differences in growth rates are difficult to interpret. For example, if firms with slower growth rates are at greater risk of failure and network connections increase the odds of survival, then network connections might predict lower growth rates conditional on firm survival (particularly if the primary economic effect of connected firms is to function as "financiers of last resort"). It would be incorrect to interpret such a result as evidence that network connections harm connected firms.

As our main measure of network connections, we compute each firm's degree centrality, or the total number of connections it has through its executives and directors to other firms in the sample (*Total Connections*). To help tease out the mechanism through which connections matter for firm survival, we also consider several partitions of the network. We consider separately the subsets of connections to cash-rich firms and connections to cash-poor firms. We define a firm as cash-rich (cash-poor) if its cash holdings scaled by total assets are larger (smaller) than the sample median. Similarly, we consider separately connections to firms that increase and decrease accounts receivable during the peak Depression period of 1928 to 1933. We also consider two other partitions to distinguish between "local" and "distant" connections: connections within and outside the firm's industry and connections within and outside the states in which the firm has offices. All connections measures are likely to have a mechanical positive correlation with board size. Thus, we include board size as a key control variable in all of our analysis.

Our degree centrality measures capture direct connections between pairs of companies, or the number of paths of length one that include each firm. Another way to characterize the director network is by calculating each firm's eigenvector centrality. This measure instead counts the number of paths of all lengths that include the firm. In our sample, the two measures are strongly positively correlated (0.67). Nevertheless, they could capture different economic channels through which networks affect firm survival. Direct firm-to-firm assistance – e.g., through the provision of trade credit – could be better captured by the degree centrality measure while general access to economic information could be better captured by the eigenvector measure. Though the two measures generally relate to firm survival in a similar way, we find stronger relations between degree centrality and firm survival and thus focus our analysis on that measure.[8]

In Table 1, we report summary statistics of the data. The mean (median) firm in our sample has total assets of \$16.029M (\$4.259M) in 1927 dollars. These numbers translate into roughly \$240M (\$64.5M) in 2017 dollars. Among small firms with total assets less than the sample median, mean (median) total assets are \$2.158M (\$2.050M). Thus, our larger sample size compared to other studies of Depression era firms does not appear to come from filling the sample with large numbers of tiny firms. The mean (median) firm has cash holdings equal to 8.6% (4.9%) of total assets. The mean (median) firm has 8.2 (7) directors on the board. Given that the mean of *Total Connections* is 7.5, a firm obtains on average a single connection to an external firm for each

[8] Consistent with our economic interpretation of the measures, the eigenvector measure has the strongest relation with the probability that a firm is acquired. Taking this analysis a step further, we find that the relations between degree centrality and firm survival (or the likelihood of being acquired) hold even after controlling for the firm's eigenvector centrality. This result suggests it is indeed direct firm-to-firm relationships that matter most in the context of a negative financial shock.

director serving on its board. Connections to cash-rich firms are more common than connections to cash-poor firms, consistent with those connections having greater value to the firm. Though connections to firms that increased receivables between 1929 and 1933 could be similarly valuable, we find that they are far less common than connections to firms that decrease receivables, consistent with the unanticipated nature of the shock and firm's differential responses to it. 20% of firms in 1928 disappeared by 1937 and an additional 10.8% were acquired by another firm. We observe a reasonably rich distribution of firms across industries. Geographically, we observe firms operating in 49 distinct states (we do not observe any firms in Alaska), though there are noticeable clusters of firms in New York and Massachusetts. We use state fixed effects in our analysis to correct for differences across state markets. However, the distribution of firms geographically also allows us to test for differential effects of connections across different types of local markets.

In Table 2, we report pairwise correlations of several of our key dependent and independent variables. Notably, we observe a strong and statistically significant negative correlation between the *TotalConnections* measure and the indicator variable for firm failure by 1937. We also observe that network ties are less frequent among private firms and among firms in rural areas. These correlations are consistent with geographic segmentation in the director labor market, a feature we exploit for identification later in the paper.

3. Network Connections and Firm Survival

Our hypothesis is that the value of information that is available through network ties is higher at the time of a negative economic shock, when uncertainty is higher. Moreover, at these times, network ties can increase value directly, for example, by easing access to finance among (unexpectedly) financially constrained firms. Though network ties can also destroy value through peer effects and herding, we expect the positive effect to dominate in bad times.

3.1. Baseline Regressions

Our initial approach to identifying the effect of network connections on firm value is to employ a strategy similar in spirit to Opler and Titman (1994). We exploit a sudden and unexpected shock, the financial market crash of 1929, and compare the performance of firms with many network ties to other firms with the performance of firms that have few network ties to other firms prior to the shock. Our identifying assumption is that we can treat firms' pre-existing network ties as exogenous with respect to the shock. Thus, we essentially compare differences in responses across firms that happened to have more and less network ties at the time of the shock. Because the market crash in 1929 is an unanticipated event, the assumption that firms did not endogenously form network links in anticipation of the shock knowing that they would mitigate its negative impacts is clearly plausible (i.e., reverse causality is not a major concern).

As a starting point, we present visual evidence of the relation between network connections and failure. In Figure 1, we graph the network of industrial firms in 1928. Each vertex on the graph represents a firm; firms that failed by 1937 are colored red and firms that survived are green. We exclude firms with no connections from the figure. Towards the center of the graph, we observe a dense cluster of green dots. Red dots (or failing firms) become more common as we move toward the perimeter of the figure. Moreover, failure rates among isolated firms (excluded from the picture) are more than ten percentage points higher than they are among firms with at least one connection. This basic pattern between network connections and firm survival is also statistically significant if we estimate it within a simple univariate regression.

The main threat to identification is that network ties are correlated with an omitted factor that also predicts survival rates in response to the shock. Our first approach to address this concern is to saturate a regression model with fixed effects and controls. In the remainder of the Section, we provide additional analysis to bolster the causal intrepretation.

To begin, we estimate the following linear probability model:

$$Y_{i1938} = \beta_0 + \beta_1 Connections_{i1928} + \boldsymbol{X'_{i1928}\beta_2} + \varepsilon_{i1928}, \tag{1}$$

where *i* indexes the firm, *Y* is an indicator variable that takes the value 1 if a firm in our 1928 sample fails before 1937, *Connections* is the measure of network ties to other firms, and ***X*** is a vector of control variables. In all of our regressions, we include the natural logarithm of one plus the number of directors on the board. This control captures both the mechanical tendency for larger boards to have more connections and any link between board size and effectiveness (Yermack, 1996). We also control for other factors that could affect survival probability and correlate with the network links of firms' executives and directors: firm size (measured by the natural logarithm of total assets), firm leverage (measured as total debt scaled by total assets), firm cash holdings (measured as cash plus marketable securities scaled by total assets), and an indicator that takes the value one if the firm is private. In some specifications, we also include industry fixed effects and fixed effects for all of the states in which firms have offices. We correct standard errors for heteroskedasticity across firms.[9]

We report the results of estimating Equation (1) in Table 3. In Column 1, we use a continuous measure of *Connections*, the natural logarithm of one plus *TotalConnections*. We confirm a negative and significant correlation between network ties and the likelihood of firm failure (p-value = 0.078). Economically, a one standard deviation increase in network ties predicts a decrease in the likelihood of failure by roughly 1.5 percentage points, a 7.5% decrease from the sample average of 20%. Among the control variables, we find that smaller firms, private firms, and firms with smaller cash stocks are significantly more likely to fail, consistent with the arrival of a large, unanticipated financial shock in 1929. Though we do not find a statistically significant

[9] Each firm appears only once in the regression sample and in the same year (1928). Thus, serial correlation and time effects are not a concern.

relation between debt levels and failure, the relation is positive. Moreover, we recover a positive and strongly statistically significant relation if we exclude the cash control. Interestingly, we find that firms with larger boards weather the shock better than firms with smaller boards. In more recent data, Yermack (1996) finds evidence that firms with smaller boards perform better than firms with larger boards. The apparent reversal of the result in our sample is consistent with constraints in the director market that prevent some firms from choosing boards of optimal size.

In Column 2 of the paper, we measure *Connections* using a binary indicator that equals one for firms with a value of *TotalConnections* greater than the sample median. This approach is less parametric and also more robust to the presence of measurement error in *TotalConnections*. Using this alternative measure, we identify a larger effect of network ties on the odds of firm survival. Here, a firm with more network ties than the median firm has a 3.4 percentage point smaller likelihood of failure (*p*-value = 0.022), a 17% decrease from the baseline failure probability. In Column 3, we further saturate the model with indicators for firms in the second, third, and fourth quartiles of the distribution of *TotalConnections*. We find a negative, but insignificant 2.9 percentage point decrease in the likelihood of failure moving from the first quartile (baseline group) to the second quartile. There is an additional 4 percentage point decrease moving to the third quartile from the second, resulting in an overall 6.9 percentage point lower rate of failure in this quartile compared to the baseline, which is significant at the 1% level. The effect of network connections declines moving to the fourth quartile, though the effect in this quartile relative to the baseline is similar in magnitude to the effect in the second quartile. In Section 3.4, we will find that there is strong heterogeneity in the effect of networks in the cross-section. The lack of power in the fourth quartile here appears to be due to low representation of the types of firms in which connections tend to matter the most: small, private, rural, cash-poor.

Finally, in Columns 4 to 6 of Table 3, we report the results of re-estimating the specifications from the first three columns of the table, but adding industry and state fixed effects as additional controls. The fixed effects capture omitted variation at the industry or state level that might correlate with network ties and also predict better performance following the shock. For example, firms located in states with larger populations might both have more network ties and weather the financial shock better. Because our dataset is one cross-section measured at a single point in time, the fixed effects capture industry and state level factors that are time invariant and time-varying. We find that controlling for these factors has little effect on our estimates and, if anything, strengthens their significance in some specifications.

A potential confounding factor is the quality of the firm at the time of the shock. Connections could correlate positively with firm quality and this underlying quality, rather than connections themselves, could predict higher survival during the Depression. Alternatively, weaker firms could seek out connections with other firms more aggressively, to the extent that connections increase value, causing us to understate the effect of connections on survival if we do not account for differences in firm quality. We do not include a direct control for performance in our baseline specification because we do not observe the required income statement information for roughly 30% of our sample firms. However, as a robustness check, we replicate Table 3, but including the ratio of net income to assets as an additional control. Despite the noise in the measure, we find that higher profitability strongly increases survival odds, both economically and statistically. But, importantly, the estimated effect of connections is largely unaffected (and, if anything, slightly stronger). We also perform several additional robustness checks, including specific controls for firm age and director expertise among other factors, none of which can explain the effect of connections we estimate in Table 3. Full results are provided in the Online Appendix.

3.2. *Local severity of the Great Depression and the Value of Network Connections*

Our baseline strategy in Section 3.1 identifies the effect of network connections on firm survival using a single cross-section of observed ten-year failure rates following the financial shock of 1929. Despite our control for performance, it is possible that firms with more network connections are less likely to fail because they differ from less connected firms on some other dimension of firm quality. Moreover, given our focus on a single cross-section, the estimated network effect could reflect those differences in quality rather than differential responses to a common shock. If so, our evidence would be consistent with even a reverse causality interpretation: directors may generally prefer to accept positions on the boards of companies that they believe are more likely to survive than on the boards of companies that are likely to fail. To confirm the importance of the shock itself and thereby address the concern, we test whether the effect of network connections is stronger in localities in which the 1929 financial shock was more severe. The severity of the shock must not be positively correlated with the unobserved quality of local firms for our approach to be valid.

To implement this identification strategy, we consider variation in the severity of the financial crisis that is due to variation in the county-level rate of bank suspensions during the heart of the Depression. Following Calomiris and Mason (2003) and Nanda and Nicolas (2014), we use data from the Federal Deposit Insurance Corporation (FDIC), which provides county-level annual reports on active and suspended banks and their deposits from 1920 to 1936.[10] Because the peak of bank runs and failures occurred between the summer of 1929 and winter of 1933 (Mitchener and Richardson, 2019; Richardson, 2007, 2008; Bernanke, 1983; Calomiris and Mason, 2003), we

[10] County-level information on banking deposits for the 1920-1936 period is available online at http://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/7. While these data do not distinguish bank failures from bank suspensions, Calomiris and Mason (2003) argue that these shortcomings do not interfere with identifying bank distress empirically. The data are unavailable in the states of Wyoming, Hawaii, and Alaska, and in the District of Columbia.

focus on suspensions that occurred during the 1930 to 1933 window in our analysis. Prior to the Depression, bank loans were a primary source of working capital for the industrial sector (Currie, 1931; Reifer, Friday, Lichtenstein, and Riddle, 1937). Thus, greater local failure rates are a reasonable proxy for differences in the intensity of the financial shock across firms. (In Section 4.1, we provide direct evidence of the importance of disruption to trade credit for firm failure.) Consistent with this view, Nanda and Nicholas (2014) note that "Ford Motor Company provided approximately $12 million in loans to local banks to avert the crisis" (p. 276). On the other hand, it is unlikely that local bank failure rates positively correlate with the locations of ex-ante higher quality firms (i.e., firms that are more likely to survive independently from network connections). If anything, banks located in areas surrounded by stronger firms might be less likely to fail.

We match the fraction of bank deposits that were held in banks that were suspended between 1930 and 1933 as a fraction of deposits available in 1929 to the county-locations of each firm's offices in our dataset and take the minimum across offices (for firms with multiple office locations). We then estimate Equation (1) including this fraction and its interaction with our network measures as additional independent variables. We estimate versions of all of the specifications from Table 3 and report the results in Table 4. Consistent with the discussion above, we find that greater local bank distress is associated with a higher likelihood of firm failure when we include state and industry fixed effects (Columns 4 to 6). We also confirm that the effect of network connections on failure probability is larger in magnitude where a larger fraction of local banks is in distress. The estimates of the interactive effect of our network connection measures with the bank distress variable are negative in all cases and appear to increase with the number of connections. For example, in Columns 3 and 6, we estimate interactions of -0.29 and -0.27, respectively, with the indicator for connections in the top quartile of the distribution (both statistically significant at the 5% level), compared to interactions of -0.13 and -0.12 for firms with numbers of connections in the second quartile. At the mean of the distress variable (0.13), these estimates imply a decline in the likelihood of failure of roughly 4 percentage points among firms with network ties in the top quartile. However, they also suggest large heterogeneity in the effect of connections. For example, the most distressed counties have bank suspension rates greater than 90%. In such counties, the Column 6 estimates would imply a roughly 26 percentage point lower failure rate among the most connected firms. Overall, the results provide additional evidence in support of a causal interpretation of the relation between network ties and firm failure and, in particular, confirm the relevance of the financial shock itself for the estimated differences.

3.3. Instrumental Variables Regressions

One way to address directly the concern that network ties correlate with an omitted factor that positively predicts firm survival is to construct an instrument for network connections. Our IV strategy relies on two empirical observations. First, director markets were relatively segmented in 1928 (e.g., our sample predates the widespread introduction of commercial air travel in the United States). In the Online Appendix, we demonstrate this segmentation at the regional level within our sample. This pattern implies that most of the demand for directors' services in other firms will be local and that there can be substantial differences in this demand across localities at any given point in time. Second, firms are more likely to choose directors from firms within their own industries.[11] This preference implies that firms located in states in which the number of local directors in the industry is small are likely to have fewer network connections because of a lower

[11] In our data, within-industry directors are roughly equally as common on boards as directors from outside the industry, which is a clear over-representation relative to random assignment among 25 industries.

local demand for their directors' services. Geographic segmentation in turn implies that the lower local demand is not substituted one-for-one by heightened out-of-state demand.

One reason why there could be low local demand for a director's services within her industry is because the local market is small. However, this source of variation is likely to correlate directly with the chances of survival in a crisis. We instead construct our instrument to exploit variation in local demand that is due to variation in the sizes of the boards of local firms in the industry. We define our instrument *Low* as an indicator variable that takes the value one if the fraction of the directors in the state(s) in which the firm operate(s) that are in the firm's industry is in the bottom third of the distribution.[12] We isolate variation the comes from differences in average board sizes by directly controlling for the number of firms in the state-industry pair (both continuously and as an indicator that, like *Low*, takes the value of one if the number of firms in the state-industry pair is in the bottom third of the distribution).[13] Moreover, we control for the overall number of directors in the state (again continuously and as an indicator for firms located in states in the upper third of the distribution).[14] These controls ensure that it is only the ratio of the number of directors to firms in a state-industry pair that identifies our results. Variation in the total number of directors, which is captured by the additional controls, could again correlate with variation in local market vibrancy. Finally, we add an indicator for firms with board sizes in the lower third of

[12] The exact cutoff point is not crucial for our identification. What is key is that we identify the lower portion of the distribution. For example, we find similar results if we instead consider firms in the bottom quartile of the distribution. We also consider using the continuous measure of the local director pool in the industry as the instrument, but it has a weaker correlation with network ties, making it a worse candidate for an IV regression.

[13] Another way to capture local market size is to measure total assets (or sales) within an industry-state pair. As a robustness check, we add these additional controls to our IV regressions. The results are qualitatively similar and the controls themselves are economically and statistically insignificant. Because both variables decrease sample size, we do not include them in our base regressions.

[14] We can identify these controls despite the presence of state fixed effects because some firms operate in more than one state in our sample. We also estimate a specification in which the binary indicator is for firms in the lower third of the distribution with very little effect on the results. A nonlinearity at the upper end of the distribution is more likely to account for the explanatory power of *Low*.

the distribution. The firm's own board size could correlate with the local average board size and, as we see in Table 3, has a weak negative correlation with firm failure. The added control prevents the instrument from absorbing nonlinearities in this effect. Ultimately, our identification rests on the assumption that *Low* is excludable from Equation (1). Failure would require differences between the average board sizes of firms within the same industry across different states, conditional on the full set of covariates in our regressions, to correlate with an omitted factor that predicts firm survival.

We present the results of implementing our IV strategy in Table 5. Because the instrument varies both within-state and within-industry, we can use it to identify the effect of connections while continuing to absorb (separately) all industry and state level variation with fixed effects. In Column 1, we report the results from the reduced form regression of the indicator for firm failure on the instrument *Low* and our set of controls. We find that the instrument *Low* has a positive and significant effect on the likelihood of failure. Firms located in areas in which their directors have less outside demand for their services are more likely to fail, even controlling for the size of their local product markets. As discussed above, the most obvious threat to the exclusion criterion centers around correlation between *Low* and some notion of local market vibrancy. Importantly, none of the direct controls that we add to capture local market conditions – such as the numbers of firms or directors in the state-industry pair – have any significant explanatory power for the likelihood of failure (even if we exclude *Low* as an explanatory variable), casting significant doubt on the ability of this alternative story to explain our findings.

In Column 2, we report the first stage regression for our instrumental variables strategy using the natural logarithm of *TotalConnections* as the endogenous variable in Equation (1). As predicted, we find a strong negative partial correlation of *Low* with network ties after including the controls. The instrument is strongly statistically significant (p-value <0.01); however, the first-stage F-statistic of 8.049 lies between the Stock-Yogo (2005) critical values for a test of 15% and 20% size, suggesting some caution in assessing the strength of the instrument. In Column 3, we report estimates from the second stage regression. We find that the instrumented effect of *TotalConnections* is negative and statistically significant (p-value = 0.056). In Columns 4 and 5, we report the results from a similar two-stage least squares system in which the endogenous measure of network ties is an indicator variable that equals one for firms with a value of *TotalConnections* greater than the sample median. We again find that the instrument significantly predicts *TotalConnections* in the first stage (p-value < 0.001) and that the instrumented effect of network ties on the likelihood of firm failure is negative and statistically significant (p-value = 0.025). Here, the first-stage F-statistic of 20.278 lies comfortably above the Stock and Yogo (2005) threshold for a test of 10% size, suggesting that the instrument is indeed strong.

It is noteworthy that the estimated effect of network ties is substantially larger in magnitude in these regressions than in the baseline regressions in Table 3. One possibility, consistent with the negative correlation between net income and network ties in our sample, is that weaker firms are more likely to seek network ties so that endogeneity attenuates estimates of the network effect in OLS specifications. (Hermalin and Weisbach (2003) make a similar argument in the context of board independence). We also observed in Section 3.2 that there is heterogeneity in the effect of networks in the sample (we provide additional evidence of this heterogeneity in Section 3.4). Another possibility, then, is that the local treatment effect measured by *Low* applies to a subset of firms in which the effect of network ties is larger than the population effect. We provide additional tests to distinguish these possible explanations from weakness of the instrument in the Online

Appendix. Ultimately, given the results from Section 3.2 and the remainder of the paper, the causal interpretation of our results does not rest solely on the validity of the IV approach.

3.4. The Value of Network Connections for Firms of Different Types

Our results in Section 3.2 suggest that network ties contribute the most to firm survival where financial constraints are most likely to bind, suggesting a role for connections in easing the flow of financing to constrained firms. Moreover, network ties could facilitate the flow of information about firm or market conditions, leading to more effective adjustment to changing fundamentals. If so, network connections should have a stronger effect among firms that are otherwise more isolated from information flow. Given this discussion, we test whether network connections are more valuable to information-sensitive and financially-constrained firms. By confirming the specific theoretical patterns predicted by a network effect, these tests can further bolster the causal interpretation of our baseline results. In particular, a potential omitted variable must be able to explain not only the simple positive relation between network links and survival, but also the interacted effects with measures of constraint.

In the 1920s, not only was travel between different geographic markets more difficult, modern forms of communication – such as fax, email, and internet – had not yet been introduced. Thus, we construct a measure of geographic isolation to capture variation in access to information. We define an indicator variable for rural firms that takes the value of one if the rural population in the state(s) in which the firm operates – defined using publicly available data from the 1930 U.S. Census – is in the top three quartiles of the distribution.[15] We also consider three measures of

[15] The data on rural and urban population is available from the U.S. Census Bureau's website: https://www.census.gov/population/censusdata/urpop0090.txt. Urban states under this classification scheme are California, Connecticut, Illinois, Massachusetts, Maryland, Michigan, New Jersey, New York, Ohio, Pennsylvania, and Rhode Island. The District of Columbia also counts as an urban area.

financial constraint. Most directly, we compare firms that have cash holdings scaled by assets that are above the median in 1928 to firms that have cash holdings below the sample median. Building on the literature on financing constraints, we also compare small to large firms, defining an indicator variable that splits the sample at the median value of total assets. And, we compare private to public firms. The final proxy is likely to capture financing constraints, but also opaqueness and inferior access to information.

In Table 6, we report the results from augmenting the linear probability model in Equation (1) individually with each proxy for information sensitivity or financing constraints and its interaction with network ties. To measure network ties, we use the indicator variable that takes the value one if the firm has *TotalConnections* greater than the sample median. Focusing on Columns 1 to 4 of the table, we find that the three measures of financial constraint – *Small Firm*, *Private*, and *Low Cash* – are each significant positive predictors of firm failure following the financial shock in 1929. Firms that we identify as financially constrained have a likelihood of failure that is larger by 7.6 to 10.8 percentage points, consistent with our interpretation of the measures. Turning to the interactions, in all cases we find a significant negative interaction with network ties. Economically, membership in the high connections subsample erases the effect of financial constraints on firm failure using all three measures (i.e., we cannot reject the hypothesis that the coefficient estimates on financial constraint and its interaction with connections sum to zero). We do not find that rural firms have a different likelihood of failure from firms located in urban states (Column 2). However, we find a significant negative interaction effect with network ties. Firms in rural areas that are members of the high connections subsample have failure rates roughly 9 percentage points lower than other firms.

In Columns 5 to 8, we repeat the regressions, but include state and industry fixed effects, with little qualitative effect on the results. We also find broadly similar patterns if we use our instrument for network connections, running separate two-stage least squares estimations on subsamples defined by each proxy for constraint. In all cases, we find estimates of the effect of network ties that are larger in magnitude among firms we classify as constrained. In two cases (*Private* and *LowCash*), we find significant instrumented effects of network ties only within the constrained subsample. Finally, we isolate firms that are less than five years old as an alternative measure of constraint. Though the estimates are weaker economically and statistically, we do observe that younger firms are generally more likely to fail and that network links reduce the effect.

4. Economic Mechanisms

Director and executive network connections to other firms increase the odds of survival through the Great Depression, particularly among firms that are likely to experience financial constraints at the time of the shock. Next, we provide additional analysis to identify the economic mechanisms through which connections aid industrial firms. First, we test whether managerial connections facilitate firm-to-firm lending via trade credit. Second, we explore the possibility that connections help firms to coordinate their pricing policies with product market competitors. Third, we test whether banker-directors with direct links to financial institutions are responsible for the effects. Finally, we test whether connections increase the likelihood that firms receive equity investments from other industrial firms. By identifying additional patterns that an omitted variable would have to explain, but that follow naturally from a causal link between networks and firm survival, this analysis further addresses potential concerns about the endogeneity of the network measures.

4.1. Trade Credit

One channel through which network ties could improve firms' resilience during a financial crisis is by facilitating the extension of more favorable trade credit terms between firms with customer-supplier relationships. Pre-existing network connections can be a way to lower the information asymmetries that could otherwise make such lending excessively costly. In addition, a pre-existing trading relationship between the borrowing and lending firms can increase the marginal benefit to the lender of providing financial assistance during a time of crisis in order to avoid a costly search for new trading partners. Nanda and Nicholas (2014) document the dependence of the automobile industry in Detroit on local banking during the 1930s. More generally, their evidence suggests that working capital from trading partners could be particularly important to small, financially constrained firms at a time when local bank financing is scarce, consistent with our results in Section 3.

To test for evidence of the trade credit channel in our data, we exploit variation in the financial conditions of the firm(s) to which sample firms are connected. First, we distinguish between connections to firms that are cash-rich (i.e., have cash holdings as a fraction of total assets that are higher than the sample median) and connections to firms that are cash-poor. In Table 6, we report the results from estimating Equation (1) using separate variables to capture connections to cash rich and cash poor firms. Mirroring the specifications in Table 6, we compare the survival rates of firms with levels of each type of connection that are above and below the sample median. In Column 1, we include connections to cash-rich firms as the independent variable of interest. We find that such connections have a strong negative effect on the likelihood of firm failure that is statistically significant at the 1% level. Economically, the effect is roughly 50% bigger than the effect of having an above-median level of total connections on failure, as reported in Column 2 of Table 3. In Column 2, we report the results using connections to cash-poor firms to define the independent variable of interest. Here instead we do not find any significant effect of connections on the likelihood of firm failure, though the effects of all other included independent variables are similar to the estimates in Column 1. In Column 3, we report estimates from a regression including both the measure of high connections to cash-rich and cash-poor firms. We again find a strong negative effect of connections to cash-rich firms on failure. The small negative effect of cash-poor connections we report in Column 2 does not survive when we also include the measure of cash-rich connections, suggesting that it is an artifact of positive correlation between the two measures. In Columns 4 to 6, we report the results from replicating the Columns 1 to 3 regressions with the addition of state and industry fixed effects. As in prior tables, our results are largely unchanged.

Second, we test for direct evidence that it is connections to firms that report increased accounts receivable during the crisis years that correlate with reduced failure rates. To perform this test, we collect information on accounts receivable for each sample firm from the 1928 and 1934 Moody's manuals and compute log changes for each firm.[16] Because 1933 was near the nadir of the Great Depression, we unsurprisingly observe an average decrease in both accounts receivable and accounts payable between 1927 and 1933. We observe positive changes in roughly the top quartiles of the distributions of both variables. Thus, we define firms with high changes in receivables to be firms in the top quartile of the distribution (and, later, likewise for payables). We then construct two indicator variables to identify firms with above-median connections to firms with high changes in receivables and above-median connections to firms with low changes in receivables. It is important to note that we only observe the necessary data to compute changes in

[16] Accounting data, even when available, is not reported in a standardized way across firms. For example, one firm might report "Accounts Receivable," while another reports "Accounts and Notes Receivable" or some other variation. We collect the item most closely resembling accounts receivable for each firm. We verify that individual firms generally maintain a consistent reporting convention over time, so that changes between 1928 and 1933 are measured meaningfully.

receivables for roughly 56% of the firms in our sample. We do not include connections to firms with missing trade credit data in either category. As a result, these connections will be in the comparison group, which will tend to attenuate our estimates of the effects of connections on the likelihood of failure.

In Table 8, we report estimates of Equation (1) using the measures of connections to firms with high and low changes in receivables as the key independent variables. The specifications exactly mirror those we reported in Table 7 to measure the effects of connections to cash-rich and cash-poor firms. We find that it is indeed connections to firms that increased accounts receivable between 1927 and 1933 that significantly predict a lower likelihood of failure, whether we consider them independently or together with connections to firms that reduced receivables. There is no appreciable effect of connections to firms that did not increase receivables on the likelihood of firm failure.

We conduct two additional tests to explore the nature of the trade credit channel. First, we replicate the Table 8 specifications using changes in accounts payable rather than accounts receivable to partition connections. As with receivables, it appears to be connections to firms that increase payables during the Depression that are associated with lower failure rates, but the magnitude of the estimates is smaller than the effect of receivables and none are statistically significant. Though short term funding through increased receivables appears to be the most important to reduce the odds of failure, the results together are consistent with cash-rich firms stepping into the void left by failing banks more generally to intermediate the flow of working capital among industrial firms. As a second step, we test whether trade credit flows are indeed responsible for the effect of cash-rich connections on failure that we measured in Table 7. To do so, we further partition connections to firms with high changes in accounts receivable into those that are cash-rich and cash-poor (following the definitions from Table 7) and likewise for connections to firms with low changes in receivables. We then define four indicator variables for firms with above-median numbers of connections in each of the implied categories (cash-rich high change in receivables; cash-poor high change in receivables; cash-rich low change in receivables, cash poor low change in receivables). In Table 9, we report the results of estimating Equation (1) including combinations of these measures of connections. When all four types are included together, we confirm that it is connections to cash-rich firms that also increase accounts receivable during the crisis that significantly predict a reduced likelihood of failure. None of the other types of connections predict failure, economically or statistically. As in prior tables, the results are robust to the inclusion of both our typical set of controls and state and industry fixed effects.

As a final test, we ask whether the effect of connections to cash-rich firms on survival is particularly prominent among firms that we classify as financially constrained. We focus on cash holdings for this test because the greater availability of cash data gives more power to make cross-group comparisons (recall we only observe full trade credit data for just over half of the sample). We consider all three measures of financial constraints from Table 6: firms with low cash holdings, private firms, and small firms. We report the results of separately estimating the regression specification from Column 6 of Table 7 (i.e., including both connections to cash-rich and cash-poor firms in Equation (1) along with state and industry fixed effects) in the subsamples of financially constrained and unconstrained firms for each measure of constraint.

In Columns 1 and 2 of Table 10, we report the results using firm cash holdings as the measure of financial constraints. In Column 1, we find that connections to cash-rich firms indeed have a strong negative effect on the likelihood of firm failure among cash-poor (constrained) firms, but connections to cash-poor firms again do not have a significant effect. By contrast, we see in

Column 2 that neither type of connection has a significant effect on the likelihood of firm failure among cash-rich (unconstrained) firms. In Columns 3 and 4, we report the results for private (constrained) and public (unconstrained) firms. And, in Columns 5 and 6, we do the same for small (constrained) and large (unconstrained) firms. In both cases, we find the same pattern: connections to cash-rich firms are a significant predictor of firm survival following the financial panic, but only among constrained firms. Connections to cash-poor firms never have a significant effect on the likelihood of firm failure. We do not observe a similar pattern if we split the sample into firms located in urban and rural states, a partition with a less obvious relation with financial constraints.

Overall, our tests suggest that one mechanism through which director and executive network links reduce the probability of firm failure is by facilitating access to short-term finance through trade credit channels.

4.2. Product Market Collusion

Another mechanism through which director and executive connections could increase survival odds through the crisis is by facilitating price coordination in product markets. Competing firms that sell in the same markets could collude to keep prices high in order to stave off failure. If this is the case, then the effect of connections on survival should be strongest for connections to firms in the same state and industry because collusion is most beneficial when firms sell the same product to the same customers. Thus, we test whether executive and director connections have a greater effect on survival if they are to firms that operate in the same industry or state.

In Columns 1 to 3 of Table 11, we report the results of estimating Equation (1), using indicator variable that measure above-median numbers of connections to firms within and outside the industry as independent variables of interest. For brevity, we report only specifications with state and industry fixed effects. Consistent with the story, we find that it is indeed connections to firms inside the industry and not outside the industry that increase the odd of survival. Firms for which the number of within-industry network connections exceeds the median have a 5.7 percentage point lower failure rate during the Depression. Above-median levels of out-of-industry connections, on the other hand, do not significantly affect the likelihood of survival. We perform a similar test in which we measure separately the effects of connections to in-state and out-of-state firms. Here, we do not find strong evidence that the effect of network ties on survival differs depending on whether the connection is to an in-state or out-of-state firm (though the point estimate on an indicator for above-median in-state connections in our baseline specification is generally larger in magnitude than the estimate for out-of-state connections).

Given our definitions of industry groups, our evidence that connections within the group have more effect on survival is also consistent with the trade credit channel. For example, we define the Oil industry group using search strings that include “gasoline,” “crude,” and “refin.” In this case, firms from the entire supply chain, stretching from extraction to retail sales, are part of the industry group. To separate the potential effect of price collusion from the effects of trade credit, we distinguish between within industry connections to firms located in-state and out-of-state. We report the results in Columns 4 to 6 of Table 11. We find that above-median numbers of connections to within-industry firms located out-of-state significantly predict a lower failure probability, while above-median connections to within-industry firms located in-state does not. While not obviously consistent with the collusion channel, this result can be reconciled with the trade credit channel if customers and suppliers do not necessarily collocate in the same markets or if the effect of the financial shock is not identical across states. In Columns 7 to 9 of Table 11, we report the results of interacting industry connections with the cash holdings of the connected firm. We confirm that above-median connections to high-cash firms within-industry predict heightened survival. Above median connections to high-cash firms out-of-industry do not (nor do above median connections to low cash firms of either type). We also find some evidence that it is above-median connections to high-cash firms out-of-state that particularly matter, though here the cross group differences are not statistically significant. Taken together, this evidence, though indirect in nature, suggests that the disproportionate impact of within-industry ties may be additional evidence of the extension of favorable trade credit terms between connected firms on the same supply chains rather than evidence of price collusion.

4.3. Links to Financial Institutions

Another possibility is that the shared directors we observe in our sample are actually banker-directors who aid the firm directly by facilitating access to financial markets. For example, Frydman and Hilt (2017) find evidence that firms with underwriters on their boards had cheaper access to finance and higher investment rates in the early twentieth century. Though they argue such directorships were most common among railroads, it is possible that a similar mechanism could have aided industrial firms during the Depression. We take two approaches to assess the likelihood that this mechanism could drive our results. First, we recalculate our measure of connections excluding cases in which the connection comes via an individual we only observe as a director in the 1928 Moodys' Industrial Manual. Moody's published a separate volume that provided financial and management information for banks (and another for railroads). Thus, we can be sure that individuals we identify as managers are not bankers. Second, we restrict our sample only to firms that did not have any outstanding bank debt or mortgages in 1928. The results in Table 5 show that our results are strongest among private firms. Thus, the most plausible concern is that the connections driving our results come from shared commercial bankers who serve on the boards to facilitate bank lending. We find that neither restriction has a material effect on our results.

In Online Appendix Table 3, we present the estimates of regressions that impose both additional conditions. We continue to find that connections significantly decrease failure rates among private, rural, cash poor, and small firms. If anything, the point estimates are larger in magnitude, suggesting it is unlikely that the presence of banker-directors is responsible for our results.

4.4. Equity Stakes

Another way that firms could provide financial assistance to troubled peers in addition to providing firm-to-firm credit is by taking equity stakes. Executive and director network ties could lower the costs of such investments by reducing the information asymmetries between firms. In particular, the information that flows through such connections could aid firms in distinguishing between potential targets that are in financial and economic distress during the crisis.

To explore this channel, we test whether network connections affect the probability that a firm becomes a takeover target or merges with another firm during the Depression. Takeovers are the limiting case of cross-firm equity investments, but have the advantage of being readily observable. Though they are also a mechanism through which firms "disappear" from the marketplace, we analyze acquisitions separately from closures because our prediction for the direction of the effect of network ties is opposite in the two contexts.

We use a variant of the linear probability model in Equation (1) to test whether network ties increase the likelihood that a firm is acquired during the Great Depression. In this case, the dependent variable is an indicator variable that takes the value of one if the firm is acquired or merged with another firm before 1938. Otherwise, we mirror the regression specifications from our analysis of firm failure in Table 3, including the same controls and network measures. We report the results in Table 12. In Column 1, the measure of network ties is the natural logarithm of one plus *TotalConnections*. In Column 2, we use an indicator variable that takes the value of one if the firm has more network connections to other firms than the median firm in the sample and in Column 3 we include indicator variables for the top three quartiles of the distribution of connections. Generally, we find that more network ties indeed increase the likelihood that a firm is acquired or merges with another firm following the shock to financial markets in 1929. The economic magnitudes are somewhat larger than the effect of network connections on the likelihood of firm failure, though opposite in sign. A modest difference is that the effect on acquisitions appears to come primarily from the comparison of firms in the top three quartiles of the distribution of connections to firms in the bottom quartile. We do not observe significant differences across the top the quartiles. In Columns 4 to 6, we repeat the regressions from Columns 1 to 3, but including additional controls for state and industry effects. The results are similar, though state and industry controls yield estimates of the network effect that are modestly larger.[17]

As in Table 6, we test whether the effect on the likelihood of being acquired is magnified within small, cash-poor, rural, or private firms. We present the results in the Online Appendix. In general, we do not uncover any consistent relation between financial constraints and the effect of network ties on the likelihood of being acquired. When we use the most direct measure of financial constraints, low cash holdings, the estimate of the interaction effect is statistically insignificant and near zero. We find similar results when we use firm size as the proxy for financial constraints. We also do not find any evidence that the positive correlation between network ties and the likelihood of being acquired is concentrated among firms located in states with larger rural populations. However, we do find that the positive effect of network connections is concentrated

[17] We also reexamine the evidence within a two-stage least squares framework using the instrument *Low* from Section 3.3. Though the first stage regressions are identical to the ones we report in Table 4, here we do not find any significant effects of network ties on the likelihood of acquisition or merger in the second stage regressions. Thus, caution is warranted in the interpretation of the findings. One possibility is that network ties cause an increase in the likelihood of acquisition during crisis times because they facilitate the flow of information to potential acquirers. Another possibility is that the positive correlation in Table 8 comes from selection: weaker firms choose directors with more network ties and are also more likely to fail and be purchased during the Depression.

among private firms. The effect is particularly strong, economically and statistically when we include state and industry fixed effects. These results are consistent with the role of connections in facilitating information flow about opaque firms to potential acquirers, but, surprisingly, do not suggest that the mechanism is more or less active among firms that are financially constrained.

Overall, our evidence points to the increased flow of trade credit as a key economic channel through which executive and director connections help financially constrained firms to survive through the Depression. We also observe some evidence that network connections facilitate equity investments, but the effects are not concentrated among financially constrained firms. Nevertheless, it is important to note that these and other potential economic mechanisms are not mutually exclusive. In particular, there may be other conduits through which connected industrial firms can aid troubled peers – such as partial equity stakes or direct long-term loans – that we do not observe directly in our data.

5. Conclusion

We study how network connections to other firms through executives and directors affect firm outcomes during a major financial shock. We find that firms with more network ties in 1928, on the eve of the Great Depression, are more likely to survive over the following 10 years.

Among the advantages of our historical setting is that both financial and director markets were more segmented than they are today. We exploit plausibly exogenous variation across these local markets to mitigate the identification challenge posed by the endogeneity of director network links. Following the banking literature (e.g., Nanda and Nicholas, 2014), we show that connections have a stronger positive relation with survival probability in local markets in which a greater fraction of banks entered distress during the peak crisis years of 1929 to 1933. We also show that the portion of the variation in network ties that is predicted by differences in the local demand for directors' services outside the firm – conditioning on the vibrancy of the local market – is sufficient to identify our results. As a third way to address the concern that network ties could be correlated with an omitted factor that predicts firm survival, we test whether connections indeed matter the most among firms that are likely to be the most vulnerable to a financial shock. We find that the effect is indeed particularly pronounced among financially constrained firms – small firms, private firms, and firms with low cash holdings as well as among firms located in rural areas.

We also investigate a variety of mechanisms that could explain our baseline finding. Our evidence suggests that network ties are particularly important to facilitate the flow of trade credit from financially healthy firms to constrained trading partners. We find not only that it is connections to cash-rich firms that mainly drive our results, but that, in particular, it is connections to cash-rich firms that also increase their accounts receivable between the peak crisis years of 1929 and 1933 that predict higher survival rates. The evidence suggests that network links allow firms to distinguish between firms that are only constrained by the shock, but economically viable. This information allows them to profitably perform an intermediation function that is normally done by commercial banks. Thus, our results provide a novel link between the literature on director networks and the literatures on trade credit and cash holdings. In the latter case, our findings could help to resolve the puzzle of large corporate cash holdings despite their tax disadvantages. In addition to providing precautionary savings, cash enables firms to extend working capital to trading partners in times of crisis. The effects on failure rates are significant – even on average our analysis suggests that high connections reduce the likelihood of failure by roughly 20%. In turn, the cash-rich firm can avoid the disruption to production from the loss of trading partners as well as the costly search for new partners.

More generally, our evidence suggests that network ties can provide some stabilization of the economy in times when credit markets freeze up, preventing the failure of firms that are viable except for the bad fortune of lacking financial resources at the time of the shock. Such a backstop could be particularly important to the degree that firm failures result in layoffs that further depress local demand, producing the potential for additional feedback effects. Thus, policies regarding board composition and corporate governance can affect not only individual firms, but also could have a multiplier effect through networks. In this sense, our results suggest a partial counterargument to the conventional wisdom in the governance literature that "busy" CEOs and directors who serve as directors on multiple boards are bad for firm value. Moreover, our analysis questions the policy prescriptions of the literature on "interlocked directorship." That literature suggests benefits from restricting firms' ability to choose board members. Our results instead suggest that limiting firms' abilities to construct optimal networks could also limit the effectiveness of networks as a stabilizing mechanism in response to common shocks.

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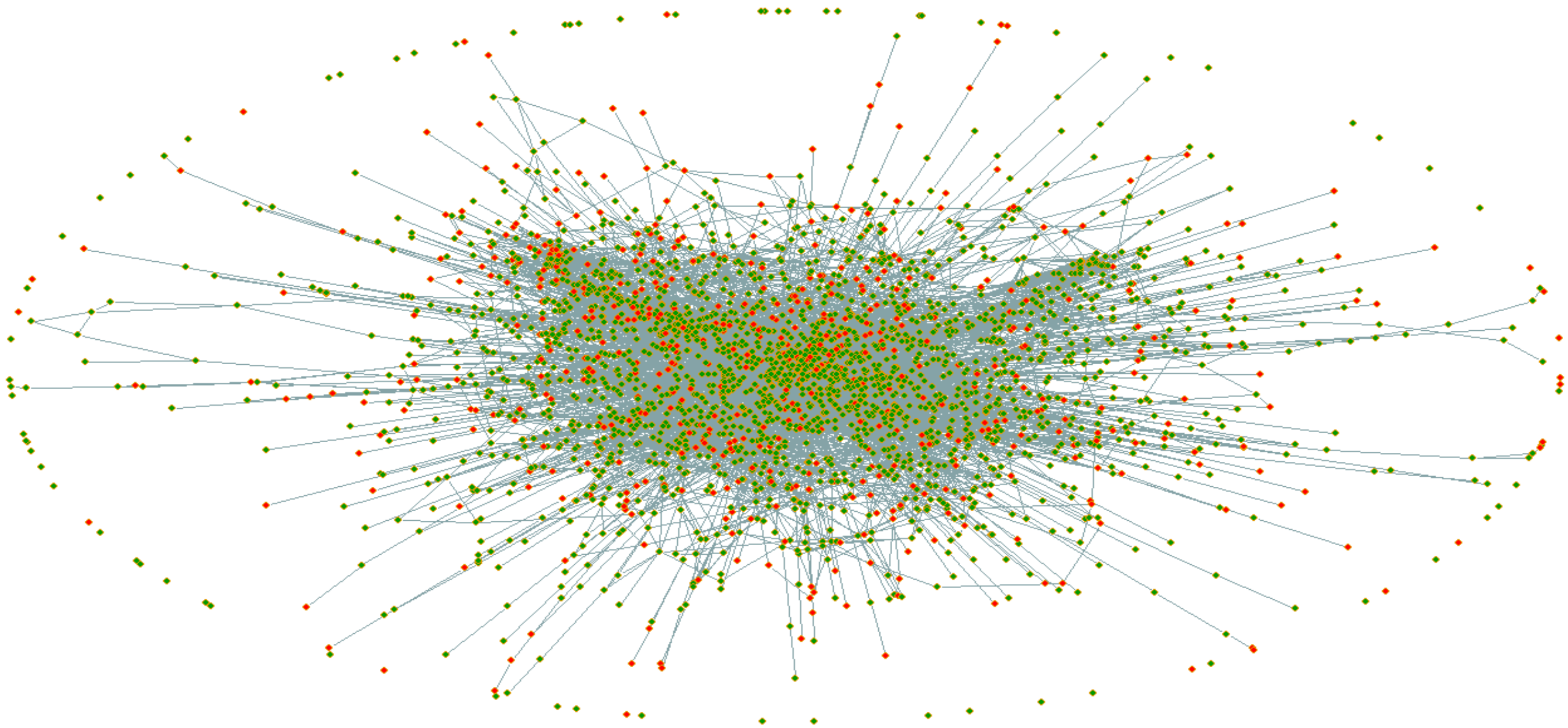

Figure 1. The figure presents a graphical representation of the network of directors and executives in the sample of industrial companies from the 1928 Moody's Industrials manual. Subsidiaries and foreign companies are excluded from the network. The diagram does not include 746 firms that do not have any connections to other firms, though they are included in the analysis. The representation is an energy diagram created using the 2D Fruchterman-Reingold algorithm. Colors indicate firms that survived until 1937 (green) and firms that did not (red).

Table 1
Summary Statistics

The sample consists of firms from the 1928 volume of the Moody's Industrials manual, excluding foreign firms and subsidiaries. All variables are measured as of 1928, except where indicated. Rural is an indicator variable equal to one for firms that have offices only in states in which the rural population is larger than the 25th percentile as of the 1930 Census. Total Connections is the sum of connections to other firms in the sample via shared directors or managers. In measuring Connections to High (Low) Cash Firms, High Cash Firms are firms with Cash/Assets above the sample median value. Low Cash Firms are the complementary set of firms with values below the sample median. Connections to firms for which Cash/Assets is unavailable are not included in either group. Total assets are reported in $1000.

	Observations	Mean	Median	Standard Deviation
Panel A. Main Control Variables				
Total Assets	3024	16,029	4,259	68,924
Cash/Assets	2992	0.086	0.049	0.1
Debt/Assets	3024	0.106	0.001	0.145
Net Income/Assets	2158	0.065	0.054	0.078
Private	3024	0.573	1	0.495
Rural	2959	0.212	0	0.408
Number of Directors	3024	8.248	7	3.433
Panel B. Network Connection Measures				
Total Connections	3024	7.522	4	10.13
Connections to High Cash Firms	3024	3.465	1	5.392
Connections to Low Cash Firms	3024	2.953	1	4.193
Connections to Inc. Accts. Rec. Firms	3024	0.871	0	1.562
Connections to Dec. Accts. Rec. Firms	3024	2.616	1	4.262
Connections to Out-of-State Firms	3024	3.078	1	4.921
Connections to In-State Firms	3024	2.671	1	4.838
Connections to In-Industry Firms	3024	3.299	1	5.514
Connections to Out-of-Industry Firms	3024	3.549	1	6.194
Panel C. Key Outcome Variables				
Disappeared by 1937	3024	0.197	0	0.398
Acquired by 1937	3024	0.108	0	0.310

Panel D. Industry Distribution (N = 2774)

Steel	0.052	Fertilizer	0.023
Coal	0.038	Ships	0.042
Textiles	0.070	Construction	0.159
Motor Vehicles	0.031	Paper	0.113
Rubber	0.014	Agriculture	0.127
Oil	0.074	Manufacturing	0.129
Copper	0.021	Entertainment	0.018
Rail	0.099	Mines	0.055
Sugar	0.031	Power	0.051
Tobacco	0.009	Mills	0.112
Meat	0.013	Warehouses	0.020
Leather	0.021	Other	0.006
Retail	0.081		

Table 1 (cont)

Panel E. State Distribution (N = 3009)			
Alabama	0.004	Montana	0.003
Arkansas	0.001	North Carolina	0.005
Arizona	0.003	North Dakota	0.001
California	0.046	Nebraska	0.004
Colorado	0.010	New Hampshire	0.002
Connecticut	0.026	New Jersey	0.037
District of Columbia	0.002	New Mexico	0.001
Delaware	0.025	Nevada	0.004
Florida	0.003	New York	0.281
Georgia	0.012	Ohio	0.083
Hawaii	0.005	Oklahoma	0.008
Iowa	0.003	Oregon	0.005
Idaho	0.002	Pennsylvania	0.084
Illinois	0.094	Rhode Island	0.006
Indiana	0.013	South Carolina	0.008
Kansas	0.003	South Dakota	0.000
Kentucky	0.006	Tennessee	0.009
Louisiana	0.011	Texas	0.011
Massachusetts	0.138	Utah	0.008
Maryland	0.017	Virginia	0.011
Maine	0.007	Vermont	0.002
Michigan	0.046	Washington	0.010
Minnesota	0.013	Wisconsin	0.022
Missouri	0.034	West Virginia	0.009
Mississippi	0.000	Wyoming	0.001
Outside U.S.	0.007		

Table 2
Pairwise Correlations

The sample consists of firms from the 1928 volume of the Moody's Industrials manual, excluding foreign firms and subsidiaries. All variables are measured as of 1928, except where indicated. Rural is an indicator variable equal to one for firms that have offices only in states in which the rural population is larger than the 25th percentileas of the 1930 Census. Total Connections is the sum of connections to other firms in the sample via shared directors or managers. The *p* -value and number of observations are reported in parentheses below each correlation.

	Total Conn.	Private	Rural	Debt/Assets	Cash/Assets	Total Assets	NI/Assets	Disappeared	Acquired
Total Connections	1								
Private	-0.2137	1							
	(0.00, 3024)								
Rural	-0.0965	0.1418	1						
	(0.00, 2959)	(0.00, 2959)							
Debt/Assets	0.0064	0.0868	0.0465	1					
	(0.63, 3024)	(0.00, 3024)	(0.01, 2959)						
Cash/Assets	0.0348	-0.0897	-0.0938	-0.2369	1				
	(0.06, 2992)	(0.00, 2992)	(0.00, 2928)	(0.00, 2992)					
Total Assets	0.1910	-0.1667	-0.0631	0.0208	0.0266	1			
	(0.00, 3024)	(0.00, 3024)	(0.00, 2959)	(0.25, 3024)	(0.15, 2992)				
Net Income/Assets	-0.0353	-0.1257	-0.0239	-0.2467	0.4429	-0.0042	1		
	(0.10, 2158)	(0.00, 2158)	(0.27, 2103)	(0.00, 2158)	(0.00, 2144)	(0.84, 2158)			
Disappeared by 1937	-0.1307	0.2013	0.0179	0.0353	-0.0923	-0.0831	0.0305	1	
	(0.00, 3024)	(0.00, 3024)	(0.33, 2959)	(0.05, 3024)	(0.00, 2992)	(0.00, 3024)	(0.19, 1866)		
Acquired by 1937	-0.0048	0.0308	0.0156	0.016	-0.0174	-0.032	0.0371	-0.1738	1
	(0.79, 3024)	(0.09, 3024)	(0.40, 2959)	(0.38, 3024)	(0.34, 2992)	(0.08, 3024)	(0.11, 1866)	(0.00, 3024)	

Table 3
Network Connections and Firm Failure

Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The dependent variable is Disappeared by 1937, an indicator variable that takes the value one if the firm does not survive to 1937. Total Connections is the sum of connections to other firms in the sample via shared directors or managers. Total Connections > Median is an indicator variable equal to one for firms that have a value of Total Connections greater than the sample median. Total Connections Quartile 2 (3/4) is an indicator variable equal to one for firms that have a value of Total Connections greater than the sample 2nd (3rd/4th) quartile. Private is an indicator variable equal to one for firms without publicly traded equity. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
ln(Total Assets)	-0.062 ***	-0.062 ***	-0.065 ***	-0.062 ***	-0.063 ***	-0.065 ***
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
Private	0.071 ***	0.071 ***	0.070 ***	0.074 ***	0.073 ***	0.074 ***
	(0.015)	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)
Debt/Assets	0.063	0.062	0.064	0.085	0.084	0.083
	(0.052)	(0.052)	(0.052)	(0.056)	(0.056)	(0.056)
Cash/Assets	-0.307 ***	-0.308 ***	-0.314 ***	-0.269 ***	-0.270 ***	-0.276 ***
	(0.071)	(0.071)	(0.071)	(0.077)	(0.077)	(0.077)
ln(1+Number of Directors)	-0.043 *	-0.043 *	-0.054 **	-0.048 *	-0.050 *	-0.061 **
	(0.025)	(0.024)	(0.025)	(0.026)	(0.026)	(0.025)
ln(1+Total Connections)	-0.013 *			-0.014 *		
	(0.007)			(0.008)		
Total Connections > Median		-0.034 **			-0.035 **	
		(0.015)			(0.016)	
Total Connections Quartile 2			-0.029			-0.034
			(0.021)			(0.022)
Total Connections Quartile 3			-0.069 ***			-0.068 ***
			(0.020)			(0.021)
Total Connections Quartile 4			-0.023			-0.027
			(0.021)			(0.023)
Industry Fixed Effects				Yes	Yes	Yes
State Fixed Effects				Yes	Yes	Yes
R-squared	0.088	0.088	0.090	0.098	0.099	0.100
N	2992	2992	2992	2729	2729	2729

Table 4
Network Connections and Firm Failure by Local Bank Distress

Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The dependent variable is Disappeared by 1937, an indicator variable that takes the value one if the firm no longer exists in 1937. Total Connections is the sum of connections to other firms in the sample via shared directors or managers. Total Connections > Median is an indicator variable equal to one for firms that have a value of Total Connections greater than the sample median. Total Connections Quartile 2 (3/4) is an indicator variable equal to one for firms that have a value of Total Connections greater than the sample 2nd (3rd/4th) quartile. Private is an indicator variable equal to one for firms without publicly traded equity. Dep. Susp. is the minimum fraction of bank deposits as of 1929 in banks that were suspended from 1930 through 1933 in the counties in which the firm has offices. Private is an indicator variable equal to one for firms without publicly traded equity. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
ln(Total Assets)	-0.065 ***	-0.065 ***	-0.067 ***	-0.065 ***	-0.065 ***	-0.067 ***
	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Private	0.071 ***	0.071 ***	0.068 ***	0.074 ***	0.074 ***	0.073 ***
	(0.015)	(0.015)	(0.015)	(0.017)	(0.017)	(0.017)
Debt/Assets	0.052	0.052	0.051	0.075	0.075	0.074
	(0.053)	(0.053)	(0.053)	(0.057)	(0.057)	(0.057)
Cash/Assets	-0.324 ***	-0.324 ***	-0.332 ***	-0.285 ***	-0.286 ***	-0.293 ***
	(0.072)	(0.073)	(0.072)	(0.078)	(0.078)	(0.078)
ln(1+Number of Directors)	-0.053 **	-0.051 **	-0.055 **	-0.057 **	-0.058 **	-0.060 **
	(0.026)	(0.025)	(0.026)	(0.027)	(0.027)	(0.027)
ln(1+Total Connections)	0.025 **			0.016 **		
	(0.007)			(0.007)		
Total Connections > Median		-0.016			-0.014	
		(0.019)			(0.020)	
Total Connections Quartile 2			-0.01			-0.017
			(0.028)			(0.030)
Total Connections Quartile 3			-0.058 **			-0.052 *
			(0.025)			(0.027)
Total Connections Quartile 4			0.018			0.012
			(0.026)			(0.028)
Deposits in Suspended Banks	0.103	0.005	0.071	0.247 **	0.166 **	0.22 **
	(0.087)	(0.064)	(0.094)	(0.106)	(0.083)	(0.112)
Dep. Susp. * ln(1+Total Connections)	-0.105 **			-0.095 **		
	(0.042)			(0.047)		
Dep. Susp. * Total Connections > Median		-0.141 *			-0.136	
		(0.082)			(0.089)	
Dep. Susp. * Total Connections Quartile 2			-0.128			-0.118
			(0.128)			(0.137)
Dep. Susp. * Total Connections Quartile 3			-0.111			-0.118
			(0.115)			(0.124)
Dep. Susp. * Total Connections Quartile 4			-0.290 **			-0.268 **
			(0.122)			(0.136)
Industry Fixed Effects				Yes	Yes	Yes
State Fixed Effects				Yes	Yes	Yes
R-squared	0.092	0.092	0.095	0.100	0.100	0.102
N	2872	2872	2872	2627	2627	2627

Table 5
Network Connections and Firm Failure: IV Regressions

Coefficient estimates in Column (1) are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. Coefficient estimates in Columns (2) and (3) and, separately, (4) and (5) are from two-stage least squares systems of regressions. The dependent variable in Columns (1), (3), and (5) is Disappeared by 1937, an indicator variable that takes the value one if the firm does not survive to 1937. The dependent variable in Column (2) is the natural logarithm of one plus Total Connections. Total Connections is the sum of connections to other firms in the sample via shared directors or managers. The dependent variable in Column (4) is an indicator variable equal to one if the firm has a value of Total Connections greater than the sample median. Private is an indicator variable equal to one for firms without publicly traded equity. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Small Board is an indicator variable equal to one if the firm's number of directors is less than the sample 33rd percentile. Few Local Firms is an indicator variable equal to one if the number of firms in the firm's state-industry pair is less than the sample 33rd percentile. Local Firms is the number of firms in the firm's state-industry pair. Many Local Directors is an indicator equal to one if the number of directors in the firm's state-industry pair is above the sample 66th percentile. Local Directors is the number of directors in the firm's state. The instrument Low is an indicator variable equal to one if the number of directors in the firm's industry-state pair as a fraction of the number of directors in the state is less than the sample 33rd percentile. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Reduced Form	First Stage	Second Stage	First Stage	Second Stage
	(1)	(2)	(3)	(4)	(5)
ln(Total Assets)	-0.064 ***	0.151 ***	-0.007	0.050 ***	-0.040 ***
	(0.007)	(0.018)	(0.031)	(0.008)	(0.013)
Private	0.079 ***	-0.202 ***	0.002	-0.085 ***	0.037
	(0.017)	(0.042)	(0.046)	(0.021)	(0.027)
Debt/Assets	0.070	0.271 **	0.172 *	0.090	0.114 *
	(0.057)	(0.129)	(0.092)	(0.064)	(0.066)
Cash/Assets	-0.276 ***	0.192	-0.204 *	0.043	-0.256 ***
	(0.078)	(0.181)	(0.110)	(0.087)	(0.087)
ln(1+Number of Directors)	-0.044	1.035 ***	0.348 *	0.340 ***	0.121
	(0.036)	(0.082)	(0.210)	(0.039)	(0.082)
Small Board	0.023	-0.078	-0.006	-0.075 ***	-0.013
	(0.024)	(0.057)	(0.035)	(0.029)	(0.032)
ln(1+Local Firms)	0.003	0.012	0.007	-0.008	-0.001
	(0.018)	(0.042)	(0.024)	(0.020)	(0.019)
Few Local Firms	0.004	-0.071	-0.023	-0.008	0.000
	(0.030)	(0.068)	(0.040)	(0.033)	(0.033)
ln(1+Local Directors)	0.01	0.107 *	0.050	0.073 ***	0.046 *
	(0.022)	(0.058)	(0.032)	(0.028)	(0.026)
Many Local Directors	0.040	-0.013	0.035	0.070	0.074
	(0.066)	(0.131)	(0.083)	(0.071)	(0.076)
Low	0.060 **	-0.158 ***		-0.123 ***	
	(0.024)	(0.055)		(0.027)	
ln(1+Total Connections)			-0.379 *		
			(0.198)		
Total Connections > Median					-0.486 **
					(0.217)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.100	0.359		0.251	
N	2681	2681	2681	2681	2681

Table 6
Network Connections and Firm Failure by Firm Characteristics

Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The dependent variable is Disappeared by 1937, an indicator variable that takes the value one if the firm does not survive to 1937. Total Connections > Median is an indicator variable equal to one for firms that have a value of Total Connections greater than the sample median, where Total Connections is the sum of connections to other firms in the sample via shared directors or managers. Private is an indicator variable equal to one for firms without publicly traded equity. Rural is an indicator variable equal to one for firms that have offices only in states in which the rural population is larger than the 25th percentile. Low Cash (Small Firm) is an indicator variable equal to one for firms that have Cash/Assets (Total Assets) less than the sample median. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(Total Assets)	-0.064 ***	-0.064 ***	-0.061 ***	-0.050 ***	-0.063 ***	-0.064 ***	-0.062 ***	-0.051 ***
	(0.006)	(0.006)	(0.006)	(0.008)	(0.007)	(0.007)	(0.007)	(0.009)
Private	0.108 ***	0.073 ***	0.068 ***	0.071 ***	0.111 ***	0.076 ***	0.072 ***	0.074 ***
	(0.021)	(0.015)	(0.015)	(0.015)	(0.022)	(0.017)	(0.016)	(0.016)
Debt/Assets	0.055	0.055	0.055	0.061	0.077	0.081	0.080	0.083
	(0.051)	(0.052)	(0.052)	(0.052)	(0.056)	(0.057)	(0.056)	(0.056)
Cash/Assets	-0.312 ***	-0.331 ***	-0.124	-0.304 ***	-0.275 ***	-0.284 ***	-0.111	-0.264 ***
	(0.071)	(0.072)	(0.087)	(0.072)	(0.077)	(0.078)	(0.094)	(0.078)
ln(1+Number of Directors)	-0.044 *	-0.049 **	-0.041 *	-0.043 *	-0.051 **	-0.055 **	-0.047 *	-0.051 **
	(0.024)	(0.024)	(0.024)	(0.024)	(0.026)	(0.026)	(0.026)	(0.026)
Total Connections > Median	0.011	-0.016	-0.003	0.002	0.010	-0.018	0.000	0.005
	(0.018)	(0.017)	(0.019)	(0.017)	(0.020)	(0.018)	(0.020)	(0.019)
Total Connections > Median * Private	-0.079 ***				-0.079 ***			
	(0.027)				(0.029)			
Total Connections > Median * Rural		-0.091 ***				-0.068 *		
		(0.034)				(0.036)		
Rural		0.010				0.007		
		(0.024)				(0.047)		
Total Connections > Median * Low Cash			-0.064 **				-0.069 **	
			(0.027)				(0.029)	
Low Cash			0.087 ***				0.083 ***	
			(0.023)				(0.025)	
Total Connections > Median * Small Firm				-0.073 **				-0.082 ***
				(0.028)				(0.031)
Small Firm				0.076 ***				0.075 ***
				(0.025)				(0.026)
Industry Fixed Effects					Yes	Yes	Yes	Yes
State Fixed Effects					Yes	Yes	Yes	Yes
R-squared	0.090	0.092	0.092	0.091	0.101	0.100	0.102	0.101
N	2992	2928	2992	2992	2729	2681	2729	2729

Table 7
Network Connections to Cash Rich Firms and Firm Failure

This table shows the relation between a firm's connections to cash rich vs. cash poor firms and firm failure. Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The dependent variable is Disappeared by 1937, an indicator variable that takes the value one if the firm does not survive to 1937. CashRichConnections (CashPoorConnections) > Median is an indicator variable equal to one for firms that have a value of Connections to High Cash (Low Cash) Firms greater than the sample median, where Connections to High Cash (Low Cash) Firms is the sum of connections to firms with Cash/Assets greater than (less than) the sample median via shared directors or managers. We do not count connections toward either total for cases in which shared directorship or management is observed but Cash/Assets in the connected firm is unobserved. Private is an indicator variable equal to one for firms without publicly traded equity. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
ln(Total Assets)	-0.062 ***	-0.064 ***	-0.063 ***	-0.063 ***	-0.064 ***	-0.063 ***
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
Private	0.067 ***	0.072 ***	0.067 ***	0.070 ***	0.075 ***	0.071 ***
	(0.015)	(0.015)	(0.015)	(0.017)	(0.016)	(0.016)
Debt/Assets	0.062	0.063	0.062	0.086	0.084	0.086
	(0.052)	(0.052)	(0.052)	(0.056)	(0.056)	(0.056)
Cash/Assets	-0.304 ***	-0.311 ***	-0.303 ***	-0.271 ***	-0.273 ***	-0.270 ***
	(0.071)	(0.071)	(0.071)	(0.077)	(0.077)	(0.077)
ln(1+Number of Directors)	-0.041 *	-0.052 **	-0.042 *	-0.048 *	-0.059 **	-0.049 *
	(0.024)	(0.024)	(0.024)	(0.025)	(0.025)	(0.026)
CashRichConnections > Median	-0.046 ***		-0.049 ***	-0.045 ***		-0.047 ***
	(0.015)		(0.016)	(0.016)		(0.017)
CashPoorConnections > Median		-0.015	0.007		-0.015	0.005
		(0.015)	(0.016)		(0.016)	(0.017)
Industry Fixed Effects				Yes	Yes	Yes
State Fixed Effects				Yes	Yes	Yes
R-squared	0.090	0.087	0.089	0.100	0.097	0.099
N	2992	2992	2992	2729	2729	2729

Table 8

Network Connections and Firm Failure: By Changes in Connected Firm Accounts Receivable

Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The dependent variable is Disappeared by 1937, an indicator variable that takes the value one if the firm no longer exists in 1937. HighChgRecConnections (LowChgRecConnections) is an indicator variable equal to one for firms that have a value of Total Connections to firms with high changes in Accounts Recivable between 1928 and 1933 above (below) the sample median, where Total Connections is the sum of connections to other firms in the sample via shared directors or managers and high changes in Accounts Receivable are changes in the top quartile of the sample distribution. Private is an indicator variable equal to one for firms without publicly traded equity. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
ln(Total Assets)	-0.063 ***	-0.064 ***	-0.063 ***	-0.063 ***	-0.064 ***	-0.063 ***
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
Private	0.071 ***	0.072 ***	0.071 ***	0.074 ***	0.076 ***	0.074 ***
	(0.015)	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)
Debt/Assets	0.065	0.063	0.065	0.088	0.083	0.088
	(0.052)	(0.052)	(0.052)	(0.056)	(0.056)	(0.056)
Cash/Assets	-0.303 ***	-0.309 ***	-0.303 ***	-0.263 ***	-0.272 ***	-0.263 ***
	(0.071)	(0.071)	(0.071)	(0.077)	(0.077)	(0.077)
ln(1+Number of Directors)	-0.048 **	-0.056 **	-0.049 **	-0.053 **	-0.062 **	-0.054 **
	(0.023)	(0.024)	(0.024)	(0.025)	(0.025)	(0.025)
HighChgRecConnections	-0.030 **		-0.031 **	-0.035 **		-0.036 **
	(0.014)		(0.015)	(0.015)		(0.016)
LowChgRecConnections		-0.007	0.004		-0.008	0.003
		(0.015)	(0.016)		(0.016)	(0.017)
Industry Fixed Effects				Yes	Yes	Yes
State Fixed Effects				Yes	Yes	Yes
R-squared	0.088	0.087	0.088	0.099	0.097	0.098
N	2992	2992	2992	2729	2729	2729

Table 9
Network Connections to High vs. Low Change in Receivable Firms and Firm Failure by Cash Holdings

Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The dependent variable is Disappeared by 1937, an indicator variable that takes the value one if the firm no longer exists in 1937. CashRichConnections (CashPoorConnections) are TotalConnections to firms that are Cash Rich (Cash Poor). Cash Rich (Cash Poor) Firms are firms with Cash/Assets greater than (less than or equal) the sample median. Total Connections are links between firms via shared executives or directors. ChgReceivables is the change in accounts receivable reported in the connected firm between the 1928 and 1933 manuals. Q1 indicates the top quartile of the sample distribution. Private is an indicator variable equal to one for firms without publicly traded equity. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
ln(Total Assets)	-0.063 ***	-0.064 ***	-0.063 ***	-0.062 ***	-0.064 ***	-0.062 ***
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
Private	0.071 ***	0.072 ***	0.071 ***	0.074 ***	0.076 ***	0.074 ***
	(0.015)	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)
Debt/Assets	0.065	0.063	0.065	0.088	0.083	0.088
	(0.052)	(0.052)	(0.052)	(0.056)	(0.056)	(0.056)
Cash/Assets	-0.305 ***	-0.309 ***	-0.304 ***	-0.263 ***	-0.272 ***	-0.263 ***
	(0.071)	(0.071)	(0.071)	(0.077)	(0.077)	(0.077)
ln(1+Number of Directors)	-0.049 **	-0.056 **	-0.051 **	-0.052 **	-0.06 **	-0.053 **
	(0.024)	(0.024)	(0.024)	(0.025)	(0.026)	(0.026)
CashRichConnections and ChgReceivables=Q1	-0.030 **		-0.032 **	-0.033 **		-0.033 **
	(0.015)		(0.016)	(0.016)		(0.017)
CashPoorConnections and ChgReceivables=Q1		-0.002	-0.004		-0.015	-0.015
		(0.017)	(0.017)		(0.017)	(0.018)
CashRichConnections and ChgReceivables<Q1	-0.002		0.004	-0.009		-0.002
	(0.016)		(0.016)	(0.017)		(0.017)
CashPoorConnections and ChgReceivables<Q1		-0.003	0.003		-0.004	0.003
		(0.016)	(0.016)		(0.016)	(0.017)
Industry Fixed Effects				Yes	Yes	Yes
State Fixed Effects				Yes	Yes	Yes
R-squared	0.087	0.086	0.087	0.098	0.097	0.098
N	2992	2992	2992	2729	2729	2729

Table 10
Network Connections to Cash Rich Firms and Firm Failure by Firm Type

This table shows the relation between a firm's connections to cash rich vs. cash poor firms and firm failure for different sub-samples of firms. The full sample is the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. In column 1 (2), we limit the sample to firms with Low Cash (High Cash) holdings, where High Cash (Low Cash) are firms with Cash/Assets ratios above (below) the sample median. In column 3 (4), we limit the sample to Private (Public) firms, where Private firms are firms without publicly traded equity. In column 5 (6), we limit the sample to Small (Large) firms, where Small (Large) firms are firms with Total Assets below (above) the sample median. Coefficient estimates are from ordinary least squares regressions. The dependent variable is Disappeared by 1937, an indicator variable that takes the value one if the firm does not survive to 1937. CashRichConnections (CashPoorConnections) > Median is an indicator variable equal to one for firms that have a value of Connections to High Cash (Low Cash) Firms greater than the sample median, where Connections to High Cash (Low Cash) Firms is the sum of connections to firms with Cash/Assets greater than (less than) the sample median via shared directors or managers. We do not count connections toward either total for cases in which shared directorship or management is observed but Cash/Assets in the connected firm is unobserved. Private is an indicator variable equal to one for firms without publicly traded equity. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Low Cash	High Cash	Private	Public	Small	Large
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Total Assets)	-0.073 ***	-0.050 ***	-0.091 ***	-0.051 ***	-0.120 ***	-0.034 ***
	(0.012)	(0.009)	(0.012)	(0.008)	(0.025)	(0.008)
Private	0.068 ***	0.057 ***			0.092 ***	0.067 ***
	(0.026)	(0.021)			(0.029)	(0.019)
Debt/Assets	0.047	0.138 *	0.047	0.102	-0.085	0.176 **
	(0.081)	(0.080)	(0.081)	(0.074)	(0.092)	(0.070)
Cash/Assets	-2.889 ***	-0.039	-0.328 ***	-0.175	-0.473 ***	-0.134
	(0.879)	(0.099)	(0.118)	(0.101)	(0.124)	(0.097)
ln(1+Number of Directors)	-0.042	-0.039	-0.078 **	0.000	-0.081 *	-0.040
	(0.037)	(0.035)	(0.039)	(0.031)	(0.047)	(0.028)
CashRichConnections > Median	-0.059 **	-0.035	-0.061 **	-0.029	-0.097 ***	0.002
	(0.026)	(0.024)	(0.027)	(0.022)	(0.030)	(0.019)
CashPoorConnections > Median	-0.025	0.033	0.001	0.007	0.022	-0.008
	(0.026)	(0.023)	(0.027)	(0.022)	(0.030)	(0.020)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.099	0.091	0.072	0.063	0.070	0.062
N	1386	1343	1528	1201	1302	1427

Table 11
Network Connections to Within vs Outside Industry Firms and Firm Failure

Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The dependent variable is Disappeared by 1937, an indicator variable that takes the value one if the firm no longer exists in 1937. WithinIndustryConn (OutsideIndustryConn) > Median is an indicator variable equal to one for firms that have a value of Connections greater than the sample median, where Connections is the sum of connections to firms within (outside) the firm's industry via shared directors or managers. We do not count connections toward either total for cases in which shared directorship or management is observed but industry of the connected firm is unobserved. WithinIndustryConn_and_"X" (WithinIndustryConn_and_"notX") > Median captures connections that are both within industry and also satisfy (do not satisfy) an additional "X" condition. In Columns 4-6, the "X" ("notX") condition is that the firm's connection has to be also through executives and directors who are at firms operating in the states where the firm operates (where the firm does not operate). In Columns 7-8, the "X" ("notX") condition is that the firm's connection has to be also through executives and directors who are at Cash Rich (Cash Poor) firms. Cash Rich (Cash Poor) Firms are firms with Cash/Assets greater than (less than or equal) the sample median. Similar to WithinIndustryConn > Median, WithinIndustryConn_and_"X" (WithinIndustryConn_and_"notX") > Median is an indicator variable for firms with connections greater than the sample median. OutsideIndustryConn_and_"X" > Median is defined similar to the WithinIndustryConn_and_"X" > Median. Private is an indicator variable equal to one for firms without publicly traded equity. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					"X" = In State			"X" = Cash Rich	
ln(Total Assets)	-0.061 ***	-0.064 ***	-0.061 ***	-0.063 ***	-0.062 ***	-0.062 ***	-0.062 ***	-0.063 ***	-0.062 ***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Private	0.072 ***	0.076 ***	0.073 ***	0.074 ***	0.072 ***	0.071 ***	0.071 ***	0.075 ***	0.071 ***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)	(0.016)	(0.017)
Debt/Assets	0.091	0.083	0.092	0.085	0.091	0.092	0.085	0.086	0.087
	(0.056)	(0.056)	(0.056)	(0.056)	(0.056)	(0.056)	(0.056)	(0.056)	(0.056)
Cash/Assets	-0.270 ***	-0.271 ***	-0.270 ***	-0.269 ***	-0.273 ***	-0.271 ***	-0.266 ***	-0.273 ***	-0.267 ***
	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)
ln(1+Number of Directors)	-0.0470 *	-0.060 **	-0.050 *	-0.054 **	-0.049 *	-0.043 *	-0.053 **	-0.053 **	-0.049 *
	(0.025)	(0.026)	(0.026)	(0.025)	(0.026)	(0.026)	(0.025)	(0.025)	(0.026)
WithinIndustryConn > Median	-0.054 ***		-0.057 ***						
	(0.016)		(0.017)						
WithinIndustryConn_and_*"X" > Median*				-0.028 *		-0.021	-0.046 ***		-0.041 **
				(0.017)		(0.017)	(0.016)		(0.017)
WithinIndustryConn_and_*"notX" > Median*					-0.049 ***	-0.045 ***		-0.022	-0.011
					(0.016)	(0.016)		(0.016)	(0.017)
OutsideIndustryConn > Median		-0.009	0.009						
		(0.016)	(0.017)						
OutsideIndustryConn_and_*"X" > Median*				-0.012		-0.009	0.002		0.005
				(0.017)		(0.017)	(0.017)		(0.017)
OutsideIndustryConn_and_*"notX" > Median*					0.003	0.006		-0.012	-0.006
					(0.017)	(0.017)		(0.016)	(0.017)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.101	0.097	0.101	0.098	0.100	0.100	0.099	0.098	0.099
N	2729	2729	2729	2729	2729	2729	2729	2729	2729

Table 12
Network Connections and the Likelihood of Firm Being Acquired

Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The dependent variable is Acquired by 1937, an indicator variable that takes the value one if the firm is acquired by another firm by 1937. Total Connections is the sum of connections to other firms in the sample via shared directors or managers. Total Connections > Median is an indicator variable equal to one for firms that have a value of Total Connections greater than the sample median. Total Connections Quartile 2 (3/4) is an indicator variable equal to one for firms that have a value of Total Connections greater than the sample 2nd (3rd/4th) quartile. Private is an indicator variable equal to one for firms without publicly traded equity. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
ln(Total Assets)	-0.016 ***	-0.015 ***	-0.014 ***	-0.02 ***	-0.019 ***	-0.018 ***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Private	0.003	0.002	0.004	0.003	0.002	0.004
	(0.013)	(0.013)	(0.013)	(0.014)	(0.014)	(0.014)
Debt/Assets	0.034	0.034	0.032	0.020	0.022	0.020
	(0.039)	(0.039)	(0.039)	(0.043)	(0.043)	(0.043)
Cash/Assets	-0.045	-0.043	-0.041	-0.031	-0.029	-0.025
	(0.057)	(0.057)	(0.057)	(0.061)	(0.061)	(0.061)
ln(1+Number of Directors)	-0.036 *	-0.030	-0.033 *	-0.041 *	-0.032	-0.036
	(0.020)	(0.019)	(0.020)	(0.022)	(0.021)	(0.022)
ln(1+Total Connections)	0.015 **			0.019 ***		
	(0.006)			(0.007)		
Total Connections > Median		0.024 *			0.029 **	
		(0.013)			(0.014)	
Total Connections Quartile 2			0.038 **			0.048 ***
			(0.016)			(0.017)
Total Connections Quartile 3			0.049 ***			0.062 ***
			(0.016)			(0.018)
Total Connections Quartile 4			0.033 *			0.038 **
			(0.017)			(0.019)
Industry Fixed Effects				Yes	Yes	Yes
State Fixed Effects				Yes	Yes	Yes
R-squared	0.005	0.005	0.006	0.019	0.018	0.021
N	2992	2992	2992	2729	2729	2729

Data Appendix for
"Friends during Hard Times: Evidence from the Great Depression"

In this appendix we provide details on the construction of the director network database, as well as the definitions of the industry, geograpical and other cross-sectional variables used in our analysis. In section 1 we discuss how we obtain information on firms' executives and directors from the 1928 Moody's Industrials manual using OCR and natural language processing techniques. In section 3 we discuss other data that we automatically retrieve from the same manual, such as geographical location and industry information. In section 2 we discuss variables we obtain manually from the 1928 and 1938 Moody's Industrials manuals.

1 Data on Executives and Directors from the 1928 Moody's Industrials manual

The main source for our analysis is the 1928 Moody's Industrials Manual. The manual was the major source of information for industrial firms existing at the time. We run Optical Character Recognition (OCR) on the images of the manual, using "ABBYY FineReader" as the software package of choice. Our main data source is the text output from this OCR stage.

The Moody's firm-level information is roughly organized as follows:

(a) Firm title (in capitals), followed by an entry in parenthesis specifying if the firm is a subsidiary of another firm (in parenthesis, using "Controlled by" or "Affiliated with").

(b) Details on firm history, from the time it was founded until the year the manual is published.

(c) Management and board of directors information. This includes the names of officers and directors as well as their geographic location.

(d) Firm offices location, auditors, day of annual meeting.

(e) Financial and operating data such as income statement and balance sheet.

(f) Securities ratings. In particular, the manual provides fixed income security ratings in all years and also equity ratings.

(g) Business and products. The manuals give detailed information on the business lines and different products marketed by the companies.

(h) Exchange where the stocks are listed.

The focal point of our research is item (c) above, for which we detail our data gathering efforts below. We also use items (d), (e), and (h) in our analysis and describe the data gathering process for those items in the next sections. While the quality of the images of the 1928 Moody's

Industrials manual is quite high, the OCR has some non-trivial typographical errors in its output. As a first step in our analysis, we perform an "OCR typo correction" focused on strings of interest, in particular, strings that define sections in the document in which we are particularly interested (i.e. the management and directors section). The code generates flags for pages where the OCR may be corrupted due to image errors, and in those cases we enter/fix the data manually (about 2% of the pages required some manual intervention).

Figure 1 presents the image of the first page of the manual that provides firm-level data. Firm-level data follows a long introduction that includes different indexes and other aggregate data. Figure 1 is a typical entry for a large firm, for which the Moody's manual devotes multiple pages. Figure 2 presents page 2892 of the manual, which is a typical page for small firms. Note how in this page we have data on five firms: Munson Steamship Line (entry that starts on page 2891), Murphy Varnish Co., Mutual Chemical Co. of America, Mutual Stores Inc., and Myers (F.E.) & Bro. Co. There is significant variation in the scope of coverage, but note how all companies list their management team, board of directors, as well as office location.

For a given firm, we obtain information on the management and board of directors by selecting the entries in the Moody's manual that follow the string "MANAGEMENT," or strings that in the OCR output are close to "MANAGEMENT" (e.g. "MGNAGEMENT"). We use natural language processing techniques to parse the text into a database, which involves both typo correction techniques, as well as Named Entity Recognition algorithms. In this step, we obtain the names of each manager and director associated with a given firm as well as their geographic location. Table 2 presents a list of the first few firms appearing in the manual and of their directors, together with location information, from the 1928 Industrials manual. We obtain similar information on the firms' management and combine the management and director information for each firm, eliminating duplicate observations for people who appear as both executives and directors. We use this list to construct the network.

2 Firm Accounting, Survival and M&A Information

We obtain data on balance sheet and income statement variables from the 1928 Moody's Industrials manual by hiring research assistants who manually inputted each firm's information. To identify private firms, we collect information on exchanges where firms list their equity shares. Firms with no listed equity are defined as private firms.

To define our main dependent variables on future survival and M&A status of firms in the 1928 Moody's Industrials manual, we obtain information on reasons for firm exit from the Moody's manual coverage. Specifically, the 1938 Moody's Industrials manual contains the list of "ADDITIONAL U. S. AND CANADIAN COMPANIES FORMERLY INCLUDED", which provides the list of companies which appeared in previous editions (1928–37) of the Industrials Manual but have been dropped as well as the reason for dropping coverage. Figure 3 shows an example of the list (its first page).

We use this list to determine firms from the 1928 Moody's Industrials manual that were dropped from coverage and to identify the reason for the exit. We define our key dependent variables as follows. The indicator variable "Disappeared by 1937" equals 1 for firms in the 1928 Moody's Industrials manual that over the subsequent 10-year period were dropped from coverage for one of the following reasons: going bankrupt, liquidated, reorganized, foreclosed, dissolved, sold at foreclosure, no public interest, or due to Moody's inability to find information on that firm. The indicator variable "Acquired by 1937" equals 1 for firms in the 1928 Moody's Industrials manual that over the subsequent 10-year period were dropped from coverage because they were acquired or merged with another firm. Cases in which the firm is the target of an acquisition vastly outnumber cases in which the firm merges with another firm: out of 326 firms that exit due to M&A activity 17.8% of firms are merged into another firm and 82.2% are acquired.

3 Other Cross-sectional Information

Office Location. We also obtain the data on the office location(s) of the firm, which always follows the information on the auditors and the annual meeting date for shareholders of the firm. Table 3 presents the office information that we parse out using natural language processing techniques, again for the first set of firms in the 1928 Industrials manual. We use this information to define state fixed effects (dummy variables equal to one for a given state if a firm has an office in that state; since a firm can have offices in several states, it can have several state dummies equal to one). We also use the state information to define firms as either rural (indicator variable "Rural" = 1) or urban ("Rural" = 0). The indicator variable "Rural" takes the value of one if the rural population in the state(s) in which the firm operates (defined using publicly available data from the 1930 U.S. Census) is in the top three quartiles of the distribution.

Industry Information. Pages xvii–xliv of the 1928 Moody's Industrials manual contain details on "The Nation's Basic Industries". This section of the manual gives both tables with sales, production, wages, prices, as well as qualitative information on each of the industries. We augment this list of qualitative information for each industry with the information in pages xlv–lv, which includes an alphabetical index of "The principal commodities, industries, articles, etc, carried in this volume."

The following list gives the 25 different industries we consider, together with the strings that we associate with each of the industries.

1. Steel and Iron: steel, iron, rolled, forge, slab, billet, tonnage.
2. Coal: coal, anthrac, bitumi, coke
3. Textile, Silk and Wool: textile, shirt, apparel, cloth, cotton, silk, wool, fall river, woolen, knit, yarn, cloth, worsted, towels, hosiery, fabric, laundr, wear, underwear, corset
4. Motor: motor, automo, airplane, aircraft, truck, road, tire.
5. Rubber: rubber, tires, tire fabric, belting.
6. Petroleum: petroleum, benzol, gasoline, crude, refin, oil, gas, tar, pipe.
7. Copper: copper, metal.
8. Equipment: equipment, car, bolts, freight, locomotive, railroad, valve, stove, passenger, foundry, machine, typewri, refrig, boiler, tubes, turbin, heater.
9. Sugar: sugar confect sweet.
10. Tobacco: tobacco, cigar, leaf, snuff, chew.

11. Packing: packing, cattle, hog, meat, sheep, animal, pork, beef, slaught, canned.
12. Shoe and leather: shoe, leather.
13. Retail trading: retail, store, grocer, music, piano, organ, grocery, candy, drug, mail.order, cigar.store, dry good, l.ght, neon, lamp.
14. Fertilizer: fertilizer, farm, crop, potash, phosph, nitrat, ammoni, sulphat, sulphur,
15. Shipping: ship, dredg, yards, dock, marine, ocean, idle tonnage, freight, charter, liner, boat, sea, steam, wharf.
16. Building: building, hardware, construct, lock, cement, lumber, asphalt, built, roof, asbesto, portland cem, glass, brick, plumb, realty, tile, tiling, paint, furnit.
17. Paper: paper, fibre, newsprint, print, pulp, wood, book, board, wrapping, bag, tissue, felt, timber, publish, press.
18. Food: food, grain, juice, molas, salt, soda, fruit, ice, butter, spice, soup, cream, milk, dairy, dairi, chocolat, coffee, cocoa, water, rice, bake, bakin, butcher, bottl, cereal, flour, beer, agricul, alcoho, beverag, biscuit, brew, wine, ale.
19. Manufacturing: manufact, mfg.
20. Entertainment: theat, fil, hotel, radio.
21. Mining: mine, mines, minin., gold, silver, zinc, bronze, lead, tin, nickel.
22. Electrical/Chemical: wire, cable, brass, power, electric, chemical, enginee, furnace.
23. Mills: mill, milling.
24. Storage: warehouse, storage.
25. Miscelanea: pharma, magnet, batteries, battery, signal.

We use regexes to decide whether a firm is in a given industry, checking the list of words for each industry against the whole entry for a given firm in the manual. We use the whole corpus of text we assign to a given company when defining industries. We note that in the above list the expressions between commas should be read as a regex (i.e., `l.ght` refers to strings that start with the letter "l," followed by any other symbol, and then the string "ght").

We use firm industry information to define industry fixed effects in the following way: we count the total number of words associated with an industry B appearing in the text for a given firm A. To define industry dummies, we set an indicator variable for an industry B of a given firm A equal to 1 if the count of words associated with the industry B in firm's A text comprises at least 25% of the total industry words we identify in A's text. Thus, similar to state fixed effects, a firm might have several industry dummies equal to one.

We validate our industry classification in the following way. We estimate the variation that our industry fixed effects explain in a corporate finance variable that is known to have large cross-industry differences – firm financial leverage. In particular, we estimate R^2 in an OLS regression where we explain firm leverage with our industry fixed effects. We find that our industry fixed effects explain 8.3% of variation in firm leverage. These regressions are presented in Appendix Table 1. We then repeat this exercise with the COMPUSTAT/CRSP data. In particular, we use three cross-sections (to match the cross-sectional nature of our data) in 1980, 1990, and 2000. Using CRSP industry codes (which, unlike COMPUSTAT codes, are dynamic through time), we assign firms to Fama-French 30 industries, which are the closest in count to our 25 industry groups. We exclude financial firms and utilities, since these are not included in the industrial manuals and hence are not in our sample. This step leaves us with 28 Fama-French industries. We find that CRSP-derived industry fixed effects explain 4.5%, 5.4%, and 14.6% of variation in leverage for the 1980, 1990 and 2000 cross-sections, respectively. Comparing the R^2 in our and the COMPUSTAT samples, our industry fixed effects appear to explain a similar amount of variation in leverage to standard industry measures used in modern samples.

Table 1: OCR sample output from the 1928 Moody's Industrial Manual

The table reports the raw OCR output from ABBYY for two pages (from the top, cut for space purposes) from the 1928 Moody's Industrial Manual. See Figures 1 and 2 for the original image files.

OCR output for page 1 of the 1928 Moody's Industrial Manual

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First Section
INDUSTRIAL COMPANIES
Including security ratings where complete facts and figures are available
ACME STEEL COMPANY
History Organized in 1880 and incorporated April, 1884, in Illinois, as Acme Flexible Clasp Co.; in 1899 consolidated with Quincy Hardware Manufacturing Co.
as Acme Steel Goods Co.; changed to present title in 1926. Manufactures hot rolled hoop steel, barrel hoops, bale ties, bucket hoops, metal box straps,
corrugated fasteners and hot and cold rolled strip steel. Plants located in Chicago and Eiverdale, Illinois, have a capacity of 700 tons per day. Chicago
plant covers 2% acres with total floor space of about 5 acres. Eiverdale plant located on site of 135 acres. Branches, offices and warehouses in New York,
San Francisco, Los Angeles, New Orleans, Atlanta, Seattle, Vancouver, Winnipeg, Montreal and Detroit.
Management: Officers: J. E. MacMurray, Chairman; S. H. Norton, Pres.; F. C. Gifford, Vice-Pres.; Donald MacMurray, Vice-Pres.; C. M. MacChesney, Sec;
C. S. Traer, Treas.; T. W. Lux, Asst. Sec. and Asst. Treas., Chicago. Directors: J. E. MacMurray, F. C. Gifford, Donald MacMurray, E. H. Norton, L. H. Whiting,
C. S. Traer, C. MacChesney, Chicago.  Annual Meeting:   Third Tuesday in January.  Office:   Chicago, 111.
Comparative Income Account, Years Ended Dec. 31
Net operating profit Bond interest ......
Net income Margin of safety.
Federal taxes .....
Surplus for year Earned per share ...
1927 $1,718,981 84,623 1926 $1,447,840 84,599 1925 $1,806,627 100,147 1924 $1,143,496 92,487 1923 $1;004,853 71,900 1922 $531,352
$1,634,358 95% 219,539 $1,363,241 94% 184,038 $1,706,480 94% 217,723 $1,051,009 92% 127,799 $932,953 93% 114,491 $531,352 64,485
$1,414,819 $7.74 $1,179,203 $6.45 $1,488,757 $8.59 $923,210 $16.26 $818,462 $16.00 $466,867 t$8.45
Assets: JPlant and equipment..
* Patents............
Stocks and bonds.....
Bills and accounts rec.
Inventory...........
Cash................
Deferred charges .....
* Based on no par shares, prior to 1925.   f After deducting preferred dividend requirement.
Comparative Balance Sheet, as of Dec. 31
1927            1926 Liabilities: 1927 .1926
$6,256,172       $6,079,391      Capital stock . ;........... $4,573,950 $4,573,950
92,377            52,156     Bonded debt............... 1,381,000 1,410,000
53,522             25,500     Accounts payable ......... 225,402 185,238
885,074            809,107      Bills payable ............ ........ 300,000
1,543,995         1,913,171      Accrued interest.......... 27,311 28,200
872,527        .  126,374     Reserves for taxes......... 322,052 385,628
1,646             4,139     Surplus.......-........... 3,175,598 2,226,822
```

OCR output for page 2892 of the 1928 Moody's Industrial Manual

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MOODY'S MANUAL OF INVESTMENTS
annual interest requirements in semi-annual installments, and in addition thereto an amount in cash and/or securities of this issue at their face value sufficient
to bring the amount, including interest, up to $350,000 annually during the first five years, as a sinking fund, and annually thereafter an amount in cash and/or
 securities of this issue at their face value equal to $100,000 as a sinking fund, all such sinking fund payments to be made in equal semi-annual instalments.
Sinking fund to be applied to purchase or call bonds at not exceeding the Call price. Bonds so retired to be cancelled. Secured by a first mortgage on the
Munson Building, New York. Legal for trust funds in New York. Free of New York State tax. Pennsylvania and Connecticut 4 mills tax, Maryland 4% mills tax,
District of Columbia 5 mills tax and Massachusetts 6% income tax refunded. Company pays normal income tax up to 2%.
Offered ($4,000,000) at par June, 1924, by Hoagland, Allum & Co., Inc., and A. B. Leach & Co., New York.
Capital Stock: 1. Munson Steamship Line 6% cum. pref.: Authorized $3,000,000 (increased from $1,000,000 in Dec, 1923); outstanding, $1,104,500; par $100.
Has preference as to assets and dividends. Dividends payable quarterly, Jan. 1, etc.
2. Munson Steamship Line common: Authorized, $3,000,-000 (increased from $600,000 in Feb., 1917) ; outstanding, $2,400,000; par $100. Dividends paid, but
rate not reported. Stock closely held. Stock transferred at company's office.
MURPHY VARNISH CO.: Incorporated under the laws of New Jersey, Jan. 9, 1891. Manufactures varnishes, etc.; plants located at Newark, N. J., and Chicago, 111.'
Number of employees, Dec. 31, 1927, 225. ≪.
Management: Officers: Franklin Murphy, Chrm. of Board, Newark, N. J.; C. J. Roh, Pres., Montclair, N. J.; P. S. Kennedy, Vice-Pres.; Z. Belcher, Jr., Sec, Newark, N. J.;
H. C. Ware, Treas., Orange, N. J.: W. H. DeCamp, Supt., East Orange, N. J. Directors: -Franklin Murphy, P. S. Kennedy, Newark, N. J.; C. J. Roh, Montclair, N. J.;
A. J. Beecher, New Haven, Conn.; Charles Bradley, Convent, N. J.; C .M. Baker, Chicago, 111.; E. F. Hopper, Maplewood, N. J. Annual Meeting: Second Tuesday in January.
Office:   224 McWhorter St., Newark, N. J.
Capital Stock: 1. Murphy Varnish Co. 6% cum. preferred:  Authorized and outstanding, $1,500,000; par, $100.
2. Murphy Varnish Co. common: Authorized and outstanding, $1,500,000; par, $100.   Stock closely held.
Stock transferred and registered at company's office. Number of stockholders Dec 31^ 1927: Preferred, 235; common, 173.
MUTUAL CHEMICAL CO. OF AMERICA: Incorporated in New Jersey, Oct. 9, 1908. Acquired properties of Baltimore Chrome Works, American Chrome Co., and Mutual Chemical
Co. of Jersey City. Plants are located at Baltimore, Md., and Jersey City, N. J. Company is said,to be largest producer of bichromate of soda and potash in the
United States.
Management: Officers: F. W. White, Pres.; H. M. Kaufmann, Vice-Pres. and. Gen. Mgr.; W.> H. Bower, 2nd Vice-Pres.; G. G. Henry, Sec. and Treas., New York.
Directors: F. W. White, W. R. Peters, Dr. H. M. Kaufmann, New York; W. H. Bower, F. B. Bower, Philadelphia; J. Beebe, Boston, Mass.; S. W. White, Nutley, N. J.
Annual Meeting: Jan. 31, at Jersey City, N. J. Offices: 270 Madison Ave., New York; West Side Ave., Jersey City, N. J. and Baltimore, Md.
Capital Stock: 1: Mutual Chemical Co. of America 6% cum. preferred: Authorized and outstanding, $1,500,000; par $100.  Regular dividends paid quarterly, March 31, etc.
2. Mutual Chemical Co. of America common: Authorized, $5,000,000 (increased from $2,000,000 during 1922); outstanding, $4,005,000; par $100. Dividends paid but
rate not reported. Registrar: American Exchange Irving Trust Co., New York.
MUTUAL STORES, INC.: Incorporated in California Feb. 26, 1927, to succeed Mutual Creamery Co., Inc., incorporated under California laws in 1919. Engaged in
the retail food business in Oakland, San Francisco, Berkeley, Alamada, and other California towns, selling groceries, farm products and dairy products.
Manufactures ice-cream, butter, baking products, etc. Properties include 58,000 sq. ft. of ground at Fourth Ave. and East Eleventh St., Oakland, on which is
a plan't with floor space of 36,000 sq. ft.; 5% acres at Fifty-seventh Ave. and East Fourteenth St., Oakland, on which is another plant; trucks, store
fixtures, etc. In Nov., 1927, purchased plant of California Baking Co.
on Twelfth St. between Howard and Folsom Sts., San Francisco.
```

Table 2: List of directors with location from the Moody's 1928 Industrial Manual

The table reports the list of directors at the first two companies listed in the Moody's 1928 Industrials Manual The first column lists the firm, the second the name of the board member, the third and fourth the city and state where the board members are located.

ACME STEEL COMPANY	J E MacMurray	Chicago	Ill
ACME STEEL COMPANY	F C Gifford	Chicago	Ill
ACME STEEL COMPANY	Donald MacMurray	Chicago	Ill
ACME STEEL COMPANY	E H Norton	Chicago	Ill
ACME STEEL COMPANY	L H Whiting	Chicago	Ill
ACME STEEL COMPANY	C S Traer	Chicago	Ill
ACME STEEL COMPANY	C MacChesney	Chicago	Ill
THE AMERICAN AGRICULTURAL CHEMICAL COMPANY	Horace Bowker	New York	N Y
THE AMERICAN AGRICULTURAL CHEMICAL COMPANY	R S Bradley	New York	N Y
THE AMERICAN AGRICULTURAL CHEMICAL COMPANY	Samuel F Pryor	New York	N Y
THE AMERICAN AGRICULTURAL CHEMICAL COMPANY	G C Clark Jr	New York	N Y
THE AMERICAN AGRICULTURAL CHEMICAL COMPANY	Geo B Burton	New York	N Y
THE AMERICAN AGRICULTURAL CHEMICAL COMPANY	J F Dulles	New York	N Y
THE AMERICAN AGRICULTURAL CHEMICAL COMPANY	J S Alexander	New York	N Y
THE AMERICAN AGRICULTURAL CHEMICAL COMPANY	Charles Hayden	New York	N Y
THE AMERICAN AGRICULTURAL CHEMICAL COMPANY	George C Lee	Boston	Mass
THE AMERICAN AGRICULTURAL CHEMICAL COMPANY	Philip Stockton	Boston	Mass
THE AMERICAN AGRICULTURAL CHEMICAL COMPANY	C B Whittlesey	New London	Conn
AMERICAN CHICLE COMPANY	L R Adams	New York	N Y
AMERICAN CHICLE COMPANY	H C Leighton	New York	N Y
AMERICAN CHICLE COMPANY	H L McVickar	New York	N Y
AMERICAN CHICLE COMPANY	S T Britten	San Francisco	Cal
AMERICAN CHICLE COMPANY	S B Adams	Portland	Me
AMERICAN CHICLE COMPANY	W S Primley	Chicago	Ill
AMERICAN CHICLE COMPANY	T H Blodgett	New York	N Y
AMERICAN CHICLE COMPANY	W C Langley	New York	N Y
AMERICAN CHICLE COMPANY	F W Shibley	New York	N Y
AMERICAN CHICLE COMPANY	H B Clark	New York	N Y

Table 3: List of main offices from the Moody's 1928 Industrial Manual

The table reports the main offices of companies, as listed in the Moody's 1928 Industrials Manual. The first column lists the firm name, the second the street, then the city and the state. Note how the Moody's manual often includes more than one office per firm.

Company name	Street	City	State
ACME STEEL		Chicago	Ill
AMERICAN AGRIC. CHEMICAL	420 Lexington Ave.	New York City	New York
AMERICAN CHICLE	Manly St.	Long Island City	New York
AMERICAN CYANAMID	535 Fifth Avenue	New York City	New York
AMALGAMATED PHOSPHATE	535 Fifth Ave.	New York City	New York
THE AMERICAN HARDWARE		New Britain	Conn
THE AMERICAN SHIP BUILDING	West 54th St.	Cleveland	Ohio
AMERICAN SNUFF		Memphis	Tenn
AMERICAN SUMATRA TOBACCO	131 Water St.	New York City	New York
AMERICAN TYPE FOUNDERS	300 Communipaw Ave.	Jersey City	N J
AMERICAN TYPE FOUNDERS	96 Beekman St.	New York City	New York
BARNHART BROTHERS & SPINDLER	Throop Sts.	Chicago	Ill
BARNHART BROTHERS & SPINDLER	300 Communipaw Ave	Jersey City	N J
NATIONAL PAPER & TYPE	38 Burling blip	New York City	New York
AMERICAN VITRIFIED PRODUCTS	15 Broad St.	Akron	Ohio
AMERICAN VITRIFIED PRODUCTS	Oliver Building.	Pittsburgh	Pa
AMERICAN WHOLESALE	354 Fourth Ave	Baltimore	Md
AMERICAN WINDOW GLASS MACHINE	Farmers Bank Building	Pittsburgh	Pa
AMERICAN WINDOW GLASS	1 Madison Ave.	New York City	New York
AMOSKEAG MANUFACTURING	10 State St.	Boston	Mass
AMOSKEAG MANUFACTURING	34 Thomas St.	New York City	New York
ARCHER-DANIELS-MIDLAND		Minneapolis	Minn
ARLINGTON MILLS	78 Chauncey Street	Boston	Mass
THE ARUNDEL CO.	Pier 2 Pratt St.	Baltimore	Md
ATLAS POWDER CO.	Market Sts.	Wilmington	Del
BELDING HEMINWAY		Rockville	Conn
BELDING HEMINWAY	Madison Ave. & 34th St.	New York City	New York
BROWN CO.		Portland	Me
BROWN CO.	110 So. Dearborn St.	Chicago	Ill
BROWN CO.	233 Broadway.	New York City	New York
BROWN CO.		Quebec	Can
BROWN SHOE INC	Seventeenth St.	St. Louis	Mo
BUTLER BROTHERS	Canal Sts.	Chicago	Ill
A M BYERS	235 Water St.	Pittsburgh	Pa
CENTRAL AGUIRRE SUGAR		Aguirre	Porto Rico
CENTRAL AGUIRRE SUGAR	45 Milk St.	Boston	Mass
CENTRAL AGUIRRE SUGAR	129 Front St.	New York City	New York
CLINCHFIELD COAL		Dante	Va
CLUETT PEABODY & CO INC		Troy	New York
CONTINENTAL MOTORS		Detroit	Mich
CRUCIBLE STEEL OF AMERICA	17 East 42nd Street	New York City	New York
CRUCIBLE STEEL OF AMERICA	15 Exchange Place	Jersey City.	N J
CUBA CANE SUGAR	Moron	Camaguey	Cuba
CUBA CANE SUGAR	123 Front St.	New York City	New York
EASTERN CUBA SUGAR	Moron	Camaguey	Cuba
THE CUBAN-AMERICAN SUGAR	136 Front St.	New York City	New York
THE CUDAHY PACKING	111 West Monroe St.	Chicago	Ill
ALFRED DECKER & COHN INC	Market Sts.	Chicago	Ill
ALFRED DECKER & COHN INC	200 Fifth Ave.	New York City	New York

First Section

INDUSTRIAL COMPANIES

Including security ratings where complete facts and figures are available

ACME STEEL COMPANY

History: Organized in 1880 and incorporated April, 1884, in Illinois, as Acme Flexible Clasp Co.; in 1899 consolidated with Quincy Hardware Manufacturing Co. as Acme Steel Goods Co.; changed to present title in 1925. Manufactures hot rolled hoop steel, barrel hoops, bale ties, bucket hoops, metal box straps, corrugated fasteners and hot and cold rolled strip steel. Plants located in Chicago and Riverdale, Illinois, have a capacity of 700 tons per day. Chicago plant covers 2½ acres with total floor space of about 5 acres. Riverdale plant located on site of 135 acres. Branches, offices and warehouses in New York, San Francisco, Los Angeles, New Orleans, Atlanta, Seattle, Vancouver, Winnipeg, Montreal and Detroit.

Management: OFFICERS: J. E. MacMurray, Chairman; S. H. Norton, Pres.; F. C. Gifford, Vice-Pres.; Donald MacMurray, Vice-Pres.; C. M. MacChesney, Sec.; C. S. Traer, Treas.; T. W. Lux, Asst. Sec. and Asst. Treas., Chicago. DIRECTORS: J. E. MacMurray, F. C. Gifford, Donald MacMurray, R. H. Norton, L. H. Whiting, C. S. Traer, C. MacChesney, Chicago. ANNUAL MEETING: Third Tuesday in January. OFFICE: Chicago, Ill.

Comparative Income Account, Years Ended Dec. 31

	1927	1926	1925	1924	1923	1922
Net operating profit	$1,718,981	$1,447,840	$1,806,627	$1,143,496	$1,004,853	$531,352
Bond interest	84,623	84,599	100,147	92,487	71,900	....
Net income	$1,634,358	$1,363,241	$1,706,480	$1,051,009	$932,953	$531,352
Margin of safety	**95%**	**94%**	**94%**	**92%**	**93%**	....
Federal taxes	219,539	184,038	217,723	127,799	114,491	64,485
Surplus for year	$1,414,819	$1,179,203	$1,488,757	$923,210	$818,462	$466,867
*Earned per share	$7.74	$6.45	$8.59	$16.26	$16.00	†$8.45

* Based on no par shares, prior to 1925. † After deducting preferred dividend requirement.

Comparative Balance Sheet, as of Dec. 31

ASSETS:	1927	1926	LIABILITIES:	1927	1926
‡Plant and equipment	$6,256,172	$6,079,391	Capital stock	$4,573,950	$4,573,950
*Patents	92,377	52,156	Bonded debt	1,381,000	1,410,000
Stocks and bonds	53,522	25,500	*Accounts payable*	*225,402*	*185,238*
Bills and accounts rec.	*885,074*	*809,107*	*Bills payable*	....	*300,000*
Inventory	*1,543,995*	*1,913,171*	*Accrued interest*	*27,311*	*28,200*
Cash	*872,527*	*126,374*	*Reserves for taxes*	*322,052*	*285,628*
Deferred charges	1,646	4,139	Surplus	3,175,598	2,226,822
Total	$9,705,313	$9,009,838	Total	$9,705,313	$9,009,838

* After depreciation accrued to Dec. 31: 1927, $526,288; 1926, $515,295. ‡ After depreciation and amortization to Dec. 31: 1927, $1,763,186; 1926, $1,530,695.

Working Capital: *1927, current assets, $3,301,596; current liabilities, $574,765; net current assets, $2,726,831.*
1926, current assets, $2,848,652; current liabilities, $799,066; net current assets, $2,049,586.

Table A—Bond Records	Interest Payable	Maturity	Authorized	Outstanding	Five Year Average Income	Interest Required Per Annum	Times Interest Earned	Security	Salability	Rating
1. Acme Steel Goods Co. 1st 6s.	M&S	Mr. 1943	$3,500,000	$1,381,000	$1,424,359	$82,860	17.2	High	Fair	A

1. Acme Steel Goods Co. first sinking fund gold 6s, series A:

Authorized—$3,500,000; outstanding, $1,381,000; retired to Dec. 31, 1927, $119,000.

Dated—March 1, 1923; due March 1, 1943.

Interest Paid—M&S 1, at Trustee's office.

Trustee—Harris Trust & Savings Bank, Chicago.

Denomination—Coupon, $500 and $1,000; interchangeable; registerable as to principal.

Callable—At any time on 60 days' notice at 103 prior to March 1, 1933; at 102 prior to Mar. 1, 1938; at 101 until Sept. 1, 1942; thereafter at par. Bonds may also be purchased or called for the sinking fund (which see).

Sinking Fund—Semi-annually beginning Jan. 1, 1924, sufficient to retire 68% of the issue by maturity by purchase at not exceeding redemption price or if not so obtainable by call at that price. During the years 1928 to 1932 inclusive sinking fund payments shall amount to 3% of the total bonds of this issue; 1933 to 1937 4% annually; 1938 to 1942 incl., 5% annually.

Security—First mortgage on all fixed assets of the company now owned or hereafter acquired. Indenture provides that no cash dividends shall be paid on common except out of earnings, subsequent to January 1, 1923, and in no event when such action will reduce current assets below twice current liabilities, and that no additions to fixed assets shall be made which will reduce current assets below two and one-half times current liabilities.

Additional Bonds—May be issued for 60% of cost or value of additional property and permanent improvements provided net earnings for two years preceding date of proposed issue average at least three times total annual interest charges on all bonds outstanding and to be issued.

Tax Provisions—Company pays normal income tax up to 2%.

Offered—($1,500,000) at 99 in March, 1923, by Marshall Field, Glore, Ward & Co., New York.

Table B—Stock Records	Rate of Dividend	Authorized	Outstanding	Five Year Average Income	Dividend Requirement	Salability	Rating
1. Acme Steel Co. stock	See text	200,000 sh.	182,958 sh.	$1,164,890	$914,790*	Fair	*Ba*

For stock description, see following page.

* To pay $5 per share.

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Figure 1: Image of page 1 from the 1928 Moody's Industrials Manual.

annual interest requirements in semi-annual installments, and in addition thereto an amount in cash and/or securities of this issue at their face value sufficient to bring the amount, including interest, up to $350,000 annually during the first five years, as a sinking fund, and annually thereafter an amount in cash and/or securities of this issue at their face value equal to $100,000 as a sinking fund, all such sinking fund payments to be made in equal semi-annual instalments. Sinking fund to be applied to purchase or call bonds at not exceeding the call price. Bonds so retired to be cancelled. Secured by a first mortgage on the Munson Building, New York. Legal for trust funds in New York. Free of New York State tax. Pennsylvania and Connecticut 4 mills tax, Maryland 4½ mills tax, District of Columbia 5 mills tax and Massachusetts 6% income tax refunded. Company pays normal income tax up to 2%.

Offered ($4,000,000) at par June, 1924, by Hoagland, Allum & Co., Inc., and A. B. Leach & Co., New York.

CAPITAL STOCK: 1. Munson Steamship Line 6% cum. pref.: Authorized $3,000,000 (increased from $1,000,000 in Dec., 1923); outstanding, $1,104,500; par $100. Has preference as to assets and dividends. Dividends payable quarterly, Jan. 1, etc.

2. Munson Steamship Line common: Authorized, $3,000,000 (increased from $600,000 in Feb., 1917); outstanding, $2,400,000; par $100. Dividends paid, but rate not reported. Stock closely held.

Stock transferred at company's office.

MURPHY VARNISH CO.: Incorporated under the laws of New Jersey, Jan. 9, 1891. Manufactures varnishes, etc.; plants located at Newark, N. J., and Chicago, Ill. Number of employees, Dec. 31, 1927, 225.

MANAGEMENT: OFFICERS: Franklin Murphy, Chrm. of Board, Newark, N. J.; C. J. Roh, Pres., Montclair, N. J.; P. S. Kennedy, Vice-Pres.; Z. Belcher, Jr., Sec., Newark, N. J.; H. C. Ware, Treas., Orange, N. J.: W. H. DeCamp, Supt., East Orange, N. J. DIRECTORS: Franklin Murphy, P. S. Kennedy, Newark, N. J.; C. J. Roh, Montclair, N. J.; A. J. Beecher, New Haven, Conn.; Charles Bradley, Convent, N. J.; C .M. Baker, Chicago, Ill.; E. F. Hopper, Maplewood, N. J. ANNUAL MEETING: Second Tuesday in January. OFFICE: 224 McWhorter St., Newark, N. J.

CAPITAL STOCK: 1. Murphy Varnish Co. 6% cum. preferred: Authorized and outstanding, $1,500,000; par, $100.

2. Murphy Varnish Co. common: Authorized and outstanding, $1,500,000; par, $100. Stock closely held.

Stock transferred and registered at company's office. Number of stockholders Dec. 31, 1927: Preferred, 235; common, 173.

MUTUAL CHEMICAL CO. OF AMERICA: Incorporated in New Jersey, Oct. 9, 1908. Acquired properties of Baltimore Chrome Works, American Chrome Co., and Mutual Chemical Co. of Jersey City. Plants are located at Baltimore, Md., and Jersey City, N. J. Company is said to be largest producer of bichromate of soda and potash in the United States.

MANAGEMENT: OFFICERS: F. W. White, Pres.; H. M. Kaufmann, Vice-Pres. and Gen. Mgr.; W. H. Bower, 2nd Vice-Pres.; G. G. Henry, Sec. and Treas., New York. DIRECTORS: F. W. White, W. R. Peters, Dr. H. M. Kaufmann, New York; W. H. Bower, F. B. Bower, Philadelphia; J. Beebe, Boston, Mass.; S. W. White, Nutley, N. J. ANNUAL MEETING: Jan. 31, at Jersey City, N. J. OFFICES: 270 Madison Ave., New York; West Side Ave., Jersey City, N. J. and Baltimore, Md.

CAPITAL STOCK: 1. Mutual Chemical Co. of America 6% cum. preferred: Authorized and outstanding, $1,500,000; par $100. Regular dividends paid quarterly, March 31, etc.

2. Mutual Chemical Co. of America common: Authorized, $5,000,000 (increased from $2,000,000 during 1922); outstanding, $4,005,000; par $100. Dividends paid but rate not reported.

Registrar: American Exchange Irving Trust Co., New York.

MUTUAL STORES, INC.: Incorporated in California Feb. 26, 1927, to succeed Mutual Creamery Co., Inc., incorporated under California laws in 1919. Engaged in the retail food business in Oakland, San Francisco, Berkeley, Alamada, and other California towns, selling groceries, farm products and dairy products. Manufactures ice-cream, butter, baking products, etc. Properties include 58,000 sq. ft. of ground at Fourth Ave. and East Eleventh St., Oakland, on which is a plant with floor space of 36,000 sq. ft.; 5½ acres at Fifty-seventh Ave. and East Fourteenth St., Oakland, on which is another plant; trucks, store fixtures, etc. In Nov., 1927, purchased plant of California Baking Co. on Twelfth St. between Howard and Folsom Sts., San Francisco.

COMPARATIVE OPERATING DATA

	*1927	1926	1925
Number of stores ..	185	127	84
Capital in business.	....	$530,300	$369,569
Store sales	$2,735,976	6,761,200	4,609,674
Net profits	99,257	252,701	186,497
Av. sales per store.	14,789	53,238	54,877
Av. profits per store	537	1,990	2,220
Capital per store ..	....	4,176	4,400

* Four months ended June 30, 1927.

MANAGEMENT: OFFICERS: E. A. Hagstrom, Pres.; Andrew Stockholm, Vice-Pres.; W. B. Rosemond, Sec. and Treas. DIRECTORS: Agnes Hagstrom, E. A. Hagstrom, John Muhelsen, W. B. Rosemond, Andrew Stockholm. GENERAL AUDITORS: Price, Waterhouse & Co. ANNUAL MEETING: First Tuesday in Feb. OFFICE: 425 East 11th St., Oakland, Cal.

BALANCE SHEET, as of Feb. 28, 1927 (giving effect to new financing): Capital stock, $710,094; bonded debt, $700,000; accounts payable, $318,910; other current liabilities, $53,003; deferred credits, $245; total, $1,782,252. Contra: Land, buildings and equipment (less depreciation), $529,131; construction account, $350,000; investment, $5,000; cash, $256,300; accounts receivable, $36,166; inventories, $537,245; deferred charges, $68,410; total, $1,782,252.

BONDED DEBT: 1. Mutual Stores, Inc., convertible debenture gold 7s, series of 1937: Authorized, all series, $2,000,000; outstanding, series of 1937, $700,000. Dated Mar. 1, 1927; due Mar. 1, 1937.

Interest paid M&S 1 at Bank of Italy National Trust & Savings Association, San Francisco, Trustee. Coupon, $500 and $1,000. Callable on any interest date on 30 days' notice at 105 to Mar. 1, 1928 incl., and at ½% less each year or part thereof thereafter. Convertible into capital stock at any time prior to maturity, or if redeemed before maturity prior to ten days before the redemption date on basis of par for debentures and $50 per share for capital stock, accrued interest on debentures to conversion date to be paid in cash. Sinking fund payable annually and cumulative beginning Mar. 1, 1929 of $35,000. In event debentures are called for redemption and shall, subsequent to such call and prior to ten days before the redemption, be converted into capital stock, sinking fund shall be credited to that extent. Bonds at par may be tendered in lieu of cash.

A direct obligation of the company but not secured by mortgage. Company agrees that it will not mortgage any of its properties, nor create any other indebtedness except (a) purchase money obligations for property other than merchandise, including renewals and substitutions thereof, (b) indebtedness incurred in the usual course of business of no longer than six months' maturity and (c) additional authorized debentures. Additional debentures up to $1,300,000 may be issued in one or more series provided net earnings for twelve months next preceding have been at least twice interest charges on debentures outstanding and to be issued, and further shall be issued only to reimburse company for not exceeding 50% of cost of capital improvements made since issuance of last debentures and shall be issued only when aggreate debentures outstanding and to be issued, shall not exceed 50% of net worth of company, including proceeds from such issue of debenture bonds and excluding bonded indebtedness. Issued for additions to plant, for expansion and for other corporate purposes. California not exceeding 5 mills taxes refunded. Company pays normal income tax up to 2%.

Offered ($700,000) at par in Apr., 1927 by Blyth, Witter & Co., and Mitchum, Tully & Co., San Francisco.

CAPITAL STOCK: 1. Mutual Stores, Inc. stock: Authorized, 150,000 shares; outstanding, 110,000 shares; reserved for conversion, 40,000 shares; no par.

MYERS (F. E.) & BRO. CO.: Incorporated under Ohio laws in 1927 to succeed company of some name incorporated in 1920. Business established in 1878. Manufactures pumps of various types and sizes, water systems for domestic and industrial use, automobile washers, spraying units, hay tools, door hangers, etc.

MANAGEMENT: OFFICERS: P. A. Myers, Pres.; J. C. Myers, G. C. Myers, A. N. Myers, G. D. Myers, Vice-Pres.; F. B. Kellogg, Sec. and Treas., Ashland, O. DIRECTORS: P. A. Myers, J. C. Myers, G. C. Myers, A. N. Myers, G. D. Myers, F. B. Kellogg, Ashland, O.; J. R. Nutt, L. B. Williams, Cleveland, O. GENERAL AUDITORS: Ernst & Ernst. OFFICE: Ashland, O.

NET EARNINGS (after eliminating income from investments in excess of those now owned, increasing depreciation charges to basis of appraised values, allowing for Federal

Figure 2: Image of page 2892 from the 1928 Moody's Industrials Manual.

ADDITIONAL U. S. AND CANADIAN COMPANIES FORMERLY INCLUDED

The following companies which appeared in previous editions (1928-37) of the Industrial Manual have been dropped. The date in parentheses indicates last edition in which statement appeared.

NOTE: For statements of banks, insurance companies, investment trusts, finance, mortgage and real estate companies, formerly included in the Industrial Manual, see Moody's Bank, Insurance and Financial Manual.

A. B. C. Brewing Co. (1936)
Acquired by Terre Haute Brewing Co.
A. B. C. Cigar Co. (1935)
No recent information
A & K Petroleum Co. (1936)
Name changed to Kerlyn Oil Co.
A. P. W. Pulp & Power Co. (1932)
Name changed to Halifax Power & Pulp Co.
A. W. Consolidated Stock Trust, Ltd. (1932) No recent information
A. W. Second Stock Trust (1932)
No recent information
Abendroth Bros. (1935)
Operations discontinued
Abitibi Fibre Co., Ltd. (1928)
Merged by Abitibi Power & Paper Co., Ltd.
Acadia Mills (1936)
Manufacturing discontinued
Acme Apparatus Corp. (Mass.) (1930)
No recent information
Acme Die Casting Co. (1937)
Merged by Michigan Die Casting Co., Sept., 1937
Acme Glass Co. (1930)
No public interest
Acme Road Machinery Co. (1937)
Purchased by D. E. Winslow, Inc., Detroit, Mich., April, 1937
Acme Staple Co. (1930)
No recent information
Acosta Aircraft Corp. (Del.) (1930)
No recent information
Acoustics Products Co. (1929)
Receivership
Acushnet Mill Co. (1930)
Equipment sold; dissolved
Adams Axle Co. (1932)
Little public interest
Adams (C. F.) Co. (1935)
Properties sold
Adams-McGill Co. (1930)
No recent information
Adams Royalty Co. (1937)
Name changed to Adams Oil & Gas Co., 1937
Addressograph Co. (1936)
Dissolved
Addressograph International Corp. (1930). Name changed to Addressograph Multigraph Corp.
Addressograph Multigraph of Canada, Ltd. (1937). No public interest
Aeolian Weber Piano & Pianola Co. (1932)
Name changed to International Holding Corp. of Garwood
Aero Alarm Co. ((1931)
Bankrupt
Aero Corp. of California, Inc. (1933)
Liquidated
Aero Engines of Canada, Ltd. (1930)
No recent information
Aeromarine Klemm Corp. (1930)
Receivership
Aetna Brewing Co. (1935)
No recent information
Aetna Mills (1937)
Name changed to Shirreffs Worsted Co., Nov. 12, 1937
Affiliated Products, Inc. (1936)
Merged with American Home Products Corp.
Ahrens-Fox Fire Engine Co. (1926)
Merged with Le Blond-Schacht Truck Co.
Ahumada Lead Co. (1932)
Liquidated
Aiken Mills (1928)
Sold to United Merchants & Manufacturers, Inc.
Aircraft Corp. of America (1930)
No public interest
Aircraft, Ltd. (1930)
No public interest
Aircraft Plywood Corp. (1926)
Consolidated with U. S. Plywood Co.
Aircraft Slotted Wing Corp., Ltd. (1933)
Operations discontinued
Airparts & Tool Corp. (1930)
Acquired by Ex-Cello Aircraft & Tool Corp.
Airport Holding Corp. (1931)
No recent information
Airport Lighting, Inc. (1930)
Name changed to Airport Holding Corp.
Ajax Rubber Co., Inc. (1935)
Sold at foreclosure
Alabama Mills Co. (1933)
Name changed to Alabama Mills, Inc.
Aladdin Chemical Corp. (1934)
No recent information
Aladdin Industries Inc. (1932)
No public interest
Alameda Sugar Co. (1934)
Merged with Sutter Butte Land Co.
Alaska Gold Mines Co. (1932)
Sold by decree, Aug. 15, 1932
Alaska Mining & Power Co. (1934)
Acquired by Alaska Juneau Mining Co.
Alaska Refrigerator Corp. (1931)
Acquired by Norge Corp.
Alaska Treadwell Gold Mining Co. (1928). Liquidated
Alaska Washington Consolidated Airways (1930). Inactive
Albany Packing Co., Inc. (1937)
No recent information
Albatross Steel Furniture Co. (1937)
Property foreclosed
Alberta Wood Preserving Co., Ltd. (1932)
Merged with Dominion Tar & Chemical Co.
Albmite Die Casting & Mfg. Co. (1937)
Dissolved, July 1937
Alexander Industries, Inc. (1932)
Bankrupt
Algoma Consolidated Corp. (1937)
Assets transferred to trustee, 1937
Algomah Mining Co. (1924)
Operations suspended
All American Mohawk Corp. (1934)
No recent information
Alleghany River Mining Co. (1937)
No public interest
Allen (J. P.) & Co. (1935)
Little public interest
Allen (S. L.) & Co., Inc. (1930)
No recent information
Allen-Hough Carryola Co. (1932)
Operations discontinued
Allen Mfg. Co., Inc. (1932)
Bankrupt
Allen Oil Co. (1930)
No recent information
Allen Stockholding Corp. (1930)
No recent information
Allen Wales Corp. (1930)
Succeeded by Allen Wales Adding Machine Corp.
Allen Wales Adding Machine Corp. (1934)
Little public interest
Allendale Corp. (1937)
Acquired by Fashion Park Inc., Feb., 1938
Allentown Dairy Corp. (1937)
All owned by Philadelphia Dairy Products Corp.
Allerton Corp. (1931)
Succeeded by Allen Properties Corp.
Allied Aviation Industries, Inc. (1931)
Receivership
Allied Motor Industries, Inc. (1934)
Dissolved, April, 1934
Allied Packers, Inc. (1929)
Acquired by Hygrade Food Products Corp.
Allied Petroleum Corp. (1937)
No recent information
Allied Tar & Chemical Corp. (1931)
Operations discontinued
Alligator Co. (1937)
No recent information
Allison Drug Stores Corp. (1931)
No recent information
Allith-Prouty Co. (1935)
Bankrupt
Alloy Steel Spring & Axle Co. (1934)
Dissolved, Jan., 1934
Almar Stores Corp. (1932)
Name changed to J. R. Peters & Co.
Alta Merger Mines Co. (1932)
No recent information
Alta Michigan Mines Co. (1932)
No recent information
Amalgamated Coal Corp. (Tenn.) (1930)
Assets sold at auction in 1930.
Amalgamated Laundries, Inc. (1934)
Properties sold May, 1933
Amalgamated Silk Corp (1930)
Bankrupt
Amason Cotton Mills (1930)
No recent information
American Aeronautical Corp. (1934)
No recent information
American Agricultural Chem. Co., Conn. (1934). Dissolved Dec. 31, 1934
American Airports Corp. (1930)
No recent information
American Art Works, Inc. (1930)
Merged by American Colortype Co.
American Austin Car Co., Inc. (1936)
Succeeded by American Bantam Car Co.
American Beet Sugar Co. (1934)
Name changed to American Crystal Sugar Co.
American Bensol Corp. (1930)
No recent information
American Bosch Magneto Corp. (1930)
Name changed to United American Bosch Corp.
American Brick Co. (1932)
Assets sold to Medfield Brick Co. in Sept., 1932
American Broadcasting Co. (1929)
Operations discontinued
American Brown Boveri Electric Corp. (1931). Name changed to N. Y. Shipbuilding Corp.
American Cable Co., Inc. (1934)
Merged with American Chain Co.
American Caramel Co. (1935)
No recent information
American Cereal Food Corp. (1937)
Reorganization proceedings entered, Jan., 1938
American Chain Co. (1936)
Name changed to American Chain & Cable Co.
American Chatillon Corp. (1929)
Merged into Tubize Chatillon Corp.
American Chinaware Corp. (1932)
Properties sold
American Cigar Co. (1936)
Name changed to American Cigarette & Cigar Co.
American Cirrus Engines, Inc. (1930)
Bankrupt
American Controlled Oilfields, Inc. (1931). Operations discontinued.
American Cottonpicker Corp. (1930)
No recent information
American Dairies, Inc. (1931)
No recent information
American Dept. Stores Corp. (Del.) (1937). Reorganized into Brager-Eisenberg, Inc., 1937
American Drug Corp. (1935)
Little public interest
American Druggists Syndicate (1928)
Merged into Vadsco Sales Corp.
American Dry Corp. (1930)
No recent information
American Dry Ice Corp. (1934)
Acquired by Dry Ice, Inc.
American Eagle Aircraft Corp. (1930)
Acquired by American-Eagle-Lincoln Aircraft Corp.
American Electric Switch Corp. (1930)
No recent information
American Finishing Co. of Tenn. (1928)
Name changed to American Finishing Co.
American Forge & Machine Co. (1931)
Bankrupt
American Fruit Distribution, Inc. (1929)
Stock issued illegally
American Fruit & S. S. Corp. (1933)
Merged by Standard Fruit & S.S. Co.
American Glue Co. (1930)
Liquidating as Eastern Equities Corp.—see Moody's Bank & Finance Manual
American Greenhouse Mfg. Co. (1930)
Bankrupt
American Linen Co. (1930)
Dissolved
American Linseed Co. (1928)
Property sold
American Lithographic Co. (1929)
Acquired by U. S. Printing & Lithographing Co.
American Mathis, Inc. (1931)
No public interest
American Medicinal Spirits Co. (1935)
Dissolved
American Motor Body Corp. (1929)
Merged into Hale & Kilburn Co.
American Multigraph Co. (1930)
Merged into Addressograph Multigraph Co.
American Neon Light Corp. (1930)
No recent information
American News Co., Inc. (1934)
Succeeded by American News N. Y. Corp.
American News New York Corp. (1937)
Merged into American News Co., Dec. 1937
American Oak Leather Co. (1929)
Little public interest
American Oil Co. (1929)
Merged into Gold Dust Corp.
American Paulia System, Inc. (1931)
Little public interest
American Plate Glass Corp. (1934)
Properties sold
American Powder Co. (1929)
Acquired by American Cyanamid Co.
American Printing Co. (1936)
Liquidating
American Radio & Television Stores Corp. (1932). No recent information

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Figure 3: Image of page from the 1938 Moody's Industrial Manual with the list of firms dropped from coverage over 1928-1937.

Data Appendix Table 1
Industry Classification Validation

Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The dependent variable is firm finanical leverage (debt scaled by assets). All variables are measured as of 1928. Firm age is measured as 1928 minus the year of establishment. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
ln(Total Assets)		0.018 ***	0.017 ***	0.017 ***	0.016 ***
		(0.002)	(0.003)	(0.003)	(0.003)
Private		0.043 ***	0.028 ***	0.044 ***	0.031 ***
		(0.005)	(0.006)	(0.006)	(0.006)
Cash/Assets		-0.317 ***	-0.298 ***	-0.309 ***	-0.292 ***
		(0.023)	(0.024)	(0.023)	(0.024)
ln(1+Number of Directors)		-0.009	-0.018 **	-0.006	-0.015 *
		(0.009)	(0.009)	(0.009)	(0.009)
ln(Firm Age)		-0.036 ***	-0.036 ***	-0.033 ***	-0.034 ***
		(0.003)	(0.003)	(0.003)	(0.003)
State Fixed Effects				Yes	Yes
Industry Fixed Effects	Yes		Yes		Yes
R-squared	0.083	0.129	0.189	0.154	0.213
Adjusted R-squared	0.074	0.127	0.180	0.137	0.188
N	2774	2924	2687	2909	2672

Online Appendix
for
"Friends during Hard Times: Evidence from the Great Depression"

In this Appendix, we report the results of additional tests to support the analysis in the main text. First, we provide additional robustness analysis of our main result that director network connections predict a significant reduction in the probability that a firm fails during the Great Depression. Next, we present additional analysis to support the instrumental variables approach that we discuss in Section 3.3 of the main text. Then, we provide more details on a number of tests that we briefly describe in the main text, including our analysis of the potential banker-director and equity infusion mechanisms from Section 4.

1. Baseline Analysis: Additional Robustness Checks

In this Section, we expand upon the robustness checks of our baseline tests that we briefly described at the end of Section 3.1 of the main text.

1.1. Control for Firm Performance

First, we tabulate the results of reestimating our baseline specification (Equation (1) in the main text) including 1928 net income scaled by assets as an additional control variable. Our main specification uses differential responses to a major unanticipated financial shock among connected and unconnected firms to identify the effect of connections on firm survival. Though this strategy directly addresses reverse causality concerns that would plague a simple regression of survival on network ties, it does not solve all potential endogeneity concerns. The biggest threat to identification is that connections correlate with an omitted variable that itself predicts more resilience to the financial shock. An obvious way to address the concern that connected firms could simply be better than unconnected firms is to control for ex ante profitability. We do not do so in our main regressions because we only observe usable income statement information for roughly 70% of our sample firms. However, as a robustness check, we include the ratio of net income to assets to control for ex ante differences in firm quality. While this ratio is not an ideal measure of return on assets (net income is net of interest payments to creditors), we also control directly for leverage, which should mitigate the concern. We do not use sales as the numerator because sales information is even less reliably reported in the 1928 Manual. We tabulate the results in Online Appendix Table 1. Despite the noise in the measure, we find that ex ante net income is a strong negative predictor of failure during the Depression. The coefficient estimate on the control is statistically significant at the 1% level in all specifications. Economically, a one standard deviation increase in scaled net income is associated with a 5.8 percentage point decline in the likelihood of firm failure (or a nearly 40% reduction in the likelihood of failure from the baseline rate). These estimates validate the quality of the control, despite the measurement challenges outlined in the text. Yet, including the control does not have a major effect on our estimates of the effect of director network connections on firm survival. The point estimates are generally slightly larger in magnitude (and statistical significance) than those we report in Table 3 of the main text. An exception is the estimated effect of director connections that fall in the top quartile of the distribution. After we control for ex ante performance, we estimate an effect of top-quartile connections that is roughly double the magnitude of the estimate in Table 3 and statistically significant at the 5% level. This difference in estimates is consistent with the discussion in the text that firms in the top quartile of the connections distribution appear to be disproportionately firms whose characteristics predict low failure rates (large, public, cash-rich and, here, profitable).

1.2. Control for Firm Age

Though our control for ex ante performance addresses the possibility of an omitted factor that correlates with network connections and predicts generally better performance, it is still possible that an omitted factor that correlates with connections, but only matters for performance precisely during bad economic times could threaten the causal interpretation of our estimates. One possible confounding factor is firm age. Older firms could be more likely to employ connected directors and also more likely to have the resources to weather a major financial shock, even if they perform similarly to other firms in normal markets. For example, they could have longer relationships with lending banks or other outside investors that make them less prone to face financing constraints during a crisis. To address this concern, we supplement the regressions in Table 3 with a control for the natural logarithm of firm age.[1] We find some evidence that older firms are indeed more likely to survive (the coefficient estimate on age is negative and marginally significant in the specifications that include industry and state fixed effects, but not significant when these fixed effects are not included). However, our estimate of the network effect is virtually unchanged. We present the results in Online Appendix Table 2. We also test the robustness of our result to a less parametric age control, including indicator variables for twenty bins of the firm age distribution, with similar results. Overall, the economic factors captured by firm age do not seem to explain the link between director connections and firm survival.

1.3. Control for Director Expertise

Another possibility that is not directly addressed by our baseline controls or, potentially, the control for ex ante firm performance is that directors on boards with more connections also

[1] We do not include firm age in our base set of controls again because missing data results in additional sample attrition with no material changes to the estimates of interest.

have other specific skills that matter precisely for navigating the firm through a crisis. For example, director financial expertise could be irrelevant to firm performance in normal times, but help the firm to access scarce finance precisely during a major negative financial shock. Though we do not observe background information on directors in the Moody's manual, we use the information on positions that directors hold in other Moody's firms to construct proxies for director skills. Specifically, we construct firm-level controls for the percentage of directors who (1) serve as executives in other firms or (2) serve as financial executives in other firms (i.e., Treasurer).[2] Since both proxies require a director to hold positions in other firms, they are by construction positively correlated with our measure of network connections. Nevertheless, neither of them have significant explanatory power for firm survival. Moreover, the effect of network connections on survival is similar if we include either proxy as an additional control in Equation (1). We present the results in Online Appendix Table 3. Though there could of course be other specific director skills that matter for survival and for which we do not directly control, it is easiest to generate concerns about financial skills given the totality of our results. Thus the fact that we find virtually no effect on our key estimates from including controls for such skills also mitigates the more general concern.

2. Instrumental Variable Analysis

Our IV strategy relies on exploiting differences in the local demand for directors' services across states (and industries). We begin by providing evidence to support this assumption; that is, we measure the segmentation of director markets within our 1928 sample. In Online Appendix Figure 1, we present a visual representation of the geographic distribution of the network. Each vertex represents an industrial firm from the 1928 manual. We use colors to distinguish firms that

[2] Treasurer appears to be the 1920s analog of the modern Chief Financial Officer.

are located in different Census divisions.[3] In our data, the divisions with the most sample firms (in descending order) are the Middle Atlantic (which includes New York and is indicated in purple), East North Central (which includes Chicago and is indicated in green), New England (which includes Boston and is indicated in pink), and the Pacific (which includes California and is indicated in yellow). From the picture, it is evident that there is geographic clustering of firms within the network. Firms in the Pacific cluster in the upper right, while firms in New England cluster in the upper left. Firms in East North Central cluster towards the bottom of the graph and, intuitively, firms in the Middle Atlantic cluster near the center. Moreover, we observe several small, disconnected networks around the perimeter of the main network and we omit roughly a quarter of the firms from the diagram because they do not have any network connections.[4] Thus, in addition to clear variation in degree centrality across firms, there appears to be substantial network segmentation that we can use as a source of identification.

Our identification relies on differences across industries within a state in average board sizes (or, alternatively, differences across states within an industry). It is tempting to conjecture that our instrument – which exploits differences in average board sizes across industries within a state (or across states within an industry) – is just a proxy for whether a state is urban or rural, or alternatively for the overall market activity in the state. This type of intuition is incorrect. For example, consider the distinction between urban and rural areas. Geographic segmentation of markets only predicts that there are constraints on the ability of directors to serve at multiple firms across large distances. However, a firm in an urban environment could still face constraints on the

[3] The nine Census divisions are Pacific, Mountain, West North Central, East North Central, New England, Middle Atlantic, South Atlantic, East South Central, and West South Central. See https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf for the detailed mapping of states to divisions.

[4] These features are not as prominent in more recent data. See, e.g., Fracassi (2017) for an analogous diagram of the 2005 network of firms. Some of the difference could reflect geographic clustering due to higher travel costs. Some of it could also reflect our inclusion of private firms.

availability of local experts if there are few other local firms in the industry or if local firms in the industry happen to have small boards. For example, a cotton mill in New York could operate in a *Low* industry, while a cotton mill in Georgia does not. Conversely a bank in Georgia might be in a *Low* industry, while a bank in New York is not. We observe variation in *Low* both across industries within a state and across states within an industry.

To demonstrate the nature of the variation we exploit more directly, we construct a heat map of the fraction of industries in each state in which *Low* takes the value 1. We present the map in Online Appendix Figure 2. Confirming the above discussion, there is a wide distribution of *Low* industries geographically. Most states have at least one *Low* industry. Some urban states with many industries also have relatively large numbers of *Low* industries (e.g., New York), while some rural states with few industries have relatively small numbers of *Low* industries (e.g., Kansas).[5] On the other hand, some urban states have relatively few *Low* industries (e.g., Maryland) while some rural states have relative many (e.g., Colorado).

As we noted in the main text, the relative magnitude of our IV estimates compared to the OLS estimates of the network effect could raise concerns about the validity of the instrument. There, we discuss why endogeneity could obscure the relation between network ties and firm failure in OLS specifications. Moreover, we note the large heterogeneity in the effect of networks that we observe in our sample so that a local average treatment effect that exceeds the population effect is not altogether surprising. However, another possibility is that the inflation in our estimates is a symptom of a weak instrument, despite the sizable first stage explanatory power. Here it is noteworthy that the instrument does not produce estimates that are economically or statistically

[5] We define "urban" and "rural" states using data from the 1930 U.S. Census. See the discussion in Section 4 and footnote 20 for a list of urban states.

significant if we consider the probability of being acquired as the dependent variable rather than the indicator for firm failure.

To explore these possibilities further, we experiment with a more flexible specification of the instrument. Instead of partitioning the sample into thirds using the fraction of the local director pool that works at within-industry firms, we partition the sample into sixths and define indicator variables for each partition. We then re-estimate the IV specification from Columns 4 and 5 of Table 5 using subsets of the indicator variables as instruments in place of *Low*. Specifically, we first include only the indicator for the bottom sextile, then progressively add the indicators for additional sextiles, in order, until we include indicators for all but the top sextile as instruments. When we include indicators for the bottom two sextiles, we find essentially the same result we report in Table 5 (unsurprisingly). As we continue to add additional instruments, the F statistic for the joint significance of the instruments declines. When we saturate the model with indicators for the bottom five sextiles, all five instruments are individually significant at the 5% level (the bottom two, which correspond to *Low*, each at the 1% level). However, the F statistic drops to 5.82. Thus, we have greater concern about weak instruments. Nevertheless, the second stage coefficient estimate on the indicator for high network connections declines in magnitude to -0.296 (p-value = 0.08). This analysis is consistent with the interpretation of the IV estimates in Table 5 as a local average treatment effect on a portion of the sample in which the effect of network connections on failure is larger. Using additional variation in network connections that is predicted by a less extreme part of the distribution of local market depth results in an estimated effect that is smaller in magnitude, despite producing a weaker set of instruments. Nevertheless, the size of the differences in estimates relative to our baseline OLS specifications suggests caution and the validity of the IV estimates ultimately rests on the validity of the exclusion criterion.

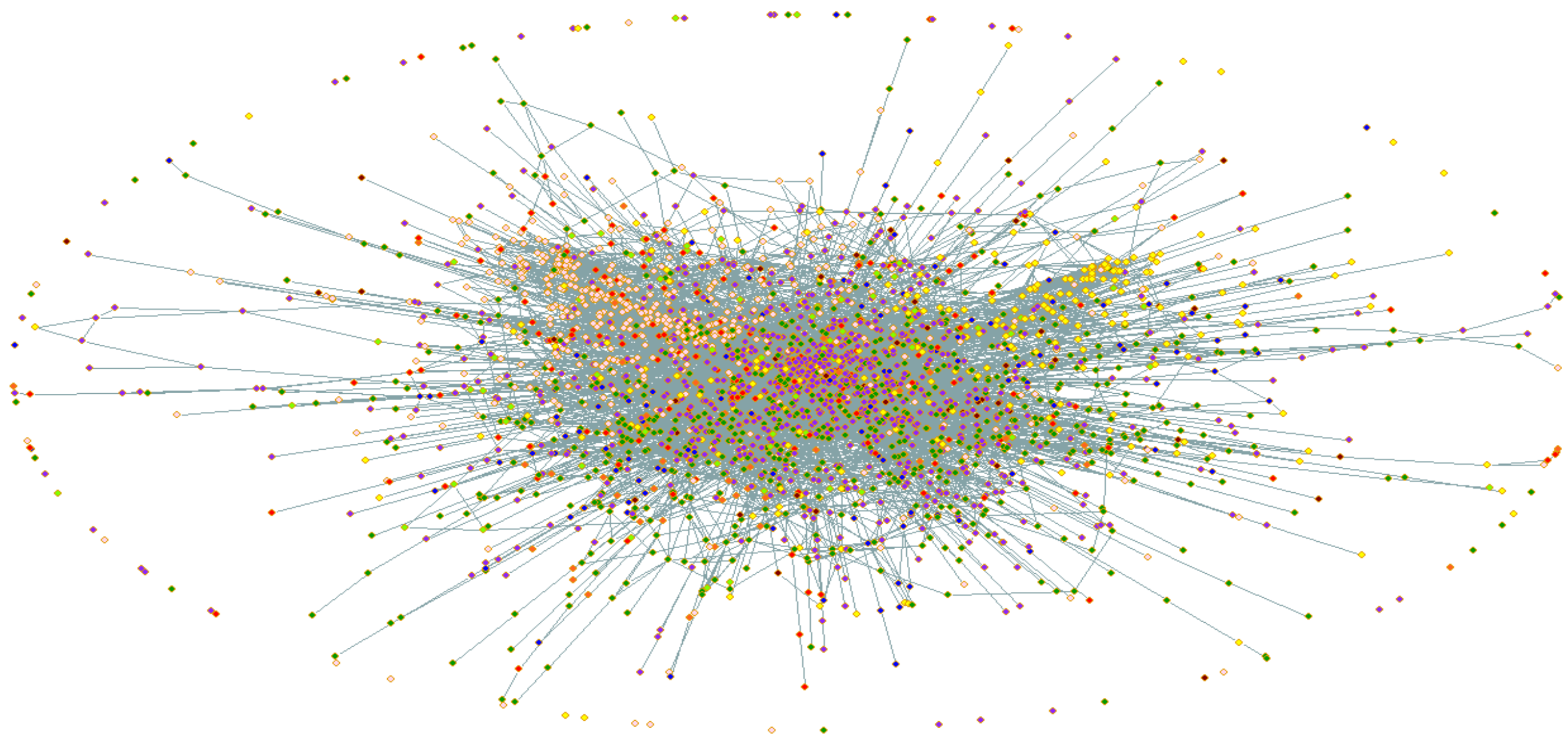
3. Additional Evidence on Economic Mechanisms

In Section 4 of the main text, we present additional tests to shed light on the economic channel(s) through which network connections facilitate firm survival during the Depression. In Section 4.3, we discuss our approach to test whether network connections particularly matter among financially constrained firms because connected directors are actually banker directors (or correlate with the presence of such directors). In particular, we recompute network connections restricting attention only to directors who also serve as executives of industrial firms. And, we drop firms from the sample that had outstanding bank debt or mortgages in 1928. In Online Appendix Table 4, we present the estimates of the cross-sectional specifications from Table 6 of the main text after imposing both of these restrictions on the data. In all cases, the estimates of the effect of network connections are very similar to those we report for the corresponding specifications in Table 6.

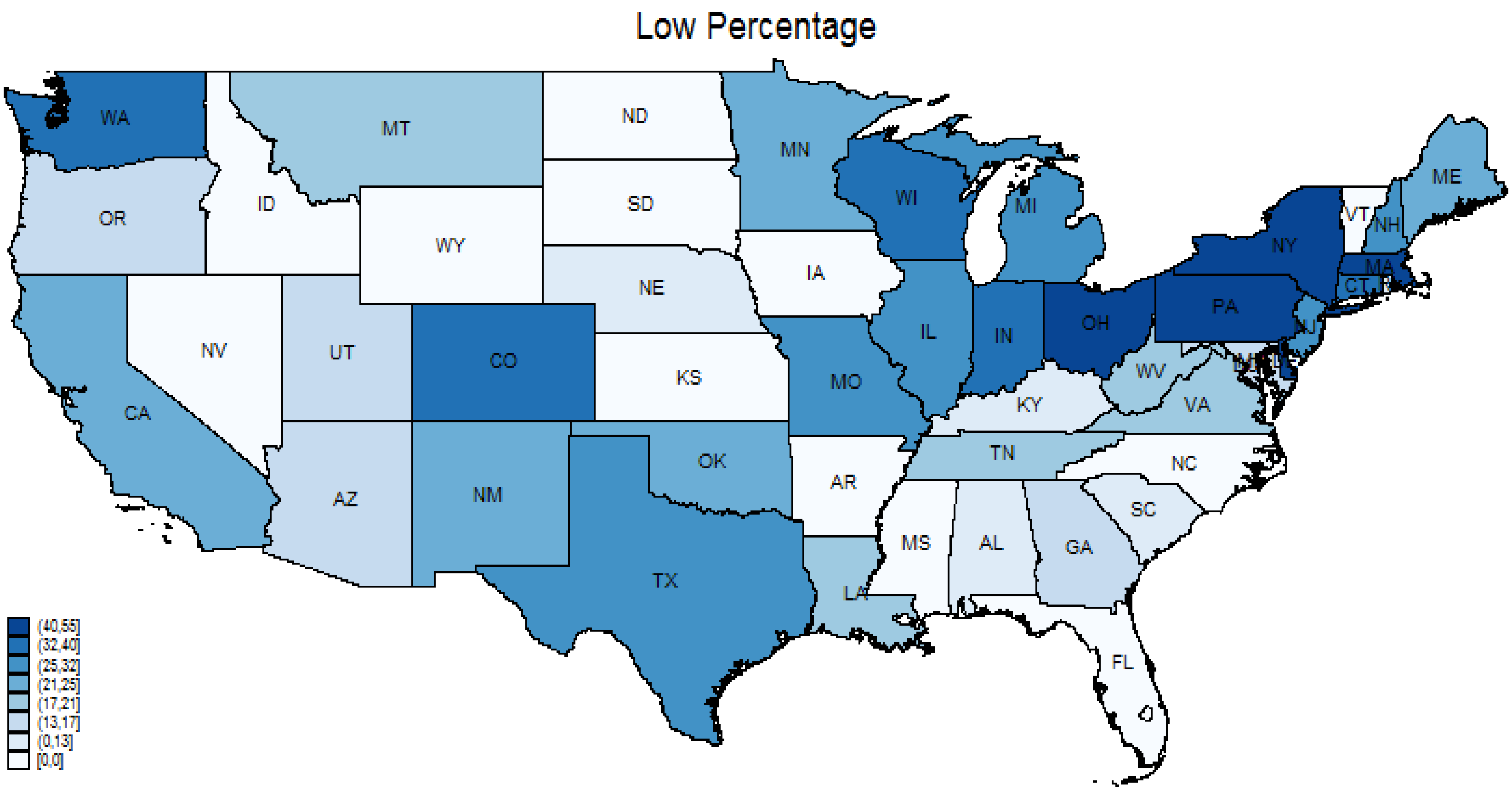
In Section 4, we also discuss direct equity infusions via acquisition as a potential channel through which network connections could facilitate the flow of financing to constrained firms. We show in Table 11 that network connections are indeed associated with a higher likelihood of being an acquisition target during the Depression years. We also discuss additional analysis in which we replicate the cross-sectional analysis from Table 6 in the context of acquisitions. Specifically, we test whether this acquisition effect is also more pronounced among small, private, rural, and/or cash poor firms (like the effect of networks on firm survival). We present the results of this analysis in Online Appendix Table 5. We do not find any evidence of cross-sectional differences except when we compare private to public firms. We do observe that private firms in which directors have more connections than in the median firm have a significantly higher probability of being acquired. Interestingly, we also do not observe that any of the proxies (with the exception of firm size in one specification) have significant level effects on the probability of being acquired. So, perhaps puzzlingly, firms most likely to be financially constrained are not more likely to be acquired than peers nor do connections facilitate such firms' participation in the market for corporate control.

References

Fracassi, Cesare, 2017. Corporate finance policies and social networks. *Management Science* 63: 2420-2438.



Online Appendix Figure 1. The figure presents a graphical representation of the network of directors and executives in the sample of industrial companies from the 1928 Moody's Industrials manual. Subsidiaries and foreign companies are excluded from the network. The diagram does not include 746 firms that do not have any connections to other firms, though they are included in the analysis. The representation is an energy diagram created using the 2D Fruchterman-Reingold algorithm. Colors indicate the Census division in which the firm is located. For firms with multiple offices, we classify the firm in the region in which it has the most offices. Colors map to regions as follows: Pacific - Yellow, Mountain - Lime Green, West North Central - Blue, East North Central - Forest Green, New England - Pink, Middle Atlantic - Purple, South Atlantic - Red, East South Central - Orange, West South Central - Brown.



Online Appendix Figure 2. The figure reports the percentage of industries operating in each state for which the instrument Low is equal to one. Low is an indicator variable equal to one if the number of directors in a firm's industry-state pair as a fraction of the number of directors in the state is less than the sample 33rd percentile. Darker shades indicate a higher fraction of Low industries in the state.

Online Appendix Table 1
Network Connections and Firm Failure: Controlling for Net Income

Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The dependent variable is Disappeared by 1937, an indicator variable that takes the value one if the firm does not survive to 1937. Total Connections is the sum of connections to other firms in the sample via shared directors or managers. Total Connections > Median is an indicator variable equal to one for firms that have a value of Total Connections greater than the sample median. Total Connections Quartile 2 (3/4) is an indicator variable equal to one for firms that have a value of Total Connections greater than the sample 2nd (3rd/4th) quartile. Private is an indicator variable equal to one for firms without publicly traded equity. Total Assets, Debt/Assets, Net Income/Assets and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
ln(Total Assets)	-0.053 ***	-0.054 ***	-0.054 ***	-0.053 ***	-0.054 ***	-0.054 ***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Private	0.045 ***	0.045 ***	0.043 ***	0.052 ***	0.053 ***	0.051 ***
	(0.016)	(0.017)	(0.016)	(0.018)	(0.018)	(0.018)
Debt/Assets	0.081	0.077	0.080	0.097	0.093	0.097
	(0.059)	(0.059)	(0.059)	(0.065)	(0.065)	(0.065)
Cash/Assets	0.091	0.092	0.088	0.140	0.140	0.135
	(0.090)	(0.090)	(0.090)	(0.099)	(0.099)	(0.099)
ln(1+Number of Directors)	-0.017	-0.021	-0.018	-0.026	-0.033	-0.028
	(0.026)	(0.025)	(0.026)	(0.027)	(0.027)	(0.027)
Net Income/Assets	-0.765 ***	-0.769 ***	-0.768 ***	-0.720 ***	-0.724 ***	-0.722 ***
	(0.122)	(0.123)	(0.123)	(0.134)	(0.134)	(0.134)
ln(1+Total Connections)	-0.019 ***			-0.018 **		
	(0.007)			(0.008)		
Total Connections > Median		-0.041 ***			-0.031 *	
		(0.016)			(0.017)	
Total Connections Quartile 2			-0.033			-0.046 *
			(0.023)			(0.024)
Total Connections Quartile 3			-0.061 ***			-0.055 **
			(0.022)			(0.023)
Total Connections Quartile 4			-0.051 **			-0.051 **
			(0.022)			(0.024)
Industry Fixed Effects				Yes	Yes	Yes
State Fixed Effects				Yes	Yes	Yes
R-squared	0.093	0.093	0.093	0.089	0.089	0.090
N	2144	2144	2144	1981	1981	1981

Online Appendix Table 2
Network Connections and Firm Failure: Controlling for Firm Age

Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The dependent variable is Disappeared by 1937, an indicator variable that takes the value one if the firm does not survive to 1937. Total Connections is the sum of connections to other firms in the sample via shared directors or managers. Total Connections > Median is an indicator variable equal to one for firms that have a value of Total Connections greater than the sample median. Total Connections Quartile 2 (3/4) is an indicator variable equal to one for firms that have a value of Total Connections greater than the sample 2nd (3rd/4th) quartile. Private is an indicator variable equal to one for firms without publicly traded equity. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Firm age is measured as 1928 minus the year of establishment. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
ln(Total Assets)	-0.060 ***	-0.060 ***	-0.062 ***	-0.058 ***	-0.059 ***	-0.060 ***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Private	0.075 ***	0.075 ***	0.073 ***	0.078 ***	0.078 ***	0.077 ***
	(0.015)	(0.015)	(0.015)	(0.017)	(0.017)	(0.017)
Debt/Assets	0.049	0.048	0.048	0.066	0.066	0.064
	(0.054)	(0.054)	(0.054)	(0.058)	(0.058)	(0.058)
Cash/Assets	-0.311 ***	-0.311 ***	-0.317 ***	-0.273 ***	-0.273 ***	-0.279 ***
	(0.072)	(0.072)	(0.072)	(0.078)	(0.078)	(0.078)
ln(1+Number of Directors)	-0.052 **	-0.051 **	-0.055 **	-0.057 **	-0.058 **	-0.061 **
	(0.025)	(0.024)	(0.025)	(0.026)	(0.026)	(0.026)
ln(Firm Age)	-0.009	-0.009	-0.011	-0.015 *	-0.015 *	-0.016 *
	(0.008)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
ln(1+Total Connections)	-0.011			-0.013 *		
	(0.007)			(0.008)		
Total Connections > Median		-0.031 **			-0.033 **	
		(0.015)			(0.016)	
Total Connections Quartile 2			-0.028			-0.033
			(0.021)			(0.022)
Total Connections Quartile 3			-0.065 ***			-0.067 ***
			(0.020)			(0.022)
Total Connections Quartile 4			-0.017			-0.023
			(0.021)			(0.023)
Industry Fixed Effects				Yes	Yes	Yes
State Fixed Effects				Yes	Yes	Yes
R-squared	0.089	0.089	0.091	0.099	0.099	0.101
N	2924	2924	2924	2671	2671	2671

Online Appendix Table 3
Network Connections and Firm Failure: Controlling for Board Characteristics

Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The dependent variable is Disappeared by 1937, an indicator variable that takes the value one if the firm no longer exists in 1937. Total Connections > Median is an indicator variable equal to one for firms that have a value of Total Connections greater than the sample median, where Total Connections is the sum of connections to other firms in the sample via shared directors or managers. Private is an indicator variable equal to one for firms without publicly traded equity. % Outside Executives (Outside Treasurers) is the percentage of directors on the firm's board who serve in other industrial companies as executives (Treasurers). Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
ln(Total Assets)	-0.063 ***	-0.062 ***	-0.059 ***	-0.059 ***
	(0.006)	(0.006)	(0.006)	(0.006)
Private	0.07 ***	0.07 ***	0.068 ***	0.067 ***
	(0.015)	(0.015)	(0.016)	(0.016)
Debt/Assets	0.064	0.063	0.046	0.049
	(0.052)	(0.052)	(0.053)	(0.053)
Cash/Assets	-0.307 ***	-0.306 ***	-0.290 ***	-0.288 ***
	(0.071)	(0.071)	(0.075)	(0.075)
ln(1+Number of Directors)	-0.039	-0.039	-0.061 **	-0.056 **
	(0.025)	(0.024)	(0.025)	(0.026)
% Outside Executives	0.022	-0.005		
	(0.030)	(0.033)		
% Outside Treasurers			0.064	0.046
			(0.069)	(0.074)
Total Connections > Median	-0.040 **	-0.040 **	-0.031 *	-0.036 **
	(0.017)	(0.016)	(0.017)	(0.016)
Industry Fixed Effects		Yes		Yes
State Fixed Effects		Yes		Yes
R-squared	0.088	0.088	0.087	0.087
N	2992	2992	2744	2744

Online Appendix Table 4
Network Connections and Firm Failure by Firm Characteristics: Only Executives and No Bank Loans or Mortgages

Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The sample also excludes all firms with outstanding bank loans or mortgages in 1928. The dependent variable is Disappeared by 1937, an indicator variable that takes the value one if the firm no longer exists in 1937. Total Executive Connections > Median is an indicator variable equal to one for firms that have a value of Total Executive Connections greater than the sample median, where Total Executive Connections is the sum of connections to other firms in the sample via shared directors or managers. To form a connection a director must appear in a management position in a firm in the 1928 Moody's Industrials manual; shared directors who do not hold a managerial position in an industrial company do not count as connections. Private is an indicator variable equal to one for firms without publicly traded equity. Rural is an indicator variable equal to one for firms that have offices only in states in which the rural population is larger than the 25th percentile. Low Cash (Small Firm) is an indicator variable equal to one for firms that have Cash/Assets (Total Assets) less than the sample median. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(Total Assets)	-0.065 ***	-0.064 ***	-0.062 ***	-0.046 ***	-0.066 ***	-0.065 ***	-0.064 ***	-0.048 ***
	(0.007)	(0.007)	(0.007)	(0.009)	(0.007)	(0.008)	(0.007)	(0.010)
Private	0.110 ***	0.069 ***	0.064 ***	0.068 ***	0.111 ***	0.074 ***	0.070 ***	0.072 ***
	(0.021)	(0.016)	(0.016)	(0.016)	(0.022)	(0.018)	(0.017)	(0.018)
Debt/Assets	-0.027	-0.034	-0.028	-0.017	-0.009	-0.011	-0.009	0.001
	(0.055)	(0.056)	(0.056)	(0.055)	(0.060)	(0.061)	(0.060)	(0.060)
Cash/Assets	-0.336 ***	-0.357 ***	-0.164 *	-0.337 ***	-0.313 ***	-0.322 ***	-0.157 *	-0.314 ***
	(0.073)	(0.074)	(0.088)	(0.073)	(0.079)	(0.080)	(0.095)	(0.079)
ln(1+Number of Directors)	-0.050 **	-0.055 **	-0.049 **	-0.048 *	-0.044	-0.048 *	-0.044	-0.043
	(0.025)	(0.025)	(0.025)	(0.025)	(0.027)	(0.027)	(0.027)	(0.027)
Total Executive Connections > Median	0.046 **	0.021	0.023	0.029 *	0.034 *	0.015	0.019	0.027
	(0.019)	(0.018)	(0.019)	(0.017)	(0.021)	(0.019)	(0.021)	(0.019)
Total Executive Connections > Median * Private	-0.094 ***				-0.085 ***			
	(0.028)				(0.031)			
Total Executive Connections > Median * Rural		-0.123 ***				-0.109 ***		
		(0.035)				(0.039)		
Rural		0.019				0.010		
		(0.025)				(0.048)		
Total Executive Connections > Median * Low Cash			-0.066 **				-0.068 **	
			(0.029)				(0.031)	
Low Cash			0.086 ***				0.082 ***	
			(0.024)				(0.026)	
Total Executive Connections > Median * Small Firm				-0.075 **				-0.084 **
				(0.030)				(0.033)
Small Firm				0.091 ***				0.093 ***
				(0.025)				(0.027)
Industry Fixed Effects					Yes	Yes	Yes	Yes
State Fixed Effects					Yes	Yes	Yes	Yes
R-squared	0.085	0.085	0.086	0.085	0.099	0.097	0.100	0.100
N	2578	2522	2578	2578	2345	2303	2345	2345

Online Appendix Table 5
Network Connections and the Likelihood of Being Acquired by Firm Type

Coefficient estimates are from ordinary least squares regressions on the sample of firms from the 1928 Moody's Industrials manual, excluding foreign firms and subsidiaries. The dependent variable is Acquired by 1937, an indicator variable that takes the value one if the firm is acquired by 1937. Total Connections > Median is an indicator variable equal to one for firms that have a value of Total Connections greater than the sample median, where Total Connections is the sum of connections to other firms in the sample via shared directors or managers. Private is an indicator variable equal to one for firms without publicly traded equity. Rural is an indicator variable equal to one for firms that have offices only in states in which the rural population is larger than the 25th percentile. Low Cash (Small Firm) is an indicator variable equal to one for firms that have Cash/Assets (Total Assets) less than the sample median. Total Assets, Debt/Assets, and Cash/Assets are winsorized at the 1% level. Standard errors that are robust to heteroskedasticity are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(Total Assets)	-0.015 ***	-0.016 ***	-0.016 ***	-0.004	-0.018 ***	-0.017 ***	-0.019 ***	-0.006
	(0.005)	(0.005)	(0.005)	(0.008)	(0.006)	(0.006)	(0.006)	(0.008)
Private	-0.017	0.001	0.003	0.001	-0.026	0.001	0.002	0.000
	(0.017)	(0.013)	(0.013)	(0.013)	(0.019)	(0.015)	(0.014)	(0.014)
Debt/Assets	0.038	0.034	0.037	0.037	0.027	0.017	0.024	0.024
	(0.039)	(0.040)	(0.039)	(0.039)	(0.043)	(0.043)	(0.043)	(0.043)
Cash/Assets	-0.041	-0.035	-0.103	-0.046	-0.025	-0.027	-0.115	-0.033
	(0.057)	(0.059)	(0.075)	(0.057)	(0.061)	(0.062)	(0.082)	(0.061)
ln(1+Number of Directors)	-0.029	-0.031	-0.030	-0.028	-0.031	-0.035	-0.033	-0.030
	(0.019)	(0.020)	(0.019)	(0.019)	(0.021)	(0.022)	(0.021)	(0.021)
Total Connections > Median	0.002	0.026 *	0.021	0.022	-0.004	0.029 *	0.024	0.015
	(0.018)	(0.014)	(0.017)	(0.016)	(0.020)	(0.016)	(0.019)	(0.017)
Total Connections > Median * Private	0.040 *				0.058 **			
	(0.024)				(0.026)			
Total Connections > Median * Rural		0.004				0.015		
		(0.031)				(0.033)		
Rural		0.009				-0.011		
		(0.019)				(0.035)		
Total Connections > Median * Low Cash			0.007				0.009	
			(0.023)				(0.024)	
Low Cash			-0.022				-0.032	
			(0.019)				(0.020)	
Total Connections > Median * Small Firm				0.005				0.030
				(0.024)				(0.026)
Small Firm				0.035 *				0.029
				(0.020)				(0.021)
Industry Fixed Effects					Yes	Yes	Yes	Yes
State Fixed Effects					Yes	Yes	Yes	Yes
R-squared	0.005	0.004	0.005	0.005	0.019	0.018	0.019	0.019
N	2992	2928	2992	2992	2729	2681	2729	2729