Friends during Hard Times: Evidence from the Great Depression*

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Abstract

We test whether network connections to other firms through executives and directors increase value by exploiting differences in survival rates in response to a common negative shock. We find that firms that had more connections on the eve of the 1929 financial market crash have higher 10-year survival rates during the Great Depression. Consistent with a financing channel, we find that the results are particularly strong for small firms, private firms and firms with small cash holdings relative to the sample median prior to the shock. Moreover, connections to cash-rich firms are stronger predictors of survival, overall and among financially constrained firms. Because of the greater segmentation of markets in the 1920s and 1930s than in modern data samples, we can mitigate the potential endogeneity of network connections at the time of the shock by exploiting variation in the local demand for directors' services. We also find evidence that the information that flows through network links increases the odds that a firm will be acquired.

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1. Introduction

How do the network connections of a firm's executives and directors to other firms affect firm value? Using a novel sample of network connections between more than 3,000 firms in 1928, we find that network ties significantly increase the odds of firm survival during the Great Depression. The effects are particularly pronounced among firms that are likely to be information sensitive or cash constrained – private firms, cash-poor firms, small firms, and firms located in rural areas. Moreover, connections to cash-rich firms have a stronger effect on the likelihood of survival than connections to cash-poor firms, suggesting that firms use network conduits to ease financing constraints during the crisis.

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, forthcoming). 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.

To test our hypothesis, 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. The Great Depression provides a good laboratory in which to test our hypothesis because – unlike other economic shocks such as the financial crisis of 2008 – it was accompanied by a high failure rate of industrial firms. Thus, it is credible to assume that the shock to financial markets affected the policy choices of the typical firm. We use ten-year survival from 1928 to 1937 as our main outcome variable. We also separately consider the likelihood that the firm is acquired by another firm during the ten-year window.

To measure network centrality, we count the total number of first-degree connections to other firms that a firm has by virtue of managerial positions or directorships that its own managers and directors hold in other firms. We make this computation for each firm in the 1928 Moody's Industrial Manual, excluding foreign firms and subsidiaries. We then regress an indicator variable for firm survival on our measure of network centrality, controlling for firm and board size, cash holdings, financial leverage, and an indicator for whether the firm has publicly-traded equity. We find that connections are associated with higher survival probabilities, whether we include a continuous measure of connections or indicator variables for different cutpoints of the distribution as explanatory variables. 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%. The results are robust to including fixed effects for industries and the states in which the firms operate.

A general challenge for studies that seek to identify the effect of network connections on value is the endogeneity of network connections. Our strategy of measuring differential responses to a common, unexpected macroeconomic 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. Then, to the extent that highly connected and less connected firms are otherwise similar, 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. This strategy is similar, for example, to the approach in Opler and Titman (1994) to measure the effect of financial distress on firm performance, which has been widely adapted by subsequent empirical literature. A key remaining concern, however, is the degree to which connections correlate with other differences across firms. One approach to address this concern is to saturate the model with a variety of controls and fixed effects. We take this approach to the extent it is possible, notably by including state and industry fixed effects. However, the relative lack of standardized accounting data for Depression-era firms imposes some limitations on our analysis. As an alternative, we construct an instrument for connections. To do so, we assume that there is state-level segmentation in the market for directors. This assumption seems reasonable given the relatively low rates of migration by U.S. workers across states, even in post-2000 data.[1] For each firm, we instrument for the number of connections to other firms using a measure of the size of the director pool within the firm's industry and state, controlling for the number of firms in the industry and state along with industry and state fixed effects. Thus, the identifying variation

[1] For example, Tate and Yang (2015) report that fewer than 2% of workers move across state lines in a broad sample of workers drawn from the U.S. Census Bureau's firm-worker matched panel data.

comes from differences in the average sizes of boards across firms in the same industry (state), but located in (operating in) different states (industries), controlling for cross-state (cross-industry) differences in average board size. Using the instrument for identification, we continue to find that network connections predict a lower likelihood of firm failure during the Depression.

Next, we test whether there is cross-sectional variation in the effect of network connections on firm survival. If network connections facilitate the flow of information between firms, then network connections should have a larger effect on the survival rates of firms with worse access to information absent those connections. Moreover, to the extent that information asymmetries impose barriers to accessing financial markets, the effect of network connections should be highest among firms that are likely to be financially constrained. Consistent with these predictions, we find that the effects of network connections on firm survival are concentrated among privately-held firms, small firms, cash-poor firms, and firms located in rural areas. For these firms, the magnitude of the effect of connections on survival probabilities is two to three times our baseline estimate.

Similarly, we test whether the characteristics of the firm to which a given firm is connected matter for the power of the connection to predict firm survival. We find that connections to firms that are cash-rich prior to the Great Depression have a stronger positive effect on the probability of survival than connections to cash poor firms. Connections to cash-poor firms do not significantly affect survival. On the other hand, having more connections to cash-rich firms than the median firm in the sample reduces the likelihood of failure by 4.6 to 4.8 percentage points. Since cash-rich firms generally have higher survival rates, one mechanism through which the effect could arise is that these connections are less likely to be severed during the Depression. This potential mechanism does not appear to be strong in our sample.[2] If cash-rich firms are strong performers or are adept at navigating financial markets, then another possibility is that they may have more valuable information to pass to connected firms than cash-poor peers, particularly in the context of a major financial crisis and economic depression. Alternatively, cash-rich firms may be in a stronger position to extend trade credit or other financial assistance to connected firms than cash-poor firms. We find that connections to cash-rich firms are particularly important for cash-poor, private, and small firms. However, they are not more important than connections to cash-poor firms among firms located in rural areas. Taken together, this evidence suggests that such connections help to alleviate the financial constraints of connected firms. A prominent pattern in corporate financing during the 1920s is the relative decline of bank lending as a source of finance (see, e.g., Currie, 1931), raising speculation as to the degree that cash-rich firms might have partially displaced banks in providing working capital to the system (Reifer, Friday, Lichtenstein, and Riddle, 1937). Our results suggest this is indeed the case and identify network connections as conduits that facilitate the flow of financing between firms.

As a final step, we measure the effect of connections on the probability that a firm is acquired during the 1928 to 1937 window. In frozen financial markets, firms with a strong financial position can take advantage of the availability of assets in failing firms at attractive prices. Firms with more connections are more likely to be targets in such transactions if those network conduits alleviate information asymmetries between the firm and potential acquirers. We find evidence consistent with this hypothesis: more connected firms are indeed more likely to become takeover targets. Our inferences in this context are more tentative, however, as our

[2] We observe that 18.7% of connected high-cash firms fail in our sample compared to 19.7% of connected low-cash firms. Note the fact that neither rate exceeds the sample average failure rate (20%) is itself consistent with the benefits of connections.

instrument is not sufficiently powerful to identify the effect of connections. Perhaps surprisingly, we do not find that the correlations are stronger among cash-poor, small, or rural firms, for which the information asymmetries are likely to be stronger (though they are stronger among private firms). Overall, increasing the likelihood of an acquisition appears to be another channel through which network connections can aid firms during a period of general distress.

Our results contribute to the literature in corporate finance that measures the relation between network connections among officers and directors of firms and corporate outcomes in those firms. A number of papers provide evidence that network ties between CEOs and their firms' directors weaken corporate governance (Fracassi and Tate, 2012; Hwang and Kim, 2009; Nguyen, 2012; Schmidt, 2015). More closely related to our analysis, a second strand of literature focuses on the effect of network links between executive and directors across firms. Fracassi (forthcoming) and Shue (2013) find evidence that firms that have directors that share network links have more commonality in investment and M&A policies. Engelberg, Gao, and Parsons (2012) find a positive relation between a CEO's network connectedness and compensation. Links between firms and financial institutions also affect access to capital and its price (Guner, Malmendier, and Tate, 2008; Engelberg, Gao, and Parsons, 2013). Existing work makes different inferences for the effect of connections on firm value, consistent with the existence of both a positive channel (e.g., reduced information frictions) and a negative channel (e.g., herding). We contribute to this second strand of literature by showing that network links have a clear positive effect on firm value in times of negative shocks, significantly increasing survival probabilities.

We also contribute to the literature on the corporate effects of financial shocks. A number of papers demonstrate real effects of financial shocks on corporate policies. Campello, Graham, and Harvey (2010) provide survey evidence that firms that report financial constraints also plan to postpone or cancel investments in response to the global financial crisis of 2008. Almeida, Campello, Laranjeira, and Weisbenner (2012) and Duchin, Ozbas, and Sensoy (2010) find that financially constrained firms at the time of the crisis indeed cut investment, among other policy changes, using field data. 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. Focusing on the Great Depression, Benmelech, Frydman, and Papanikolaou (2016) find that firms likely to face financing constraints due to the inability to roll over debt cut employment more than peer firms. Our interest, instead, is on the role of network connections through the board of directors as a mitigating factor for the negative real effects of financial crisis. In this sense, we also contribute to the extensive literature on optimal board composition.[3] Huang, Jiang, and Lie (2012) correlate a variety of network measures with changes in corporate policies around the 2008 crisis. They do not find a relation between the type of interfirm connections we measure on firm bankruptcy or failure rates. A possible explanation is the relative severity of the financing shocks in 2008 and 1929. For example, Almeida, Campello, Larnajeira, and Weisbenner (2012) find that firms had the ability to absorb much of the shock to financing following the 2008 crisis with their cash holdings; however, there was a higher rate of firm failure during the Great Depression. Moreover, the relative lack of mobility and modern forms of communication in the 1920s and 1930s allow us to use geographic variation as a credible source of identification in our sample in ways that might not be appropriate in modern data.

2. Data

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

[3] See, e.g., Adams, Hermalin, and Weisbach (2010) for a recent survey of the extensive literature on board composition.

between directors and executives of industrial firms. We collect information on the executives and directors of all firms in the manual, excluding foreign firms and subsidiaries. Here we outline the basics of the data collection and variable construction. For a more detailed description of how we collect the data, see the 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.

We also collect a variety of financial information for each company from the 1928 manual and supplement it with the same information from the 1938 manual. The manuals contain 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 top line of firms' income statements and refer to it as "sales."[4] 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. 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

[4] Though we report summary statistics of sales in Tables 1 and 2, we generally do not use the sales variable in our analysis. First, sales data are only available for roughly 60% of the firms for which we observe total assets, severely reducing our power. Second, our measure of sales is very noisy. Not all firms directly report sales information in the Moody's manual. Sometimes firms report revenues, profits, or even net earnings. In our data collection, we group all of these variants of reported top-line earnings together as sales. But, they clearly measure different quantities and, therefore, are not appropriate to use in cross-sectional analysis.

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.[5]

We use information from the 1938 manual to construct our key 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.[6] 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.

We use two main measures of network connections in our analysis. First, for each firm in the sample, we compute the total number of connections through its executives and directors to other firms in the sample (*Total Connections*). Second, we consider separately the subsets of connections to cash-rich firms (*Connections to High Cash Firms*) and connections to cash-poor firms (*Connections to Low Cash 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. Both measures are likely to have a mechanical positive correlation with board size. Thus, we compute board size and include it as a key control variable in all of our analysis.

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). Among small firms with total assets less than

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[5] 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.

[6] 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.

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 8.248 (7) directors on the board. Given that the mean of *Total Connections* is 7.522, a firm obtains on average a single connection to an external firm for each 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. 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 distinctly non-uniform distribution of firms geographically also allows us to test for differential effects of network 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. The main threat to identification is that network ties are correlated with an omitted factor that also predicts relative performance in response to the shock. Our first approach to address this concern is to saturate our regression model with fixed effects and controls. In Section 3.2, we also consider an instrument for network ties.

To begin, we estimate the following linear probability model:

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

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 $\boldsymbol{X}$ 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.[7]

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 effect of network ties on the likelihood of firm failure (*p*-value = 0.078). Economically, a one standard deviation increase in network ties decreases 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. 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.

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[7] 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.

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. The lack of significance in the fourth quartile could be due to difficulty in statistically distinguishing the network effect from a size effect at the very top of the distribution.

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 time-invariant 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. We find that controlling for these factors has little effect on our estimates of the effect of networks on firm survival and, if anything, strengthens their significance in some specifications.

3.2. Instrumental Variables Regressions

To further address the concern that network ties could be correlated with an omitted factor that also predicts firm survival in the wake of the 1929 financial shock, we construct an instrument for network ties. Our strategy exploits the fact that markets for directors are likely to be more segmented in 1928 than in the modern era. For example, the Great Depression pre-dates the advent of commercial air travel in the United States. Thus, it is reasonable to assume that much of the demand for directors' services will derive from local firms in our sample. Our estimates in Table 3 already identify the effect of networks using within-state variation. To exploit geographic segmentation of the market for directors, then, we also exploit the fact that firms are more likely to choose directors from firms within their own industries. Within each state pair, we compute the fraction of directors in each 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.[8] We expect firms for which *Low* equals one to have fewer network ties. Individual directors in these markets have a smaller outside demand for their services from local firms. Thus, each director is likely to have fewer total connections to other firms.

We include state and industry fixed effects in our regressions so that the identifying variation comes from differences across industries within states in the demand for directors (or vice versa). We also control in two ways for the number of firms in the state-industry pair to

[8] 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.

ensure that *Low* does not simply capture market size. First, we control for the natural logarithm of one plus the number of firms and, second, we define a binary control in a parallel manner to *Low* (i.e., as an indicator variable equal to one if the number of firms in the state-industry pair is in the bottom third of the distribution). We add the second control to ensure that *Low* is not capturing a nonlinearity in the effect of market size across locales on network ties. We also supplement our continuous control for board size with a similarly defined indicator for firms with board sizes in the lower third of the distribution. The firm's own board size could correlate with the local supply of directors and, as we see in Table 3, has a weak negative correlation with firm failure. However, the pairwise correlation between board size and *Low* is weakly positive in our sample, so that any tendency for *Low* to pick up the effect of board size would bias against our hypothesis. Finally, we add two additional controls for the overall number of directors in the state: a continuous control (in natural logs) and a binary indicator for firms located in states in the upper third of the distribution.[9] We can identify these controls despite the presence of state fixed effects because firms can operate in more than one state in our sample. The absolute number of local directors could again capture local economic activity. Though we add several controls relative to the baseline OLS estimations of Equation (1) in Table 3, none of those additional controls are necessary to obtain our results.

Our strategy is to isolate variation due to the mix of directors in the local market. Because we also control for the number of firms, we can think of the instrument as measuring differences across areas in which firms in a particular industry just happen to have larger or smaller boards. Or, alternatively, across industries in the same state in which firms just happen to have larger or smaller boards. Though our approach addresses the most obvious potential threats to the

[9] 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*.

excludability of the instrument, ultimately identification rests on the validity of the assumption that *Low* is excludable from Equation (1).

In Column 1 of Table 4, we report the results from the reduced form regression of the indicator for firm failure on the instrument *Low* and our set of controls. Generally, the control variables have coefficient estimates similar to those we report in Table 3. Notably, our added controls for local market size do not significantly predict the likelihood of firm failure. Nor does our added control for nonlinearity in the effect of firms' own board size. The lack of explanatory power among the direct controls for factors like market and board size suggests that they are unlikely to drive a spurious relation between the instrument and firm failure. However, 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 face less outside demand for their services are more likely to fail following the financial market shock of 1929, even controlling for the size of their local product markets.

In Column 2 of Table 4, 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-Yogo 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. This pattern might raise concerns about the validity of the instrument. However, in our setting, there are strong economic reasons to believe that endogeneity might obscure rather than magnify the effect of connections on firm survival. As in the context of board independence (Hermalin and Weisbach, 2003), weak firms might have a particularly strong incentive to choose connected directors, if those connections bring value to the firm. Then, the higher likelihood of failure among weak firms could obscure the positive effect of connections on value. Consistent with this conjecture, we observe a negative correlation between firm sales and network connections in our sample. Nevertheless, we focus on the more conservative estimates in the remainder of our analysis.

4. The Value of Network Connections in the Cross Section

Having established that network links to other firms help firms to weather the shock to financial markets in 1929, we next turn to the cross section of firms. Network connections could aid survival by facilitating the flow of information between firms. Following a bad economic shock, better informed firms could reoptimize faster in response to new market fundamentals, leading to a more efficient allocation of scarce resources and hence a better chance of survival. If so, then network connections should have a stronger effect on survival among firms that are more isolated from information flow in the marketplace. Moreover, connections could be particularly valuable to firms facing binding financial constraints at the time of the shock. Firms could use their connections to receive direct financial assistance, for example via trade credit, firm-to-firm loans, or equity infusions.

We test whether network connections are more valuable to information-sensitive and financially-constrained firms. 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. Specifically, 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.[10] We also consider three measures of 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 5, 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

[10] 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.

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 in the regressions 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.

We find that there is substantial cross-sectional variation in the effect of network ties on firm value. Firms that are likely to be more vulnerable to a negative shock – isolated firms and financially constrained firms – receive a disproportionate benefit from having network ties to other firms through their executives and directors. One potential explanation is that network connections matter by facilitating the flow of information or financing between firms. 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 (forthcoming) 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 alternative 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 come from 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 the estimates in Table 5. In the Appendix, we present a table that imposes 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.

5. The Value of Connections to Cash-Rich Firms

Network connections have different value to different types of firms. Likewise, it is possible that network connections to different types of firms could have different value. Because network connections appear to be of the most value to firms that are likely to face binding financial constraints following the financial panic in 1929, we consider whether network links to firms that are themselves cash-rich have greater value in mitigating the negative consequences of the shock to the firm. Cash-rich firms may or may not have better information that they can impart to connected firms. A key difference with cash-poor firms, however, is their potential to help mitigate financing constraints. Such firms could provide direct finance to connected firms in an environment in which capital markets freeze up, for example, by taking minority stakes. They could also provide trade credit or help to facilitate financing from banks or other financiers with whom they have relationships. Our data ultimately do not allow us to observe these mechanisms directly. However, we can partition each sample firm's set of network connections into connections with firms that have cash holdings above and below the sample median. Then, we test whether the two types of connections have different effects on survival probabilities following the onset of the financial panic.

In Table 6, we report the results of estimating Equation (1) using separate variables capturing connections to cash-poor and cash-rich firms as the measure of network ties. In Column 1, connections to cash-rich firms are the independent variable of interest. We find that connections to cash-rich firms have a strong negative effect on the likelihood of firm failure that is statistically significant at the 1% level. Economically, the size of the effect is a little more than three times the size of the effect of total network ties that we estimate in Column 1 of Table 3. In Column 2, we report the results using connections to cash-poor firms as the measure of network ties. Though the effects of all other included independent variables are similar to the effects in Column 1, here we do not find any effect of connections on the likelihood of firm failure. In Column 3, we include both connections to cash-rich and cash-poor firms as independent variables. We again find a strong negative effect of connections to cash-rich firms on firm failure. And, even the small negative effect of cash-poor connections in Column 2 appears to be due to the positive correlation of the measures of connections to cash-rich and cash-poor firms, since it completely disappears in Column 3. In Columns 4 to 6, we repeat the same three specifications, but including industry and state fixed effects. As in prior tables, these additional controls have no effect on our inferences.

To provide additional evidence of financial constraints as the mechanism, we tie the results in Table 6 back to our results in Table 5. Specifically, we ask whether the strong negative effect of connections to cash-rich firms is particularly prominent among firms we classify as financially constrained. We consider all three measures of financial constraints from Table 5: 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 6 (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 7, 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, by contrast, never have a significant effect on the likelihood of firm failure.

Overall, our results suggest that one way in which network connections contribute to firm value during bad times is by helping to ease financing constraints. It is important to note that they do not preclude access to higher quality or more timely information about market conditions or investment opportunities as another mechanism.

6. Network Connections and the Likelihood of Acquisition or Merger

Thus far, our analysis has centered on the relation between network ties and firm failure. Another possibility is that a firm survives through the Depression to 1938, but no longer operates as an independent entity. In Section 5, we consider the possibility that a cash-rich firm could take partial stakes in a financially constrained firm to which it is connected at the time of an extreme financial market shock. An acquisition is an extension of that logic in which the investment is for the full value of the company. Network ties could increase the likelihood of an acquisition – whether solicited by the target or not – if they facilitate the flow of information about the target's financial condition and future prospects to potential acquirers via the connected firm. In this Section, we test whether network connections affect the probability that a firm becomes a takeover target or merges with another firm during the Depression. 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 variation 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 in the model 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 8. In Column 1, the measure of network ties is the natural logarithm of one plus *TotalConnections*. We find that more network ties indeed increases the likelihood that a firm is acquired or merges with another firm following the shock to financial markets in 1929. The economic magnitude is similar to the effect of network connections on the likelihood of firm failure, though opposite in sign. 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 as the measure of network ties. We again find a positive and marginally significant effect of network ties on the likelihood of an M&A transaction. In Column 3, we include three separate indicator variables as network measures that allow us to separately identify the effect of different quartiles of the distribution of network connections. We find that the positive effect of network connections on the likelihood of combining with another firm comes mainly from a comparison of firms above and below the 25th percentile of the distribution of connections. The coefficient estimates on indicators variables for the 2nd, 3rd, and 4th quartiles of the distribution are all positive and significant – indicating a positive effect relative to the baseline group of firms that are in the bottom quartile – but are not significantly different from each other.

In Columns 4 to 6, we repeat the regressions from Columns 1 to 3, but including additional controls for state and industry effects. Again, the results are similar, though here it appears that state and industry controls yield estimates of the network effect that are modestly larger. We also reexamine the evidence within a two-stage least squares framework using the instrument *Low* from Section 3.2. 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 in Table 8. One possible interpretation 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.

As a final step, we perform additional cross-sectional analysis to assess the mechanism behind the correlations in Table 8. We consider the same cross-sectional characteristics as in Table 5. We use geographic isolation to proxy for diminished access to information, splitting the sample into firms located in areas with mostly rural versus mostly urban populations. We also consider three proxies for financial constraints at the time of the 1929 financial market shock (noting that at least the first of the three is also likely to capture information opaqueness). We split the sample into private (constrained) versus public firms, firms with low (constrained) versus high cash holdings, and small (constrained) versus large firms. For each measure, we estimate Equation (1) using an indicator variable for being acquired by 1938 as the dependent variable, an indicator variable for having more network connections to other firms than the sample median as the network measure, and the interaction of the network measure with the measure of information or financial frictions. The coefficient on the interacted term provides the estimate of economic interest. We also present sets of estimates excluding (Columns 1 to 4) and including (Columns 5 to 8) state and industry fixed effects.

We present the results in Table 9. 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 among private firms. The effect is particularly strong, economically and statistically, in Column 5 in which we include state and industry fixed effects. These results suggest that the mechanism is distinct from the one that drives the relation between network ties and firm survival. Here, the effect does not appear to go through the channel of easing financing constraints. Instead, the evidence is more consistent with network ties facilitating information flow about opaque firms to potential acquirers.

Overall, our evidence suggests that network ties to other firms through executives and directors can be beneficial to firms in a time of financial crisis through multiple channels. For firms that are financially constrained at the time of the crisis, network ties can provide a conduit to access finance. For firms that may be more opaque to potential acquirers, they can also facilitate the flow of information necessary to assess a potential takeover bid. In both cases, these links can increase value for the firm's claimholders.

7. Conclusion

We study whether network connections to other firms through executives and directors provide a source of value to the firm. In normal times, the value implications of network ties are likely to be ambiguous. They could create value by facilitating information flow. But, they could also destroy value by encouraging policy imitation or herding. Taking a cue from the corporate governance literature, we argue that good times provide firms the luxury to engage in value-destroying practices that provide private benefits. However, firms are likely to curtail these practices in hard times when resources are scarce. Thus, we examine outcomes around a major negative financial market shock – the market crash of 1929 and subsequent Depression – as a way to isolate the value-enhancing effects of network ties from the net effect. Because the shock is unexpected, it also provides a way to estimate the effects of network connections on outcomes absent concerns about reverse causality.

We find that firms with more network ties in 1928, on the eve of the shock, are more likely to survive through the Great Depression. The effect is particularly pronounced among financially constrained firms – small firms, private firms, and firms with low cash holdings. It is also more pronounced among firms located in rural areas. Consistent with a role in easing financing constraints, we find that connections to cash-rich firms are a stronger predictor of firm survival than connections to cash-poor firms, and particularly among financially constrained firms. We also find that firms with more connections are more likely to be acquired during the Depression, though only among private firms, consistent with network connections having a role in reducing information frictions.

Though our strategy of looking at differences in outcomes around an unexpected shock reduces some types of endogeneity concerns, it does not eliminate the possibility that network ties correlate with an omitted unobserved factor that itself predicts better outcomes following a financial shock. To address this concern, we construct an instrument for network ties exploiting the greater segmentation of director markets that existed during the 1920s compared to modern times. We find that all of our key results on firm survival go through using a proxy for the demand for directors' services in other local firms as a plausibly exogenous source of variation in network links.

Overall, our analysis suggests that network ties create value for firms. The mechanisms we uncover, such as the easing of financial constraints, are particularly relevant following negative macroeconomic shocks. Thus, 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. In this sense, our results suggest a partial counterargument to the conventional wisdom in the governance literature that "busy directors" are bad for firm value.

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Table 1
Summary Statistics

The sample consists of firms from the 1928 volume of the Moody's Industrial 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. 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	16029.60	4259	68923.683
Cash/Assets	2992	0.086	0.049	0.1
Debt/Assets	3024	0.106	0.001	0.145
Sales/Assets	1866	0.756	0.532	0.795
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	10.127
Connections to High Cash Firms	3024	3.465	1	5.392
Connections to Low Cash Firms	3024	2.953	1	4.193
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 Industrial 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. 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	Cash/Assets	Total Assets	Sales/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)						
Cash/Assets	0.0348	-0.0897	-0.0938	1				
	(0.06, 2992)	(0.00, 2992)	(0.00, 2928)					
Total Assets	0.1910	-0.1667	-0.0631	0.0266	1			
	(0.00, 3024)	(0.00, 3024)	(0.00, 2959)	(0.15, 2992)				
Sales/Assets	-0.1567	-0.006	-0.0039	0.1442	-0.0562	1		
	(0.00, 1866)	(0.80, 1866)	(0.87, 1821)	(0.00, 1855)	(0.02, 1866)			
Disappeared by 1937	-0.1307	0.2013	0.0179	-0.0923	-0.0831	0.0305	1	
	(0.00, 3024)	(0.00, 3024)	(0.33, 2959)	(0.00, 2992)	(0.00, 3024)	(0.19, 1866)		
Acquired by 1937	-0.0048	0.0308	0.0156	-0.0174	-0.032	0.0371	-0.1738	1
	(0.79, 3024)	(0.09, 3024)	(0.40, 2959)	(0.34, 2992)	(0.08, 3024)	(0.11, 1866)	(0.00, 3024)	

Table 3
Network Connections and Firm Survival

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. 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 Survival: 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 no longer exists in 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-industry pair. 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 5
Network Connections and Firm Survival 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 no longer exists in 1937. TotConn 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)
TotConn	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)
TotConn * Private	-0.079 ***				-0.079 ***			
	(0.027)				(0.029)			
TotConn * Rural		-0.091 ***				-0.068 *		
		(0.034)				(0.036)		
Rural		0.010				0.007		
		(0.024)				(0.047)		
TotConn * Low Cash			-0.064 **				-0.069 **	
			(0.027)				(0.029)	
Low Cash			0.087 ***				0.083 ***	
			(0.023)				(0.025)	
TotConn * 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 6
Network Connections to Cash Rich Firms and Firm Survival

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. CashRichConn (CashPoorConn) 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. Both CashRichConn and CashPoorConn are set to zero for cases in which share 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)
CashRichConn	-0.046 ***		-0.049 ***	-0.045 ***		-0.047 ***
	(0.015)		(0.016)	(0.016)		(0.017)
CashPoorConn		-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 7
Network Connections to Cash Rich Firms and Firm Survival 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 Disappeared by 1937, an indicator variable that takes the value one if the firm no longer exists in 1937. CashRichConn (CashPoorConn) 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. Both CashRichConn and CashPoorConn are set to zero for cases in which share 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. The Private (Public) subsample contains firms without (with) publicly traded equity. The Cash and Size subsamples are determined by splitting the sample at the sample median value of Cash/Assets and Total Assets, respectively. 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)
CashRichConn	-0.059 **	-0.035	-0.061 **	-0.029	-0.097 ***	0.002
	(0.026)	(0.024)	(0.027)	(0.022)	(0.030)	(0.019)
CashPoorConn	-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 8
Network Connections and the Likelihood of 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. 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

Table 9
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. TotConn 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)
TotConn	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)
TotConn * Private	0.040 *				0.058 **			
	(0.024)				(0.026)			
TotConn * Rural		0.004				0.015		
		(0.031)				(0.033)		
Rural		0.009				-0.011		
		(0.019)				(0.035)		
TotConn * Low Cash			0.007				0.009	
			(0.023)				(0.024)	
Low Cash			-0.022				-0.032	
			(0.019)				(0.020)	
TotConn * 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

Appendix

Network Connections and Firm Survival 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. TotConn_Exec 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. 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)
TotConn_Exec	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)
TotConn_Exec * Private	-0.094 ***				-0.085 ***			
	(0.028)				(0.031)			
TotConn_Exec * Rural		-0.123 ***				-0.109 ***		
		(0.035)				(0.039)		
Rural		0.019				0.010		
		(0.025)				(0.048)		
TotConn_Exec * Low Cash			-0.066 **				-0.068 **	
			(0.029)				(0.031)	
Low Cash			0.086 ***				0.082 ***	
			(0.024)				(0.026)	
TotConn_Exec * 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

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 2 we discuss other data that we automatically retrieve from the same manual, such as geographical location and industry information. In section 3 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. This covers important events including major M&A activity in which the firm has been involved.

(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 very 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 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 complement 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 industries presented in the Moody's "The Nation's Basic Industries" list, together with the strings that we use to associate firms 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.

3 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.

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
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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.
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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.

1

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

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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. (1936)
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.
Alemite 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. (1934)
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
Amazon 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 Benzol 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.