# The Network Centrality of Influential Bankers: a new Capital Structure Determinant

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**Abstract**

This paper studies the impact of the presence of bankers in the board of a corporation on its capital structure. We assume that the presence of bankers lowers information asymmetry problems, facilitating information transmission between corporations and financial institutions. Using a large database on Board of Directors, we construct the directors's social network and measure the relative influence (centrality) of bankers on the information transmission mechanism. Our results indicate that for a sample of US firms, the presence of bankers in the board increases the leverage ratio. This effect is magnified by the influence of the banker, i.e. the more connected a banker is, the higher the leverage ratio of the firm in which he or she sits.

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# 1 Introduction

In this paper we examine whether the presence of bankers in the board of a corporation affects or not the capital structure of the firm. Moreover, using social network analysis we measure the influential role (centrality) of the bankers on the network of directors and examine whether the banker's centrality impacts or not on the capital structure of a firm when seating on the board of directors.

Modigliani and Miller's (1958) famous proposition states that capital structure should be irrelevant under a set of assumptions in the sense that the value of a firm does not depend on the debt/equity ratio. As both theoretical research and empirical evidence increased showing that capital structure was a main determinant of firm value, the set of assumptions used by Modigliani and Miller emerged as empirically false. Relaxing the assumptions characterizing the MM frictionless economy would be the source of research in Corporate Finance.

In 1963, Modigliani and Miller added a simplified tax structure to their model, yielding a tax benefit from debt. This tax shield would imply that the firms maximize their value when choosing an all debt capital structure.

Bankruptcy costs [Baxter (1967), Stiglitz (1972), Kraus and Litzemberger (1973), Kim (1978)], agency costs [Jensen and Meckling (1976)], and information asymmetry [Ross (1973), Myers and Majluf (1984)], are added to the analysis as an offsetting cost of debt. The trade-off between tax advantages and costs of debt imply that an optimal capital structure may exist. Although Miller (1977) argues that, when adding personal taxes, optimal capital structure exists only at macro level, and not at firm-level, DeAngelo and Masulis (1980) show that corporate tax shield substitutes (such as depreciation, amortization and investment tax credits) imply "a unique interior optimum leverage decision with or without leverage related costs". Myers (1984) suggests that after setting a target leverage ratio, firms gradually adjust their capital structure.

Diamond (1984) shows that if banks act as "delegated monitors" when lending money to corporations, as suggested by Schumpeter (1939), informational asymmetries in the financial markets are reduced, minimizing the monitoring costs. Petersen and Rajan (1994) and Berger and Udell (1995) relate increases in availability of credit with bank-firm relationship. Moreover, banker-directors, i.e. bankers who seat simultaneous on the board of directors of a bank and of a non-financial firm, provide financial expertise to management [Mace (1971), Lorsh and MacIver (1989)]. The informational advantage of bankers-directors and the ability to discipline management, either by termination of compensation structure is a more effective monitoring mechanism then loan covenants [Williamson (1988), Kroszner and Strahan(2001)].

Therefore the presence of banker-directors may reduce the monitoring costs even further [Fama (1985)], possibly lowering the costs of funds [James (1987), Berger and Udell (1995)], specially in the cases where there is higher information asymmetry between insiders and the public financial markets [Fama (1985), Leland and Pyle (1997), Kracaw and Zenner (1998), Kroszner and Strahan (2001)]. Booth and Deli (1999), Kroszner and Strahan (2001) and Bird and Mizruchi (2005) demonstrate a positive correlation between firms' capital structure and the presence of unaffiliated banker-directors (if they sit on the board of Banks who are not the leading arranger of the loan contracted by the firm). Ciammara (2006) shows that, when taking into account the endogeneity[1] between the presence of a baker-director and the capital structure, the presence of an affiliated banker-director has a positive effect on the firm leverage.

However, creditors on the board have an informational advantage over outside creditors [Leland and Pyle (1997), Kracaw and Zenner (1998) and Krozner and Straham (2001)]. Using an international sample, Ferreira and Matos (2008) provide evidence that banks extract informational rents from the firms, by charging higher spreads[2]. Güner et al. (2008) also show that the presence of financial experts on the board affect corporate decisions, although not always in the best interest of shareholders. Stecher and Grønnevet (2009) propose a theoretical framework where the creditors' interests protection increases with information asymmetry, board

[1]Endogeneity occurs because firms simultaneous choose board composition and capital structure: firms may invite a banker to the board anticipating future financing needs, or a banker on the board may facilitate access to credit increasing the leverage ratio.

[2]Kracaw and Zenner (1998) show evidence of negative price reaction to annoucement of loan renewals involving a bank represented on the firm's board.

size and proportion of outside directors on the board, providing a more benevolent interpretation of the misconduct of bankers as proposed by Güner et al. (2009). Similarly, Andersen et al. (2004) find that the cost of debt is inversely related to board independence and board size. Raheja (2005) proposes a model where insiders of large boards release more information to outside directors in the periods prior to CEO sucession in order to increase the probability of being nominated CEO. In fact, board size plays a decisive role in our work: on one hand the number of connections of a director will depend on the board size; on the other hand, the probability of having a banker on the board increases with the board size.

In this work, we test the role of a banker-director on the information flow that is released to the (credit) market. In the case of a significant role, we also test how the influence of bankers contributes to the reduction of information asymmetry, reducing monitoring costs and, therefore, impacting on the capital structure of the firm. We propose to classify the influence of bankers by measuring their centrality in the social network of boards and directors: the more directors a banker is linked with, the more information is passed through him, helping to reduce information asymmetry, either by disseminating information or by having a certification role[3].

Recent studies show the influence of social networks on financial decisions. Fracassi (2008) show that the social network of the management team have an impact on corporate investment decisions, where connected firms make similar investments. Cohen et al. (2009) show that portfolio managers invest in firms they are connected through their network. In both cases, profitability is higher the more central the managers are on the network. Both studies argue that the network lower information-gathering costs [Nahapiet and Ghosal (1998)] screening and selecting the important pieces of information Burt (1997).

(no reference to small world so far. Cohen et al. have "small world " in the title but they never mentioned it again on the paper nor they justify the name with the model of Watts and Strogatz. Latora and Marchiori

[3]The presence of bankers on the board may also have a certification role (Fama (1985), Bhatacharya and Chiesa (1995), BhataKracaw and Zenner (1998)]. Byrd and Mizruchi (2005) results suggest that non-lenders bankers have a certification role for distressed firms while exercising a monitoring role for non-distressed firms.

(2008) show the small world networks are the most efficient in information transmission.)

This paper is organized as follows. In Section 2 we summarize the determinants of capital structure and hypothesize how the presence (and the centrality) of a banker-director may also be considered a capital structure determinant. In Section 3 we describe the data. In Section 4 we present the directors' network, explaining the centrality measures used to classify the influential role of bankers. In Section 5 we present the methodology used to correct for a possible endogeneity bias. In Section 6 we present the results. The main conclusions are summarized in Section 7.

## 2 Capital Structure Determinants

In this section we start by presenting the known determinants of capital structure, already established in the literature. We will then propose a new determinant, based on the influence of bankers and their role in the information channels.

### 2.1 Established in the literature

Previous studies show that size, asset tangibility and specificity, growth opportunities , profitability, and median industry leverage are the main determinants of capital structure[4]. We will briefly discussed the theory behind and the variables we used to proxy for each determinant.

#### 2.1.1 Size

Size has a positive impact on leverage. First, larger firms are usually covered by a higher number of analysts, reducing the information asymmetry. Therefore, when lending to smaller firms, lenders face relatively higher monitoring costs. This extra cost is passed to the borrower by increasing the interest rate, and hence reducing

[4] For a thorough review of the literature, see Frank and Goyal (2007).

the leverage. Secondly, bankruptcy costs are fixed and therefore larger firms have relatively lower bankruptcy costs.

This positive relationship is empirically documented in several studies such as Rajan and Zingales (1995), Schenoy and Koch (1996), although there is some mixed evidence in the literature as in Titman and Wessels (1988).

#### 2.1.2 Profitability

The pecking order theory of Myers (1984) and Myers and Majluf (1984) suggests a hierarchy in the financing mechanism, where in order to reduce information asymmetry costs, firms favour internal funds over external funds, and among these, firms favour debt over equity. Therefore, more profitable firms will be less leveraged.

This negative relationship is consensual among the empirical literature [Rajan and Zingales (1995), Booth et al. (2001), Fan et al. (2003) and Jong et al. (2006)]

#### 2.1.3 Asset Tangibility and Specificity

According to Jensen and Meckling (1976), the conflict of interests between debtholders and shareholders may be avoided by allocating collateral debt to specific projects. Therefore, firms with higher levels of tangible assets can have higher leverage, as new debt contracts can use those assets as collateral. Jensen et al. (1992) and Rajan and Zingales (1995) show evidence of a positive relationship between asset tangibility and leverage.

However, Shenoy and Koch (1996) find mixed results across industries. This difference in results is due to the asset specificity and its liquidity if used as collateral. If an (tangible) asset is highly specific to the firm, it might be worthless outside the firm even if its book value is high, implying a negative relationship between asset specificity and leverage.

Also, some authors find mixed results when differentiating between short-term and long-term debt [see Wijst and Thurik (1993) and Chittenden et al. (1996)]

### 2.1.4 Growth opportunities

According to Myers (1977) growth firms should use more equity finance in order to avoid passing up profitable investments. The same author has suggested the use of the market-to-book ratio as a proxy for future growth opportunities. Therefore, we should expect a negative effect of the market-to-book ratio on the leverage ratio.

This theory has mixed evidence on the literature. While Rajan and Zingales (1995) and Hirota (1999) have found the expected negative relationship (for an international and a Japanese sample respectively), Chiarella, Pham and Tan (1992) and Lee, Lee and Lee show the opposite (for Australian and Korean sample, respectively).

## 2.2 A new capital structure determinant

Podolny (1994) shows that social relationships between market agents may prevent market failure due to uncertainty and information asymmetry. Moreover, Burt (1997) shows that a network of social relationships allows people to gather more information about others whom they don't know personally, playing a crucial role in screening and selecting the relevant pieces of information. Nahapiet and Ghosal (1998) provide evidence that argues that social networks represent information channels that lower information-gathering costs. Moreover, Nohria (1992) shows that the creation and maintenance of information flows, usually referred to networking, increases one's information allowing the possible inclusion of private information.

In the same way, we should expect the social relationships of the directors of a firm to play a role in information transmission, reducing the information asymmetry between agents in the market. Shane and Cable (2002) show the importance of social ties in obtaining venture capital. The authors survey directly a small sample of entrepreneurs classifying the degree of "acquainteness" of seed-stage investors, i.e. how well does each entrepreneur knows each investor before presenting the project. They conclude that the social network of the entrepreneurs has an important role in facilitating credit. However the survey approach is not feasible when analyzing a large numbers of firms[5].

[5] The survey included 100 hours of interview for 106 individuals and 50 firms.

Our proposal is to use the network of the boards and directors as a proxy for the real social network of the market agents. This means that the network we construct only has partial information of the professional relationships between agents, excluding all others relationships, both professional (all non-board related connections) or private (family/friendship ties or common memberships of Universities, clubs). Also, in contrast with Shane and Cable (2002) approach, where qualitative data on the strength of the social relationship is available, we can only observe that two directors sit in the same board at a particular time and assume that those two must know each other and therefore are directly connected.

Using social network analysis and the suitable centrality measures (to be defined in Section 4.1), we infer the influential role of each director. In particular, we are interested in the role of bankers-directors in the information flow, its impact on the reduction of information asymmetries and, as a consequence, its impact on the firm's capital structure. We focus on the role of bankers because we are interested in the connection between privileged access to information and the mechanism of credit concession. If the social network of directors is a good proxy for the real life social network, then we should expect that:

**Hypothesis i** *The presence of a banker on the board increases the leverage of a firm.*

and

**Hypothesis ii** *The more influential a banker-director, the higher the leverage of a firm*

The previous literature presented in the introduction has analyzed the impact of the presence of bankers in the capital structure, as stated in Hypothesis i, but so far no study has evaluated the role of banker-directors in the information transmission mechanism, as established in Hypothesis ii.

## 3 Data

The data is the result of the merge of two databases: the financial database, provided by Datastream, and the board composition database, provided by BoardEX.

### 3.1 Financial data

All financial data is from Datastream using all the firm from WorldScope list. We will use the logarithm of sales as a measure of size, the ratio of tangible to total assets as a measure of asset tangibility, the ratio of R&D expenditure to total assets as a proxy for asset specificity, market-to-book ratio as the usual growth opportunities measure, ROA as the profitability measure. We will also use industrial sector dummies (SIC 2-digit level) in order to control for the median industry value.

### 3.2 Directors's network data

Our data on boards is based on BoardEX reports, which provide information on the interlocks of the boards, i.e. instead of presenting a directory of names and titles, BoardEX provides historical linkages between boards of different firms. The sample includes data from 2000 to 2006 and, although firm coverage increases through time, the proportion of US firms in the sample is around 60% each year.

[Insert Table A1 here]

The fact that firm coverage is not constant may create sample selection bias. BoardEX started its activity in 1998, covering 2783 firms in 34 countries, while in 2006 its coverage included 8187 firms in 57 countries. Although BoardEX provides no information on how firms are selected, we deem that initial coverage included bigger and more known firms, with smaller firms being added posteriorly. This hypothesis is supported by the decrease of the average market value of firms in the sample as seen in Figure 1.

[Insert Figure 1 here]

Hence, all results must be interpreted taking into consideration that the proportion of small firms in the sample increases with time. For example, the average board size in sample seems to decreases through time (see Table 2). However, if we restrict the sample to firms that were initially covered by BoardEX, the average board size does not change significantly, as we can see in Table 3.

[Insert Table A2 around here]

[Insert Table A3 here]

In fact, there is a positive relationship between firm size and board size which is well documented in the literature. Both Linck, Netter and Yang (2008) and Boone et al. (2007) found evidence that the board size of firms increase with size and complexity of operations, where the former study focuses on young firms (<10 years since IPO) and the latter on the different characteristics of boards in small and large firms. This positive relationship between firm and board size is also present in our data, although it is only significant for some countries. Table 4 presents the correlation between the board size and firm size[6] for countries with more than 25 firms analyzed by BoardEX in 2006.

[Insert Table A4 here]

The selection bias can also be reflected in other ways. When a firm does not appear on BoardEX reports linking Bank boards to firm boards, it does not necessarily mean that there is no banker-director: it may be the case that the firm is not analyzed by BoardEX. This is evident in Table 5, which compares the proportion of firms with banker-directors using the whole WorldScope[7] sample or restricting the sample to firms for which BoardEX also provides information on board size (only available from 2001 onwards).

[Insert Table A5 here]

As expected, in bank-based economies (France and Germany) the proportion of firms with banker-directors is much higher than for market-based economies (United Kingdom and United States). For the United States, the sharp decrease after 2003 is due to regulatory change. Following the Enron financial scandal, the 2002

[6] measured as the logarithm of the firm market value in USD.

[7] The comprehensive coverage available on Worldscope represents more than 95% of the world's market value. Worldscope includes up to 20 years of historical data on more than 50,000 public and private companies, with up to 1,500 data elements on each company record.

Sarbanes-Oxley strongly recommended[8] that bankers should not seat on the board of firms with whom they also had a lending relationship through the bank.

# 4 Methodology

## 4.1 Network Construction and Centrality Measures

Using the BoardEX reports, we construct the network of directors for each year between 2000 and 2006, where two directors are connected when they sit in the same board during the same year. Figure 2 is a graphical representation of part of the boards and directors network for 2006. The top vertex represents the board of Thomson Corporation, connected to vertices representing Thomson's directors. The next layer represents the firms that shared at least one director with Thomson in 2006. Finally, the bottom layer represent directors of the latter firms.

Note that in this figure there are no connections between directors. directors are linked only to boards. This is a characteristic of affiliation networks, more generally referred to as 2-mode network. These networks have two types of vertices and connections can only occur between vertices of different types.

Our aim is to try to mimic the unobserved information flows by constructing the network formed by the boards and directors. Although a firm is a legal entity, information does not flow between firms, but rather through the individuals placed in different firms. Hence, we analyze the flow of information between firms, by constructing the network of relationship between directors as described above. In the social network terminology, we project the original network, a two-mode graph, onto the space of directors. The result is a network only with directors.

Figure 3 is the result of projecting the network of Figure 2 onto the space of directors. There are only directors and no firms. The top layer of vertices represent Thomson's directors. In this layer, each vertex is

[8] The original SOX proposal limited the pool of financial expert to CPAs or other professional with direct accounting experience, but the final proposal would include bankers.

now connected to every other vertex because they were all linked to Thomson's board. Some of these vertices are connected to vertices in the lower layer. This happens when a Thomson's director also sits in another firm's board.

We are now able to measure the role of each individual on the flow of information, by computing a centrality measure for each vertex of the network. In this work we will focus on three basic measures of centrality commonly used in information flows /contagion analysis: degree, closeness and betweeness.

1. The **degree** of a vertex is the number of connections of a vertex with other vertices of the network. Formally, the degree $k_i$ of vertex $i$ is

$$k_i = \sum_{j=1}^{n} A_{ij}$$

   where $A_{ij}$ equals 1 if vertex $i$ is connected to vertex $j$, or 0 otherwise and $n$ is the size of the network, i.e. the number of vertices in the network. It is usual to normalize this measure by the maximum possible degree $(n-1)$. The normalized measure becomes the so-called **degree centrality** and is given by

$$k'_i = \frac{\sum_{j=1}^{n} A_{ij}}{n-1}$$

   Within the directors network it represents the number of directors with whom a particular individual is related to. A director with higher degree centrality knows more directors inside the network.

2. **Closeness centrality** (Sabidussi 1965) is the inverse of the average distance from a particular vertex to every other vertex. More formally, the closeness centrality $C_i$ of vertex $i$ is:

$$C_i = \left( \frac{\sum_{j \neq i} d_G(i,j)}{n-1} \right)^{-1}$$

   where $d_G(i,j)$ represents the geodesic distance between $i$ and $j$, i.e. the length of the shortest path between the two vertices. Within the directors network, it represents the average number of contacts that a director would have to make in order to reach any other director on the network. As there are directors which are isolated/separated from part of the network, the classical definition of closeness is not well defined. The solution for these cases, is to use the influential range of each director, i.e. to measure the centrality within the reachable component of the network (Lin 1976) as a ratio of the total number of vertices,

$$C_i' = \left( \frac{\sum_{j \neq i} d_G(i,j)}{J_i - 1} \right)^{-1} \frac{J_i}{n}$$

where $J_i$ is the size of the network component of vertex $i$. A director with higher closeness centrality will need on average less intermediaries to reach any other director.

3. **Betweenness centrality** for a given vertex $i$ is defined (Freeman 1977) as follows. Let $g_{jk}$ denote the number of the shortest paths connecting vertices $j$ and $k$, and $g_{jk}(i)$ denote the number of the subset of those shortest paths that also pass through vertex $i$. The betweenness centrality $B_i$ of vertex $i$ is

$$B_i = \sum_{j<k} \frac{g_{jk}(i)}{g_{jk}}$$

The ratio $\frac{g_{jk}(i)}{g_{jk}}$ can be interpreted as the probability that director $i$ is a vehicle of information transfer between director $k$ and director $j$, assuming that all shortest paths are equally likely to be used.

After calculating the centrality measures of each individual in the directors' network, we aggregate the centrality measures to the firm level. As we are interested in the information role of bankers-directors, we only use these individuals for aggregation purposes: for each firm, the corresponding centrality measure is the maximum value of the banker-director in the board. If there is no banker-director, the centrality measure is 0.[9]

[9] We repeat the whole analysis using the sum instead of the maximum and the results are robust. We proxy the informational role of the board through the maximum for two reasons. First, we assume that the determinant individual in the information distribution is the one who is more connected/influential. Second, the sum of centrality measures can be ambiguously interpreted.

## 4.2 Estimation

We will test our hypothesis by running the following regression equation

$$
\begin{aligned}
LR_{t+1,i} &= \beta_0 + \beta_1 \text{Size}_{t,i} + \beta_2 \text{Profitability}_{t,i} + \beta_3 \text{Asset\_Tangibility}_{t,i} \\
&\quad + \beta_4 \text{Asset\_Specificity}_{t,i} + \beta_5 \text{Growth\_Opportunities}_{t,i} + \delta \text{Banker}_{t,i} \\
&\quad + \gamma_1 \text{Industry\_Dummies}_{t,i} + \gamma_2 \text{Year\_Dummies}_t
\end{aligned}
$$

where Size denotes the logarithm of sales, Profitability denotes ROA, Asset tangibility denotes the ratio of tangible to total assets, Asset Specificity denotes the ratio of R&D expenditure to total assets, Growth_Opportunities denotes the market-to-book ratio and Banker denotes either the presence of banker on the board (hypothesis i) or one of the three banker-director centrality measures (hypothesis ii). We also control for industry and year effects. All variables were winsorized at 1% level.

We need to correct for possible endogeneity bias when testing for our hypothesis that bankers-directors (and their centrality on the network) affect the capital structure of a firm. The choice of board composition, and hence the presence and influence of the banker, may not be independent of the choice of the (target) capital structure. The most common way to deal with endogenous regressors is to use Instrumental Variables (IV). However, the IV approach is not valid when the endogenous regressor is a binary variable[10]. This means that, in spite the IV approach being correct for measuring the impact of bankers centrality on the capital structure,

[10] Let $d_i$ denote a binary variable with $d_i = 1$ if the treatment is received, and $d_i = 0$ otherwise and $y_i^1$ and $y_i^0$ denote outcome with treatment and without treatment, respectively.

$$
\begin{aligned}
y_i^1 &= \beta X_i + \alpha_i + \varepsilon_i \text{ if } d_i = 1 \\
y_i^0 &= \beta X_i + \varepsilon_i \qquad \text{if } d_i = 0
\end{aligned}
$$

where $X_i$ is a set of (observable) variables known to influence the outcome and $\varepsilon_i \sim N(0, \sigma_\varepsilon)$.

The observable outcome $y_i$ is

$$
\begin{aligned}
y_i &= (1 - d_i)\, y_i^0 + d_i y_i^1 \\
y_i &= \beta X_i + \alpha_i d_i + \varepsilon_i \qquad (1)
\end{aligned}
$$

If selection into treatment does not depend on the outcome $y_i$, we can estimate the average treatment effect by OLS, provided the same is not true when measuring the impact of the mere presence of a banker-director. The latter is methodologically equivalent to evaluating the impact of a treatment on a variable of interest, where selection into treatment is endogenous. We will use Rosenbaum and Rubin's (1984) Average Treatment Effects (ATE) approach where selection into treatment is model as an index function dependent on a set of instruments. In our case, the instruments are the number of directors in each board, and three-year averages[11] of the leverage ratio, its determinants (excluding the new proposed one) and volatility. The same instruments will be used for the IV approach.

# 5 Results

Tables R1 and R2 present the results for US and non-US countries, respectively[12]. We can conclude that the presence of bankers on the board of the firms affects the leverage ratio. This effect is positive in the US but it is negative for the remaining countries. This means that, for the U.S., the mere presence of a banker on the board of a firm increases its leverage ratio by 0.194 on average. (hypothesis i)

The magnitude of this effect increases with the banker's centrality on the network, independent of which centrality measure we use. (hypothesis ii)

The coefficients of the previously documented determinants of capital structure have the expected sign. The

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that, apart from regressors exogeneity, the usual OLS assumptions hold.

$$E\left[\hat{\alpha}_{OLS}\right] = \frac{1}{n}\sum_{i=1}^{N}\alpha_i = \bar{\alpha}$$

In our case, $y_i$ is the leverage ratio defined as $\frac{\text{Total debt}}{\text{Market Value}}$, $d_i$ indicates the presence of a Banker on the firm's Board and $X_i$ are firm control variables which are empirically known to affect the capital structure. However, firms simultaneously choose the capital structure and Board composition, which implies that $d_i$ is correlated with $\varepsilon_i$ and

$$E\left[\hat{\alpha}_{OLS}\right] = \bar{\alpha} + E\left[\varepsilon_i|d_i = 1\right] - E\left[\varepsilon_i|d_i = 0\right]$$

leading for the inconsistency of the OLS estimator.

See also Imbens and Angrist (1994) and Angrist, Imbens and Rubens (1996).

[11] All instruments are lagged one period. This means that for leverage ratio at $t+1$, the regressors are at time $t$, number of directors in board is at time $t-1$, and the three year averages are calculated using times $t-1$, $t-2$ and $t-3$.

[12] US is the only country for which there are enough observations to run a separate regression.

results are robust for changes in the aggregation criteria (sum of individual bankers centrality measure), the dependent variable (book value leverage ratio) and banker definition (using SIC financial sector classification (2-digit SIC $\in [60, 70)$).

In table R3, we present the evolution of coefficients for the treatment, when using just one year of data or dividing the sample in pre and post SOX years. Although the positive effect of the presence of a banker is present throughout the years, the impact of the centrality measure is not always significant nor with the same sign as when using the whole sample. For the Post-SOX regressions, degree and betweenness become not significant, while the magnitude of the closeness coefficient is halved. The impact of the presence does not change.

## 6 Conclusion

Our results show the impact of bankers-directors on the capital structure of firms. After correcting for endogeneity, the presence of a banker-director significantly increases the leverage ratio of US firms. Moreover, this impact is stronger the higher the centrality of the banker on the directorship network. This suggests that bankers-directors have an essential role in the dissemination of information in the US markets. The more central a banker is on the network, e.g. the more connected the banker is to other directors, the more influence he has on the information transmission, reducing information asymmetries between the firm and the credit market, consequently allowing for higher levels of leverage.

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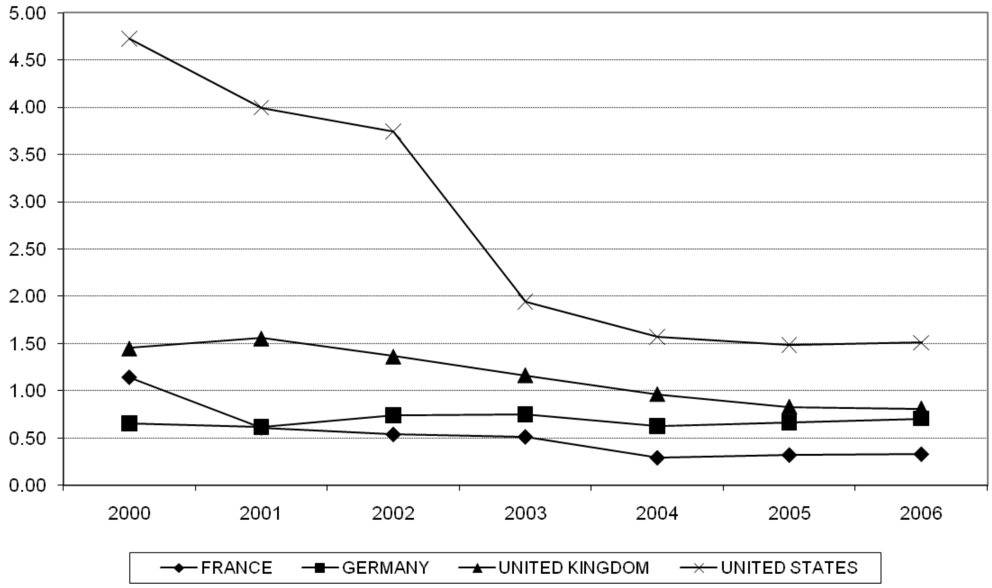


**Figure 1: Average Market Value of firms in BoardEX**, normalized by the average market value of firms in WorldScope - extensive worldwide database provided by Thomson Financial - for France, Germany, United Kingdom and United States.

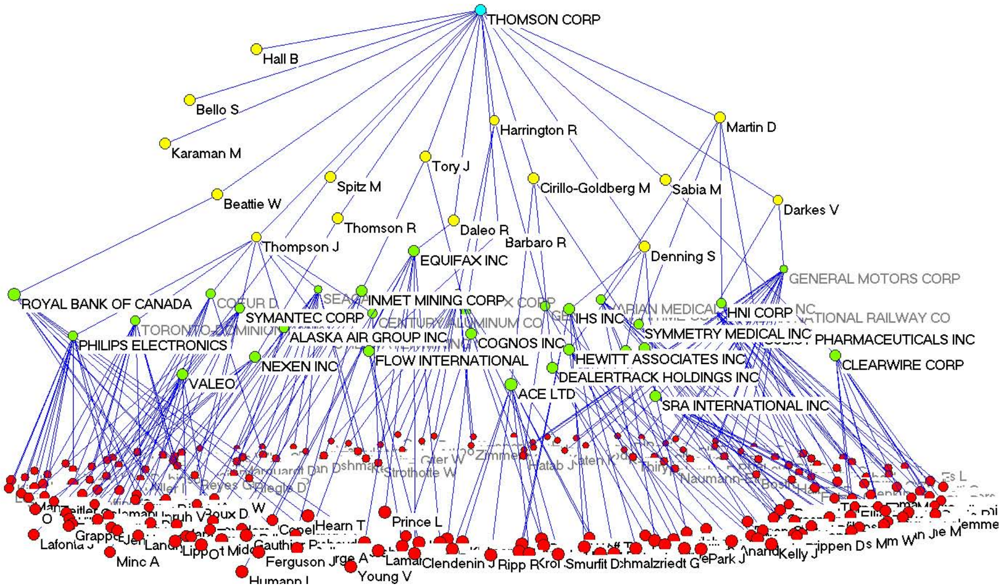


**Figure 2: Boards and Directors Network:** Graphical representation of the 3-neighboorhood of Thomson Corporation Board in 2006. Yellow vertices (second tier from top) represent Thomson Directors. Green vertices (Third tier from top, capital letters) represent firms which have a Thomson Director on its board. Red vertices represent the directors of firms which have a Thomson Director on its board.

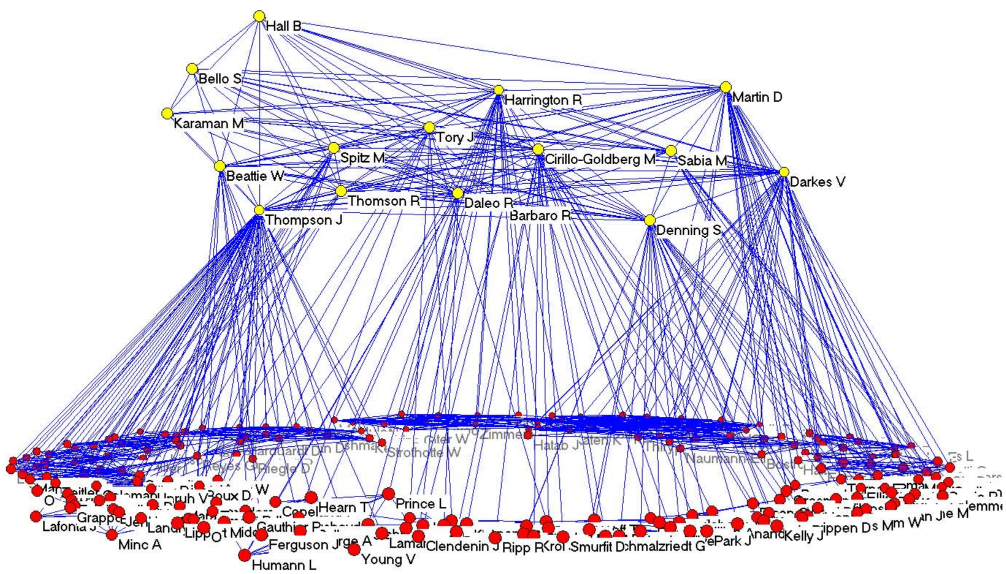


**Figure 3: Directors Network:** Graphical representation of the projection of the network represented in figure 2 onto the space of Directors. Yellow vertices represent Thomson Directors. Red vertices represent the directors of firms which have a Thomson Director on its board.

**Table A1**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|
| **Countries** | **34** | **36** | **40** | **43** | **49** | **57** | **57** |
| **Firms** | **2,783** | **3,508** | **3,753** | **5,863** | **7,123** | **8,040** | **8,187** |
| United States | 1,550 | 1,897 | 1,974 | 3,659 | 4,457 | 4,848 | 4,754 |

**Table A1: BoardEX Coverage.** Number of countries and firms covered by BoardEX reports.

## Table A2 - Average Boardsize

| **English Origin** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** |
|---|---|---|---|---|---|---|---|
| Australia | | 9.00 | 8.00 | 7.89 | 7.74 | 7.12 | 7.05 |
| Canada | | 11.00 | 11.90 | 9.91 | 9.27 | 9.19 | 9.21 |
| Cayman Islands | 11.00 | 10.00 | 9.00 | 8.00 | 8.20 | 7.80 | 7.50 |
| Gibraltar | | | | | | 8.00 | 8.33 |
| Guernsey | 7.00 | 7.00 | 7.00 | 7.00 | 6.50 | 6.00 | 5.67 |
| Hong Kong | 7.00 | 8.00 | 7.00 | 6.00 | 6.40 | 6.87 | 6.76 |
| India | | | | | | 11.80 | 11.33 |
| Isle Of Man | 3.00 | 6.00 | 7.00 | 7.00 | 5.25 | 5.45 | 6.00 |
| Israel | 8.00 | 9.80 | 8.50 | 7.68 | 7.35 | 7.60 | 7.41 |
| Jersey | 8.50 | 8.00 | 7.33 | 7.67 | 6.83 | 6.42 | 6.04 |
| Malaysia | | | 10.00 | 9.00 | 6.00 | 5.25 | 4.75 |
| New Zealand | | | | | 7.00 | 7.67 | 6.75 |
| Republic Of Ireland | 12.80 | 10.27 | 9.55 | 9.46 | 9.54 | 8.99 | 8.77 |
| Singapore | 7.00 | 8.50 | 9.50 | 8.67 | 8.80 | 7.17 | 8.67 |
| South Africa | | | 11.00 | 9.00 | 10.50 | 10.00 | 9.33 |
| United Kingdom | 8.22 | 7.95 | 7.73 | 7.35 | 6.93 | 6.66 | 6.56 |
| United States | 9.53 | 9.44 | 9.31 | 8.52 | 8.39 | 8.33 | 8.39 |
| **Average** | **9.16** | **9.03** | **8.83** | **8.29** | **8.09** | **7.93** | **7.90** |

| **French Origin** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** |
|---|---|---|---|---|---|---|---|
| Argentina | | | | 7.00 | 11.50 | 11.00 | 14.50 |
| Belgium | 17.20 | 10.07 | 10.08 | 9.68 | 9.76 | 9.36 | 9.51 |
| Brazil | | | | | | 8.00 | 9.00 |
| Cyprus | | | | | 18.00 | 6.67 | 8.60 |
| Egypt | | | | | | 11.00 | 14.00 |
| France | 14.60 | 12.35 | 12.06 | 11.36 | 11.27 | 10.80 | 10.68 |
| Greece | 13.67 | 13.85 | 12.44 | 12.00 | 11.86 | 10.79 | 10.53 |
| Italy | 12.60 | 13.08 | 13.68 | 13.61 | 13.49 | 13.36 | 12.88 |
| Mexico | | | | | | 13.00 | 12.00 |
| Netherlands | 11.58 | 9.53 | 9.29 | 9.10 | 9.06 | 8.93 | 9.08 |
| Portugal | 13.50 | 13.63 | 12.33 | 12.50 | 13.00 | 13.00 | 15.50 |
| Spain | 14.67 | 14.54 | 14.09 | 14.89 | 13.88 | 13.84 | 13.90 |
| **Average** | **13.79** | **11.90** | **11.71** | **11.41** | **11.31** | **10.92** | **10.88** |

| **German Origin** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** |
|---|---|---|---|---|---|---|---|
| Austria | 21.25 | 20.75 | 20.75 | 20.00 | 20.20 | 18.57 | 16.63 |
| Germany | 18.69 | 19.05 | 18.96 | 18.56 | 18.47 | 16.41 | 15.59 |
| Japan | | | | | 11.00 | 14.00 | 13.50 |
| Switzerland | 11.96 | 12.09 | 11.55 | 11.34 | 10.75 | 10.40 | 10.63 |
| **Average** | **16.87** | **17.16** | **16.94** | **16.54** | **16.36** | **14.97** | **14.49** |

| **Scandinavian Origin** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** |
|---|---|---|---|---|---|---|---|
| Denmark | 12.40 | 13.36 | 12.91 | 12.67 | 11.85 | 11.83 | 12.15 |
| Finland | 10.17 | 9.50 | 10.00 | 11.50 | 8.17 | 8.67 | 7.60 |
| Norway | 7.08 | 6.78 | 6.34 | 6.64 | 6.71 | 6.45 | 6.64 |
| Sweden | 10.15 | 10.44 | 10.21 | 10.38 | 10.35 | 9.97 | 10.16 |
| **Average** | **9.70** | **9.72** | **9.39** | **9.63** | **9.46** | **9.18** | **9.42** |

| **Post socialism** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** |
|---|---|---|---|---|---|---|---|
| China | 7.00 | 8.00 | 8.00 | 8.33 | 6.33 | 6.40 | 6.56 |
| Russian Federation | 10.00 | | 11.00 | 11.00 | 10.50 | 10.75 | 10.60 |

**Table 2: Average Board Size.** Countries are grouped according to legal rules origin as in La Porta et al.(1998)

## Table A3 - Evolution of Average Board Size

| Country | Sample | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|
| **France** | **Initial** | 14.6 | 14.4 | 14.3 | 14.0 | 14.1 | 13.8 | 13.6 |
| | **All** | 14.6 | 12.3 | 12.1 | 11.4 | 11.3 | 10.8 | 10.7 |
| **Germany** | **Initial** | 18.7 | 18.8 | 18.8 | 18.6 | 18.6 | 18.5 | 18.4 |
| | **All** | 18.7 | 19.1 | 19.0 | 18.6 | 18.5 | 16.4 | 15.6 |
| **United Kingdom** | **Initial** | 8.2 | 8.2 | 8.1 | 8.1 | 8.1 | 8.1 | 8.1 |
| | **All** | 8.2 | 8.0 | 7.7 | 7.3 | 6.9 | 6.7 | 6.6 |
| **United States** | **Initial** | 9.5 | 9.7 | 9.5 | 9.6 | 9.6 | 9.6 | 9.7 |
| | **All** | 9.5 | 9.4 | 9.3 | 8.5 | 8.4 | 8.3 | 8.4 |

**Table A3: Evolution of Average Board Size** for France, Germany, United Kingdom and United States. For each country upper values represent average of firms initially covered by BoardEX (2000) while bottom values include firms that were added in later years.

## Table A4 - Correlation( Board size, Firm size)

| Country | | Correlation |
|---|---|---|
| United States | (n=3856) | **0.268*** ** |
| United Kingdom | (n=1279) | **0.453*** ** |
| Australia | (n=162) | 0.061 |
| France | (n=93) | -0.054 |
| Canada | (n=86) | 0.0841 |
| Germany | (n=84) | 0.0962 |
| Netherlands | (n=70) | **0.681*** ** |
| Sweden | (n=65) | **0.344** ** |
| Israel | (n=45) | -0.172 |
| Switzerland | (n=37) | **0.367* ** |
| Italy | (n=35) | **0.437** ** |
| Norway | (n=29) | **0.527*** ** |
| Belgium | (n=27) | -0.0482 |
| Spain | (n=26) | 0.01778 |
| Republic Of Ireland | (n=25) | 0.0500 |

**Table A4: Correlation between board size and firm size**, measured as the logarithm of market value in USD for 2006 by country. Countries with less than 25 firms analyzed by BoardEX are excluded.

## Table A5 -

| Panel A | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|
| **All** | 7% | 6% | 6% | 6% | 6% | 7% | 7% |
| **France** | 4% | 4% | 4% | 5% | 7% | 7% | 8% |
| **Germany** | 4% | 6% | 5% | 7% | 5% | 5% | 8% |
| **United Kingdom** | 9% | 10% | 11% | 10% | 10% | 12% | 12% |
| **United States** | 10% | 10% | 10% | 11% | 13% | 14% | 15% |

| Panel B | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|
| **All** | - | 32% | 28% | 27% | 20% | 18% | 19% |
| **France** | - | 67% | 25% | 33% | 41% | 39% | 40% |
| **Germany** | - | 50% | 50% | 60% | 50% | 57% | 43% |
| **United Kingdom** | - | 21% | 19% | 17% | 15% | 15% | 15% |
| **United States** | - | 35% | 30% | 30% | 20% | 18% | 19% |

**Table A5: Proportion of firms with banker-directors.** Panel A includes all firms present in WorldScope sample, while the Panel B restricts the sample to firms for which BoardEX also provides information on board size.

## Table R1

Dependent Variable: Leverage Ratio (market value). US

| | (1) OLS | (2) OLS | (3) OLS | (4) OLS | (5) OLS | (6) OLS | (7) ATE | (8) IV | (9) IV | (10) IV | (11) IV |
|---|---|---|---|---|---|---|---|---|---|---|---|
| main | | | | | | | | | | | |
| logsales | 0.0127*** | 0.0120*** | 0.0126*** | 0.0126*** | 0.0128*** | 0.0124*** | 0.000265 | -0.0248** | -0.0234** | -0.0169** | -0.0613** |
| | -14.64 | -13.3 | -14.28 | -14.26 | -14.31 | -14.22 | -0.17 | (-2.99) | (-2.92) | (-2.61) | (-3.18) |
| roa | -0.131*** | -0.129*** | -0.131*** | -0.131*** | -0.131*** | -0.131*** | -0.106*** | -0.0684 | -0.0714* | -0.0636* | -0.0775 |
| | (-12.79) | (-12.57) | (-12.77) | (-12.77) | (-12.80) | (-12.78) | (-9.37) | (-1.88) | (-2.01) | (-2.43) | (-0.83) |
| tang | 0.0722*** | 0.0722*** | 0.0722*** | 0.0722*** | 0.0720*** | 0.0730*** | 0.0733*** | 0.0938* | 0.0903* | 0.112*** | 0.314** |
| | -6.24 | -6.25 | -6.25 | -6.25 | -6.23 | -6.31 | -5.5 | -2.43 | -2.4 | -4.27 | (2.64) |
| rdratio | -0.165*** | -0.163*** | -0.165*** | -0.165*** | -0.165*** | -0.166*** | -0.149*** | -0.202** | -0.206** | -0.150** | -0.382 |
| | (-7.09) | (-6.98) | (-7.09) | (-7.09) | (-7.09) | (-7.12) | (-5.60) | (-2.60) | (-2.70) | (-2.98) | (-1.77) |
| ln_mtb | -0.0290*** | -0.0291*** | -0.0290*** | -0.0290*** | -0.0290*** | -0.0290*** | -0.0292*** | -0.0342*** | -0.0341*** | -0.0353*** | -0.0297 |
| | (-13.41) | (-13.45) | (-13.41) | (-13.41) | (-13.39) | (-13.41) | (-12.45) | (-4.72) | (-4.80) | (-7.28) | (-1.52) |
| dummy_banker_indm3 | | 0.0103* | | | | | 0.194*** | | | | |
| | | -2.56 | | | | | -10.07 | | | | |
| degree_max_indm3 | | | 0.000205 | | | | | 0.0957*** | | | |
| | | | -0.48 | | | | | -4.83 | | | |
| norm_degree_max_indm3 | | | | 3.771 | | | | | 1334.0*** | | |
| | | | | -0.62 | | | | | -4.82 | | |
| closeness_max_indm3 | | | | | -0.0606 | | | | | 16.01*** | |
| | | | | | (-0.51) | | | | | -4.77 | |
| betweeness_max_indm3 | | | | | | 58.84* | | | | | 17190.7*** |
| | | | | | | -2.18 | | | | | (4.20) |
| Constant | 0.0571 | 0.0665 | 0.0583 | 0.0586 | 0.0553 | 0.0605 | 0.133 | 0.621 | 0.506 | 0.448* | 1.158 |
| | -0.55 | -0.64 | -0.56 | -0.57 | -0.53 | -0.59 | -1.5 | -1.71 | -1.92 | -2.37 | (1.61) |
| dummy_banker_indm3 | | | | | | | | | | | |
| boardsize | | | | | | | 0.0307*** | | | | |
| | | | | | | | -3.93 | | | | |
| treat_lv_mv | | | | | | | 0.772*** | | | | |
| | | | | | | | -3.47 | | | | |
| treat_logsales | | | | | | | 0.210*** | | | | |
| | | | | | | | -10.56 | | | | |
| treat_roa | | | | | | | -0.939*** | | | | |
| | | | | | | | (-4.46) | | | | |
| treat_tang | | | | | | | -0.114 | | | | |
| | | | | | | | (-0.61) | | | | |
| treat_rdratio | | | | | | | -1.359** | | | | |
| | | | | | | | (-2.68) | | | | |
| treat_ln_mtb | | | | | | | 0.0217 | | | | |
| | | | | | | | -0.58 | | | | |
| treat_vol | | | | | | | -0.521*** | | | | |
| | | | | | | | (-3.99) | | | | |
| Constant | | | | | | | -9.204*** | | | | |
| | | | | | | | (-14.06) | | | | |
| hazard | | | | | | | | | | | |
| lambda | | | | | | | -0.108*** | | | | |
| | | | | | | | (-9.93) | | | | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 5030 | 5030 | 5030 | 5030 | 5030 | 5030 | 5030 | 5030 | 5030 | 5030 | 5030 |

$t$ statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**Table R1 (US firms sample)**: Estimation results for $\mathrm{LR}_{t+1,i} = \beta_0 + \beta_1 \mathrm{logsales}_{t,i} + \beta_2 \mathrm{ROA}_{t,i} + \beta_3 \mathrm{tang}_{t,i} + \beta_4 \mathrm{rdratio}_{t,i} + \beta_5 \mathrm{mtb}_{t,i} + \delta \mathrm{Banker}_{t,i}$ , where LR denotes the leverage ratio, logsales denotes the logarithm of sales (size), ROA denotes return on assets (profitability), tang denotes the ratio of tangible to total assets (asset tangibility), rdratio denotes the ratio of R&D expenditure to total assets (asset specificity), mtb denotes the market-to-book ratio (growth opportunities) and Banker denotes either the presence of banker on the board (hypothesis i) or one of the three banker-director centrality measures (hypothesis ii). Instruments: boardsize denotes the number of directors in each board, variables starting with "treat_" denote the corresponding three year averages of the leverage ratio, its determinants and stock price volatility. All instruments are lagged one period. For leverage ratio at $t+1$, the regressors are at time $t$, the number of directors in board is at time $t-1$, and the three year averages are computed using times $t-1$, $t-2$ and $t-3$. We also control for industry and year effects. All variables were winsorized at 1% level.

# Table R2

Dependent Variable: Leverage Ratio (market value). non US

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OLS | OLS | OLS | OLS | OLS | OLS | ATE | IV | IV | IV | IV |
| main | | | | | | | | | | | |
| logsales | 0.0119*** | 0.0138*** | 0.0131*** | 0.0131*** | 0.0134*** | 0.0123*** | 0.0215*** | 0.0240*** | 0.0243*** | 0.0297*** | 0.0226*** |
| | -8.08 | -8.66 | -8.5 | -8.49 | -8.67 | -8.06 | -10.6 | -9.36 | -9.36 | -9.71 | (8.72) |
| roa | -0.121*** | -0.124*** | -0.123*** | -0.123*** | -0.123*** | -0.121*** | -0.142*** | -0.142*** | -0.144*** | -0.149*** | -0.136*** |
| | (-6.69) | (-6.91) | (-6.82) | (-6.82) | (-6.83) | (-6.71) | (-7.83) | (-6.75) | (-6.78) | (-6.05) | (-6.23) |
| tang | 0.100*** | 0.101*** | 0.101*** | 0.101*** | 0.101*** | 0.101*** | 0.103*** | 0.109*** | 0.109*** | 0.114*** | 0.108*** |
| | -5.14 | -5.19 | -5.19 | -5.19 | -5.21 | -5.15 | -5.21 | -4.82 | -4.83 | -4.34 | (4.60) |
| rdratio | -0.231*** | -0.224*** | -0.223*** | -0.223*** | -0.222*** | -0.228*** | -0.196*** | -0.149*** | -0.148*** | -0.123* | -0.150*** |
| | (-6.68) | (-6.49) | (-6.42) | (-6.43) | (-6.42) | (-6.57) | (-5.53) | (-3.57) | (-3.50) | (-2.54) | (-3.40) |
| ln_mtb | -0.0231*** | -0.0232*** | -0.0229*** | -0.0229*** | -0.0230*** | -0.0229*** | -0.0229*** | -0.0216*** | -0.0215*** | -0.0223*** | -0.0186*** |
| | (-6.64) | (-6.69) | (-6.62) | (-6.61) | (-6.65) | (-6.59) | (-6.62) | (-5.41) | (-5.33) | (-4.76) | (-4.36) |
| dummy_banker_indm3 | | -0.0236** | | | | | -0.117*** | | | | |
| | | (-3.08) | | | | | (-6.97) | | | | |
| degree_max_indm3 | | | -0.00152** | | | | | -0.0149*** | | | |
| | | | (-2.61) | | | | | (-6.29) | | | |
| norm_degree_max_indm3 | | | | -21.09* | | | | | -213.3*** | | |
| | | | | (-2.56) | | | | | (-6.34) | | |
| closeness_max_indm3 | | | | | -0.584** | | | | | -7.046*** | |
| | | | | | (-3.13) | | | | | (-7.65) | |
| betweeness_max_indm3 | | | | | | -30.2 | | | | | -836.5*** |
| | | | | | | (-0.98) | | | | | (-5.67) |
| Constant | 0.124 | 0.106 | 0.0983 | 0.0993 | 0.0872 | 0.117 | 0.0316 | -0.128 | -0.126 | -0.32 | -0.0746 |
| | -1.03 | -0.88 | -0.82 | -0.82 | -0.72 | -0.97 | -0.25 | (-0.89) | (-0.87) | (-1.86) | (-0.50) |
| dummy_banker_indm3 | | | | | | | | | | | |
| boardsize | | | | | | | 0.121*** | | | | |
| | | | | | | | -5.81 | | | | |
| treat_lv_mv | | | | | | | 0.429 | | | | |
| | | | | | | | -0.66 | | | | |
| treat_logsales | | | | | | | 0.470*** | | | | |
| | | | | | | | -9.97 | | | | |
| treat_roa | | | | | | | -0.256 | | | | |
| | | | | | | | (-0.40) | | | | |
| treat_tang | | | | | | | -0.237 | | | | |
| | | | | | | | (-0.51) | | | | |
| treat_rdratio | | | | | | | 1.978 | | | | |
| | | | | | | | -1.57 | | | | |
| treat_ln_mtb | | | | | | | -0.0558 | | | | |
| | | | | | | | (-0.64) | | | | |
| treat_vol | | | | | | | 0.668 | | | | |
| | | | | | | | -1.82 | | | | |
| Constant | | | | | | | -8.977*** | | | | |
| | | | | | | | (-6.76) | | | | |
| hazard | | | | | | | | | | | |
| lambda | | | | | | | 0.0662*** | | | | |
| | | | | | | | -6.52 | | | | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1362 | 1362 | 1362 | 1362 | 1362 | 1362 | 1362 | 1362 | 1362 | 1362 | 1362 |

$t$ statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**Table R1 (non-US firms sample)**: Estimation results for $\text{LR}_{t+1,i} = \beta_0 + \beta_1 \text{logsales}_{t,i} + \beta_2 \text{ROA}_{t,i} + \beta_3 \text{tang}_{t,i} + \beta_4 \text{rdratio}_{t,i} + \beta_5 \text{mtb}_{t,i} + \delta \text{Banker}_{t,i}$ , where LR denotes the leverage ratio, logsales denotes the logarithm of sales (size), ROA denotes return on assets (profitability), tang denotes the ratio of tangible to total assets (asset tangibility), rdratio denotes the ratio of R&D expenditure to total assets (asset specificity), mtb denotes the market-to-book ratio (growth opportunities) and Banker denotes either the presence of banker on the board (hypothesis i) or one of the three banker-director centrality measures (hypothesis ii). Instruments: boardsize denotes the number of directors in each board, variables starting with "treat_" denote the corresponding three year averages of the leverage ratio, its determinants and stock price volatility. All instruments are lagged one period. For leverage ratio at $t+1$, the regressors are at time $t$, the number of directors in board is at time $t-1$, and the three year averages are computed using times $t-1$, $t-2$ and $t-3$. We also control for industry and year effects. All variables were winsorized at 1% level.

## Table R3

| | (1) 2000 | (2) 2001 | (3) 2002 | (4) 2003 | (5) 2004 | (6) 2005 | (7) ≤2002 | (8) >2002 | (9) All years | (10) All years SOX dummy |
|---|---|---|---|---|---|---|---|---|---|---|
| dummy_banker_indm3 | 0.163** | 0.159** | 0.144*** | 0.126** | 0.179*** | 0.122** | 0.166*** | 0.171*** | 0.194*** | 0.196*** |
| | (2.97) | (2.78) | (3.39) | (3.01) | (4.61) | (3.27) | (5.42) | (7.16) | (10.07) | (10.07) |
| degree_max_indm3 | 0.0709** | 0.0303 | 0.0668** | 0.0425* | -0.0443* | 0.00534 | 0.0712*** | 0.0134 | 0.0600*** | 0.0600*** |
| | (2.64) | (1.60) | (3.00) | (2.04) | (-2.07) | (0.72) | (4.08) | (1.50) | (3.85) | (3.85) |
| closeness_max_indm3 | 34.44** | -0.176 | 16.14* | -9.281 | 1.403 | 13.96* | 18.98*** | 10.09*** | 15.48*** | 15.48*** |
| | (3.27) | (-0.04) | (2.36) | (-1.60) | (0.67) | (2.54) | (3.87) | (3.34) | (4.73) | (4.73) |
| betweeness_max_indm3 | 3465.0** | 13595.2** | 6281.3** | 3887.0** | 3622.8* | -1390.3 | 10655.0*** | 11680.5 | 15109.0** | 15109.0** |
| | (2.62) | (3.16) | (3.11) | (2.64) | (2.12) | (-1.92) | (4.24) | (1.94) | (3.02) | (3.02) |
| Observations | 426 | 534 | 587 | 1003 | 1218 | 1262 | 1547 | 3483 | 5030 | 5030 |

$t$ statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**Table R3**: Evolution of $\delta$ coefficient, when restricting the leverage ratio sample to a specific year or dividing the sample in pre and post Sarbannes-Oxley Act (SOX) years.