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The interaction among multiple governance mechanisms in young newly public firms

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Abstract

We focus on the relations among inside ownership, board composition, unaffiliated block ownership, and compensation structure for a sample of firms following their IPOs. Specifically, we follow firms for up to eleven years after their IPOs and examine the full sample and subsamples of firms that survive, are acquired, or that file for bankruptcy during the sample period. We find that as CEO ownership declines, board independence, board seats held by venture capitalists, and unaffiliated block ownership increase. Our findings suggest that as inside ownership decreases alternative governance mechanisms evolve to help mitigate the resulting increase in agency costs. Interestingly, the associations between CEO ownership, the fraction of venture capital board membership, and unaffiliated block ownership exist only for firms that survive over the eleven-year sample period.

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1. Introduction

It is well established in the literature that the separation of ownership and control, absent other governance mechanisms, leads to agency costs. That is, professional managers with little ownership in the firm may have incentives to maximize their own utility at shareholders' expense. Moreover, Jensen and Meckling (1976) and Fama and Jensen (1983) assert that agency

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costs of equity increase as managerial ownership decreases. Of particular interest in this study is the existing evidence suggesting that inside ownership tends to decrease following IPOs (e.g., Mikkelson et al., 1997; Frye, 2003; Boone et al., 2004; Harjoto and Garen, in press). We confirm that insider ownership declines for our sample of firms following their IPOs. Given these findings, the purpose of this paper is to explore governance changes following IPOs that may attenuate the increased agency costs of equity resulting from declining managerial ownership. In particular, we examine the interrelations between CEO ownership, board structure, unaffiliated block ownership, and incentive-based compensation. Additionally we find, as do others, that many firms do not survive beyond ten years after their initial public offerings. Therefore, we examine the interrelations among governance mechanisms separately for firms that survive as independent entities, those that are acquired, and those that file for bankruptcy.[1]

We focus our analysis on governance changes that take place following IPOs for firms with limited operating histories (i.e., young firms). Older private firms may carry over into their public lives elements of their previous governance structures. That is, firms that are older at the time they go public may have entrenched governance structures. To avoid this complication we turn our attention to firms that are both newly public and young.

Our paper is unique along several dimensions. First, we examine the interactions among multiple governance mechanisms. Second, we adopt a panel approach tracking IPO firms and their governance structures for up to eleven years following their public debuts. Finally, we examine how governance structures evolve in three subsamples: firms that remain independent, are acquired, or go bankrupt.

We follow 109 young firms (three years or younger at the time of the IPO) each year for a period of up to 11 years (823 firm-years) after they go public. Consistent with Mikkelson et al. (1997), Frye (2003), Boone et al. (2004), Harjoto and Garen (in press) and others, we find decreases in CEO ownership following IPOs without regard to firm fate. We also find that for survivor firms, venture capitalist stock ownership and board representation decline naturally as firms age. For firms that survive or that are acquired we find that non-venture capitalist board independence and unaffiliated outside block ownership increase over time. We find that incentive-based compensation is relatively flat over time for all subsamples of the data.

When we examine the governance mechanisms together we find that venture capital board representation, board independence, and unaffiliated block ownership all increase as CEO ownership decreases following the IPO. We also show that board independence may be maintained because as venture capitalists leave the board, non-venture capitalist board independence increases. These changes in governance structure are strongest for survivor firms and are not present for firms that ultimately fail. In other words, governance mechanisms appear to work together to help mitigate the agency problems created by lower management ownership after IPOs, but these adaptations appear to be limited to firms that survive as independent entities.

We structure the paper as follows: in Section II we provide a discussion of the data selection criteria and summary characteristics; in Section III we provide a univariate analysis of post-IPO governance trends; in Section IV we develop the empirical model and discuss our control variable selections; in Section V we present the results of the study; and in Section VI we summarize the paper and provide concluding remarks.

[1] Dividing the sample by fate (or final outcome) possibly imposes a look-ahead bias or may appear to assume perfect foresight.

2. Data selection and trends in summary characteristics

We use Securities Data Corporation (SDC) Global Listings to identify initial public offerings (IPOs) occurring between 1979 and 1986 (although the first data year in the sample, due to selection criteria, is 1980). We use the period 1979 to 1986 to allow sufficient data from which to make inferences and to allow for analysis of the firms for up to eleven years following their IPOs. We begin the sample in 1979 because proxy statements are available from the Q-file after 1978. Like other IPO researchers we exclude best efforts offers, unit offerings, spin offs, financial firms (SIC 60–67), and utilities (SIC 46–49). We eliminate firms from the sample if 1) Compustat, CRSP, or Moody's data are not available; 2) proxy statement data from Lexis-Nexis or Q-data are missing for three consecutive years; 3) proxy data are not available for at least two years; and/or 4) the first available proxy statement is not within two years of the IPO year.

Denis and Sarin (1999), Kole and Lehn (1998), Frye (2003), and Boone et al. (2004) show that governance characteristics for publicly traded companies change in systematic ways over time. Governance mechanisms and their interrelations for private firms may survive the going public process. We want to examine governance evolution in firms with as little holdover as possible from the structures that were in place when they were private. Therefore, we focus our analysis on firms that are three years of age or younger at their IPOs, where firm age is the age at the IPO year minus the year founded (obtained from the Moody's manuals). Occasionally, there are ambiguities in the Moody's founding date and the actual founding date from the firm's proxy statement. We eliminate firms if the proxy statement indicates that an officer or director joined the firm more than three years prior to the IPO (e.g., the firm is actually more than three years of age at the IPO).

Applying these criteria results in a sample of 109 firms covering 823 firm-years. We determine whether the firm survives as an independent entity, is acquired, or is bankrupt as of 12 years after the IPO (11th year following the IPO year) based on information available in proxy statements, annual reports, and press releases. Approximately 49% (53 firms) of our sample firms survive as independent entities. Our sample is comparable to Mikkelson et al. (1997) and to Boone et al. (2004) who find that 44.2% and 41%, respectively, of their IPO firms (of all ages) operate independently after ten years. Boone et al. further report that 37% of their firms are acquired or merged with other firms. Roughly 39% of our firms are acquired and the remaining 12% go bankrupt at some point during the sample period.

In Table 1 we provide a summary of means and medians of selected firm characteristics for the first post-IPO year (designated "Begin") and for the last year (designated "End") before the firm is acquired, goes bankrupt, or the sample period ends for survivors. Median total assets grew from $20.4 million to $65.9 million, with the most dramatic growth experienced by firms in the survivor subsample. By comparison, Mikkelson et al. (1997) report median assets of $19.2 million one year post-IPO and $33.1 million ten years post-IPO. Profitability (measured by ROA) improved for our firms, but the improvement was driven by survivor and acquired firms only. Bankrupt firm ROA declines on average from 2.9% to −8.2%. The debt ratio for our full sample increases from a median of 5.9% to 12.7%. Gillan et al. (2003) find that median book leverage is 19.3% for a sample of firms that are on average (mean) 45 years old, suggesting that older firms have more debt than very young firms.

Monitoring may be more difficult (and therefore strong governance mechanisms may be more necessary) for firms with fewer tangible assets or with greater returns volatility. *Capital intensity* (net fixed assets divided by total assets) and *industry R&D-to-sales* (industry average R&D

Table 1
The following table lists the summary statistics for accounting measures and other control variables of the entire sample of 109 firms and for each subsample by firm fate

Variable	Total sample		Survivors		Acquired		Bankrupt	
	Begin	End	Begin	End	Begin	End	Begin	End
Total assets	43.8	**281.5**	43.0	**476.2**[a,b]	51.9[c]	**123.6**[c]	23.6	30.82
	20.4	**65.9**	16.9	**97.5**[a,b]	29.6	**82.5**[c]	16.2	19.6
ROA	5.5	6.7	2.2	8.9[b]	11.0	9.2	2.9	−8.2
	6.8	10.3	9.2	13.0[b]	6.4	9.8[c]	11.3	2.8
Debt ratio	13.6	**19.2**	12.8	19.3	13.3	17.9	17.4	22.8
	5.9	**12.7**	4.3	13.3	5.2	11.9	11.2	16.4
Capital intensity	18.7	**11.1**	17.7	**9.2**	17.7	11.6	25.1	17.2
	15.1	**6.7**	12.7	**6.3**	14.4	6.6	20.6	9.2
Industry R&D to sales	5.5	5.6	8.1[b]	8.0[a,b]	3.7[c]	4.1[c]	1.0	1.0
	4.0	3.3	6.5[a,b]	6.8[b]	4.0[c]	3.2[c]	0.1	0.2
Returns volatility	15.2	6.8	14.5	16.8[b]	16.2	16.7	15.5	17.5
	14.3	15.2	12.7[a]	15.1[a]	15.7	17.3	16.2	13.8

All sample firms went public between 1979 and 1986 and were under three years old at the time of going public. Accounting data are taken from COMPUSTAT. *Total assets* is the book value of total assets. **ROA** is the 3-year average of operating income divided by total assets. *Debt ratio* is the book value of long-term liabilities divided by total assets. *Industry R&D to sales* is the industry average research and development expense to sales ratio. *Capital intensity* is the ratio of net fixed assets divided by total assets. *Returns volatility* is the standard deviation of monthly stock returns for a given year from CRSP monthly returns files. The first year of data available after the IPO is designated "begin" and the final year of data available before the end of the sample period, the firm is acquired, or the firm goes bankrupt is designated as "end". Mean values are on top with median values below. All variables are percentages other than total assets (stated in millions of dollars).
Superscript "a" indicates that the value is different (at the 5% level) for the survivor firms relative to the acquired firms.
Superscript "b" indicates that the value is different (at the 5% level) for the survivor firms relative to the bankrupt firms.
Superscript "c" indicates that the value is different (at the 5% level) for the acquired firms relative to the bankrupt firms.
Bold values indicate that the ending value is different from the beginning value (at the 5% level).

expense divided by sales) are our measures of asset tangibility. Capital intensity declines from 15.1% to 6.7% and is considerably lower than the capital intensity ratio of 23% of Mikkelson et al. The industry R&D-to-sales ratio for our firms does not change over time, but bankrupt firms appear to operate in industries with lower levels of R&D than either survivor or acquired firms. *Returns volatility* (one-year standard deviation of monthly stock returns) is relatively flat across the three subsamples.

3. Post-IPO governance trends

In Table 2 we examine the mean and median levels of governance characteristics for the full sample and for each subgroup. *CEO ownership* is the beneficial ownership reported in the firm's proxy statement for the year and includes outstanding options that are exercisable within 60 days of the record date. We find that median CEO ownership declines from 11.3% just after the IPO to 3.6% 11 years later. Boone et al. (2004) find that mean CEO ownership declines from 16% to 7% after ten years and Mikkelson et al. report median CEO ownership of 15.9% just after the IPO and 5.5% after ten years. We identify decreasing median CEO ownership for survivor, acquired, and bankrupt firms alike. These trends imply that the agency costs of equity for IPO firms will increase over time if there are no increases in monitoring provided by alternative governance mechanisms.

Table 2
The following table lists the summary statistics for governance characteristics of the entire sample of 109 firms and for each subsample by firm fate

Variable	Total sample		Survivors		Acquired		Bankrupt	
	Begin	End	Begin	End	Begin	End	Begin	End
CEO ownership	14.7	**9.2**	12.6	**6.7**	14.9	11.0	21.9	13.1
	11.3	**3.6**	11.5	**2.3**[a,b]	9.2	**5.4**	11.6	**6.6**
Board independence	26.4	**34.9**	25.9	**36.3**	27.2	**36.0**	25.9	26.3
	25.0	**33.3**	24.5	**33.3**	26.8	**36.7**	22.5	33.3
Venture capitalist directors	15.1	**7.4**	17.7[b]	**7.0**	14.4	9.3	7.6	3.4
	0.0	**0.0**	12.5[b]	**0.0**	0.0	0.0	0.0	0.0
Total outside board membership	41.5	42.3	43.5	43.3[b]	41.6	45.2[c]	33.5	29.7
	42.9	42.9	43.5	42.8	43.7	47.2[c]	31.0	35.4
Venture capitalist ownership	8.1	**2.7**	10.4	**2.7**	6.0	3.4	5.5	1.2
	0.0	**0.0**	0.0	**0.0**	0.0	0.0	0.0	0.0
Incentive-based pay	23.4	25.1	27.7	27.9	26.2	20.9	20.1	26.0
	0.0	1.3	0.0	9.7[a]	0.0	0.0	0.0	0.0
Unaffiliated blockholdings	5.8	**13.9**	5.2	**12.5**	4.8	**15.4**	10.9	14.0
	0.0	**8.0**	0.0	**11.1**	0.0	**7.3**	0.0	2.8

All sample firms went public between 1979 and 1986 and were under three years old at the time of going public.
CEO ownership is the fraction of total equity owned by the CEO. *Board independence* is the fraction of independent outside directors on the board. Independent outside directors are directors with no disclosed ties to the firm other than their seat on the board. They include current or retired decision makers at other companies, academics, private investors, and unaffiliated blockholder representatives. *Venture capitalist directors* is the fraction of the directors on the board that are venture capitalists. *Total outside board membership* is *Board independence* plus *Venture capitalist directors*. *Venture capitalist ownership* is the fraction of total equity owned by venture capitalists. *Incentive-based pay* is the fraction of total compensation comprised of equity-based compensation. Equity-based compensation includes the value of stock option grants and restricted stock awards. Stock options are valued using the Black–Scholes model with continuously paid dividends. *Unaffiliated blockholdings* is the fraction of equity owned by all unaffiliated blockholders (excluding venture capitalists). Blockholders are defined as shareholders owning a minimum of 5% equity stake in the firm. The first year of data available after the IPO is designated "begin" and the final year of data available before the end of the sample period, the firm is acquired, or the firm goes bankrupt is designated as "end". Mean values are on top with median values below. All variables are percentages.
Superscript "a" indicates that the value is different (at the 5% level) for the survivor firms relative to the acquired firms.
Superscript "b" indicates that the value is different (at the 5% level) for the survivor firms relative to the bankrupt firms.
Superscript "c" indicates that the value is different (at the 5% level) for the acquired firms relative to the bankrupt firms.
Bold values indicate that the ending value is different from the beginning value (at the 5% level).

We define *board independence* as the fraction of independent, non-venture capitalist outside directors on the board. Using this metric we find that mean board independence increases for the full sample of IPO firms from 26.4% (Begin) to 34.9% (End).[2] We observe the same pattern of mean and median increases in independence in survivor and acquired firms; however, we do not find increased board independence for the bankrupt firm subsample.

Venture capitalists are identified from proxy statement information and from *Pratt's Guide to Venture Capital Sources*. We see a decreasing pattern over time for all groups in *venture capitalist directors* (the fraction of directors on the board that are venture capitalists) and in

[2] Directors are classified into one of three categories based on background information and relationships with the firm as disclosed in the annual proxy statements. Directors who are chief executive officers, other employees of the company, former employees of the company, or relatives of the firm's managers are deemed "inside" directors. Directors who are commercial or investment bankers, accountants, consultants, attorneys, or have a political or other disclosed affiliation with the firm are considered "gray" directors. All other directors other than venture capitalists (who are given their own director category) are "independent outside" directors.

venture capitalist ownership (the fraction of total equity owned by venture capitalists). These findings are consistent with the fact that venture capital representation is intended to be short-lived. Venture capitalists typically maintain seats on the board long enough to protect their investments in fledgling firms, but their influence decreases over time as they liquidate their positions in the firm.

Although the average percentage of non-venture capitalist board members increases over time and average venture capital board membership decreases over time, *total outside board membership* (the fraction of independent non-venture capitalist and venture capitalist directors) remains remarkably stable (increasing from 41.5% to 42.3%) for the sample as a whole and for each subsample of firms. Gillan et al. (2003) find that the mean percentage of independent board members is 59% for mature firms, while Boone et al. (2004) find that 56.5% of their mixed age IPO firms' board members are outsiders. Thus, firms that are more mature at the time they go public appear to have greater outside board member representation.

Incentive-based pay is the value of the CEO's stock options and restricted stock awards divided by his or her total compensation. We calculate the value of stock options granted during the year using the Black–Scholes (1973) model adjusted for continuously paid dividends. We extract the number of shares underlying the options, the strike price, and the expiration date from proxy statements. We use the weighted average strike price if options were awarded more than once during the year. If the expiration date or the term of the option is not provided, a ten-year maturity is assumed. Total non-incentive-based compensation includes salary, bonus, and the value of other annual or long-term compensation extracted from proxy statements. We find no discernable pattern over time in incentive-based pay.

We categorize large block ownership as affiliated or unaffiliated. Affiliated blockholders disclose ties beyond their ownership interests with the firm. Unaffiliated blockholders are considered outside, or independent, blockholder companies, investment firms, or pension funds. Individual blockholders are often employees or founders of the firm, but they may also include private investors. Our *unaffiliated blockholdings* variable is defined as the fraction of equity owned by unaffiliated, non-venture capitalist blockholders. Like *CEO ownership*, this measure is based on beneficial ownership as reported in the firm's proxy statement for the year and includes outstanding options that are exercisable within 60 days of the record date. We find that unaffiliated block ownership increases over time for the sample as a whole and for both the survivor and acquired firm subsamples.

Overall, the governance trends show that CEO ownership declines after firms go public. Additionally, venture capital representation on the board seems to have a natural tendency to decrease as survivor firms age. However, the potential increases in the agency costs of equity resulting from decreased CEO ownership may be offset by increasingly independent boards of directors and by the monitoring provided by large outside blockholders for firms that do not go bankrupt. Incentive-based pay schemes do not appear to change over time.

4. Model development

4.1. Empirical model

Although it is interesting to observe general governance trends over time, we examine the mechanisms together in a multivariate framework to see how the mechanisms may be

interrelated (Agrawal and Knoeber (1996) also examine the interdependence of governance mechanisms).

The multivariate framework also allows us to control for other factors that may influence governance characteristics and their interrelations, as well as for the potential that governance mechanisms may be endogenously determined. For example, Lehn et al. (2003) use a fixed effects model and show that a majority of the variation in both board size and board structure can be explained by firm size and growth opportunities. In other words, governance components evolve rationally in accordance with the maximization of firm value. Lehn et al. (2003) further note that failing to treat these and other components as endogenous may lead to the establishment of erroneous inferences (e.g., good performance is "caused" by good governance).

To address the endogeneity issue in this paper, we adopt the general approach of Lehn et al. (2003) and Himmelberg et al. (1999) and use a firm-level, fixed effects (i.e., panel) specification. We also use industry-level rather than firm-level fixed effects and report these findings in later in the paper. The fixed effects specification should adequately control for endogeneity problems, although the reliance on within-firm time-series variation to control for relations may raise issues regarding statistical power. For a very thorough overview of the effectiveness of various statistical approaches to combating endogeneity, see Coles et al. (2003). We examine the following four models:

$$\text{Inside ownership} = f(\text{board composition}, \text{unaffiliated blockholder ownership}, \text{compensation structure}, \text{control variables}, \text{time}) \quad (1)$$

$$\text{Board composition} = f(\text{inside ownership}, \text{unaffiliated blockholder ownership}, \text{compensation structure}, \text{control variables}, \text{time}) \quad (2)$$

$$\text{Compensation structure} = f(\text{inside ownership}, \text{board composition}, \text{unaffiliated blockholder ownership}, \text{control variables}, \text{time}) \quad (3)$$

$$\text{Unaffiliated block ownership} = f(\text{inside ownership}, \text{board composition}, \text{compensation structure}, \text{control variables}, \text{time}). \quad (4)$$

We use *CEO ownership* as our measure of inside ownership (Eq. (1)). We have two measures of board composition: the percentage of non-venture capitalist outside board members (*board independence*) and the percentage of venture capitalists on the board (*venture capitalist directors*). Compensation structure is measured by the percentage of incentive-based pay (*incentive-based pay*). Unaffiliated block ownership (*unaffiliated blockholdings*) is the percentage of ownership by 5% and greater blockholders with no ties to the firm. We interpret negative and statistically significant coefficient estimates as evidence that the governance characteristics are substitutes for each other. We interpret positive, statistically significant coefficients as evidence that the governance attributes are complements.

4.2. Common control variables

Factors such as firm size, performance, risk, and asset composition may influence firms' governance characteristics. Therefore, we include as control variables in all models *ROA* (industry-adjusted), *total assets*, *debt ratio* (industry-adjusted), *returns volatility*, *capital intensity* (industry-adjusted), *industry R&D-to-sales*, and year dummy variables (time).

We use industry-adjusted ROA as a proxy for firm performance, but it may also be used to measure the scope for discretionary spending as a proxy for free cash flow.[3] Poor performance within the firm (revealed by low ROA) may be an indication of agency problems requiring greater monitoring. On the other hand free cash flow (indicated by high ROA) may result in excessive perquisite consumption requiring a greater monitoring effort.

We control for firm size using the natural log of total assets. Morck et al. (1988) and McConnell and Servaes (1990) find firm size to be inversely related to firm value (as measured by Tobin's Q). A manager (or any potential blockholder) may find it prohibitively expensive to maintain ownership of a large percentage of his or her firm's shares. Agency costs of equity may increase as firms grow due to a more diffuse ownership structure, difficulty with monitoring managers, or more free cash flow. However, larger firms may hire better managers or may have better internal monitoring or a closer analyst following which may reduce the scope of the moral hazard problem.

Firms that are more highly levered may have a reduced potential for moral hazard because interest payments serve to bond managers to shareholders and/or because debtholders may monitor managerial actions. Also, greater debt commitments may reduce free cash flow (Jensen, 1986). However, levered firms have greater business risk, perhaps resulting in managers pursuing safe investment strategies at the expense of the firm's shareholders.

Beatty and Zajac (1994) suggest that riskier firms rely more heavily on monitoring measures than on incentive-based measures (which add to the overall risk faced by managers) to help control agency problems. In general it is more difficult to monitor risky firms because it is harder to evaluate managerial and firm performance. To minimize personal risk exposure, risk-averse managers may forego value-enhancing strategies that would otherwise benefit shareholders (Agrawal and Mandelker, 1987). We use *returns volatility* as a proxy for managers' human capital risk exposure.

Expenditures on hard capital are observable and therefore may be more easily monitored than expenditures on soft capital (Himmelberg et al., 1999). We use *capital intensity* to measure the observability of managerial spending. Also, Gompers (1995) shows that increased monitoring is needed as capital intensity decreases and as intangible growth opportunities (measured by *industry R&D-to-sales*) increase.

4.3. Model-specific control variables

Measures that may affect CEO ownership (Eq. (1)) include whether the CEO is also a firm founder (*CEO founder*), the length of time that the individual has held the CEO position (*CEO tenure*), and whether there is CEO turnover during the year (*CEO turnover)*. We expect CEO ownership to be higher for CEOs who are firm founders and for CEOs who have been with their firms longer. However, we expect ownership to be negatively related to CEO turnover.

[3] Given that the firms in the sample are young, newly public firms, we also measure performance and capital intensity using industry-adjusted sales (rather than assets). Our results are not sensitive to this alternative specification.

We measure board composition (Eq. (2)) as the percentage of non-venture capitalist independent directors (*board independence*) and as the percentage of *venture capitalist directors*. Board composition may be affected by board size (*number of directors*), the *number of board meetings*, the *number of board committees*, the average number of other directorships held by all directors (*other directorships*), and whether the CEO and Chairman titles are held by separate individuals (*CEO–Chair separation*). It is unclear, ex ante, how many of these variables will be related to board independence; however, each of them has been included in proposals for board reform, including the Business Roundtable Statement on Corporate Governance (1997).

We measure compensation structure (Eq. (3)) using *incentive-based pay.* Incentive compensation may be affected by *CEO age* and *CEO turnover*. For example, an older CEO may not desire and, therefore, may not be motivated by options-based compensation due to a naturally shorter personal planning horizon. Additionally, a change of CEO necessitates a newly negotiated compensation package for the new CEO. Whether the packages for new CEOs typically contain more or less incentive-based compensation is unknown.

In the model for unaffiliated block ownership (Eq. (4)) we include board size (*number of directors*) as a control variable. Consistent with Yermack (1996) larger boards may be less efficient and may require additional monitoring unrelated to board composition. Therefore, we expect firms with larger boards to have a greater percentage of shares owned by unaffiliated large blockholders (*unaffiliated blockholdings*).

5. Results

5.1. Full sample results—governance variables

In Table 3 we provide a summary of the regression results for the full sample of firms. Separate regressions are reported for CEO ownership (Model 1), board independence (Model 2), venture capitalist board membership (Model 3), incentive-based pay (Model 4), and unaffiliated blockholdings (Model 5).[4] We predict a negative relation between *CEO ownership* and each of the other governance variables, supporting the conjecture that these mechanisms compensate for a loss of inside ownership after firms go public.

We find negative, statistically significant relations between *CEO ownership* and both *board independence* (Model 2) and *venture capitalist directors* (Models 1 and 3). These findings suggest that enhanced board independence—whether venture capitalist or non-venture capitalist—serves as a substitute for decreases in management ownership. Similarly, we find that monitoring by venture capitalists through their ownership in the firms is positively related to inside ownership. The results are consistent with Boone et al. (2004), Gillan et al. (2003), and Frye (2003) (except for venture capitalist involvement). The negative relation between CEO ownership and board composition is also consistent with Dahya and McConnell (2005) who find that firms with boards that conform to the UK's independent board guidelines are more likely to appoint outside CEOs (who would initially have lower levels of share ownership).

In Table 3 we show that the relation between *CEO ownership* and *incentive-based pay* (Models 1 and 4) is not significant at conventional levels. This result is not consistent with

[4] Each regression in Table 3 was also run using pooled OLS estimates with standard errors robust to serial correlation and heteroskedasticity. A likelihood ratio test strongly rejects pooling the observations across firms in favor of the fixed-effects specification.

Table 3
Fixed effects regressions for firms that went public between 1979 and 1986 and were under three years old at the time of going public

	Model 1	Model 2[a]	Model 3	Model 4[a]	Model 5
	CEO ownership	Board independence	Venture capitalist directors	Incentive-based pay	Unaffiliated blockholdings
CEO ownership		−0.1736 (.027)*	−0.1540 (.005)**	−0.1490 (.417)	−0.2005 (.003)**
Board independence	−0.0333 (.067)		−0.2176 (.000)***	0.1076 (.228)	0.1459 (.000)***
Venture capitalist directors	−0.0934 (.000)***	−0.4547 (.000)***		0.3824 (.003)**	−0.0793 (.106)
Incentive-based pay	−0.0037 (.633)	0.0214 (.171)	0.0306 (.005)**		−0.0055 (.695)
Unaffiliated blockholdings	−0.0550 (.008)**	0.1652 (.000)***	−0.0595 (.042)*	−0.0169 (.868)	
ROA	0.0189 (.265)	0.0706 (.043)*	−0.0208 (.388)	0.0843 (.313)	−0.0535 (.088)
Total assets	−0.0080 (.021)*	−0.0146 (.059)	−0.0120 (.000)***	0.0186 (.278)	0.0016 (.809)
Debt ratio	0.0445 (.001)***	−0.0369 (.187)	0.0096 (.619)	0.1270 (.056)	0.1039 (.000)***
Returns volatility	−0.0813 (.010)**	0.0771 (.234)	−0.1279 (.004)**	−0.1145 (.460)	0.0048 (.935)
Capital intensity	0.0345 (.116)	0.0074 (.870)	0.0084 (.788)	0.0571 (.599)	−0.0732 (.072)
Industry R&D to sales	−0.0164 (.747)	−0.2983 (.004)**	0.0337 (.641)	0.1356 (.586)	−0.1472 (.117)
CEO founder	0.0221 (.033)*				
CEO tenure	0.0051 (.000)***				
CEO turnover	−0.0185 (.024)*			0.1750 (.000)***	
CEO–Chair separation		−0.0463 (.003)**	−0.0036 (.735)		
Number of directors		0.1016 (.000)***	−0.0241 (.190)		0.0138 (.565)
Number of board meetings		−0.0023 (.256)	0.0009 (.536)		
Number of board committees		0.0215 (.000)***	0.0193 (.000)***		
Other directorships		0.0305 (.003)**	0.0180 (.012)*		
CEO age				−0.0041 (.073)	
N	823	823	823	823	823
Adjusted R^2	.7577	.6652	.7663	.2968	.5528
P-value of *F*-test	0.0001	0.0001	0.0001	0.0001	0.0001

All models include year dummies. A superscript "a" next to the model number indicates that no year dummies are significant. Intercepts are included in the models but are not shown.
P-values are in parentheses (*, **, and *** denote significance at the 5%, 1%, and .1% levels, respectively).
CEO ownership is the fraction of total equity owned by the CEO. *Board independence* is the fraction of independent outside directors on the board. Independent outside directors are directors with no disclosed ties to the firm other than their seat on the board. They include current or retired decision makers at other companies, academics, private investors, and unaffiliated blockholder representatives. *Venture capitalist directors* is the fraction of the directors on the board that are venture capitalists. *Unaffiliated blockholdings* is the fraction of equity owned by all unaffiliated blockholders (excluding venture capitalists). Blockholders are defined as shareholders owning a minimum of 5% equity stake in the firm. *Incentive-based pay* is the fraction of total compensation comprised of equity-based compensation. Equity-based compensation includes the value of stock option grants and restricted stock awards. Stock options are valued using the Black–Scholes model with continuously paid dividends. *ROA* is the 3-year average of operating profit divided by total assets adjusted for the industry median. *Total assets* is the log of the book value of total assets. *Debt ratio* is the book value of long-term liabilities divided by the book value of assets adjusted for the industry median. *Returns volatility* is the standard deviation of monthly stock returns for a given year. *Capital intensity* is the ratio of net fixed assets divided by total assets adjusted for the industry median. *Industry R&D to sales* is the industry average research and development expense to sales ratio. *CEO founder* is an indicator variable equal to one when the CEO is also the founder of the firm. *CEO tenure* is the number of years the CEO has been in his present position as CEO. *CEO turnover* is an indicator variable equal to one if the CEO changes in a given year. *CEO–Chair separation* is an indicator variable equal to one when the positions of chairman and CEO are held by separate individuals. *Number of directors* is the log of the number of individuals serving on the board of directors (board size). *Number of board meetings* is the total number of full board of directors meetings per year as reported in the firm's proxy statement. *Number of board committees* is the number of committees of the board of directors. *Other directorships* is the mean number of outside directorships held by the board of directors in a given year as reported in the firm's proxy statement. *CEO age* is the age of the chief executive officer (CEO).

Mehran (1995) or with Frye (2003) who report that firms with higher inside ownership use less equity-based compensation. However, our finding of a negative relation between *CEO ownership* and *unaffiliated blockholdings* (Models 1 and 5) is consistent with univariate statistics reported by Mikkelson et al. (1997) and regression results reported by Frye (2003). Thus, outside blockholders do appear to provide increased monitoring of managers when CEO ownership declines in the years following the IPO.

In Table 3 we also document that there is an inverse relationship between our two measures of board composition, *board independence* and *venture capitalist directors* (Models 2 and 3). This result suggests that representation by outside board members may increase to offset the decrease in venture capitalist board representation such that, on net, board independence is perhaps maintained.[5] In Models 2 and 5 we show that *unaffiliated blockholdings* is positively related to *board independence* but is negatively related to *venture capitalist directors*. There may also be a mechanical relation between *unaffiliated blockholdings* and *board independence* because blockholders often have representation on the board of directors.

We also find, consistent with Harjoto and Garen (in press), that *unaffiliated blockholdings* is significantly, negatively related to *CEO ownership* (as is *board independence*). Taken together, these results show that unaffiliated blockholdings and non-venture capitalist board independence appear to work together to offset post-IPO decreases in CEO ownership and in board representation by venture capitalists. Finally, we show that the relation between *venture capitalist directors* and *incentive-based pay* is positive (Models 3 and 4). This complementary relation reveals that boards with a greater percentage of venture capitalists are more likely to employ incentive-based pay.

Overall, our univariate and regression evidence reveals that CEO ownership declines following IPOs. However, other external mechanisms such as non-venture capitalist board independence, the presence of venture capitalist directors, and unaffiliated blockholders change in ways that help to mitigate the potential agency problems that stem from the decreases in inside ownership.

5.2. Full sample results—control variables

As revealed in Table 3, industry-adjusted ROA is positively related to *board independence* (Model 2) but is not related to any of the other governance mechanisms. Firm size is negatively related to *CEO ownership* (Model 1) consistent with the idea that as firms become larger it becomes more expensive (in terms of wealth invested and in lost diversification opportunities) for managers to own large blocks of their firms' shares. Firm size is also negatively related to *board independence* (Model 2), suggesting that as firms get larger outside board representation declines (after controlling for board size).

Firms with higher CEO ownership and unaffiliated blockholdings have more leverage (*debt ratio*), suggesting that firms with lower agency costs due to better governance may be able to

[5] We do not mean to imply that there is a one-for-one correspondence between the loss of monitoring provided by a venture capitalist board member and by an outside board member. Naturally, a venture capitalist board member may provide either more or less effective monitoring than another type of independent board member. We also find that the ownership of venture capitalists is negatively related to the fraction of outside board members. Therefore, monitoring provided by outside board members may substitute for venture capital involvement in the firm either though board membership or through share ownership.

carry more debt. This finding is consistent with signaling models that state that higher leverage is an indication of firm quality (such as Ross (1977)).

We find that *returns volatility* is negatively related to *CEO ownership* (Model 1). This finding is consistent with managers seeking to balance the risk of their entire portfolios (including their human capital). We also find that *returns volatility* is significantly, negatively related to *venture capitalist directors* (Model 3). Therefore, riskier firms tend to have less venture capitalist representation on their boards of directors. Additionally, we show in Model 1 that founder CEOs and CEOs with longer tenures hold larger percentages of their firms' shares. On the other hand CEO turnover results in less stock ownership and more incentive-based pay for new CEOs (Model 4).

In Model 2, we document that when the chairman of the board is not the CEO and when the board is large (*number of directors*) the board is more likely to be independent. We also find evidence (Models 2 and 3) that boards with more committees (perhaps indicating more active boards) and with directors having more outside board appointments (perhaps indicating higher quality) are comprised of a greater proportion of independent directors.

In each model a series of year dummy variables is included to control for time-specific trends. Models with no significant year dummy variables (Models 2 and 4) are identified in Table 3 with a superscript "a" placed next to the model number. Both CEO ownership and the proportion of venture capitalist directors seem to have been generally increasing during the years 1980 through 1986. Unaffiliated blockholdings, on the other hand, experience a general negative trend during the 1980s.

5.3. Survivor, acquired, and bankrupt firm results

Kole and Lehn (1998) show that firm survival in the airline industry is influenced by the ability to adapt governance structure to environmental changes (in their case the regulatory environment). Also, our evidence from the univariate trend analysis (Table 2) reveals that differences in the pattern of governance evolution may exist and may be related to firm fate. Therefore, we partition the regression analysis based on the fate of the company within eleven years after the IPO year and present the results in Tables 4–6.

In Table 4 we present results for the 53 firms that continue to operate independently through the end of the sample period. Most of the relationships we detect for the full sample hold for the independent survivor sample as well. Most notably, we find that venture capitalist directors and unaffiliated block ownership appear to substitute for CEO ownership. However, non-venture capitalist board independence is no longer significant in Model 2. Again we find that *board independence* is significantly, negatively related to *venture capitalist directors*. That is, as venture capital board representation declines other outside board representation increases. We also find that *incentive-based pay* is positively related to *venture capitalist directors* and is negatively related to *unaffiliated blockholdings.* Taken together these results show that firms with greater venture capitalist presence on the board and fewer unaffiliated block owners tend to have more equity-based pay. Finally, we find that there is no significant relation between *board independence* and *unaffiliated blockholdings*.

In Table 5 we present the results for the 42 firms that were acquired within 11 years of their IPOs. The only statistically significant relationship for the acquired firms is the negative relation between *board independence* and *venture capitalist directors*. This result suggests that when venture capitalist board representation decreases, the fraction of outside directors increases in order to maintain board independence. However, neither of the mechanisms substitutes for

Table 4
Fixed effects regressions for young firms that survived for 11 years after going public between 1979 and 1986

	Model 1[a]	Model 2[a]	Model 3	Model 4[a]	Model 5
	CEO ownership	Board independence	Venture capitalist directors	Incentive-based pay	Unaffiliated blockholdings
CEO ownership		−0.0967 (.358)	−0.2778 (.000)***	−0.1072 (.673)	−0.3016 (.000)***
Board independence	−0.0162 (.375)		−0.2116 (.000)***	0.1669 (.115)	0.0566 (.077)
Venture capitalist directors	−0.1216 (.000)***	−0.5010 (.000)***		0.3839 (.021)*	−0.1970 (.000)***
Incentive-based pay	−0.0024 (.751)	(0.0380) (.034)*	0.0300 (.010)**		0.0019 (.883)
Unaffiliated blockholdings	−0.1056 (.000)***	0.0825 (.176)	−0.1662 (.000)***	0.0852 (.571)	
ROA	0.0064 (.704)	0.0874 (.031)*	−0.0337 (.201)	0.1014 (.304)	−0.0245 (.401)
Total assets	−0.0171 (.000)***	−0.0194 (.025)*	−0.0227 (.000)***	0.0092 (.646)	0.0071 (.249)
Debt ratio	0.0109 (.414)	−0.0076 (.818)	0.0058 (.785)	0.1327 (.093)	0.0741 (.002)**
Returns volatility	−0.0466 (.129)	0.0608 (.406)	−0.1486 (.002)**	−0.1059 (.557)	−0.0031 (.954)
Capital intensity	0.0860 (.000)***	0.0247 (.677)	0.0194 (.616)	−0.1023 (.485)	0.0229 (.599)
Industry R&D to sales	−0.0414 (.361)	−0.2496 (.022)*	−0.0134 (.850)	0.1323 (.617)	−0.1787 (.025)*
CEO founder	0.0409 (.000)***				
CEO tenure	0.0043 (.000)***				
CEO turnover	−0.0147 (.087)			0.2261 (.000)***	
CEO–Chair separation		−0.0858 (.000)***	−0.0217 (.077)		
Number of directors		0.0762 (.023)*	−0.0411 (.059)		0.0149 (.545)
Number of board meetings		−0.0012 (.661)	−0.0016 (.376)		
Number of board committees		0.0388 (.000)***	0.0290 (0.000)***		
Other directorships		0.0241 (.040)*	0.0093 (0.223)		
CEO age				−0.0052 (.080)	
N	572	572	572	572	572
Adjusted R^2	.7370	.6892	.7884	.2809	.4584
P-value of *F*-test	0.0001	0.0001	0.0001	0.0001	0.0001

All models include year dummies. A superscript "a" next to the model number indicates that no year dummies are significant. Intercept terms are included in the models but they are not shown.
P-values are in parentheses (*, **, and *** denote significance at the 5%, 1%, and .1% levels, respectively).
CEO ownership is the fraction of total equity owned by the CEO. *Board independence* is the fraction of independent outside directors on the board. Independent outside directors are directors with no disclosed ties to the firm other than their seat on the board. They include current or retired decision makers at other companies, academics, private investors, and unaffiliated blockholder representatives. *Venture capitalist directors* is the fraction of the directors on the board that are venture capitalists. *Unaffiliated blockholdings* is the fraction of equity owned by all unaffiliated blockholders (excluding venture capitalists). Blockholders are defined as shareholders owning a minimum of 5% equity stake in the firm. *Incentive-based pay* is the fraction of total compensation comprised of equity-based compensation. Equity-based compensation includes the value of stock option grants and restricted stock awards. Stock options are valued using the Black–Scholes model with continuously paid dividends. *ROA* is the 3-year average of operating profit divided by total assets adjusted for the industry median. *Total assets* is the log of the book value of total assets. *Debt ratio* is the book value of long-term liabilities divided by the book value of assets adjusted for the industry median. *Returns volatility* is the standard deviation of monthly stock returns for a given year. *Capital intensity* is the ratio of net fixed assets divided by total assets adjusted for the industry median. *Industry R&D to sales* is the industry average research and development expense to sales ratio. *CEO founder* is an indicator variable equal to one when the CEO is also the founder of the firm. *CEO tenure* is the number of years the CEO has been in his present position as CEO. *CEO turnover* is an indicator variable equal to one if the CEO changes in a given year. *CEO–Chair separation* is an indicator variable equal to one when the positions of chairman and CEO are held by separate individuals. *Number of directors* is the log of the number of individuals serving on the board of directors (board size). *Number of board meetings* is the total number of full board of directors meetings per year as reported in the firm's proxy statement. *Number of board committees* is the number of committees of the board of directors. *Other directorships* is the mean number of outside directorships held by the board of directors in a given year as reported in the firm's proxy statement. *CEO age* is the age of the chief executive officer (CEO).

Table 5
Fixed effects regressions for young firms that were acquired within 11 years of going public between 1979 and 1986

	Model 1[a]	Model 2	Model 3[a]	Model 4[a]	Model 5
	CEO ownership	Board independence	Venture capitalist directors	Incentive-based pay	Unaffiliated blockholdings
CEO ownership		−0.1278 (.329)	0.1167 (.244)	−0.1796 (.573)	−0.0039 (.980)
Board independence	−0.1220 (.074)		−0.2610 (.000)***	−0.4614 (.067)	0.1520 (.206)
Venture capitalist directors	−0.1397 (.101)	−0.4448 (.000)***		0.0523 (.872)	0.1493 (.302)
Incentive-based pay	−0.0128 (.615)	−0.0558 (.106)	−0.0053 (.843)		0.0311 (.481)
Unaffiliated blockholdings	−0.0398 (.457)	0.0973 (.175)	0.0934 (.089)	0.1378 (.461)	
ROA	0.1538 (.008)**	−0.0607 (.369)	−0.0907 (.116)	0.1950 (.337)	−0.1419 (.148)
Total assets	0.0004 (.974)	0.0102 (.566)	−0.0169 (.215)	0.0549 (.196)	0.0053 (.809)
Debt ratio	0.4302 (.001)***	−0.0459 (.438)	−0.0092 (.840)	0.0774 (.614)	0.1846 (0.12)*
Returns volatility	−0.1374 (.362)	0.4197 (.031)*	0.0210 (.889)	0.1547 (.770)	0.2833 (.267)
Capital intensity	0.0373 (.598)	−0.0372 (.688)	0.0420 (.554)	0.0557 (.823)	−0.1705 (.153)
Industry R&D to sales	0.4380 (.451)	1.2403 (.108)	−0.2876 (.629)	2.7961 (.172)	1.2078 (.226)
CEO founder	0.0887 (.002)**				
CEO tenure	−0.0086 (.105)				
CEO turnover	−0.0272 (.235)			0.0454 (.519)	
CEO–Chair separation		0.0353 (.235)	0.0352 (.121)		
Number of directors		0.0084 (.883)	0.0124 (.776)		−0.0377 (.602)
Number of board meetings		−0.0022 (.594)	0.0011 (.718)		
Number of board committees		−0.0046 (.663)	−0.0057 (0.484)		
Other directorships		0.0344 (.213)	0.0879 (0.000)***		
CEO age				−0.0048 (.259)	
N	186	186	186	186	186
Adjusted R^2	.7567	.6420	.8301	.3061	.7128
P-value of *F*-test	0.0001	0.0001	0.0001	0.0001	0.0001

All models include year dummies. A superscript "a" next to the model number indicates that no year dummies are significant. Intercept terms are included but they are not shown.
P-values are in parentheses (*, **, and *** denote significance at the 5%, 1%, and .1% levels, respectively).
CEO ownership is the fraction of total equity owned by the CEO. *Board independence* is the fraction of independent outside directors on the board. Independent outside directors are directors with no disclosed ties to the firm other than their seat on the board. They include current or retired decision makers at other companies, academics, private investors, and unaffiliated blockholder representatives. *Venture capitalist directors* is the fraction of the directors on the board that are venture capitalists. *Unaffiliated blockholdings* is the fraction of equity owned by all unaffiliated blockholders (excluding venture capitalists). Blockholders are defined as shareholders owning a minimum of 5% equity stake in the firm. *Incentive-based pay* is the fraction of total compensation comprised of equity-based compensation. Equity-based compensation includes the value of stock option grants and restricted stock awards. Stock options are valued using the Black–Scholes model with continuously paid dividends. *ROA* is the 3-year average of operating profit divided by total assets adjusted for the industry median. *Total assets* is the log of the book value of total assets. *Debt ratio* is the book value of long-term liabilities divided by the book value of assets adjusted for the industry median. *Returns volatility* is the standard deviation of monthly stock returns for a given year. *Capital intensity* is the ratio of net fixed assets divided by total assets adjusted for the industry median. *Industry R&D to sales* is the industry average research and development expense to sales ratio. *CEO founder* is an indicator variable equal to one when the CEO is also the founder of the firm. *CEO tenure* is the number of years the CEO has been in his present position as CEO. *CEO turnover* is an indicator variable equal to one if the CEO changes in a given year. *CEO–Chair separation* is an indicator variable equal to one when the positions of chairman and CEO are held by separate individuals. *Number of directors* is the log of the number of individuals serving on the board of directors (board size). *Number of board meetings* is the total number of full board of directors meetings per year as reported in the firm's proxy statement. *Number of board committees* is the number of committees of the board of directors. *Other directorships* is the mean number of outside directorships held by the board of directors in a given year as reported in the firm's proxy statement. *CEO age* is the age of the chief executive officer (CEO).

Table 6
Fixed effects regressions for young firms that went bankrupt within 11 years of going public between 1979 and 1986

	Model 1	Model 2[a]	Model 3[a]	Model 4[a]	Model 5[a]
	CEO ownership	Board independence	Venture capitalist directors	Incentive-based pay	Unaffiliated blockholdings
CEO ownership		0.3153 (.183)	−0.0601 (.831)	0.4866 (.398)	−0.1299 (.711)
Board independence	0.1459 (.249)		−0.0832 (.729)	0.3151 (.306)	0.7413 (.011)*
Venture capitalist directors	−0.0852 (.637)	−0.0611 (.729)		0.3927 (.280)	0.2349 (.423)
Incentive-based pay	0.0464 (.528)	0.1041 (.375)	0.0988 (.472)		−0.1021 (.534)
Unaffiliated blockholdings	−0.0165 (.852)	0.0229 (.850)	−0.0349 (.805)	−0.1451 (.536)	
ROA	0.2067 (.077)	−0.2860 (.068)	0.2210 (.236)	−0.0057 (.985)	−0.0862 (.731)
Total assets	−0.0277 (.309)	0.0102 (.758)	−0.0063 (.871)	0.0321 (.643)	−0.0808 (.126)
Debt ratio	0.1211 (.249)	−0.1087 (.396)	0.1086 (.469)	−0.2305 (.412)	0.2397 (.289)
Returns volatility	0.0318 (.868)	−0.0649 (.757)	0.0058 (.981)	0.4684 (.371)	−0.2180 (.551)
Capital intensity	−0.0658 (.428)	0.1218 (.227)	−0.0620 (.603)	0.5558 (.009)**	0.0439 (.807)
Industry R&D to sales	1.4762 (.291)	−3.1948 (.111)	2.5544 (.282)	7.3191 (.052)	−0.6133 (.847)
CEO founder	−0.5283 (.007)**				
CEO tenure	0.0645 (.003)**				
CEO turnover	0.0908 (.184)			−0.1490 (.345)	
CEO–Chair separation		0.0301 (.623)	0.0038 (.957)		
Number of directors		0.1562 (.016)*	−0.0792 (.321)		−0.0909 (.464)
Number of board meetings		0.0014 (.658)	0.0061 (.099)		
Number of board committees		0.0030 (.898)	0.0423 (0.112)		
Other directorships		0.2137 (.005)**	0.0495 (.606)		
CEO age				−0.0206 (.142)	
N	65	65	65	65	65
Adjusted R^2	.7909	.8376	.5132	.6514	.3615
P-value of *F*-test	0.0001	0.0001	0.0001	0.0001	0.0302

All models include year dummies. A superscript "a" next to the model number indicates that no year dummies are significant. Intercept terms are included but they are not shown.
P-values are in parentheses (*, **, and *** denote significance at the 5%, 1%, and .1% levels, respectively).
CEO ownership is the fraction of total equity owned by the CEO. *Board independence* is the fraction of independent outside directors on the board. Independent outside directors are directors with no disclosed ties to the firm other than their seat on the board. They include current or retired decision makers at other companies, academics, private investors, and unaffiliated blockholder representatives. *Venture capitalist directors* is the fraction of the directors on the board that are venture capitalists. *Unaffiliated blockholdings* is the fraction of equity owned by all unaffiliated blockholders (excluding venture capitalists). Blockholders are defined as shareholders owning a minimum of 5% equity stake in the firm. *Incentive-based pay* is the fraction of total compensation comprised of equity-based compensation. Equity-based compensation includes the value of stock option grants and restricted stock awards. Stock options are valued using the Black–Scholes model with continuously paid dividends. *ROA* is the 3-year average of operating profit divided by total assets adjusted for the industry median. *Total assets* is the log of the book value of total assets. *Debt ratio* is the book value of long-term liabilities divided by the book value of assets adjusted for the industry median. *Returns volatility* is the standard deviation of monthly stock returns for a given year. *Capital intensity* is the ratio of net fixed assets divided by total assets adjusted for the industry median. *Industry R&D to sales* is the industry average research and development expense to sales ratio. *CEO founder* is an indicator variable equal to one when the CEO is also the founder of the firm. *CEO tenure* is the number of years the CEO has been in his present position as CEO. *CEO turnover* is an indicator variable equal to one if the CEO changes in a given year. *CEO–Chair separation* is an indicator variable equal to one when the positions of chairman and CEO are held by separate individuals. *Number of directors* is the log of the number of individuals serving on the board of directors (board size). *Number of board meetings* is the total number of full board of directors meetings per year as reported in the firm's proxy statement. *Number of board committees* is the number of committees of the board of directors. *Other directorships* is the mean number of outside directorships held by the board of directors in a given year as reported in the firm's proxy statement. *CEO age* is the age of the chief executive officer (CEO).

decreased CEO ownership following the firms' IPOs. For these firms the market for corporate control (as a governance mechanism) may be substituting for the lack of post-IPO changes in board composition, unaffiliated block ownership, and equity-based pay.

In Table 6 we provide the results of the analysis for the bankrupt sample. In model 5 we show that *unaffiliated blockholdings* is positively related to *board independence*. Otherwise, none of the previously mentioned interrelations between governance mechanisms is identified for this subsample. Although we find that CEO ownership declines over time following IPOs, neither board independence, nor compensation structure, nor unaffiliated block ownership increase to prevent an increase in the agency costs of equity. Our results must be interpreted with caution given that we base the analysis on 65 firm-years of data. However, it is interesting to note that firms with fates that would typically be viewed negatively do not have the same governance mechanism interrelations found in other, more "successful" firms.

The models presented in Tables 4–6 include year dummy variables. None of the subsamples exhibit the positive early-to-mid-1980s trend in CEO ownership experienced by the full sample. In fact the bankrupt group has consistently decreasing CEO ownership in almost every year (Model 1, Table 6). The only other model with more than three significant year dummy variables is Model 3 in Table 4. The trend revealed in that model for survivors mirrors the trend identified for the entire sample. In particular we find that venture capital board representation increases in the 1980s.

5.4. Industry controls

Gillan et al. (2003) provide a compelling analysis that demonstrates that governance characteristics are greatly influenced by industry factors. They examine three broad sets of governance choices (board structure, charter provisions, and state of incorporation) and find that these vary greatly by industry. Additionally, Boone et al. (2004) analyze many of the individual mechanisms we examine using industry-level rather than firm-level effects models to control for endogeneity.[6] Models 1–5 reported in Tables 3–6 use many control variables that have been adjusted for the median industry levels of those variables. However, such adjustments may inadequately account for industry factors. As a result we estimate all of our models using industry-level rather than firm-level fixed effects to control for endogeneity (and industry effects). The results are qualitatively unchanged with the exception that in some models *incentive-based pay* becomes significant.

6. Conclusions

Agency costs of equity have the potential to increase significantly after firms are taken public if going public results in a decrease in managerial stock ownership. The numerous internal and external governance alternatives that exist suggest that governance mechanisms may work in tandem to mitigate the agency costs of equity that arise when managerial ownership declines. The purpose of this paper is first to confirm the finding of previous researchers that CEO ownership declines following IPOs. Second, we seek to determine whether compensation

[6] Boone et al. (2004) use Fama-French industry classifications for their fixed effects models to control for endogeneity. They find that using COMPUSTAT industry definitions rather than Fama-French classifications and omitting industry controls entirely leave their results qualitatively unaffected. Our industry classifications are based on COMPUSTAT and our 109 firms fall into 25 different industry groups.

structure, board independence, and/or outside block ownership change over time and are interrelated in ways that compensate for decreases in post-IPO managerial ownership. We examine these same interrelations for three subsamples of firms: those that remain independent, those that are acquired, and those that file for bankruptcy.

We find that managerial ownership declines after firms go public. We also find that venture capital board membership, non-venture capital board independence, and unaffiliated block ownership increase as CEO ownership decreases following IPOs. As venture capital participation begins to decrease over time, however, non-venture capitalist outside board membership increases, potentially allowing board independence to be maintained. Finally, we find that most of the governance adaptations following IPOs occur only for firms that survive as independent entities.

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