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Voluntary and mandatory skin in the game: understanding outside directors' stock holdings

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We examine the determinants of equity ownership by outside directors as well as the relationship between ownership and operating performance. Unlike previous studies of equity ownership by directors, we use hand-collected data on firm-level policies requiring director ownership for S&P 500 firms during the years 2003 and 2005. Ownership requirements allow us to shed further light on the determinants of director holdings and to separate voluntary from mandatory holdings of directors. If ownership requirements reflect optimal ownership levels (from the firm's perspective), they provide a useful identification tool in the examination of ownership–performance relationships. Our primary findings are that mandatory holdings are unrelated to future performance; this is consistent with the theory that ownership requirements reflect optimal ownership levels. By contrast, voluntary holdings are positively and significantly related to future performance, suggesting that they perform an incentivizing role for directors.

Keywords: director stockholdings; equity ownership requirements; corporate governance; ownership and performance

JEL Classification Codes: G30; G34

1. Introduction

In a recent paper, Bhagat, Bolton, and Romano (2008) highlight the role of common stock held by corporate board members (director ownership) in the current corporate governance debate. They find significant positive relations between *total* director ownership and both firm performance and effective monitoring of managers. These findings lead to two interesting questions: (1) should outside directors have *mandatory* financial stakes (via stock ownership) in the performance of the firms that they monitor and counsel? (2) What determines mandatory and voluntary director ownership levels?

In the aftermath of the scandals of 2001–2002 and increased regulations imposed by Sarbanes–Oxley, many firms have turned to additional firm-level governance mechanisms designed to improve incentive alignment.[1] Some of these policies have included the introduction of director and executive equity ownership requirements. These requirements provide a useful setting for examining both the determinants of director ownership and the relationship between ownership levels and firm performance.

This paper begins with an examination of the determinants of mandatory ownership requirements, as well as actual equity holdings of outside directors in the 3 years immediately following Sarbanes–Oxley. We find that mandatory ownership requirements are more common in large firms

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and in those with a greater frequency of anti-takeover provisions. We also find that these policies impact actual holdings in 2005 but not during 2003. The results for 2005 may be due to a trend of increased enforcement, and perhaps greater board sensitivity to these requirements during the post-Sarbanes–Oxley period (Duchin, Matsusaka, and Ozbas 2010).[2]

In the second part of the analysis, we document the relationship between actual director holdings and future performance. We find that director holdings predict year-ahead performance (measured as return on assets (ROA) and, for robustness, Tobin's *Q*), for both the 2003 and 2005 cross-sectional samples. The challenge in interpreting this empirical result is analogous to Demsetz's (1983) critique of the managerial ownership and company performance literature. Demsetz notes that most of the corporate governance literature focuses on the manager–shareholder agency costs of diffuse share ownership. He argues that since we observe many successful public companies with diffuse share ownership, clearly there must be offsetting benefits, for example, better risk-sharing. He further argues that if observed ownership levels reflect equilibrium outcomes, then observed correlations between managerial ownership levels and corporate performance are spurious.

We address the Demsetz critique in the third stage of the analysis where we use the hand-collected data on director ownership policies at all S&P 500 firms for the years 2003 and 2005 to explicitly control for mandated ownership levels. Under the maintained hypothesis that ownership *requirements* reflect *optimal* ownership levels (from the perspective of firms), they provide a useful *identification tool* in the examination of ownership–performance relationships. Mandatory holdings allow us to identify the impact of 'out of equilibrium' holdings. We find that mandatory holdings are not related to future performance; this result is consistent with the above maintained hypothesis – that ownership requirements reflect optimal ownership levels. More importantly, we find that voluntary holdings are positively and significantly related to future performance.[3] This result provides evidence of a link between actual director holdings and performance.

The remainder of the paper is organized as follows. Section 2 motivates why stock ownership by board members might matter. Section 3 describes the sample and data construction. Section 4 analyses the determinants of mandatory and voluntary equity ownership by outside directors. Section 5 examines the links between holdings and performance. The final section concludes with a summary.

2. Board ownership

Berle and Means (1932), in their classic book *The modern corporation and private property*, describe the phenomenon of the domination of the large public corporation by professional management as the separation of ownership and control. The firm's nominal owners, the shareholders in such companies, exercised virtually no control over either day-to-day operations or long-term policy. Instead, control was placed in the hands of professional managers who typically owned only a very small portion of the firm's shares. One consequence of this phenomenon identified by Berle and Means was the filling of board seats with individuals selected not from the shareholding ranks, but chosen instead because of some prior relationship with management. Boards were comprised either of the managers themselves (the inside directors) or associates of the managers, not otherwise employed by or affiliated with the enterprise (the outside or non-management directors). This new breed of outside director often had little or no shareholding interest in the enterprise and, as such, no longer represented their own personal financial stakes or those of the other shareholders in rendering board service. However, as the shareholders' legal fiduciaries, the outside directors

were still expected to expend independent time and effort in their roles, and, consequently, it began to be recognized that they should be compensated directly for their activities.

The consequence of this shift in the composition of the board was to exacerbate the potential agency problem inherent in the corporate form. Without the direct economic incentive of substantial stock ownership, directors, given a natural loyalty to their appointing party and the substantial reputation enhancement and monetary compensation board service came to entail, had little incentive other than their legal fiduciary duties to engage in active managerial oversight. It may also be argued that the cash compensation received for board service may have actually acted as a disincentive for active management monitoring, given management control over the director appointment and retention process.

Since the identification of this phenomenon, both legal and finance theorists have struggled to formulate effective solutions. Numerous legal reforms have been proposed, often involving acts such as the creation of the professional 'independent director', the development of strengthened board fiduciary duties, or the stimulation of effective institutional shareholder activism. Much of this seems to have proven ineffective, as the recent corporate scandals suggest. Yet the solution may be simple and obvious. Traditionally, directors, as large shareholders, had a powerful personal incentive to exercise effective oversight. It was the equity ownership that created an effective agency. Making directors substantial shareholders can recreate this powerful monitoring incentive. This is the theoretical underpinning behind the current movement towards equity-based compensation for corporate directors. Underpinning this theory, however, is the assumption that equity ownership by directors does, in fact, create more active monitoring. Bhagat, Bolton, and Romano (2008) study the link between significant outside director stock ownership, effective monitoring and firm performance and find evidence consistent with a positive role for director stock ownership.

The primary responsibility of the corporate board of directors is to engage, monitor, and, when necessary, replace company management. The central criticism of many modern public company boards has been their failure to engage in the kind of active management oversight that results in more effective corporate performance. It has been suggested that substantial equity ownership by the outside directors creates a personal incentive to actively monitor. An integral part of the monitoring process is the replacement of the CEO when circumstances warrant. An active, non-management-obligated board will presumably make the necessary change sooner rather than later, as a poorly performing management team creates more harm to the overall enterprise the longer it is in place. On the other hand, a management-dominated board, because of its loyalty to the company executives, will take much longer to replace a poor performing management team because of strong loyalty ties. Consequently, it may be argued that companies where the CEO is replaced promptly in times of poor performance may have more active and effective monitoring boards than those companies where ineffective CEO remain in office for longer periods of time. Bhagat and Bolton (2008) find that when directors own a greater dollar amount of stock, they are more likely to replace the CEO of a company performing poorly. Given these findings, it is natural to ask what factors lead to higher director holdings and, beyond the impact on CEO turnover, whether ownership has an impact on overall firm performance.

3. Data description

3.1 *Mandatory and voluntary ownership*

We use *hand-collected* data on director ownership policies for the years 2003 and 2005.[4] This information is obtained from proxy statements for the years 2003–2006[5] for all firms in the S&P

500 as of 31 December 2005. Most of the proxy statements are dated within 3 months after calendar year end. The analysis assumes that the policy as of the proxy statement date reflects guidelines in place during the past year unless the proxy states otherwise (e.g. policy is new and introduced at a particular date, in which case the policy as of the year $t-1$ proxy is used). Policies are included when they are in place for more than half of the calendar year prior to the date of the proxy statement. We exclude firms for which proxy statements are unavailable (typically due to merger and acquisition activity). There are 463 firms in the 2003 sample and 481 firms in the 2005 sample.

The ownership guidelines are typically found in the 'Corporate Governance' or 'Board of Directors' subsections of the proxy statements. The search terms used to identify holdings policies are: 'stock ownership', 'ownership guidelines', and 'ownership'. Whenever guidelines were not

Table 1. Examples of 10 S&P 500 firms with director ownership guidelines (2005).

Company	Guideline	Time horizon	Notes
3M	2× annual retainer	Within 3 years	
Abbott Labs	5000 shares	Within 5 years	Includes restricted units
ADC Telecommunications	Directors are encouraged to own stock of the Company to align more closely their interest with those of the shareholders in general		Does not fall under ownership requirement definition used in this paper because ownership is 'encouraged' (not required)
Adobe Systems	5000 shares	Within 2 years: Requirement is '25% of net shares acquired from Adobe for 2 years unless, following the sale of such shares, his/her total shares exceeds 5000'	
AES Corp	10,000 units		Includes options, stock, or restricted units. Dollar value calculated is based on stock ownership
Aetna	Value equal to $400,000	Met within 5 years of appointment	
Affiliated Computer	Class A stocks with value equal to min 3× annual retainer	Met within 3 years for all directors; new directors within 5 years.	
Agilent Techonolgies	Value of 3× annual cash retainer		
Alberto Culver	At least $100,000 in common stock		
Alcoa	At least 10,000 shares		

found by the simple document search, the documents were reviewed by hand. One important caveat is that disclosure of ownership policies is not required; however, there is little reason for us to believe that firms have strong incentives to hide them from their investors. The fact that so many firms voluntarily disclose suggests that the information is believed to be valuable to shareholders. Moreover, unless the links among holdings, requirements and performance vary systematically with firms' decisions to report their policies, any omissions would not impact the estimated coefficients.

Policies mandating director ownership take several forms such as: retainer multiples (most common), dollar requirements, share requirements, multiples of shares or cash awarded as compensation, and multiples of exercised options. Examples of these policies can be found in Table 1. The examples are based on first 10 firms (based on the S&P 500 list, sorted alphabetically) for

Table 2. Summary statistics.

	2003			2005		
	Mean	Median	Standard deviation	Mean	Median	Standard deviation
Director Holdings and Ownership Requirements						
Median Director Holdings ($000)	1993.5	959.5	3631.5	2985.4	1172.3	10883.0
Median Director Holdings/Cash Retainer	64.740	24.915	138.630	64.080	25.440	225.986
Director Ownership Requirements Dummy	0.352	0.000	0.478	0.622	1.000	0.485
Executive Ownership Requirements Dummy	0.419	0.000	0.494	0.624	1.000	0.485
Ownership Requirement (multiple of retainer)	2.302	0.000	4.575	4.142	3.000	5.905
Cash Retainer ($)	36,663	35,000	19,103	46,881	45,000	22,387
Performance and firm characteristics						
ROA_{t+1}	0.136	0.132	0.081	0.144	0.131	0.093
$Capex/Assets_{t+1}$	0.039	0.031	0.033	0.045	0.036	0.044
Sales (log $M)	8.724	8.709	1.209	8.947	8.929	1.183
Q	2.104	1.638	1.282	2.072	1.675	1.281
Standard Dev Returns	0.020	0.018	0.008	0.015	0.014	0.005
G-Index	9.837	10.000	2.504	9.644	10.000	2.489
CEO Pay Slice	0.438	0.405	0.157	0.413	0.393	0.145
Number of observations	463			481		

Notes: This table provides the summary statistics of ownership requirements for the sample of S&P 500 firms during the years 2003 and 2005. Median Director Holdings are the median dollar value holdings of all of a given firm's outside directors during year *t*, as reported in ExecuComp. The Cash Retainer is the annual cash retainer, as reported in ExecuComp. Director (Executive) Ownership Requirements Dummy is an indicator variable equal to one if the firm reports a director (executive) ownership requirement in its proxy statement. Ownership Requirement is dollar ownership requirement, divided by the annual cash retainer. Firm performance and characteristics are: ROA, defined as earnings before interest, depreciation and taxes, divided by total assets; Capex/Assets, defined as capital expenditures divided by total assets; Sales, defined as the natural log of total revenue in millions of dollars; *Q*, defined as equity market capitalization plus the book value of assets minus the book value of common equity divided by the book value of assets; and Standard Dev Returns, the standard deviation of daily stock returns. Corporate governance measures are the *G*-Index (see Gompers, Ishii, and Metrick 2003) and CEO Pay Slice, defined as the ratio of CEO pay to the pay of the firm's top 5 executives.

which policies were identified in the 2005 sample period. There are some companies for which ownership is 'encouraged' (but not required). Those firms are considered not to have a policy. In the cases in which policies vary by director tenure, we take the policy for a first-year director to be the relevant policy.

All ownership requirements are transformed to a common measure: *Requirement*, equal to the dollar value of required holdings.[6] One might be concerned that ownership requirements are small relative to directors' wealth; however, recent findings reveal that directors respond to monetary incentives as small as $1000.[7]

To our knowledge, these data on mandatory director holdings are unique. Core and Larcker (2002) also examine mandatory holdings policies, but there are two important differences between their data and ours. First, they collect data on target ownership levels for executives. Our focus is instead on required holdings by outside directors. Second, our sample is based on all the S&P 500 companies, whereas Core and Larcker examine firms that announced the introduction of policies and changes to their policies. This allows them to identify changes in ownership policies, but not levels of ownership implied by these policies.

Table 3. Ownership requirements.

	2003			2005		
	Number of firms	Mean requirement	Median requirement	Number of firms	Mean requirement	Median requirement
Multiple of Retainer Requirement	75	3.57	3	127	3.66	3
Multiple of Cash Retainer Requirement	14	4	5	50	4.08	5
Share Ownership Requirement ('000 shares)	50	5.46	5	83	7.13	5
Dollar Value of Holdings Requirement ($'000)	15	$130.5	$100	33	$199.5	$200
Multiple of Shares Received as Compensation	9	1.89	1	14	2.29	1
Multiple of Total Director Compensation	3	1	1	4	1	1
Other Policy	30			17		

Notes: This table provides a summary of stock ownership requirements for the S&P 500 firms that disclosed a policy during the years 2003 and 2005. Multiple of Retainer Requirement is defined as a policy requiring directors to hold a multiple of *X* times their annual retainer. Multiple of Cash Retainer Requirement is a policy requiring directors to hold a multiple *X* times their annual cash retainer. Share Requirement is given in thousands of shares and indicates a policy requiring directors to own a fixed number of shares. Dollar Value of Holdings Requirement indicates a policy requiring directors to hold a fixed dollar value of shares in the firm. Multiple of Shares Received as Compensation requires directors to hold a multiple of shares that they receive as compensation. Multiple of Total Director Compensation requires directors to hold a multiple of their total annual compensation. Other Policy relates to options holdings, caps on holding requirements and requirements that govern accumulated holdings (over multiple years). The sum of the 'number of firms' column, indicating the number of firms with each type of policy, is greater than the total number of firms with ownership policies due to cases in which there exist multiple policies for a single firm.

Table 2 provides summary statistics of the data on actual equity ownership by directors. These data are from IRRC. All analysis is based on the median value of holdings by all outside directors in a given firm. It can be seen from Table 2 that directors own substantial equity stakes. In 2003, the average director holdings were $1,993,571. In 2005, holdings were $2,985,448. Recent evidence of holdings for directors in the mutual fund industry (Chen, Goldstein, and Jiang 2008) also suggests substantial director ownership. The table also reveals that mandatory policies are common, with requirements in 35.2% of firms in 2003 and in 62.2% of firms in 2005. One advantage of examining two time periods is that we are able to observe the striking shift towards the adoption of mandatory ownership policies. In 2003, firms were required to hold an average of 2.3 times their annual retainers. In 2005, that multiple increased to 4.1.

An important concern is the possibility that firms adopt policies based on 'one-size-fits-all' guidelines from corporate governance consulting firms. However, this does not appear to be the case, given the data in Table 2. The standard deviation of the ownership requirement is about twice the mean in 2003 and 1.25 times the mean in 2005. We do, however, observe a trend towards increased policy adoption and overall increases in required holdings during our sample period. Table 3 provides additional descriptive statistics on firms with ownership requirement policies and also reveals substantial variation in the types of policies adopted.

3.2 *Firm characteristics*

Summary statistics on firm characteristics and performance measures are also presented in Table 2. Firm characteristics and performance variables (ROA, sales, and *Q*) are from *COMPUSTAT*. Equity returns data are from *CRSP*. The *G-Index*, a summary of 24 [anti-]governance measures (from Gompers, Ishii, and Metrick 2003), is from IRRC.

Table 4. Ownership requirement policies (LOGIT).

	LOGIT: Dep. var. = Ownership Requirement (0,1)	
	Coeff. est.	Pr > ChiSq
Q	−0.047	0.533
Sales	0.280***	0.000
Standard Dev Returns	−37.667	0.479
Lag Returns	0.526*	0.094
Return Volatility	348.000	0.756
CEO Pay Slice	0.480	0.367
G-Index	0.130***	0.000
Year_2005	1.001***	<.0001
Number of observations	901	
Wald test of global null	134.48***	<.0001

Notes: This table presents LOGIT regression estimates in which the dependent variable is an indicator equal to 1 if the firm has a director ownership requirement. Explanatory variables are: *Q*, defined as equity market capitalization, plus the book value of assets, minus the book value of common equity, divided by the book value of assets; Sales, defined as the natural log of total revenue in millions of dollars; Standard Dev Returns, the standard deviation of daily stock returns; Lag Returns, equity returns during the year $t-1$; Return Volatility, the squared standard deviation of daily stock returns; CEO Pay Slice, the ratio of CEO pay to the pay of the firm's top 5 executives; and *G*-Index (see Gompers, Ishii, and Metrick 2003). Year_2005 is a dummy variable equal to 1 for the 2005 data. Industry fixed effects based on the Fama-French 49 industries and an intercept are also included but are not reported.

*Statistical significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

4. Determinants of mandatory and voluntary holdings

One important observation from Table 2 is that directors' actual stockholdings differ from required levels. Median director holdings are approximately 25 times the size of the annual retainer in both 2003 and 2005, while the median S&P 500 firm had no ownership requirements in 2003 and required 4 times the annual retainer in 2005.

In this section, we study the determinants of both voluntary and mandatory holdings by outside directors. Because little is known about them, we begin with an examination of firm-level policies requiring stockholdings. If these policies are set optimally from the perspective of the firm, then we would expect to observe policies in firms in which monitoring and incentive problems are more likely to be severe. For example, firms with otherwise poor corporate governance or firms with volatile cash flows. We would expect no systematic relationship with these variables if policies were set randomly or if firms followed one-size-fits-all guidelines issued by consulting firms.

We perform LOGIT regressions in which the dependent variable is an indicator equal to 1 if the firm has a director ownership requirement in place during year *t* (2003 or 2005). Explanatory variables are: *Q*, *Sales*, *Standard Dev Returns*, *Return Volatility*, *Lagged Returns*, *CEO Pay Slice*,

Table 5. Interactions ownership requirement policies (LOGIT).

	LOGIT: sep var = Ownership requirement (0,1)	
	Coeff. est.	Pr > ChiSq
Q	−0.012	0.909
Sales	0.303***	0.006
Standard Dev Returns	−69.433	0.326
Lag Returns	1.127**	0.047
Return Volatility	1139.100	0.397
CEO Pay Slice	−0.033	0.964
G-Index	0.141***	0.003
*Q*_2005	−0.034	0.785
Sales_2005	0.010	0.943
Standard Dev Returns_2005	86.695	0.503
Lag Returns_2005	−1.022	0.136
Return Volatility_2005	−1727.100	0.596
CEO Pay Slice_2005	1.104	0.291
G-Index_2005	−0.005	0.941
Year_2005	0.704	0.758
Number of observations	901	
Wald test of global null	136.335***	<0.0001

Notes: This table presents the LOGIT regression estimates in which the dependent variable is an indicator equal to 1 if the firm has a director ownership requirement (in its proxy statement). Explanatory variables are: *Q*, defined as equity market capitalization, plus the book value of assets, minus book value of common equity, divided by the book value of assets; Sales, the natural log of total revenue in millions of dollars; Standard Dev Returns, the standard deviation of daily stock returns; Lag Returns, equity returns during the year $t-1$; Return Volatility, the squared standard deviation of daily stock returns; CEO Pay Slice, the ratio of CEO pay to the pay of the firm's top 5 executives; and *G*-Index (see Gompers, Ishii, and Metrick 2003). Year_2005 is a dummy variable equal to 1 for the 2005 data. Interaction variables are defined as the variable of interest, times Year_2005 and are denoted with _2005 (for example, *Q*_2005 = *Q**Year_2005). Industry fixed effects based on the Fama-French 49 industries and an intercept are also included in the regression but are not reported.

*Statistical significance at the 10% level.

**Statistical significance at the 5% level.

***Statistical significance at the 1% level.

and the G-Index.[8] If there is information asymmetry between management and shareholders, firms with high growth opportunities might want directors to hold more shares in order to improve their monitoring and advising incentives. We use the market to book ratio (*Q*) as a proxy for growth opportunities. This follows Yermack (2004), who tests whether executive compensation is explained by information asymmetry, measured by a firm's growth opportunities. We include both *Standard Dev Returns* and *Return Volatility* (squared standard deviation) because Demsetz and Lehn (1985) hypothesize that optimal ownership will increase with noise, but risk aversion causes it to do so at a decreasing rate. They also hypothesize that optimal ownership will increase in firm size. *Sales* capture firm size and is an additional measure of monitoring difficulty.[9,10] We include lagged equity returns to control for recent performance. We also include a dummy variable for the year 2005 to reflect the increased adoption of policies over time. Finally, all regressions include industry fixed effects.

During the past decade, there have been several attempts to measure the effectiveness of various corporate governance measures, and the overall effectiveness of a company's corporate governance structure; see Bhagat, Bolton, and Romano (2008) for a literature review. Of the large number of potential measures, we focus on the *G-Index* because of its prevalence in the corporate governance literature. We interpret the *G-Index* as a measure of the frequency of anti-takeover provisions in a company. We also include *CEO Pay Slice*, the pay of the CEO relative to the top 5 executives (*CEO Pay Slice*) as a proxy for poor corporate governance, following recent findings in Bebchuck, Cremers, and Peyer (2008) that this measure of the relative importance of the CEO is negatively associated with firm value. If director ownership requirements are put in place to improve poor

Table 6. Ownership Requirement Policies (TOBIT).

	Dep. var. = \$Ownership Requirement	
	Coeff. est.	Pr > ChiSq
Q	0.124	0.685
Sales	0.842***	0.008
Standard Dev Returns	−100.733	0.651
Lag Returns	2.255*	0.068
Return Volatility	680.990	0.888
CEO Pay Slice	2.582	0.237
G-Index	0.430***	0.001
Year_2005	4.004***	<.0001
Number of observations	859	
Log likelihood	−1627.83	

Note: This table presents Tobit regression estimates in which the dependent variable is the ratio of required equity holdings to annual cash retainer. Explanatory variables are: *Q*, defined as equity market capitalization, plus the book value of assets, minus the book value of common equity, divided by the book value of assets; Sales, defined as the natural log of total revenue in millions of dollars; Standard Dev Returns, the standard deviation of daily stock returns; Lag Returns, equity returns during the year $t-1$; Return Volatility, the squared standard deviation of daily stock returns; CEO Pay Slice, defined as the ratio of CEO pay to the pay of the firm's top 5 executives; and *G*-Index (see Gompers, Ishii, and Metrick 2003). Year_2005 is a dummy variable equal to 1 for the 2005 data. Industry fixed effects based on the Fama-French 49 and an intercept are also included in the regression but are not reported.

*Statistical significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

\$ specifies that the variable is in dollars.

governance, we would expect to observe more ownership requirements in firms with otherwise poor governance. [11,12]

Results of the estimation are in Table 4. The most important determinants of having a policy in place are firm size, prior stock returns, and the frequency of anti-takeover provisions. Additionally, director ownership requirements are more likely to appear by the year 2005 compared with 2003. Note that in Table 4, we assume the slope coefficients for the explanatory variables are same for 2003 and 2005. In Table 5, we allow the slope coefficients for the explanatory variables to vary for 2003 and 2005. The results in Table 5 allow us to reject the hypothesis that the slope coefficients for the explanatory variables are statistically different for 2003 and 2005.

The analysis presented in Table 6 is similar to that in Table 4, except that we present TOBIT regressions in which the dependent variable is the level of required holdings (i.e. a continuous variable). All independent variables are identical to Table 4 analysis. The results are broadly consistent with the LOGIT regressions. Larger firms (more difficult to monitor) require greater director holdings. More positive prior stock returns and a greater frequency of anti-takeover provisions are positively and significantly related to the required director holdings. Finally, ownership requirements are larger for 2005 compared with 2003.[13] We also include an Table 7, in which we

Table 7. Interactions ownership requirement policies (TOBIT).

	Dep. var. = \$Ownership Requirement	
	Coeff. est.	Pr > ChiSq
Q	0.326	0.449
Sales	0.700	0.135
Standard Dev Returns	−97.191	0.750
Lag Returns	3.970*	0.095
Return Volatility	1158.698	0.848
CEO Pay Slice	−0.138	0.966
G-Index	0.483**	0.017
*Q*_2005	−0.254	0.619
Sales_2005	0.335	0.565
Standard Dev Returns_2005	77.857	0.881
Lag Returns_2005	−2.696	0.336
Return Volatility_2005	−1577.030	0.904
CEO Pay Slice_2005	4.890	0.246
G-Index_2005	−0.063	0.806
Year_2005	1.993	0.829
Number of observations	901	
Likelihood ratio	−1626.04	

Notes: This table presents the TOBIT regression estimates in which the dependent variable is the required equity holdings. Explanatory variables are: *Q*, defined as (equity market capitalization, plus the book value of assets, minus the book value of common equity), divided by the book value of assets; Sales, defined as the natural log of total revenue in millions of dollars; Standard Dev Returns, the standard deviation of daily stock returns; Lag Returns, equity returns during the year $t-1$; Return Volatility, the squared standard deviation of daily stock returns; CEO Pay Slice, defined as the ratio of CEO pay to the pay of the firm's top 5 executives; and *G*-Index (see Gompers, Ishii, and Metrick 2003). Year_2005 is a dummy variable equal to 1 for the 2005 data. Interaction variables are defined as the variable of interest, times Year_2005 and are denoted with _2005 (for example, *Q*_2005 = *Q**Year_2005). Industry fixed effects based on the Fama-French 49 industries and an intercept are also included in the regression but are not reported.

*Statistical significance at the 10% level.

**Statistical significance at the 5% level.

***Statistical significance at the 1% level.

\$ specifies that the variable is in dollars.

allow slope coefficients to vary by year. Similar to the findings in Table 5, we are able to reject the hypothesis that the slopes of the coefficients on the explanatory variables in the requirements regressions vary by year.

Taken together, the results in Tables 4 through 7 are consistent with ownership policies being set to establish better governance incentives. We observe greater requirements in firms that are more

Table 8. Actual director holdings and requirements (TOBIT).

	Coeff. est.	Pr > ChiSq
Panel A: Dep. var. = \$*Director Holdings*		
Q	28.295***	<.0001
Sales	−8.094**	0.038
Standard Dev Returns (*10^{-2})	78.362***	0.004
Lag Returns	−2.736	0.863
Return Volatility (*10^{-4})	−15.589***	0.007
CEO Pay Slice	−19.947	0.459
G-Index	−1.860	0.267
Requirement	0.802	0.356
Year_2005	−3.916	0.687
Number of observations	804	
Log likelihood	−4873.59	
Panel B: Dep. var. = \$*Director Holdings*		
Q	29.289***	<.0001
Sales	−15.765***	0.003
Standard Dev Returns (*10^{-2})	101.046***	0.006
Lag Returns	−39.425	0.155
Return Volatility (*10^{-4})	−22.480***	0.002
CEO Pay Slice	−39.525	0.276
G-Index	−2.499	0.271
Requirement	−1.625	0.293
*Q*_2005	−3.286	0.599
Sales_2005	12.203*	0.084
Standard Dev Returns_2005	−55.003	0.405
Lag Returns	55.007	0.106
Return Volatility_2005	14.835	0.373
CEO Pay Slice_2005	36.174	0.487
G-Index_2005	0.745	0.811
Requirement_2005	3.256*	0.077
Year_2005	−145.631	0.194
Number of observations	804	
Log likelihood	−4866.74	

Notes: This table presents Tobit regression estimates in which the dependent variable is Median Director Holdings, the natural log of the median dollar value of equity holdings by all outside directors. Explanatory variables are: *Q*, defined as equity market capitalization, plus the book value of assets, minus the book value of common equity, divided by the book value of assets; Sales, the natural log of total revenue in millions of dollars; Standard Dev Returns, the standard deviation of daily stock returns; Lag Returns, equity returns during the year $t-1$; Return Volatility, the squared standard deviation of daily stock returns; CEO Pay Slice, the ratio of CEO pay to the pay of the firm's top 5 executives; *G*-Index (see Gompers, Ishii, and Metrick 2003); and Requirement, the required equity holdings. Year_2005 is a dummy variable equal to 1 for the 2005 data. Industry fixed effects based on the Fama-French 49 industries and an intercept are also included in the regression but are not reported.

*Statistical significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

\$ specifies that the variable is in dollars.

difficult to monitor and those with lower shareholder rights (in that there are more anti-takeover provisions).

Having documented the determinants of holdings policies, we now turn to determinants of actual holdings. The main goals in this part of the analysis are: (1) to investigate whether determinants of directors' actual ownership differs from the variables that explain mandatory ownership levels and (2) to test whether mandatory ownership levels explain actual holdings. If policies are binding, we would expect a significant role for ownership requirements in directors' decisions to hold stock. Table 8 presents the results of TOBIT regressions in which the dependent variable is the actual holdings. The independent variables are identical to those in Tables 4 and 6, except that *Requirement* (required holdings) has been added as an explanatory variable. In Table 8 (Panel A), we include 2005 as a dummy variable (implying the slope coefficients are same for 2003 and 2005), whereas in Table 8 (Panel B), we allow the slope coefficients to be different for 2003 and 2005.

An important observation from Table 8 (Panel B) is that ownership requirements do explain holdings for the year 2005. This will allow cleaner identification of voluntary (versus mandatory) ownership in subsequent tests of the link between director ownership and firm performance. Somewhat puzzling is the finding that requirements in 2003 do not explain holdings in 2003. The negative result for the year 2003 may be the result of low levels of enforcement (which increased during the years following the implementation of Sarbanes–Oxley). We also find that for both sample years, directors choose to hold more equity in smaller firms and firms with high *Q*. Also, consistent with the Demsetz and Lehn (1985) hypothesis – optimal ownership increases with noise

Table 9. Firm performance, dollar value of holdings, and cash compensation.

	Dependent variable: ROA_{t+1}		Dependent variable: Q_{t+1}	
	Coefficient	*t*-Statistics	Coefficient	*t*-Statistics
Median Director \$Holdings$_t$	0.005***	2.68	0.135***	5.04
Sales$_t$	−0.089*	−1.77	−3.561***	−4.83
Leverage$_t$	−0.062***	−3.05	−1.858***	−6.44
Retainer$_t$	0.012**	1.98	0.045	0.50
CEO Pay Slice$_t$	0.020	1.17	0.011	0.04
G-Index$_t$	0.000	0.44	−0.046***	−2.99
R&D$_t$	−0.190***	−6.06	−0.821*	−1.77
Year_2005	0.010*	1.89	−0.102	−1.36
Number of observations	798		808	
Adjusted R^2	0.386		0.386	

Notes: This table presents the results of OLS regressions in which the dependent variables are firm performance measures. ROA is year-ahead ROA, defined as earnings before interest, depreciation and taxes, divided by total assets. *Q* is defined as equity market capitalization, plus the book value of assets, minus the book value of common equity and divided by the book value of assets. Explanatory variables are: Median Director Holdings, the natural log dollar value of director equity holdings; Sales, defined as the natural log of total revenue in millions of dollars; Leverage, defined as the ratio of total debt to the book value of assets; Retainer, the annual cash retainer, as reported in ExecuComp; CEO Pay Slice, defined as the ratio of CEO pay to the pay of the firm's top 5 executives; *G*-Index (see Gompers, Ishii, and Metrick 2003); R&D, the reported research and development expenditures, divided by sales. Year_2005 is a dummy variable equal to 1 for the 2005 data. Industry fixed effects based on the Fama-French 49 industries and an intercept are also included in the regression but are not reported.

*Statistical significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

\$ specifies that the variable is in dollars.

(return standard deviation), but risk aversion will make it increase at a decreasing rate (negative relation between ownership and return variance).

In the next section, we analyse the relationship between voluntary and mandatory ownership and firm performance.

5. Holdings and performance

We begin with an analysis of the relationship between actual holdings and performance. Consistent with Core, Guay, and Rusticus (2006), we consider ROA as the performance measure. Stock returns-based measures of performance, such as market-adjusted returns and Tobin's *Q*, are problematic because stock returns will have anticipated any potential effect of stock ownership on performance. Nonetheless, for robustness, we also report results with Tobin's *Q* as the performance measure. We estimate ordinary least squares (OLS) regressions in which the dependent variables are 1-year-ahead ROA and Tobin's *Q*. Explanatory variables are: actual director holdings (*Median Director Holdings*), *Sales*, *Leverage*, *Retainer*, the annual cash retainer, *CEO Pay Slice*,

Table 10. Firm performance, dollar value of director holdings, and cash compensation with year interactions.

	Dependent variable: ROA_{t+1}		Dependent variable: Q_{t+1}	
	Coefficient	*t*-Statistics	Coefficient	*t*-Statistics
Median Director $Holdings	0.005**	2.27	0.118***	3.43
$Sales_t$	−0.048	−0.73	−3.380***	−3.46
$Leverage_t$	−0.047*	−1.80	−2.129***	−5.59
$Retainer_t$	0.006	0.75	−0.007	−0.06
CEO Pay $Slice_t$	0.054**	2.28	0.321	0.92
G-$Index_t$	0.001	0.66	−0.061***	−2.88
$R\&D_t$	−0.188***	−5.58	−0.830*	−1.69
$Holdings_2005	−0.002	−0.51	0.049	0.93
Sales_2005	−0.093	−1.04	−0.302	−0.23
Leverage_2005	−0.038	−1.08	0.552	1.09
Retainer_2005	0.014	1.21	0.120	0.68
CEO Pay Slice_2005	−0.072**	−2.15	−0.609	−1.23
G-Index_2005	−0.001	−0.54	0.031	1.09
R&D_2005	0.025	0.33	−0.061	−0.06
Year_2005	−0.010	−0.07	−1.984	−1.02
Number of observations	798		808	
Adjusted R^2	0.388		0.384	

Notes: This table presents the results of OLS regressions in which the dependent variables are firm performance measures. ROA is year-ahead ROA, defined as earnings before interest, depreciation and taxes, divided by total assets. *Q* is defined as equity market capitalization, plus the book value of assets, minus the book value of common equity and divided by the book value of assets. Explanatory variables are: Median Director Holdings, the natural log of the dollar value of director equity holdings; Sales, the natural log of total revenue in millions of dollars; Leverage, the ratio of total debt to the book value of assets; Retainer, the annual cash retainer, as reported in ExecuComp; CEO Pay Slice, the ratio of CEO pay to the pay of the firm's top 5 executives; *G*-Index (see Gompers, Ishii, and Metrick 2003); R&D, the reported research and development expenditures, divided by sales. Year_2005 is a dummy variable equal to 1 for the 2005 data. Interaction variables are defined as the variable of interest, times Year_2005 and are denoted by _2005 (for example, $Q\_2005 = Q^*Year\_2005$). Industry fixed effects and an intercept are included but not reported.

*Statistical significance at the 10% level.

**Statistical significance at the 5% level.

***Statistical significance at the 1% level.

$ specifies that the variable is in dollars.

G-Index, and R&D. The main coefficient of interest is that on actual director holdings (*Median Director Holdings*). Results are in Tables 9 and 10.

Table 9 shows a positive and significant relationship between director holdings and year-ahead performance for both performance measures. Interestingly, we also find that the dollar value of the retainer has an independent positive role in future performance measured as ROA (but not when performance is measured as Tobin's *Q*). This is consistent with recent findings that payments as small as $1000 meeting fees provide incentives for directors; see Adams and Ferreira (2008). Consistent with the extant literature, for example, see Rajan and Zingales (1995), the results in Tables 9 and 10 also document a negative correlation between leverage and performance, and firm size (sales) and performance. The regression in Table 9 is similar to Table 8 (Panel B) in that we allow slopes to vary by year. With the exception of *CEO Pay Slice*, which becomes less important in the ROA regression for the year 2005, we do not find significant differences in the estimated slopes.

Although the results in Tables 9 and 10 suggest a positive correlation between director holdings and performance, the Demsetz critique that observed correlations between managerial ownership levels and corporate performance are spurious if ownership reflects equilibrium outcomes is applicable.[14] To address this critique, we use required holdings to identify optimal ownership levels. We can then test for the relationship between actual holdings and performance since we

Table 11. Dollar value of mandatory and voluntary director holdings, cash compensation, and performance.

	Dependent variable: ROA_{t+1}		Dependent variable: Q_{t+1}	
	Coefficient	*t*-Statistics	Coefficient	*t*-Statistics
Median Director $Holdings$_t$	0.005***	2.68	0.135***	5.04
Requirement$_t$	0.001	1.18	0.007	1.03
Sales$_t$	−0.094*	−1.88	−3.637***	−4.91
Leverage$_t$	−0.063***	−3.13	−1.877***	−6.49
Retainer$_t$	0.012*	1.88	0.038	0.41
CEO Pay Slice$_t$	0.020	1.13	0.005	0.02
G-Index$_t$	0.000	0.29	−0.048***	−3.10
R&D$_{t+1}$	−0.192***	−6.12	−0.853*	−1.84
Year_2005	0.008	1.49	−0.124	−1.60
Number of observations	798		808	
Adjusted R^2	0.387		0.386	

Notes: This table presents the results of OLS regressions in which the dependent variables are firm performance measures. ROA is year-ahead ROA, defined as earnings before interest, depreciation and taxes, divided by total assets. *Q* is defined as equity market capitalization, plus the book value of assets, minus the book value of common equity and divided by the book value of assets. Explanatory variables are: Median Director Holdings, the natural log dollar value of director equity holdings; Sales, defined as the natural log of total revenue in millions of dollars; Leverage, defined as the ratio of total debt to the book value of assets; Retainer, the annual cash retainer, as reported in ExecuComp; CEO Pay Slice, defined as the ratio of CEO pay to the pay of the firm's top 5 executives; *G*-Index (see Gompers, Ishii, and Metrick 2003); R&D, the reported research and development expenditures, divided by sales; and Industry ROA, defined as the median earnings before interest, depreciation and taxes, divided by total assets for all COMPUSTAT firms in the industry (two-digit SIC code), which is used as a control in the ROA regression only. Year_2005 is a dummy variable equal to 1 for the 2005 data. Industry fixed effects based on the Fama-French 49 industries and an intercept are also included in the regressions but are not reported.

*Statistical significance at the 10% level.

**Statistical significance at the 5% level.

***Statistical significance at the 1% level.

$ specifies that the variable is in dollars.

observe 'out of equilibrium' holdings (actual holdings net of firm-level requirements).[15] Results of this analysis are in Tables 11 and 12. Even after controlling for firm-level policies, we find evidence consistent with a positive role for director stock-holdings on firm performance.[16] Similar to Tables 9 and 10, we do not find differences in slopes across 2003 and 2005 with the exception of the *CEO Pay Slice* variable, which becomes less important for ROA in 2005.

Based on the results in Tables 11 and 12, with all variables at their means, the coefficient of 0.005 on (log) dollar value of director holdings implies that that a one standard deviation increase in director holdings increases next period ROA by 0.0072. This is an increase of 5.3% in mean year-ahead ROA in 2003 and a 5.0% increase in mean year-ahead ROA in 2005. Consistent with ownership requirements as being set at their optimal levels, we do not observe a relationship between mandatory holdings and ex post performance.

Table 12. Dollar value of mandatory and voluntary director holdings, cash compensation, and performance with year interactions.

	Dependent variable: ROA_{t+1}		Dependent variable: Q_{t+1}	
	Coefficient	*t*-Statistics	Coefficient	*t*-Statistics
Median Director $Holdings	0.005**	2.29	0.118***	3.44
Requirement	0.001	1.10	0.005	0.56
$Sales_t$	−0.055	−0.83	−3.438***	−3.51
$Leverage_t$	−0.047*	−1.79	−2.131***	−5.58
$Retainer_t$	0.005	0.64	−0.013	−0.11
CEO Pay $Slice_t$	0.054**	2.30	0.327	0.94
G-$Index_t$	0.001	0.51	−0.063***	−2.93
$R\&D_t$	−0.191***	−5.64	−0.854*	−1.73
$Holdings_2005	−0.002	−0.53	0.048	0.91
Requirement_2005	0.000	−0.13	0.003	0.20
Sales_2005	−0.093	−1.03	−0.348	−0.26
Leverage_2005	−0.042	−1.18	0.502	0.98
Retainer_2005	0.015	1.21	0.117	0.66
CEO Pay Slice_2005	−0.075**	−2.23	−0.639	−1.28
G-Index_2005	−0.001	−0.51	0.031	1.05
R&D_2005	0.022	0.28	−0.112	−0.11
Year_2005	−0.090	−0.670	−1.902	−0.97
Number of observations	798		808	
Adjusted R^2	0.388		0.383	

Notes: This table presents the results of OLS regressions in which the dependent variables are firm performance measures. ROA is year-ahead ROA, defined as earnings before interest, depreciation and taxes, divided by total assets. *Q* is equity market capitalization, plus the book value of assets, minus the book value of common equity and divided by the book value of assets. Explanatory variables are: Median Director Holdings, the natural log of the dollar value of director equity holdings; Requirement, the required equity holdings; Sales, defined as the natural log of total revenue in millions of dollars; Leverage, defined as the ratio of total debt to the book value of assets; Retainer, the annual cash retainer, as reported in ExecuComp; CEO Pay Slice, the ratio of CEO pay to the pay of the firm's top 5 executives; *G*-Index (see Gompers, Ishii, and Metrick 2003); R&D, the reported research and development expenditures, divided by sales; and Industry ROA, the median ROA for all COMPUSTAT firms in the two-digit SIC code, which is used as a control in the ROA regression only. Year_2005 is a dummy variable equal to 1 for the 2005 data. Interaction variables are defined as the variable of interest, times Year_2005 and are denoted with _2005 (for example, $Q_2005 = Q^*$Year_2005). Industry fixed effects and an intercept are also included but are not reported.

*Statistical significance at the 10%.

**Statistical significance at the 5% level.

***Statistical significance at the 1% level.

$ specifies that the variable is in dollars.

6. Conclusions

Previous research relating firm performance with director ownership has not distinguished between mandatory and voluntary holdings. Although common, there has been little attention paid to the role of firm-level policies regulating director equity ownership. This paper studies the determinants of mandatory and voluntary holdings of outside directors as well as the link between ownership of directors and firm performance. Because ownership policies are, presumably, set at their optimum levels, distinguishing between mandatory and voluntary holdings allows us to distinguish between equilibrium and out-of-equilibrium holdings.

The ownership requirements that we observe are significantly related to variables that indicate greater monitoring difficulty (such as firm size) as well as otherwise weak corporate governance. These requirements impact actual holdings by outside directors.

We find that, even after controlling for required holdings, actual holdings impact future performance (ROA). A one standard deviation increase in director holdings increases next period ROA by about approximately 5%.

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Notes

1. These requirements can be a useful supplement to equity-based compensation schemes. Ofek and Yermack (2000) find that after an initial level of holdings is met, managers sell whenever they get stock. If directors' level of holdings differs from levels that are optimal from the viewpoint of shareholders of that company, they may have incentives to sell their shares. Ownership policies can help curb director stock sales and keep incentives aligned.
2. These authors also document that companies did not immediately respond to the requirements of Sarbanes–Oxley regarding board composition. Over a period of years, companies became more compliant.
3. Several recent papers document a positive relation between director stock ownership and future firm operating performance; for example, see Bhagat and Bolton (2008), Dey and Liu (2010), and Guest (2009). However, these papers do not distinguish between mandatory and voluntary director stock ownership.
4. We collect information on both director and executive policies. In unreported analysis of performance, we use executive policies as a control for unobserved firm heterogeneity and the results remain qualitatively similar. We select 2003 since it was the first full-year after the enactment of Sarbanes–Oxley. At the time we initiated this research project – Fall of 2006 – the most recent year for which complete ownership and accounting data were available was 2005.
5. The Proxy Statement year depends on the firm's fiscal year end. As most firms in the sample have December fiscal year ends, for year t, we consider the proxy statement dated year t+1 (typically dated before the end of April). For firms with, January–June fiscal year ends, we consider the proxy statement dated year t.
6. Share requirements are converted into dollars using the closing stock price at the end of year t.
7. See Adams and Ferreira (2008).
8. See Gompers, Ishii, and Metrick (2003). *CEO Pay Slice*, and *G-Index* are corporate governance measures; however; see the discussion given.
9. Note that there are two potential forces at work: It may be more difficult to monitor a large firm because of its size and the amount of information that must be processed, therefore increasing the value of providing directors with equity incentives. On the other hand, empirically, large firms have been associated with variables related to low information asymmetry (analyst coverage, equity market spreads, etc.), which suggests that more information about these firms is produced. The precise role of size is an empirical question.
10. For robustness, we also consider log of total assets as a proxy for firm size. Results are consistent with those reported here.
11. Ownership guidelines are set by boards of directors. An important assumption underlying the discussion is that directors act in shareholder best interest. They set policies to give themselves the correct incentives to effectively

monitor. Findings in Yermack (2004) that directors of Fortune 500 firms have significant equity and reputation incentives are consistent with this assumption.

12. Khurshed, Lin, and Wang (2010) provide evidence consistent with the argument that board ownership is a substitute governance mechanism.
13. The results in Table 7 allow us to reject the hypothesis that the slope coefficients for the explanatory variables are statistically different for 2003 and 2005.
14. See also Zhou (2001).
15. One potential concern is that firms' ownership requirements reflect a 'minimum' level, and that this differs from optimal levels. However, we find a large number of cases in which boards are given several years to acquire required positions (see the examples in Table 1). It is unclear why boards would allow members several years to acquire 'minimum holdings'. It is more likely that time is allowed to accumulate the optimal position.
16. In robustness analysis, we use the existence of an ownership policy for CEOs in order to control for potential unobservables that might cause a firm to adopt a director policy. The results are similar.

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