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Stock ownership guidelines for CEOs: Do they (not) meet expectations?

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ABSTRACT

This paper examines the determinants and the effects of CEO stock ownership guideline adoption, differentiating Not-meet/Meet adopters – those setting the guideline above/below the CEO's stock ownership at the time of adoption. While Meet adoption is mainly determined by factors related to stakeholder management, we find that Not-meet adoption is associated with factors related to both incentive alignment and stakeholder management. CEO ownership increases and CEO incentive alignment improves for Not-meet firms. But CEO ownership and incentives are unchanged for Meet firms following guideline adoption. We find no evidence that CEO compensation changes abnormally after adoption. Not-meet firms have larger improvement in operating performance and better stock performance than Meet firms. We provide evidence that the motives and the effects of guideline adoption depend on the level of the ownership restriction relative to the CEO's ownership at the time of adoption.

1. Introduction

Over the past decade numerous public firms have implemented executive stock ownership guidelines. A survey by Equilar (2010) finds that 80.6 percent of Fortune 250 firms disclosed executive stock ownership guidelines in 2009, up from 75.5 percent in 2006. Stock ownership guidelines require executives to meet and maintain pre-determined equity ownership goals within a specified period of time, generally ranging from 3 to 5 years. Ownership guidelines are typically directed at executives with the greatest effect on firm performance, such as the CEO and other very senior executives (Ellig, 2007).

The recent trend in guideline adoption by large public firms is consistent with it being identified as a best practice in executive compensation by third party proxy advisory firms (e.g. Institutional Shareholder Services and Glass Lewis & Co.) and corporate governance leaders (Conference Board, 2002; Business Roundtable, 2003; Cook, 2008; and others). However, few studies formally investigate the determinants and consequences of adopting executive ownership guidelines,[3] with the exception of Core and Larcker (2002) and Cao et al. (2010). Furthermore, no study is on the effects of how boards set the executive ownership guideline. To fill this void, we collect and analyze a comprehensive sample of firms that adopt CEO stock ownership guidelines from 1992 to 2007. Interestingly, we find that about half of guideline adopting firms (48%) set the ownership restriction below the CEO's stock ownership at the time of adoption. For example, the median value of CEO stock ownership exceeds the median value of the ownership target ($3.32 million) by $390,000 at the time of adoption.

This suggests that there may be two distinct groups of adopters, those where the board sets the guideline above the CEO's stock ownership, Not-meet firms, and those where the board sets the guideline below the CEO's stock ownership, Meet firms, at the time of adoption. We argue that guideline adoption for Not-meet firms

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[3] Bhagat and Tookes (2012) and Farrell and Kamal (2009) study ownership guidelines for outside directors and find that stock ownership of outside directors goes up and operating performance improves after adoption.

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is likely motivated by incentive alignment. Not-meet adoption requires the CEO to increase ownership to meet the guideline, which should result in better alignment of management with shareholders and improved financial performance. However, CEOs of Meet firms already comply with the guideline at adoption. As such, Meet firms are more likely to adopt guidelines for stakeholder management as a response to pressure from stakeholders. Meet adoption is expected to have no economic value, resulting in no change in CEO ownership or financial performance.[4]

We test this conjecture by examining the determinants of stock ownership guideline adoption and the effects of adoption on CEO ownership, CEO compensation, and financial performance for each of these two distinct subsets of firms.[5] We find that proxies for both incentive alignment and stakeholder management are significant determinants of overall guideline adoption. But, when analyzing Not-meet and Meet adoption decisions separately, variables associated with incentive alignment remain significant determinants of Not-meet adoption decisions; whereas, only proxies for stakeholder management are associated with Meet adoption decisions. Specifically, CEO scaled wealth-performance sensitivity, an empirical measure of incentive alignment with shareholders (Edmans et al., 2009), is a significant determinant for Not-meet adoptions, whereas, the propensity of Meet adoption is increasing in the proportion of industry firms that have already adopted a guideline. Overall, our results are generally consistent with the view that Not-meet adoption is motivated by the desire to improve CEO incentive alignment. Meet adoption is more likely motivated by stakeholder management.

We next examine the effects of stock ownership guideline adoption on CEO ownership. We find that CEO ownership increases after adoption for Not-meet firms, suggesting that guideline adoption for this subset of firms is effective at increasing the CEO's level of ownership. The resulting increase in CEO ownership improves incentive alignment for Not-meet adopters. Scaled wealth-performance sensitivity increases after adoption. In contrast, we find that CEO ownership stays the same after guideline adoption for Meet firms. Lastly, we find that Not-meet firms have significantly larger improvement in operating performance and better stock performance compared with Meet firms following adoption.

We also examine the effect of guideline adoption on CEO compensation. CEO total annual compensation and the proportion of equity based compensation paid to the CEO do not change after guideline adoption for Not-meet or Meet firms after controlling for potential endogeneity and other factors. This result indicates that the higher levels of CEO ownership for Not-meet firms do not result from changes in the level or the mix of CEO compensation subsequent to adoptions.

Overall, the effects of Not-meet adoption on ownership, compensation, and financial performance are consistent with the view that Not-meet adoption is likely for incentive alignment. The absence of a significant effect of guideline adoption for Meet firms conforms to the stakeholder management view of Meet adoption.

Our study contributes to the debate on the effectiveness of stock ownership guidelines in the context of the existing executive compensation literature in several ways. First, and most importantly, we provide evidence that the motivation for stock ownership guideline adoption depends on the level of the ownership restriction relative to the CEO's ownership at adoption. Examining the determinants of guideline adoption, we find that Not-meet adoption is likely motivated by incentive alignment, with the aim to increase CEO ownership toward an ownership target that is above the level of CEO ownership at adoption. Meet adoption is more likely a response to external pressure from stakeholders. Further, we find evidence consistent with these divergent motivations for guideline adoption when examining the consequences of guideline adoption. Specifically, stock ownership guideline adoption increases CEO ownership levels only when the ownership guideline is set above the current level of CEO ownership. This increase is not the result of changes in the level or the mix of CEO compensation. We also demonstrate that the benefits of guideline adoption on firm performance are greater for Not-meet adopting firms relative to Meet adopting firms. Second, we cover a more recent time period than Core and Larcker (2002), in which there is not only a substantial increase in equity based compensation and ownership guideline adoption but also increasing pressure on firms to adopt ownership guidelines because they are considered as a best practice in executive compensation by third party proxy advisory firms and corporate governance leaders.

In sum, we extend the prior literature by documenting divergent motivations for guideline adoption and provide new evidence on the effect of ownership guideline adoption. This suggests that the benefits of stock ownership guideline adoption cannot be generalized to all firms and depend on where the board sets the guideline relative to the CEO's stock ownership at adoption.

In a closely related paper examining the adoption of executive ownership guidelines from 1992 to 2008, Cao et al. (2010) find divergent motivations for early vs. late guideline adoption. While their paper also finds divergent motivations for guideline adoption, our paper differs from Cao et al. (2010) in two aspects. First, Cao et al. (2010) argue that early (pre-2002) adoptions appear to be driven by efficient contracting and recent (post-2002) adoptions appear to be driven mainly by public pressure. We find that the divergent motives for guideline adoption depend on the level of the ownership restriction relative to the CEO's ownership at the time of adoption in both pre- and post-2002 adoptions. Second, unlike Cao et al. (2010), when examining the consequences of guideline adoption, we control for potential endogeneity issues related to adopting decisions.

We organize the remainder of this paper as follows. We motivate our research, review the literature, and develop our hypotheses in Section 2. We provide an overview of our sample and the data in Section 3. We present our empirical results in Section 4, and provide concluding remarks in Section 5.

2. Background, motivation, and predictions

2.1. Why do firms adopt stock ownership guidelines – incentive alignment or stakeholder management?

At the heart of the trend in stock ownership guideline adoption is evidence suggesting that despite dramatic increases in restricted stock and option compensation over the past 20 years (Hall and Liebman, 1998; Hall and Murphy, 2003),[6] higher equity-based compensation in the absence of ownership restrictions may not lead to higher levels of executive ownership and may also exacerbate agency

[4] It is also possible that Meet adoption may result in better or worse financial performance. This is discussed in Section 2.2.

[5] This approach is partly motivated by Core and Larcker (2002)'s evidence of two distinct groups of adopters – Meet vs. Not-meet. However, a key difference between this study and that of Core and Larcker (2002), is that we condition the results of ownership and performance on the CEO's ownership relative to the stock ownership guideline.

[6] Hall and Murphy (2003) note that although the average real (inflation-adjusted) pay package of CEOs of S&P 500 firms more than quadrupled from $3.5 million in 1992 to $14.7 million in 2000, the value of stock options granted to CEOs increased ninefold over the same period. While the increase coincides with Jensen and Murphy's (1990) finding that CEOs have weak incentives to increase shareholder wealth, the dramatic increase over this period has also been attributed to elimination by Congress in 1993 of the corporate income tax deduction for executive salaries in excess of $1 million. As a result, firms shifted a significant portion of executive compensation away from non-incentive based pay towards tax deductible incentive based pay such as stock and options (Bhagat and Romano, 2009).

conflicts between managers and shareholders (Jensen and Murphy, 2004). For instance, Ofek and Yermack (2000) find that for every 1000 new options awarded, an executive sells 684 shares of stock. Allowing executives the freedom to unwind equity incentives immediately after vesting eliminates the long-term incentive effect of the instrument and requires the firm to give fresh grants to unwinding executives to replenish their holdings which imposes additional costs to shareholders (Bebchuk and Fried, 2004). This has led to calls from several prominent academics to limit the ability of executives to sell equity during their tenure at the firm (Bebchuk and Fried, 2004, 2010) and into retirement (Bhagat and Romano, 2009).

In response, numerous public companies have implemented executive stock ownership guidelines that require executives to meet and maintain pre-determined equity ownership goals within a specified period of time with the stated purpose of aligning the interests of managers more closely with those of shareholders. For example, the 2007 proxy of 3 M (MMM), one of our sample firms, states: "The Company's stock ownership guidelines apply to all Section 16 Reporting Officers. They are designed to increase an executive's equity stake in 3 M and more closely align his or her interests with those of 3 M's stockholders." Similarly, Frederick Cook (2008), of compensation consulting firm Frederick W. Cook & Co., notes that "stock ownership policies requiring executives to build and hold substantial ownership positions in company stock provide market penalties for management decisions and investments that look good initially, but ultimately prove unsuccessful [partially addressing moral hazard in executive incentives]."

Core and Larcker (2002) argue that the voluntary adoption of stock ownership guidelines is one way for firms to adjust suboptimal contracts on executive ownership after ownership gradually deviates from optimum levels. They find a significant increase in the level of managerial ownership and firm performance for a sample of 195 firms implementing "target" ownership guidelines from 1991 to 1995, consistent with firms adopting ownership guidelines to improve alignment between manager and shareholder interests. Quinn (2014) also finds evidence consistent with the incentive alignment motive, earnings management declines and bid-ask spreads decrease following guideline adoption.

Consistent with this view, we predict that guideline adoption under these circumstances is likely driven by a motivation to align managerial incentives with shareholders. Firms falling into this category will set the guideline above the CEO's stock ownership at adoption. These firms, termed Not-meet firms throughout this paper, likely enact stock ownership guidelines because the board of directors believes that the CEO's level of equity ownership is insufficient and that there is a greater potential for agency conflicts between the CEO and shareholders (e.g. higher free cash flows). From a theoretical standpoint, higher managerial equity ownership should result in a convex payoff that encourages managers to work hard and take on value enhancing risky projects (Jensen and Meckling, 1976; Myers, 1977; Haugen and Senbet, 1981). Accordingly, increasing the sensitivity of CEO wealth to stock price (delta) should better align managerial behavior with shareholder interests and reduce the potential for the overinvestment of free cash flows. The setting of an explicit higher ownership requirement is used by Not-meet firms as a mechanism to require the CEO to achieve and maintain higher ownership levels. As such, the first testable hypothesis of the incentive alignment view of guideline adoption predicts:

H_{1a}. The propensity of Not-meet guideline adoption decreases as managerial incentive levels increase.

We also anticipate different effects of guideline adoption between Not-meet and Meet firms on CEO ownership and firm performance. As in Core and Larcker (2002) and the discussion above, if Not-meet adoptions are motivated by incentive alignment, we expect CEO ownership to increase post adoption. This leads to our second hypothesis for the incentive alignment view:

H_{2a}. CEO ownership will increase after stock ownership guideline adoption for Not-meet firms.

Lastly, if stock ownership guidelines increase CEO ownership for Not-meet firms, providing the CEO with stronger incentives to maximize long-term firm value, we expect an improvement in firm performance after adoption. A distinction between this prediction and previous studies finding no relation between managerial ownership and financial performance (e.g. Himmelberg et al., 1999) is that Not-meet firms are expected to have suboptimal ownership levels (Core and Larcker, 2002). Therefore, our third hypothesis for the incentive alignment view predicts:

H_{3a}. Financial performance will improve after stock ownership guideline adoption for Not-meet firms.

An alternative view of the adoption of stock ownership requirements is stakeholder management,[7] i.e., guidelines are merely a response to pressure from stakeholders – including shareholders, policymakers, or the public – to conform to popular opinion or comply with other adopting firms. Shilon (2015) notes that adopting an ownership guideline does not depend on how effective the policy is in aligning executives' interests with shareholders; rather, it depends on how the guideline is perceived by stakeholders. As such, firms may feel pressured to adopt stock ownership guidelines because they have been labeled as a good practice for executive compensation by third party proxy advisory firms (e.g. Institutional Shareholder Services and Glass Lewis & Co.) and corporate governance leaders (Conference Board, 2002; Business Roundtable, 2003; Cook, 2008; and others).

Consistent with this view, Cao et al. (2010) find that post-2002 adoptions (guidelines adopted after the passage of Sarbanes Oxley Act of 2002) appear to be driven mainly by public pressure as there is no significant post-adoption improvement in stock performance and long-term investment for most post-2002 adopters. Similarly, a study by The Conference Board, NASDAQ, and the Rock Center for Corporate Governance at Stanford University indicates that during the 2011 proxy season approximately 70.4% of surveyed companies indicated that their compensation programs were influenced by third party proxy advisory firms (e.g. Institutional Shareholder Services and Glass Lewis & Co.) and 12.9% indicated that they adopted a stock ownership or share retention guideline as a result (Larcker et al., 2012). For instance, a sample proxy advisory report for Tyson Foods, Inc. from Institutional Shareholder Services (ISS) indicates that whether a company has a stock ownership guideline is one of the 8 factors considered in scoring a company's compensation program (ISS Proxy Advisory Services, 2013).

This is consistent with Bebchuk and Fried (2010) who note that the typical stock ownership requirement is dwarfed by the CEO's annual compensation and the CEO's present level of stock and option holdings. For example, Equilar (2010) finds that the median value of target stock ownership levels for CEOs was only $6.0 million at Fortune 250 companies, representing a multiple of 5 times the base salary of the CEO. In comparison, Core and Guay (2010) demonstrate that the median CEO from 1993 to 2008 had a "stock equivalent value" of firm-specific stock and option wealth of $40.2 million. CEO ownership is substantially larger than target ownership levels for many adopting firms and suggests that guidelines have little if any incentive value.

[7] Following King and Mauer (2014) and Arentsen et al. (2015), we compute and report the marginal effect at the mean. We measure the economic significance of a control variable as the ratio of the marginal effect to the predicated probability.

In such cases, where the adopting firm sets the ownership guidelines below the CEO's stock ownership level at adoption, termed Meet firms, it is unlikely that the firm adopts the guideline as an incentive mechanism. The ownership requirement is already satisfied. Therefore, we argue that Meet adoption is likely motivated by stakeholder management. We expect that factors related to the external pressure to adopt an ownership guideline, such as firm size, the proportion of adopting firms in the same industry, and time (post-2002), will be positively associated with Meet adoption decisions, whereas factors related to a need for greater incentive alignment will be unrelated to Meet adoption decisions. As such, the first testable hypothesis of the stakeholder management view of guideline adoption predicts:

H_{1b}. The propensity of meet guideline adoption increases as measures related to external pressure to adopt a guideline increase and is unrelated to managerial incentive levels.

Similarly, CEO ownership is not expected to change post adoption for Meet firms. According to this view, Meet firms manage stakeholders by adopting policies perceived to be good compensation practices when CEO ownership is already set at optimal levels. As such, our second hypothesis for the stakeholder management view[8]:

H_{2b}. CEO ownership will not change after stock ownership guideline adoption for Meet firms.

Finally, we expect that accounting and stock performance for Meet firms will not improve post adoption if stock ownership guidelines are adopted for stakeholder management and have little economic value to the adopting firm. This leads to our last hypothesis for the stakeholder management view:

H_{3b}. Financial performance will not change after stock ownership guideline adoption for Meet firms.

2.2. Effect of guideline adoption on CEO compensation

The effect of guideline adoption on CEO compensation has been unexamined in the literature. We do not expect total CEO compensation to increase abnormally after adoption for Not-meet firms, as the primary goal of the guideline is to require the CEO to maintain higher ownership levels – incentive alignment. However, stock ownership guidelines for Not-meet firms require CEOs to hold a greater proportion of vested equity-based compensation. As noted by Core and Guay (2010), "a risk averse CEO will demand greater compensation for a requirement to hold his wealth in a less diversified portfolio than he prefers" (p. 14). This suggests that CEOs of Not-meet firms may also use guideline adoption as an excuse to demand greater compensation from the board. Similarly, CEOs of Meet adopting firms may also demand greater compensation in exchange for explicit restrictions to unwind vested equity. Still, in the benign case of stakeholder management motivated adoption, where the guideline has little or no economic value, CEO compensation should not change abnormally. As such, while we examine the effect of guideline adoption on CEO compensation, we do not make any formal predictions on the effect of guideline adoption on CEO compensation. We treat it as an open empirical question.

3. Sample selection and data

3.1. Sample selection

We first run a keyword search of SEC filings on Morningstar Document Research in 2009 using 60 search phrases (e.g. stock ownership guideline, share ownership requirement, stock ownership goal – see Appendix 1 for an entire list of search phrases). This keyword search results in 4367 search phrase hits for 1886 firms. The initial list is then merged with the Execucomp database because we require CEO compensation and ownership data for our analysis.[9] This merge results in a sample of 1070 Execucomp firms. We then supplement the keyword search by running a screen in Capital IQ of Russell 3000 firms with executive ownership guidelines as of July 3, 2010. The Capital IQ screen adds 246 more Execucomp firms. Overall, we identify 1316 Execucomp firms that may adopt guidelines from 1990 to 2009.

We then verify that our screened firms have a stock ownership guideline by manually checking proxy statements for two reasons. First, in some cases our keyword search identifies a firm that does not have a guideline as an adopter. For example, a firm is picked up by initial keyword search when the firm states that it does not have a stock ownership guideline. We are able to remove misclassified adopters through checking proxy statements. Second, in some cases the firm does not explicitly state when the guideline was adopted. We assume that the guideline was adopted in the first year that the firm mentions a guideline in its proxy for these cases. For example, if a firm announced its adoption of a CEO stock ownership guideline in its April, 2003 proxy statement, its adopting fiscal year is 2002 ($t = 0$). A limitation of our sample selection procedure is that disclosure of stock ownership policies is not mandatory. Firms voluntarily disclose this information. Adopting firms, however, are unlikely to intentionally hide this information from investors as these policies are perceived to be good compensation practices. We are able to verify that 1066 Execucomp firms adopt stock ownership guidelines from 1990 to 2009. We remove 3 observations from the years 1990 and 1991 because Execucomp data begins in 1992 and these years predate the 1992 reforms in proxy disclosure for executive compensation. We also drop 162 observations in 2008 and 2009 because we end our sample in 2007 so that we have several years post adoption to examine the effects of stock ownership guideline adoption. This results in a sample of 901 Execucomp firms that adopt stock ownership guidelines from 1992 to 2007.

The sample size varies in different analyses depending on data availability. We lose 114 firms with incomplete data to calculate

[8] An alternative view is that CEO ownership for Meet firms is higher than optimal exposing the firm to potential agency costs associated with higher managerial equity ownership. While higher equity ownership should align managerial behavior with the interests of shareholders, it may also make managers too risk averse because managers' portfolios are heavily weighted in company equity. As a result, managers may forgo risky positive NPV projects, decrease firm risk by selecting projects with lower cash flow volatility, or invest in assets that will stabilize a firm's revenue stream through diversification strategies. It may also exacerbate agency conflicts. For instance, executives may manipulate earning or withhold financial information to receive more favorable grant date stock prices (Yermack, 1997; Lie, 2005; Bergstresser and Philippon, 2006; Burns and Kedia 2006) or favorable stock prices prior to the exercise or sale of stock based compensation (Bartov and Mohanram, 2004; Bergstresser and Philippon, 2006; Johnson et al., 2009; Kedia and Philippon, 2009). As such, CEO ownership for Meet firms may drop because the guideline sets a floor on required stock ownership levels and are a "de facto endorsement of diversification of the executive's portfolio" (Ellig, 2007, p. 500).

[9] We focus on the effect of stock ownership guideline adoption on the CEO's stock ownership in this study because the CEO is the primary decision maker in the firm and due to the complexities of classifying the specific ownership restriction applicable to each specific non-CEO executive. We acknowledge the possibility that the board adopts a guideline with the intent of only increasing non-CEO ownership levels. In such cases, non-CEO ownership restrictions may be set above current ownership levels, while CEO ownership restrictions are below current ownership levels. While this may bias our results, we believe that such cases are highly unusual.

Appendix 1
Stock ownership guideline search strings.

Search phrase	Search phrase
Share ownership guidelines	Required equity ownership level
Equity ownership guidelines	Share ownership standards
Security ownership guidelines	Ownership philosophy
Stock ownership requirements	Stock ownership and retention policy
Share ownership requirements	Share ownership and retention policy
Equity ownership requirements	Equity ownership and retention policy
Security ownership requirements	Security ownership and retention policy
Ownership guidelines	Stock holding policy
Executive Share Ownership	Security ownership by management
Executive Stock ownership	Share ownership by management
Executive security ownership	Stock ownership by management
Executive equity ownership	Equity ownership by management
Equity ownership guidelines	Share ownership goal
Equity ownership requirements	Security ownership goal
Stock ownership goal	Equity retention guideline
Equity ownership goal	Security retention guideline
Share retention guideline	Equity retention requirements
Stock retention guideline	Security retention policy
Share retention requirements	Equity ownership target
Stock retention requirements	Security ownership target
Share ownership policy	Required security ownership level
Stock ownership policy	Equity ownership standards
Equity ownership policy	Security ownership standards
Security ownership policy	Stock ownership standards
Share retention policy	Mandatory share ownership guideline
Stock retention policy	Mandatory stock ownership guideline
Equity retention policy	Mandatory equity ownership guideline
Target ownership level	Mandatory security ownership guideline
Stock ownership target	Share holding policy
Share ownership target	Equity holding policy
Required stock ownership level	Security holding policy
Required share ownership level	

the CEO's unrestricted (vested) stock ownership or the dollar value of the CEO stock ownership guideline.[10] In such cases we are unable to determine whether CEO unrestricted stock ownership is below (Not-meet) or above (Meet) the stock ownership guideline at the time of adoption. This results in a Not-meet or Meet sample of 787 Execucomp firms that adopt stock ownership guidelines from 1992 to 2007.

We then match this data with Compustat for accounting data, Center for Research in Securities Prices (CRSP) for stock price data, and the Thomson 13F (13F) database for institutional ownership data. This results a matched sample with complete CEO ownership, accounting, stock price, and institutional ownership data of 593 Not-meet/Meet firms that adopt stock ownership guidelines from 1992 to 2007. We also merge our sample with RiskMetrics and Equilar in order to examine the effect of board of director characteristics on the propensity of guideline adoption. Due to data limitations in RiskMetrics, board characteristics are only available from fiscal year 1995 onward, which further reduces our sample size when using board of director variables.[11] We have 525 Not-meet/Meet firms from 1992 to 2007 with complete control and board of director data.

[10] We use unrestricted stock rather total stock (unrestricted and restricted) or total stock and options because it is a more conservative measure of stock ownership and many firms do not include restricted stock when evaluating compliance with stock ownership guidelines. For example, AON, one of our sample firms, states: "Those holdings that will not be considered when measuring stock ownership include the following: unvested restricted stock or performance units; and vested or unvested stock options."

[11] The Risk Metrics IRRC proxy database reports the year using the meeting date. We assume that the proxy date is approximately 3 months after fiscal year end and the meeting date follows by 1 month. So, firms with fiscal years ending in December 1995 will be matched with IRRC observations with meeting dates in April 1996 or earlier.

3.2. Descriptive statistics

Our primary dependent variables are measures of CEO ownership, CEO compensation, and financial performance. We also include several additional control variables for firm specific factors. Appendix 2 describes the construction of the variables and data sources in detail. All variables are winsorized at upper and lower 1% of the sample distribution each year to address potential problems associated with outliers.

Table 1 provides summary statistics for firms that adopt CEO stock ownership guidelines in our sample. Panel A reports a breakdown of stock ownership guidelines by type of guideline for firms that declare the type of guideline in the proxy statement. We identify 901 firms that adopt guidelines from 1992 to 2007.[12] The majority of firms use the multiple of salary approach to arrive at target stock ownership levels. Roughly 730 (81%) firms use this method, while 113 (13%) firms employ a fixed number of shares approach, 30 (3%) use a retention approach (the executive must retain a percentage of after-tax proceeds from grants or exercises until they reach the ownership target or in lieu of an ownership guideline), and 28 (3%) do not disclose the restriction (undisclosed). Panel B reports a frequency distribution of guideline adoption by year. The majority of our sample adopts stock ownership guidelines after 2002, with 672 firms (75%) adopting guidelines from 2003 to 2007. We are able to determine whether the ownership restriction is set above the CEO's unrestricted stock ownership (Not-meet) or below the CEO's unrestricted stock ownership (Meet) at the time of adoption for 787 firms from 1992 to 2007. CEO unrestricted stock ownership does not meet the guideline at the time of adoption for 377 firms (48%) and meets the guideline at the time of adoption for 410 firms (52%). From 1992 to 2002 (2003–2007), Not-meet adopting firms account for 61% (44%), 122 out of 201 (255 out of 586), of adopting firms. Early adoptions are more likely to be Not-meet adoptions.

Panel C reports a frequency distribution of guideline adoption by Song and Walkling's (1993) 20 industry groupings. Adopting firms appear in a large number of industries and cluster to some extent in finance, insurance, and real estate (18%), transportation, communications, utilities (12%), services (12%), and machinery (11%). The industry distribution for Not-meet and Meet firms is similar to the overall distribution of guideline adopting firms.

4. Empirical results

4.1. Determinants of stock ownership guideline adoption

We start by examining whether ownership guideline adoption is systematically related to firm characteristics. Core and Larcker (2002) only include factors like industry-adjusted returns and managers' residual ownership. Similar to Cao et al. (2010), we extend the Core and Larcker (2002) model by including variables related to incentive alignment and/or stakeholder management directly. Our model of guideline adoption also differs from Cao et al. (2010) in two important aspects. First, we differentiate Meet vs. Not meet adoption decisions, while Cao et al. (2010) focus on estimating models on the pre- and post-2002 periods. Second, we include various CEO ownership incentive measures (i.e. delta) and Cao et al. (2010) control for only CEO ownership level.

If adoption is a random occurrence, we expect that it will be unrelated to firm and governance attributes. However, if adoption

[12] Core and Larcker (2002) identify stock ownership guidelines for 195 firms from 1992 to 1995. Our sample identifies stock ownership guidelines for 69 Execucomp firms from 1992 to 1996, assuming discrepancies in the actual year of adoption. Core and Larcker (2002)'s sample of guideline adopting firms is larger because their sample is not restricted to firms in Execucomp.

Appendix 2
Variable descriptions, this table describes the construction of the variables and data sources used in the study as described in Sections 3 and 4.

Variable name	Definition and data source
CEO compensation and ownership characteristics	
Scaled wealth-performance sensitivity (Delta)	The dollar change in CEO wealth, for a one-percent change in firm value divided by total annual pay following (Edmans et al. (2009) Data source: Execucomp, CRSP, Compustat
Dollar-percent sensitivity (Delta)	The dollar change in CEO wealth, measured following Core and Guay (2002), for a one-percent change in firm value Data source: Execucomp, CRSP, Compustat
Ownership percentage (Delta)	The dollar change in CEO wealth, measured following Core and Guay (2002), for a one dollar change in firm value Data source: Execucomp, CRSP, Compustat
Portfolio value	The dollar value of CEO wealth, measured following Core and Guay (2002) Data source: Execucomp, CRSP, Compustat
Total stock multiple	The ratio of CEO total stock ownership (restricted stock and unrestricted stock) to annual salary Data source: Execucomp
Unrestricted stock multiple	The ratio of CEO unrestricted stock to annual salary Data source: Execucomp
Total annual compensation	The total compensation paid to the CEO each year, where total compensation is composed of the following: (1) salary, (2) bonus, (3) other annual, (4) total value of restricted stock granted, (5) total value of stock options granted (using Black-Scholes), (6) long-term incentive payouts, and (7) all other total (Execucomp's TDC1) Data source: Execucomp
Equity-based grant/compensation	Total value of restricted stock granted plus the total value of stock options granted (using Black–Scholes) to the CEO divided by CEO total annual compensation Data source: Execucomp
Restricted stock/compensation	Total value of restricted stock granted to the CEO divided by CEO total annual compensation Data source: Execucomp
Financial performance	
Prior year return	12-month cumulative return for the fiscal year prior to the adoption year Data source: CRSP
Prior year ROA	Operating income before depreciation over total assets for the fiscal year prior to the adoption year: (item 13/item 6) Data source: Compustat
Firm characteristics	
Tobin's Q	Market value of assets over book value of assets in the adoption year: (item6 − item60 + item25 * item199)/(item6) Data source: Compustat
B/M	Book value of equity over the market value of equity in the adoption year: (item 60)/(item 25 * item 199) Data source: Compustat
R&D	Research and development expense over sales in the adoption year: ((item 46 or 0 if missing)/item 12) Data source: Compustat
Capital expenditure	Capital expenditure over sales in the adoption year: (item 128/item 12) Data source: Compustat
Standard deviation	Annualized monthly standard deviation of monthly stock return during 36 months prior to the adoption year Data source: CRSP
Market value	Market value of equity in the adoption year, in millions: (item 25 * item 199) Data source: Compustat
Sales	Firm sales in the adoption year, in millions: (item 12) Data source: Compustat
Debt ratio	Book value of debts over book value of total assets in the adoption year: (item34 + item9)/(item6) Data source: Compustat
Free cash flow	Free cash flow over book value of total assets in the adoption year: (item13 − item15 − item16 − item19 − item21)/(item 6) Data source: Compustat
Institutional ownership	Percentage of institutional ownership of the firm in the adoption year Source: Thomson 13F
Proportion of industry adopters	Proportion of firms that have adopted a stock ownership guideline in the same Fama-French 48 industry segment in the year prior to adoption ($t-1$) Source: Proxies and Capital IQ
# of analysts	The number of analysts following the firm in the adoption year Source: Capital IQ
Board of director characteristics	
Board size	Number of directors on the board Source: RiskMetrics and Equilar
Prop of non-independent directors	Proportion of non-independent directors on the board Source: RiskMetrics and Equilar
Chairman	An indicator variable equals to one if the CEO is also the chairman of the board, zero otherwise Data source: Execucomp
CEO tenure	Number of years the outgoing CEO has held the title of CEO at the firm Calculated as the difference between the year of the observation and the year in which the executive became CEO Data source: Execucomp
Overconfident CEO	CEO who, at least once during their tenure before adoption, holds option until the expiration year, even though the option is at least 40% in the money in its final year Data source: Thomson Financial Insider Filing Data

is motivated by incentive alignment, we expect that firms with a greater need for aligning the interest of managers with shareholders will be more likely to adopt ownership guidelines.

4.1.1. CEO incentives

The need to use ownership guidelines for incentive alignment will be smaller when the CEO already has a large ownership stake

Table 1
Summary statistics.

Type	Freq.	Percent (%)
Panel A. Guideline breakdown		
Multiple of salary	730	81.02
Fixed shares	113	12.54
Retention	30	3.33
Undisclosed	28	3.11
Total	901	100.00

Adoption year	Adoption firms		Not-meet firms		Meet firms	
	# of Firms	% of Total	# of Firms	% of Total	# of Firms	% of Total
Panel B. Year distribution						
1992	1	0	0	0	1	0
1993	8	1	6	2	0	0
1994	15	2	13	3	1	0
1995	16	2	8	2	6	1
1996	29	3	17	5	8	2
1997	26	3	10	3	14	3
1998	26	3	13	3	9	2
1999	20	2	7	2	8	2
2000	24	3	11	3	12	3
2001	20	2	14	4	5	1
2002	44	5	23	6	15	4
2003	92	10	42	11	36	9
2004	108	12	41	11	57	14
2005	124	14	48	13	58	14
2006	224	25	73	19	124	30
2007	124	14	51	14	56	14
1992–2002	229	25	122	19	79	32
2003–2007	672	75	255	81	331	68
Total	901	100	377	100	410	100

Industry (SIC2 codes)	Adoption firms		Not-meet firms		Meet firms	
	# of Firms	% of Total	# of Firms	% of Total	# of Firms	% of Total
Panel C. Industry distribution						
Agriculture (01–09)	2	0	1	0	1	0
Mining (10–14)	31	3	11	3	18	4
Construction (15–19)	13	1	6	2	6	1
Food and tobacco (20–21)	27	3	9	2	15	4
Textiles and apparel (22–23)	9	1	5	1	4	1
Lumber, furniture, paper, and print (24–27)	46	5	20	5	22	5
Chemicals (28)	67	7	31	8	29	7
Petroleum, rubber, and plastics (29–30)	21	2	6	2	10	2
Leather, stone, glass (31–32)	10	1	4	1	3	1
Primary and fabricated metals (33–34)	23	3	9	2	11	3
Machinery (35–36)	100	11	40	11	43	10
Transportation equipment (37)	30	3	15	4	12	3
Instruments and misc. manufacturing (38–39)	49	5	21	6	20	5
Transportation, communications, utilities (40–49)	108	12	65	17	31	8
Wholesale trade (50–51)	29	3	9	2	18	4
Retail trade (52–59)	62	7	28	7	31	8
Finance, insurance, real estate (60–69)	164	18	50	13	85	21
Hotels and personal services (70–71)	3	0	2	1	1	0
Services (72–89)	104	12	42	11	50	12
Public administration and others (90–99)	3	0	3	1	0	0
Total	901	100	377	100	410	100

This table presents summary statistics for our sample. Panel A contains the distribution of stock ownership guidelines by type. Multiple of salary represents firms that express the stock ownership guideline in terms of a multiple of salary, fixed shares represent firms that express the stock ownership guideline in terms of a fixed number of shares, retention represents firms that express the stock ownership policy in terms of a percentage of shares held after exercise, and undisclosed represent firms that do not disclose the nature of the stock ownership guideline. Panel B presents the year distribution of our sample firms and Panel C presents the industry distribution of our sample firms. Not-meet (Meet) firms represent firms that set the stock ownership guideline above (below) the CEO's unrestricted stock ownership at the adoption year. The sample consists of 901 Execucomp firms that adopted stock ownership guidelines and 787 Execucomp firms with complete data to determine whether CEO unrestricted stock ownership is below (Not-meet) or above (Meet) the stock ownership guideline at the time of adoption from 1992 to 2007. The adoption year is the fiscal year that the proxy describes the adoption unless stated otherwise in the proxy statement. The list of adopting firms is hand-collected from a keyword search of all proxy statements on Morningstar Document Research and a screen in Capital IQ.

and therefore high ownership incentives (Core and Larcker, 2002). We use the following CEO ownership measures: *CEO dollar-percent sensitivity* (Baker and Hall, 2004), calculated as the dollar change in CEO firm-specific wealth for a 1% change in firm value, *CEO ownership percentage* (Jensen and Murphy, 1990), calculated as the dollar change in CEO firm-specific wealth for a $1 change in firm value, and the dollar value of the CEO's firm-specific stock and option portfolio (*CEO portfolio value*). Edmans et al. (2009) demonstrate that scaled wealth-performance sensitivity is a desirable empirical measure of incentives and has several empirical advantages (including size and firm risk insensitivity) over other measures of ownership incentives. We use *Scaled wealth-performance*

sensitivity, calculated as the dollar change in CEO firm-specific wealth for a 1% change in firm value scaled by total annual compensation, as our primary proxy for equity-based incentive strength. We estimate each CEO's portfolio of firm specific stock and options using data from the Execucomp database to calculate CEO incentive measures (i.e. delta) as in Core and Guay (2002). We also include two measures of the actual stock ownership multiple held by the CEO each year. These measures are comparable to the target stock ownership multiples used by firms to assess compliance with the stock ownership guideline. First, we use the dollar value of all stock owned by the CEO, including both restricted (unvested) and unrestricted (vested) stock, scaled by salary (*Total stock multiple*). We also use the dollar value of unrestricted stock owned by the CEO scaled by salary (*Unrestricted stock multiple*). We calculate the dollar value of unrestricted stock as the dollar value of shares owned excluding options net unvested shares. We set this value equal to zero when the calculated value is less than zero.

4.1.2. Free cash flow

Free cash flow worsens agency problems between managers and shareholders because managers have greater discretion in spending cash to serve their own interests (Core and Guay, 1999; and others). We expect the need to use ownership guidelines for incentive alignment will be greater for firms with higher levels of free cash flow. We measure *Free cash flow* as the amount of free cash flow over book value of total assets in the adoption year.

4.1.3. Financial performance

Core and Larcker (2002) argue that poor financial performance may indicate corporate governance problems. Poorly performing firms are more likely to adopt ownership guidelines for incentive alignment purposes. Guideline adopting firms with better performance are less likely to adopt guidelines for incentive alignment, i.e., more likely to placate stakeholders. We measure financial performance using two variables: *Prior year return* is stock performance calculated as the 12-month cumulative annualized return (the product of one plus the monthly stock returns for the 12 months of the firm's fiscal year prior to the adoption year); *Prior year ROA* is accounting performance calculated as operating income before depreciation scaled by total assets for the fiscal year prior to the adoption year.

4.1.4. Growth opportunities, investment, and risk

Other factors may be related to incentive alignment but with less predictable effects on guideline adoption decisions. For example, *Tobin's Q,* book to market (*B*/*M*), *R&D* expenditures, *Capital expenditures*, and stock return volatility (*Standard deviation*), proxy for growth opportunities and information asymmetry.[13] Firms with high growth opportunities rely more on managerial talent and firms with high information asymmetry are more difficult to monitor. Therefore, we expect firms with high *Tobin's Q, R&D*, *Capital expenditures*, *Standard deviation* and low *B*/*M* are more likely to adopt guidelines for incentive alignment because higher levels of managerial ownership is more beneficial to these firms. Conversely, firms with high growth opportunities and high information asymmetry have higher risk. As such, firms with high *Tobin's Q, R&D*, *Capital expenditures*, *Standard deviation*, and low *B*/*M* may be less likely to adopt ownership guidelines because an optimal compensation contract should reflect the tradeoff between managers' equity incentives and their need for diversification (Himmelberg et al., 1999). For instance, Holderness et al. (1999) find that higher firm volatility is associated with lower variable compensation paid to managers in the form of equity ownership.

4.1.5. External stakeholder pressure

We expect that firms subject to greater external pressure to comply with best compensation practices will be more likely to adopt ownership guidelines as a stakeholder management measure. We use the following variables to proxy for firms' exposure to such external pressure. Larger firms may attract more attention from media, financial analyst, and regulators. We expect larger firms to face greater pressure to adopt ownership guidelines. We use *Market value* as proxy for firm size. Firms with a greater number of analysts following it are subject to more intense scrutiny and therefore face greater pressure to adopt guidelines. We use *# of analysts*, the number of analysts following a firm, as a proxy of external pressure. Public firms have faced increased scrutiny of their corporate governance practices after the passage of the Sarbanes-Oxley Act in 2002. We document a steady increase in ownership guideline adoptions after 2002. Similar to Cao et al. (2010), we expect post 2002 adoptions are more likely due to mounting external pressure. Lastly, firms may also face pressure to conform to industry norms. We use *Proportion of industry adopters*, the fraction of firms that have adopted a stock ownership guideline in the same Fama-French 48 industry as an adopting firm in the year prior to the adoption. Adoptions by these firms are more likely to be a stakeholder management measure.

4.1.6. Institutional investors

There are also factors related to both incentive alignment and stakeholder management with mixed predictions on the guideline adoption decision. For example, institutional investors have greater incentives to effectively monitor management. Firms with high *Institutional ownership* may be less inclined to advocate ownership guidelines for incentive alignment. Conversely, firms with high *Institutional ownership* may favor ownership guidelines because they are deemed a good compensation practice and firms may comply as a stakeholder management measure.

4.1.7. Internal corporate governance

The internal governance of firms could be related to the ownership guideline adoption. We proxy for internal governance of firms using four variables: (1) board size; (2) the proportion of non-independent directors on the board; (3) Chairman; and (4) CEO tenure. First, we measure board size as the number of directors serving on the board during the year. Small boards are assumed to be better than large ones because large boards place a greater emphasis on "politeness and courtesy", making it easier for CEOs to control (see Yermack, 1996; Eisenberg et al., 1998). Next, following Baysinger and Butler (1985), we classify non-independent directors as insiders (employed by the firm), and affiliated (e.g., former employees, family members of employees, or those with business relations with the firm). We calculate the proportion of inside directors serving on the board as the ratio of non-independent directors scaled by total directors on the board. Regulators and academics believe that independent directors are generally more effective monitors than inside directors. The Sarbanes-Oxley Act and the exchange rules in 2002 require that the majority of the board be independent, while numerous studies link the proportion of outside directors to financial performance and shareholder wealth (e.g. Rosenstein and Wyatt, 1990; Byrd and Hickman, 1992; Brickley et al., 1994; Cotter et al., 1997). We also determine whether the CEO also holds the title of COB (chairman) and create a dummy variable equal to one in such cases, and zero

[13] Jensen (1993) argues that the monitoring of high growth firms is costly, while Fama and Jensen (1983) suggest that firms with higher stock return volatility have higher levels of information asymmetry. Demsetz and Lehn (1985) note that higher levels of information asymmetry (as measured by higher volatility) are associated with more managerial discretion, necessitating higher levels of variable compensation.

Table 2
Univariate comparisons of stock ownership guideline adopting and not-adopting firms.

	Mean			Median			Sample size
	Adopt	Not-adopt	*p*-Value	Adopt	Not-adopt	*p*-Value	
Panel A. Adopt vs. Not-adopt							
CEO compensation and ownership characteristics							
Scaled wealth-performance sensitivity	189	408	*0.00*	72	71	*0.42*	839/1765
Dollar-percent sensitivity ($ mil.)	0.88	0.62	*0.00*	0.29	0.15	*0.00*	848/1790
Ownership percentage	1.88	4.24	*0.00*	0.90	1.81	*0.00*	848/1791
Portfolio value ($ mil.)	71	55	*0.03*	20	11	*0.00*	848/1790
Total stock multiple	66	93	*0.08*	9	8	*0.06*	845/1764
Unrestricted stock multiple	53	75	*0.07*	5	5	*0.26*	845/1764
Total annual comp. ($ thou.)	6236	3219	*0.00*	3747	1706	*0.00*	839/1777
Equity-based grant/compensation	50	39	*0.00*	49	33	*0.00*	839/1770
Restricted stock/compensation	16	10	*0.00*	8	0.00	*0.00*	839/1769
Firm characteristics							
Standard deviation	0.31	0.40	*0.00*	0.28	0.35	*0.00*	784/1582
Prior year return	0.19	0.24	*0.03*	0.16	0.15	*0.79*	800/1672
Sales ($ mil.)	7388	2345	*0.00*	2290	643	*0.00*	901/1790
Market value ($ mil.)	9221	2766	*0.00*	2930	791	*0.00*	897/1782
Prior year ROA	13.59	12.00	*0.00*	13.01	12.05	*0.00*	860/1738
Tobin's Q	1.91	1.97	*0.32*	1.50	1.48	*0.03*	897/1782
B/M	0.46	0.53	*0.00*	0.41	0.45	*0.00*	897/1779
Debt ratio	23.51	22.50	*0.20*	22.62	19.72	*0.00*	897/1780
Capital expenditure	6.37	8.86	*0.00*	3.62	4.27	*0.00*	850/1643
Free cash flow	7.93	6.64	*0.00*	7.81	7.26	*0.02*	867/1742
R&D	2.67	4.66	*0.00*	0.00	0.00	*0.30*	901/1789
Institutional ownership	76	67	*0.00*	78	68	*0.00*	843/1725
Proportion of industry adopters	0.24	0.15	*0.00*	0.23	0.10	*0.00*	901/1797
Board of director characteristics							
Dummy = 1 for CEO is chairman	0.62	0.57	*0.04*	1.00	1.00	*0.04*	848/1797
CEO Tenure	7	8	*0.00*	5	6	*0.00*	843/1786
Board size	10.23	8.77	*0.00*	10.00	8.00	*0.00*	750/975
Prop of non-independent directors	0.25	0.33	*0.00*	0.22	0.30	*0.00*	750/975
	Mean			Median			Sample size
	Not-meet	Meet	*p*-Value	Not-meet	Meet	*p*-Value	
Panel B. Not-meet vs. Meet firms							
CEO compensation and ownership characteristics							
Scaled wealth-performance sensitivity	60	288	*0.00*	44	109	*0.00*	371/407
Dollar-percent sensitivity ($ mil.)	0.34	1.39	*0.00*	0.16	0.51	*0.00*	377/410
Ownership percentage	0.83	2.72	*0.00*	0.53	1.38	*0.00*	378/410
Portfolio value ($ mil.)	21.86	118	*0.00*	10.73	37	*0.00*	379/410
Total stock multiple	5.59	123	*0.00*	4	21	*0.00*	377/408
Unrestricted stock multiple	1.86	101	*0.00*	1.38	16	*0.00*	377/408
Total annual comp. ($ thou.)	5956	6501	*0.25*	3665	3979	*0.20*	371/407
Equity-based grant/compensation	51.07	49	*0.35*	52.30	48	*0.26*	371/407
Restricted stock/compensation	16.83	16	*0.75*	9.04	8	*0.52*	371/407
Firm characteristics							
Standard deviation	0.32	0.30	*0.15*	0.29	0.27	*0.05*	338/387
Prior year return	0.18	0.21	*0.22*	0.15	0.16	*0.25*	346/393
Sales ($ mil.)	8395	7003	*0.26*	2700	2425	*0.11*	377/410
Market value ($ mil.)	9178	9762	*0.63*	2680	3464	*0.08*	377/410
Prior year ROA	13.32	14.01	*0.25*	12.23	13.71	*0.09*	369/389
Tobin's Q	1.76	2.05	*0.00*	1.42	1.63	*0.00*	377/410
B/M	0.48	0.42	*0.00*	0.45	0.38	*0.00*	377/410
Debt ratio	24.56	22.46	*0.07*	23.65	22.23	*0.04*	376/408
Capital expenditure	6.39	6.34	*0.94*	3.80	3.41	*0.03*	365/381
Free cash flow	7.54	8.28	*0.10*	7.16	8.35	*0.04*	369/393
R&D	2.62	2.66	*0.92*	0.00	0.00	*0.11*	377/410
Institutional ownership	74	77	*0.11*	76	79	*0.08*	375/407
Proportion of industry adopters	0.226	0.252	*0.01*	0.221	0.242	*0.02*	377/410
Board of director characteristics							
Dummy = 1 for CEO is chairman	0.58	0.66	*0.02*	1.00	1.00	*0.02*	377/410
CEO tenure	5	8	*0.00*	4	7	*0.00*	375/407
Board size	10.49	10.08	*0.03*	10.00	10.00	*0.05*	317/369
Prop of non-independent directors	0.23	0.27	*0.00*	0.20	0.25	*0.00*	317/369

Panel A presents univariate comparisons of mean and median values for adopting and industry matched not-adopting firms in the adopting year. Adopting firms are matched with not-adopting firms in the adopting year by the same Fama-French 48 industry. Not-adopting firms are drawn without replacement. Panel B presents univariate comparisons of mean and median values for Not-meet firms and Meet firms. Not-meet (Meet) firms represent firms that set the stock ownership guideline above (below) the CEO's unrestricted stock ownership at the time of adoption. The sample consists of 901 Execucomp firms that adopted stock ownership guidelines, 787 Execucomp firms with complete data to determine whether CEO unrestricted stock ownership is below (Not-meet) or above (Meet) the stock ownership guideline at the time of adoption, and 1797 industry-matched not-adopting firms from 1992 to 2007. We winsorize firm characteristics and compensation variables at the top and bottom 1% each year to mitigate the influence of outliers. All variables are defined in Section 4.1 and Appendix 2. The *p*-value is from two-tailed *t*-tests for differences in means and from Wilcoxon rank-sum tests (two-tailed) for differences in medians.

otherwise. CEO Chairman may concentrate power in the CEO's position and allow the CEO to control information available to other directors impeding effective monitoring (Jensen, 1993). CEO overconfidence could affect the adoption of guidelines. Following Malmendier and Tate (2008), we use Thomson Financial Insider Filing Data to identify *Over-confident CEO*, defined as a CEO who, at least once during his tenure before adoption, holds an option grant until the expiration year, even though the option is at least 40% in the money in its final year. Lastly, we include CEO tenure, measured as the time the CEO has been in the current position. Core and Guay (2010) find that CEO stock ownership increases in CEO tenure, while Gibbons and Murphy (1992) note that it is optimal for explicit incentives, such as those provided by equity-based ownership, to increase in executive tenure. Furthermore, CEOs with longer tenures may be entrenched, making them more likely to avoid risk (Berger et al., 1997).

We compare descriptive statistics for these variables for sample firms and control firms in Table 2. Guideline adopting firms are matched with not-adopting firms in the adopting fiscal year from the same Fama-French 48 industry. For 901 stock ownership guideline adopting firms, we have 1797 not-adopting industry-year-matched firms.[14] Panel A reports comparisons of guideline adopting firms and not-adopting control firms. CEOs of guideline adopting firms have significantly higher levels of dollar-percent sensitivity, portfolio value, and ownership multiples, but significantly lower ownership percentage[15], than CEOs of not-adopting control firms.

The mean (median) stock ownership guideline adopting firm has a prior year stock return of 19% (16%) and ROA of 13.59% (13.01%). The mean (median) not-adopting control firm has a prior year stock return of 24% (15%) and ROA of 12.00% (12.05%). Stock ownership guideline adopting firms have significantly better accounting performance than not-adopting control firms. The mean (median) free cash flow for not-adopting control firms is 6.64% (7.26%), which is significantly lower than that of adopting firms. In sum, guideline adopting firms are significantly different from not-adopting firms on several factors related to incentive alignment.

Ownership guideline adopting firms are also significantly different from not-adopting firms on factors related to stakeholder management. We find that guideline adopting firms are significantly larger – by *Market value* and *Sales* – than not-adopting control firms. Prior year *Proportion of industry adopters* adopting firms is also significantly higher than that of not-adopting firms.

Lastly, adopting firms differ from not-adopting firms on other attributes. Guideline adopting firms have significantly larger boards, less non-independent directors, are more likely to combine the role of CEO and chairman of the board (duality), have CEOs with significantly shorter tenures than not-adopting control firms, and have CEOs receiving significantly higher compensation and a higher fraction of equity-based compensation.

The motive for stock ownership guideline adoption may also differ between Not-meet and Meet firms. Panel B reports comparisons of Not-meet adopting firms and Meet adopting firms. Not-meet and Meet adopting firms are predominantly different. All measures of CEO ownership are significantly lower for Not-meet adopting firms than Meet adopting firms. However, CEO total annual compensation and the proportion of equity based compensation are not statistically different between Not-meet and Meet firms. Not-meet adopting firms have lower levels of growth opportunities, as measured by lower Tobin's Q and higher B/M, and higher debt ratios than Meet firms. Not-meet adopting firms have lower levels of free cash flow than Meet firms. In addition, Not-meet firms have a significantly lower prior year proportion of industry adopters than Meet adopting firms. Lastly, Not-meet firms have significantly less non-independent directors, a lower proportion of CEOs holding the title of chairman, and shorter CEO tenures than Meet firms.

We now explore how CEO ownership, financial performance, and firm characteristics are related to guideline adoption with Probit models of the propensity to adopt a CEO stock ownership guideline. Panel A of Table 3 reports the marginal effects, *z*-values below the marginal effects to test whether the underlying coefficients estimates are significant, and the actual (observed) probability and predicated probability (evaluated at the means of control variables) of the probit regression for each model.[16] The marginal effects are computed as the change in the probability of guideline adoption for a one standard deviation change in the explanatory variables (for dummy variables, a discrete change from 0 to 1) holding other control variables at their mean.

Models 1–3 examine the propensity to adopt a guideline, where the dependent variable is an indicator equal to one if the firm adopts a stock ownership guideline and zero otherwise. Model (1) includes CEO ownership and firm controls, Model (2) includes governance variables as additional controls, and Model (3) includes *# of analysts* and *Overconfident CEO* as additional controls. All observations are for the year of adoption ($t = 0$). The definitions of variables are described in Section 4.1 and detailed in Appendix 2.[17]

We begin by focusing on variables related to *incentive alignment* (*Prior year return*, *Free cash flow*, and *Scaled wealth-performance sensitivity*). The estimated coefficient on *Scaled wealth-performance sensitivity* is negative and significant. The propensity to adopt a guideline is decreasing in the level of CEO incentives, as measured by scaled wealth-performance sensitivity. The marginal effect on *Scaled wealth-performance sensitivity* and the predicted probability suggest that a one standard deviation increase in *Ln* (*Scaled wealth-performance sensitivity*) decreases the probability of guideline adoption by 31% (0.10/0.325). This is consistent with the view that the board adopts stock ownership guidelines to improve equity incentives. In addition, the estimated coefficient on *Free cash flow* is positive and significant. The propensity to adopt a guideline is increasing in the amount of free cash flow. A one standard deviation increase in *Free cash flow* increases the probability of guideline adoption by 12% (0.04/0.325). This is consistent with the view that the board adopts stock ownership guidelines to improve incentives when there is greater potential for agency conflicts resulting from higher free cash flow.

We next examine variables related to *stakeholder management* (Market value, Proportion of industry adopters, Post-2002). The estimated coefficients for *Market value*, *Post-2002*, and the prior year *Proportion of industry adopters* are positive and significant. The propensity to adopt a guideline is increasing in firm size and the proportion of industry firms that have already adopted a guideline. The effects are economically significant. A one standard

[14] We do not require that control firms have complete data for all variables. This increases the sample size of potential industry-matched controls when conducting univariate analysis. We do not use a one-to-one match for two reasons. First, we want to compare adopting firms with all not-adopting firms from the same industry-year. Second, one-to-one matching does not do a good job of matching an adopting firm to a not-adopting firm that is similar in all other characteristics, as the adopting decision is determined by many factors. This is one of the reasons we perform propensity-matching later in the paper.

[15] Ownership percentage has been shown to decrease in firm size (Baker and Hall, 2004). This result is consistent with our finding that adopting firms are significantly larger than not-adopting firms.

[16] Following King and Mauer (2014) and Arentsen et al. (2015), we compute and report the marginal effect at the mean. We measure the economic significance of a control variable as the ratio of the marginal effect to the predicated probability.

[17] We use log of *scaled wealth-performance sensitivity, Market value, Debt ratio,* and *Capital expenditure* to account for the high skewness and kurtosis in the variable.

Table 3
Propensity of stock ownership guideline adoption.

Dependent variable	Predicted sign	Adopt/Not-adopt			Not meet/Meet			Not-meet/Not-adopt			Meet/Not-adopt		
Independent variable		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: probit model													
LN (market value)	+	0.51	0.46	0.34	0.16	0.14	0.14	0.49	0.52	0.42	0.33	0.37	0.21
		(3.90)***	(3.15)***	(1.92)*	(0.63)	(0.52)	(0.44)	(3.28)***	(2.53)**	(1.56)	(2.13)**	(1.76)*	(0.82)
LN (market value)^2	NA	−0.21	−0.30	−0.18	−0.12	−0.12	−0.17	−0.11	−0.15	−0.14	−0.07	−0.12	0.06
		(−2.14)**	(−2.04)**	(−0.78)	(−0.46)	(−0.44)	(−0.61)	(−1.86)*	(−1.73)*	(−0.83)	(−0.87)	(−0.90)	(0.23)
Standard deviation	NA	−0.03	−0.03	−0.02	0.04	0.05	0.05	−0.02	−0.01	−0.01	−0.03	−0.03	−0.03
		(−1.89)*	(−1.31)	(−0.68)	(1.63)	(1.97)**	(1.53)	(−1.20)	(−0.79)	(−0.52)	(−2.14)**	(−1.50)	(−0.94)
Prior year return	−	−0.01	0.00	0.00	−0.05	−0.05	−0.05	−0.01	0.00	0.02	0.00	0.01	0.00
		(−0.77)	(0.24)	(0.13)	(−1.93)*	(−1.98)**	(−1.87)*	(−0.48)	(0.10)	(0.73)	(−0.12)	(0.69)	(0.18)
Tobin's Q	NA	−0.04	−0.04	−0.05	−0.02	−0.01	0.00	−0.04	−0.05	−0.05	−0.02	−0.02	−0.06
		(−1.97)**	(−1.49)	(−1.81)*	(−0.51)	(−0.30)	(−0.00)	(−2.07)**	(−1.74)*	(−1.20)	(−1.17)	(−1.09)	(−1.92)*
B/M	NA	−0.01	−0.01	0.01	0.02	0.04	0.01	−0.01	0.00	0.01	−0.01	−0.01	0.00
		(−0.62)	(−0.35)	(0.28)	(0.50)	(1.05)	(0.35)	(−0.75)	(−0.22)	(0.47)	(−0.56)	(−0.53)	(−0.11)
Ln (debt ratio)	NA	0.04	0.05	0.05	0.01	0.02	0.03	0.04	0.05	0.07	0.02	0.04	0.04
		(2.60)***	(2.60)***	(2.13)**	(0.34)	(0.84)	(1.10)	(2.64)***	(2.67)***	(2.60)***	(1.57)	(1.93)*	(1.29)
Ln (capital expenditure)	NA	−0.08	−0.09	−0.07	0.01	0.00	0.01	−0.05	−0.06	−0.06	−0.05	−0.07	−0.05
		(−6.09)***	(−5.38)***	(−3.49)***	(0.53)	(−0.01)	(0.30)	(−4.78)***	(−4.23)***	(−2.71)***	(−5.00)***	(−4.09)***	(−2.30)**
Free cash flow	+	0.04	0.04	0.02	0.01	0.03	0.01	0.03	0.04	0.03	0.02	0.02	0.01
		(2.23)**	(1.94)*	(1.00)	(0.30)	(0.98)	(0.44)	(1.99)**	(1.90)*	(0.97)	(1.30)	(0.96)	(0.38)
Institutional ownership (percentage)	NA	−0.02	−0.05	−0.05	−0.04	−0.04	−0.04	−0.02	−0.03	−0.04	−0.01	−0.03	−0.05
		(−1.33)	(−2.47)**	(−2.17)**	(−1.31)	(−1.41)	(−1.20)	(−1.34)	(−2.06)**	(−1.85)*	(−0.67)	(−1.74)*	(−1.88)*
Post-2002	+	0.07	0.10	0.09	−0.03	−0.03	0.01	0.01	0.03	0.04	0.06	0.11	0.07
		(1.56)*	(1.88)*	(1.38)	(−0.36)	(−0.42)	(0.16)	(0.18)	(0.62)	(0.54)	(1.77)*	(2.09)**	(0.96)
Proportion of industry adopters	+	0.11	0.09	0.04	−0.07	−0.05	−0.04	0.07	0.07	0.04	0.07	0.07	0.04
		(5.34)***	(3.50)***	(1.55)	(−2.07)**	(−1.43)	(−1.16)	(3.68)***	(2.77)***	(1.35)	(4.08)***	(2.60)***	(1.20)
Ln (scaled wealth-performance sensitivity)	−	−0.10	−0.02	−0.02	−0.77	−0.25	−0.24	−0.23	−0.06	−0.08	0.05	0.03	0.05
		(−3.76)***	(−1.34)	(−0.93)	(−9.48)***	(−7.14)***	(−7.02)***	(−7.39)***	(−4.46)***	(−4.05)***	(1.68)*	(1.53)	(2.00)**
Chairman	NA		0.06	0.06		−0.05	−0.04		0.03	0.03		0.08	0.10
			(1.74)*	(1.43)		(−0.81)	(−0.66)		(0.85)	(0.59)		(2.43)**	(2.00)**
CEO tenure	NA		−0.08	−0.06		−0.11	−0.09		−0.10	−0.10		−0.04	−0.03
			(−4.30)***	(−2.43)**		(−3.02)***	(−2.40)**		(−5.43)***	(−3.94)***		(−2.43)**	(−1.15)
Board size	NA		0.08	0.07		0.03	0.04		0.06	0.06		0.06	0.07
			(3.63)***	(2.97)***		(0.93)	(1.07)		(2.91)***	(2.24)**		(3.00)***	(2.55)**
Prop. of non−independent board	NA		−0.08	−0.06		−0.08	−0.09		−0.06	−0.07		−0.03	−0.02
			(−4.16)***	(−2.75)***		(−2.89)***	(−3.14)***		(−4.14)***	(−3.08)***		(−1.72)*	(−1.01)
# of analysts	+			−0.057			0.07			−0.023			−0.066
				(−1.77)*			(1.43)			(−0.74)			(−1.99)**
CEO overconfidence	NA			0.27			−0.08			0.42			0.53
				(1.07)			(−0.23)			(1.39)			(1.59)
Observations		1638	1173	819	568	513	407	1301	860	555	1315	891	606
Pseudo R2		0.237	0.260	0.232	0.224	0.245	0.233	0.235	0.321	0.306	0.249	0.245	0.238
Observed probability		0.375	0.472	0.540	0.488	0.470	0.437	0.213	0.280	0.321	0.221	0.305	0.378
Predicted probability		0.325	0.450	0.551	0.483	0.450	0.407	0.141	0.178	0.243	0.148	0.243	0.346
Independent variable				Not meet					Meet				Not-adopt
Panel B: multinomial logit model													
LN (market value)				0.12					0.14				−0.26
				(0.10)					(0.15)				(0.17)
LN (market value)^2				−0.00					−0.00				0.00
				(0.01)					(0.01)				(0.01)
Standard deviation				0.04					−0.19				0.15
				(0.12)					(0.16)				(0.17)

Table 3 (*continued*)

Independent variable	Not meet	Meet	Not-adopt
Prior year return	−0.00	0.02	−0.01
	(0.04)	(0.04)	(0.05)
Tobin's Q	−0.02	−0.03	0.05*
	(0.02)	(0.02)	(0.03)
B/M	0.07	−0.07	0.00
	(0.07)	(0.10)	(0.11)
Ln (debt ratio)	0.03**	0.01	−0.04**
	(0.01)	(0.02)	(0.02)
Ln (capital expenditure)	−0.02	−0.05**	0.07***
	(0.01)	(0.02)	(0.02)
Free cash flow	0.03	0.02	−0.04
	(0.02)	(0.03)	(0.04)
Institutional ownership (percentage)	−0.00*	−0.00	0.00**
	(0.00)	(0.00)	(0.00)
Post-2002	0.03	0.07	−0.10
	(0.04)	(0.06)	(0.07)
Proportion of industry adopters	0.02	0.25	−0.27
	(0.14)	(0.18)	(0.21)
Ln (scaled wealth-performance sensitivity)	−0.07***	0.06***	0.01
	(0.01)	(0.02)	(0.02)
Chairman	0.00	0.07	−0.07
	(0.03)	(0.04)	(0.05)
CEO tenure	−0.01***	0.00	0.01***
	(0.00)	(0.00)	(0.00)
Board size	0.02**	0.02	−0.03***
	(0.01)	(0.01)	(0.01)
Prop. of non-independent board	−0.41***	−0.06	0.47***
	(0.12)	(0.15)	(0.17)
# of analysts	−0.00	−0.01*	0.01*
	(0.00)	(0.00)	(0.00)
CEO overconfidence	0.05	0.08	−0.14
	(0.05)	(0.09)	(0.10)
Observations	819	819	819
Pseudo R2	0.210	0.210	0.210

Panel A presents marginal effects of probit regressions of stock ownership guideline adoption and whether the CEO does not meet the guideline at adoption. In the sample, we include firms that adopted stock ownership guidelines and not-adopting firms matched by the adopting year and Fama-French 48 industry. Not-meet (Meet) firms are defined as firms where the CEO's unrestricted stock ownership is below (above) the stock ownership guideline at the time of adoption. The dependent variable in Models 1–3 is equal to one if a firm adopts a guideline and zero otherwise. The dependent variable in Models 4–6 is equal to one for Not-meet adoption and zero for Meet adoption. The dependent variable in Models (7–9)/(10–12) is equal to one if a firm adopts a Not-meet/Meet guideline and zero for no guideline. The marginal effects in Panel A are computed as the change in the probability of positive outcome for a one standard deviation increase in the explanatory variable (for dummy variables, a discrete change from 0 to 1) with all other variables at their mean. We report *z*-values for the probit models' coefficient estimates in parentheses below marginal effect in Panel A. *Z*-values are computed using robust standard errors. The observed probabilities of outcome = 1 are for the estimation sample. The predicted probabilities of outcome = 1 are evaluated at the means of the right-hand-side variables. Panel B reports marginal effects of multinomial logit regressions for Not-meet adoption, Meet adoption, and Not-adoption. The not-adopt firms are the base case. The marginal effects in Panel B are computed as the partial derivatives of independent variables with all independent variables held at their mean values. Below each marginal effect, we report in parentheses robust standard errors for marginal effects in Panel B. We use delta method to estimate the variance of the marginal effect (Greene, 2003, p.70). Since the estimates are calculated from one model, Pseudo R2 and observations in Panel B are for the entire multinomial logit model. All observations are for the year of adoption ($t = 0$). All variables are defined in Section 4.1 and Appendix 2. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively, in two-tailed tests.

deviation increase in *Ln* (*Market value*) and *Proportion of industry adopters* increases the probability of guideline adoption by 157% (0.51/0.325) and 34% (0.51/0.325), respectively. This is consistent with the view that larger firms and firms operating in industries with a greater proportion of adopting firms are likely to face greater pressure from stakeholders to adopt a guideline. Similarly, the marginal effect on *Post-2002* indicates that after 2002 the probability of guideline adoption increases by 22% (0.07/0.325).

Thus far we find evidence supporting both the incentive alignment and stakeholder management motives for overall ownership guideline adoption. In Models 4–6 we attempt to disentangle these two potential motives for ownership guideline adoption by examining the propensity of a stock ownership adopting firm to set the guideline above the CEO's unrestricted stock ownership at adoption (Not-meet), conditioning on guideline adoption. The dependent variable is an indicator equal to one if the adopting firm is a Not-meet firm and zero if the firm is a Meet firm. The estimated coefficients for *Scaled wealth-performance sensitivity* and *Prior year return* are consistently negative and significant with economically significant marginal effects. A one standard deviation increase in *Ln* (*Scaled wealth-performance sensitivity*) and *Prior year return* decreases the probability of Not-meet guideline adoption by 159% (0.77/0.483) and 10% (0.05/0.483), respectively. This suggests that, conditioning on adopting ownership guidelines, firms are more likely to adopt Not-meet ownership guidelines when they have low incentives and poor performance. This is consistent with incentive alignment view. Interestingly, the estimated coefficient on the prior year *Proportion of industry adopters* also turns negative (Models 4–6) and significant (Model 4). Conditioning on adopting a guideline, the propensity of the CEO to not meet the guideline at adoption is decreasing in proportion of industry firms that have already adopted a guideline. A one standard deviation increase in *Proportion of industry adopters* decreases the probability of Not-meet guideline adoption by 15% (0.07/0.483). In contrast, the estimated coefficient on the prior year *Proportion of industry adopters* is positive (Models 1–3) and significant (Models 1–2) for guideline adoption decisions. Firms operating in industries with a greater proportion of adopting firms may face greater pressure to adopt a guideline and they are more likely to set the guideline below the CEO's stock ownership when they do adopt. This is consistent with the stakeholder management view of meet adoptions.

As a further test of the divergent motivations for guideline adoption between Not-meet and Meet firms, we estimate Probit models of the propensity to adopt a Not-meet (Models 7–9) or Meet (Models 10–12) CEO stock ownership guidelines. The dependent variable is an indicator equal to one if the firm adopts a Not-meet (Meet) stock ownership guideline and zero for not-adopting firms in Models 7–9 (10–12). In Models 7–9, the estimated coefficients for *Post-2002* are no longer significant. The propensity of Not-meet adoption does not change significantly after 2002. The coefficients for the other variables associated with incentive alignment and stakeholder management also do not change qualitatively in Models 7–9. Therefore, we continue to find support for the incentive alignment view. In Models 10–12 for Meet adoption decisions, the estimated coefficients for *Free cash flow* are no longer significant. The estimated coefficients for *Scaled wealth-performance sensitivity* are now positive (significant in Models 10 and 12). This is consistent with the view that Meet firms are unlikely to use guidelines for incentive alignment because CEOs of Meet firms already comply with the guideline at adoption and no further action is required to meet the guideline. Conversely, estimated coefficients for *Market value*, *Post-2002*, and *Proportion of industry adopters* remain positive and significant. This is consistent with the stakeholder management view and suggests that Meet firms are more likely to adopt guidelines as a response to pressure from stakeholders.

Lastly, as an alternative way to show that the motivation for guideline adoption may differ between Not-meet and Meet firms, we also estimate a multinomial logit model (with Not-adopting firms as the base case) where the dependent variable is a categorical variable indicating Not-meet firms, Meet firms, and Not-adopting firms in Panel B of Table 3.[18] The marginal effects show how the probability of each outcome changes with respect to changes in the independent variables. The marginal effect for *Scaled wealth-performance sensitivity* is significantly negative for Not-meet firms but significantly positive for Meet firms. This is consistent with incentive alignment and stakeholder management and also supported by the finding that the marginal effects for *Scaled wealth-performance sensitivity* change from negative and significant in Models 7–9 to positive and significant in Models 10–12 in Panel A.

Internal governance measures are generally significant determinants of guideline adoption decisions. The marginal effects for the proportion of non-independent directors on the board and CEO tenure are negative and generally significant, suggesting that firms with longer tenured CEO and/or less independent boards are less likely to adopt ownership guideline and less likely to adopt Not-meet guideline conditioning on adopting. Firms where the CEO is also Chairman (Duality) and/or larger boards are more likely to adopt ownership guidelines. But CEO duality and/or larger boards are not significant determinants of Not-meet guidelines conditioning on adopting.

Overall, we find support for both the incentive alignment and stakeholder management views. Not-meet adoption is associated with factors related to incentive alignment. Meet adoption appears determined primarily by factors related to stakeholder management.

4.2. Effect of stock ownership guideline adoption on CEO ownership

We next examine the effect of stock ownership guideline adoption on CEO ownership. Table 4 presents evidence on changes in CEO ownership for the 3 years preceding to the three years after guideline adoption ($t = -3$ to $t = +3$). We report CEO ownership measures for Not-meet and Meet firms, as well as not-adopting industry control firms (Not-adopt) in Panel A. We report only median values due to the high skewness and kurtosis in the CEO ownership measures.[19] Panel B reports difference tests of median differences within firm across time periods (i.e. $m_t = m_{t+1}$). Panel C reports difference-in-difference tests (DID), test median differences of ownership change between Not-meet (Meet) adopting and not-adopting control firms across time periods (i.e. $m_{\text{Not-meet } t} - m_{\text{not-adopt } t} = m_{\text{Not-meet } t+1} - m_{\text{not-adopt } t+1}$).

Column (1) uses CEO portfolio value to measure the overall dollar value of ownership, and Column (2) uses the ownership multiple from CEO unrestricted stock to salary. The results show that CEO ownership decreases (increases) for Not-meet (Meet) adopting firms before guideline adoptions and that CEO ownership increases (decreases) for Not-meet (Meet) adopting firms after guideline adoption. This is consistent with the view that Not-meet adoption is likely motivated by low and deteriorating ownership and Not-meet guidelines are effective in increasing ownership after adoptions.

We next use *Scaled wealth-performance sensitivity* as a measure of CEO equity-based incentives to test whether increases in

[18] A disadvantage of Probit model used in our previous analysis is that each binary probit model comparing the predicted probabilities of one group to another is based on a different comparison group (Long and Freese, 2006). The remaining observations pertaining to the non-comparison groups are excluded from analysis of Probit model. The multinomial logit model allows us to overcome this limitation.

[19] Results for comparing ownership and compensation for adoption firms (Not-meet firms and Meet firms) and industry matched non-adopt control firms in mean value are qualitatively similar. They are available from authors upon request.

Table 4
Changes in ownership.

Year	(1) CEO portfolio value			(2) Unrestricted stock multiple			(3) CEO scaled wealth-performance sensitivity		
	(a) Not-meet	(b) Meet	(c) Not-adopt	(a) Not-meet	(b) Meet	(c) Not-adopt	(a) Not-meet	(b) Meet	(c) Not-adopt
Panel A: ownership level									
−3	11.07	26.70	13.71	2.07	9.70	5.92	58	107	78
−2	11.61	27.38	12.78	1.82	10.15	5.46	51	99	77
−1	10.54	28.65	13.49	1.60	13.09	5.88	49	101	78
0	10.73	36.55	11.31	1.38	16.20	5.11	44	109	71
1	11.92	27.24	10.54	2.10	12.31	4.49	50	85	64
2	11.84	28.92	10.66	2.67	10.15	4.85	50	81	69
3	15.56	27.71	10.81	3.12	9.62	4.82	53	75	62
Panel B: difference within firm across time									
(0) – (−3)	−0.24	8.91	0.39	−0.35	6.07	0.00	−9	4	−2
p-Value	*0.08*	*0.00*	*0.21*	*0.00*	*0.00*	*0.18*	*0.00*	*0.57*	*0.01*
(1) – (0)	1.36	−1.56	−0.31	0.23	−1.55	−0.05	−6	−4	
p-Value	*0.00*	*0.01*	*0.00*	*0.00*	*0.00*	*0.00*	*0.01*	*0.00*	*0.00*
(2) – (0)	1.71	−4.75	0.37	0.88	−3.34	0.00	4	−18	0.28
p-Value	*0.00*	*0.00*	*0.25*	*0.00*	*0.00*	*0.52*	*0.07*	*0.00*	*0.10*
(3)–(0)	3.29	−5.14	0.25	1.19	−3.42	0.00	6	−28	−2
p-Value	*0.00*	*0.03*	*0.20*	*0.00*	*0.03*	*0.38*	*0.02*	*0.00*	*0.01*

	(1) CEO portfolio value		(2) Unrestricted stock multiple		(3) CEO Scaled wealth-performance sensitivity	
	Not-meet vs. Not-adopt	Meet vs. Not-adopt	Not-meet vs. Not-adopt	Meet vs. Non-adopt	Not-meet vs. Not-adopt	Meet vs. Not-adopt
Panel C: difference-in-difference (DID)						
DID(0) – (−3)	−0.63	8.52	−0.35	6.07	−8	6
p-Value	*0.03*	*0.00*	*0.00*	*0.00*	*0.14*	*0.05*
DID (1) – (0)	1.67	−1.25	0.29	−1.50	7	−3
p-Value	*0.00*	*0.21*	*0.00*	*0.05*	*0.00*	*0.59*
DID (2) – (0)	1.34	−5.12	0.88	−3.34	4	−19
p-Value	*0.00*	*0.00*	*0.00*	*0.00*	*0.04*	*0.00*
DID (3) – (0)	3.04	−5.39	1.19	−3.42	8	−26
p-Value	*0.00*	*0.00*	*0.00*	*0.04*	*0.00*	*0.04*

Panel A reports the median ownership from 3 years before adopting a stock ownership guideline to 3 years after adopting a stock ownership guideline. Panel B reports tests of median differences within firm across time periods (i.e. $m_t = m_{t+1}$) for Not-meet firms (column a), Meet firms (column b), and Not-adopt firms (column c). Panel C reports tests of median differences of ownership change between Not-meet (Meet) adopting and not-adopting control firms across time periods (i.e. $m_{\text{Not-meet } t} - m_{\text{not-adopt } t} = m_{\text{Not-meet } t+1} - m_{\text{not-adopt } t+1}$). Adopting firms are matched with not-adopting firms in the adopting year by the same Fama-French 48 industry. Not-adopting firms are drawn without replacement. The sample consists of 787 firms with complete data to determine whether CEO unrestricted stock ownership is below (Not-meet) or above (Meet) the stock ownership guideline at the time of adoption from 1992 to 2007. All variables are defined in Section 4.1 and Appendix 2. The *p*-value is from Wilcoxon rank-sum tests (two-tailed) for differences in medians.

ownership lead to an improvement in incentive alignment. Column (3) shows that median CEO scaled wealth-performance sensitivity for Not-meet adopting firms' decreases significantly from 58 in year −3 to 44 in year 0. CEO scaled wealth-performance sensitivity for Not-meet firms' increases significantly (Panel B) by 3, 4, and 6 relative to the adoption year in each of the 3 years after adoption, respectively. Panel C indicates that the increases relative to the not-adopting control sample of 7, 4, and 8 are significant. CEO ownership increases after guideline adoption for Not-meet firms and the increase leads to improvement in incentives. Conversely, CEO scaled wealth-performance sensitivity for Meet adopting firms increases before the adoption and decreases significantly in each of the 3 years after adoption – DID tests indicate that the decreases relative to the not-adopting control sample are significant only in years 2 and 3.

Overall, the univariate results show a distinct contrast in the effect of stock ownership guideline adoption on CEO ownership and incentives for Not-meet and Meet adopting firms. The changes in ownership around guideline adoptions are consistent with the view that Not-meet adoption is motivated by a need to improve CEO incentive alignment. Meet adoptions are inconsistent with this view.

The results from Table 4 may be biased as managerial ownership is endogenously formed (e.g. Hermalin and Weisbach, 2003; Tong, 2008). Matching on industry may not eliminate potential bias due to other observable and unobservable firm specific variables. To control for the endogeneity problem of simultaneity bias and omitted variable bias, we endogenize stock ownership guideline adoption using the following regression equations:

$$Ownership_{it} = \beta_1(Adoption)_{it} + \beta_2(Adoption \times Meet)_{it} + \beta_3 Ownership_{it-1} + \beta_k(Controls)_{it} + \sum \beta_t(year\ dummy\ variables)_t + \varepsilon_{it} \quad (1)$$

$$Adoption_{it} = \alpha_1(Prop.Industry\ Adoptors)_{it-1} + \alpha_2 Ownership_{it-1} + \alpha_k(Controls)_{it} + \sum \alpha_t(year\ dummy\ variables)_t + u_{it} \quad (2)$$

where CEO ownership (Ownership) is a function of a dummy variable equal to 1 if the firm has adopted a stock ownership guideline in a given year and zero otherwise (Adoption), and an interaction term between Adoption and a dummy variable if the CEO's unrestricted stock ownership met the guideline at the time of adoption ($t = 0$) and zero if the CEO's unrestricted stock ownership does not meet the guideline at the time of adoption (Adoption × Meet), lagged CEO ownership, controls, and dummy variables for year. The definitions of other variables in regression Eqs. (1) and (2) are described in Section 4.1 and Appendix 2. The regression Eqs. (1) and (2) are estimated using firm fixed effects two-stage least squares (FE2SLS).

In 2SLS, instrument variables (IVs) must be highly correlated with the endogenous regressors, but uncorrelated with the disturbance process. We use the proportion of industry firms that have already adopted a guideline as an instrument for stock ownership guideline adoption. We expect that this variable will be highly correlated with stock ownership guideline adoption to satisfy the relevance criterion for a valid IV, which is supported by significant

Table 5
Fixed effect two-stage regression results of ownership on adoption.

Variables	(1) LN CEO portfolio value	(2) LN CEO unrestricted stock multiple	(3) LN CEO Dollar-percent sensitivity	(4) LN CEO ownership percentage	(5) LN scaled wealth-performancesensitivity
Adoption dummy	2.44***	1.66*	2.51***	2.43***	2.73***
	(0.91)	(0.98)	(0.92)	(0.88)	(1.06)
Adoption * Meet	−1.88***	−1.24	−1.92***	−1.84***	−2.07**
	(0.72)	(0.80)	(0.73)	(0.70)	(0.84)
Prior year ownership	0.30***	0.41***	0.29***	0.34***	0.17***
	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
LN (market value)	0.90***	0.70***	0.90***	0.06	0.82***
	(0.17)	(0.20)	(0.17)	(0.16)	(0.20)
LN (market value)^2	−0.02**	−0.01	−0.03**	−0.02*	−0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Standard deviation	0.27**	0.51***	−0.09	−0.14	−0.26
	(0.13)	(0.16)	(0.13)	(0.13)	(0.16)
Prior year return	−0.03	−0.09***	−0.01	0.06***	−0.07***
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)
Tobin's Q	0.12***	0.14***	0.09***	0.05**	0.11***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
B/M	−0.26***	−0.24***	−0.23***	−0.09	−0.18***
	(0.06)	(0.07)	(0.06)	(0.06)	(0.07)
LN (debt ratio)	−0.01	0.01	−0.01	−0.01	0.00
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
LN (capital expenditure)	0.01	0.02	0.02	0.05**	0.02
	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)
Free cash flow	0.00	0.00	0.00	0.00	−0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Institutional ownership (percentage)	0.00	−0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Post-2002	−0.63***	−0.21	−0.66***	−0.59***	−0.89***
	(0.17)	(0.22)	(0.17)	(0.17)	(0.22)
Chairman	0.28***	0.34***	0.26***	0.26***	0.22***
	(0.05)	(0.07)	(0.05)	(0.05)	(0.06)
CEO tenure	0.06***	0.07***	0.05***	0.05***	0.06***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Board size	−0.01	−0.02	−0.01	−0.01	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Prop. of non-independent board	0.24*	0.19	0.22*	0.19	0.39***
	(0.13)	(0.13)	(0.13)	(0.12)	(0.15)
Observations	11,559	10,126	11,559	11,557	11,410
Endogeneity test (p-value)	0.00	0.07	0.00	0.00	0.00
Weak IV test (F-stat)	13.98	14.27	13.94	13.93	13.54
R-squared	0.24	0.39	0.21	0.01	−0.04
Number of firms	1607	1501	1607	1607	1597

This table presents estimates from fixed effect two-stage least squares regressions of Eqs. (1) and (2). To save the space, we only report the estimates of Eq. (1). The dependent variables are measures of CEO ownership. Adoption dummy is a dummy variable equal to 1 if the firm has adopted stock ownership guideline in a given year and zero otherwise. Adoption * Meet is an interaction term between Adoption and a dummy variable if the CEO's unrestricted stock ownership met the stock ownership guideline at the time of adoption ($t = 0$) and zero if the CEO's unrestricted stock ownership does not meet the stock ownership guideline at the time of adoption. Prior year ownership is a lagged dependent variable for the respective ownership measure. We use the proportion of industry firms that have already adopted a guideline as an instrument for stock ownership guideline adoption. The sample consists of 787 firms with complete data to determine whether CEO unrestricted stock ownership is below (Not-meet) or above (Meet) the stock ownership guideline at the time of adoption from 1992 to 2007. All control variables are explained in Section 4.1 and Appendix 2. All regressions include dummy variables year (the coefficients for year are not reported). The t-statistics are calculated using robust standard errors clustered at the firm level. Robust standard errors are given in parentheses. Endogeneity test is based on the C statistics (Schaffer, 2010). Weak IV test is based on the robust Kleibergen-Paap Wald F statistic (Stock and Yogo, 2005). The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively, in two-tailed tests.

estimated coefficients in Table 3. Further, this variable measures how common it is for firms from certain industries to adopt ownership guidelines; as such, it is related to the adopting decision, but should not be correlated with each firm's CEO ownership (or CEO compensation, which is used later in our analysis) level. Empirically, after controlling for other factors, the proportion of industry firms that have already adopted a guideline is not significantly associated with CEO ownership/compensation. Although this evidence is not a formal test of the exclusion restriction, it does show that our IV does not violate the exclusion property for a valid IV.

Table 5 reports the results of firm-fixed effects two-stage least squares (FE2SLS) regression estimates of Eq. (1) with Not-meet, Meet, and all not-adopting firms. The estimated coefficient β_1 measures the effect of guideline adoption for Not-meet firms on CEO ownership. The sum of the coefficients ($\beta_1 + \beta_2$) measures the effect of guideline adoption for Meet firms on CEO ownership. We compute t-statistics using robust standard errors clustered at the firm level. We use the log of CEO ownership measures to account for the high skewness and kurtosis in the variables. In all specifications, we report a set of diagnostics to check the validity of our IV strategy. The reported p-value of the endogeneity test based on C-statistics is consistent with the presence of endogeneity.[20] For a weak IV test, we report the heteroskedasticity-robust Kleibergen-Paap Wald F statistic. Our IV is not weak according to a widely used

[20] The employed STATA routine is described in Schaffer (2010). The C-statistics is defined as the difference of two Sargan–Hansen statistics, one for the equation with the suspect regressor as endogenous, and one with the suspect regressor as exogenous. The null hypothesis is the specified endogenous regressor is exogenous. C-statistics is robust to various violations of conditional homoskedasticity.

Table 6
Guideline effect on ownership.

	(1) LN CEO portfolio value	(2) LN Unrestricted stock multiple	(3) LN CEO Dollar-percent sensitivity	(4) LN CEO ownership percentage	(5) LN CEO scaled wealth-performance sensitivity
Not-meet					
(0) – (−3)	−0.12	0.00	−0.13	−0.05	−0.07
p-Value	*0.55*	*0.99*	*0.50*	*0.77*	*0.75*
(1) – (0)	0.38	0.74	0.41	0.30	0.38
p-Value	*0.01*	*0.00*	*0.00*	*0.02*	*0.03*
(2) – (0)	0.54	1.08	0.52	0.39	0.49
p-Value	*0.04*	*0.02*	*0.04*	*0.10*	*0.08*
(3) – (0)	1.14	1.34	1.16	0.63	0.91
p-Value	*0.00*	*0.01*	*0.00*	*0.04*	*0.02*
Meet					
(−1) – (−3)	0.55	1.42	0.50	0.37	0.47
p-Value	*0.01*	*0.00*	*0.01*	*0.03*	*0.02*
(1) – (0)	−0.19	−0.10	−0.14	−0.13	−0.07
p-Value	*0.29*	*0.67*	*0.42*	*0.40*	*0.73*
(2) – (0)	−0.33	−0.38	−0.29	−0.06	−0.28
p-Value	*0.16*	*0.17*	*0.22*	*0.79*	*0.22*
(3) – (0)	−0.06	0.04	−0.03	−0.03	0.11
p-Value	*0.87*	*0.92*	*0.93*	*0.93*	*0.76*

This table reports the difference between the actual mean change of ownership for the adopting firms (treated) and its counterfactual mean change of ownership for not-adopting firm (non-treated). We use Dehejia and Wahba (1999, 2002) matching method to identify not-adopting matching firms. In this approach, propensity scores are used to select control firms that are most like the sample firms on multiple firm characteristics. Our propensity scores are the predicted probability of adopting from Probit model (2) in Table 3, which includes all variables of firm characteristics, as well as governance characteristics. The sample consists of 787 firms with complete data to determine whether CEO unrestricted stock ownership is below (Not-meet) or above (Meet) the stock ownership guideline at the time of adoption from 1992 to 2007. All ownership variables are explained in Section 4.1 and Appendix 2.

rule of thumb suggested by Staiger and Stock (1997) – an *F* statistic of less than 10 indicates a weak IV. Based on the table of critical values of Kleibergen-Paap Wald *F* statistic that varies with the tolerance level for the size distortion, number of endogenous variables, and the number of exclusion restrictions (Stock and Yogo, 2005), our IV is weak at 10% relative bias toleration (corresponding *F* statistic at 16.38) but is not weak at the 15% relative bias toleration (corresponding *F* statistic at 8.96). Overall, our IV strategy seems to be valid.

Columns 1–5 of Table 5 provide estimated results with CEO portfolio value, CEO unrestricted stock multiple, CEO Dollar-percent sensitivity, CEO Ownership percentage, and CEO scaled wealth-performance sensitivity as the dependent variable, respectively. The estimated coefficients on Adoption are all positive and significant, the estimated coefficients on the interaction term between Adoption and Meet are negative and significant (except in Model 2), and the sum of the estimated coefficients for β_1 and β_2 are not significant (un-tabulated). After controlling for endogeneity and other factors, we continue to find that CEO ownership increases for Not-meet adopting firms. A discrete change from non-adoption to adoption for a Not-meet firm is associated with a 2.73% increase in CEO scaled wealth-performance sensitivity. CEO ownership does not change abnormally for Meet firms.

As an alternative method to account for potential endogeneity, we employ propensity score matching (PSM) to account for selection bias based on observables following Dehejia and Wahba (1999, 2002). This method does not rely on IVs, thus addressing many concerns associated with invalid IVs. We estimate the propensity scores for each firm from the Probit regression (Model (2) in Table 3).[21] We then discard all industry not-adopting control firms with an estimated propensity score lower (higher) than the minimum (maximum) of the propensity score of all guideline adopting firms to eliminate control firms that are not comparable to our adoption firms. We next stratify all firms into 8 blocks defined by the propensity score distribution for sample firms. In doing so, we pass balancing tests for each independent variable in Model (2), as the *t*-tests of differences in means between stock ownership guideline adopting firms and industry not-adopting control firms within each block are not significant. This indicates that the adopting and industry not-adopting control firms are statistically similar across all independent variables within each block. Finally, for each adopting firm, we choose the minimal absolute difference in propensity scores of adopting and not-adopting firms.

Table 6 shows the difference between the actual mean change of ownership for the adopting firms (treated) and its counterfactual mean change of ownership for not-adopting firm (non-treated).[22] This is essentially the average treatment effect for the treated (ATT) of CEO ownership on stock ownership guidelines adoption using difference-in-differences (DID). The increases of CEO scaled wealth-performance sensitivity for Not-meet adopting firms relative to not-adopting firms are significant from year + 1 to year + 3, consistent with CEO ownership and incentives increasing subsequent to guideline adoption for Not-meet firms. Conversely, none of the DID tests for Meet adopting firms are significant. CEO scaled wealth-performance sensitivity for Meet firms does not change relative to the matched control firm. Our results using CEO dollar-percent sensitivity and CEO ownership percentage in Columns (3) and (4) provide similar results. Column (1) presents tests using CEO portfolio value, while Column (2) presents tests using CEO unrestricted stock to salary. Our conclusions are unchanged. Overall, we continue to find that CEO ownership and incentives for Not-meet firms increases relative to the matched control firm following stock ownership guideline adoption, while CEO ownership and incentives for Meet adopting firms do not change relative to the matched control firm.

4.3. Effect of stock ownership guidelines on CEO compensation

We examine the effect of stock ownership guideline adoption on CEO compensation in this section. Table 7 reports the results of FE2SLS regression estimates of Eq. (1) as in Table 5 replacing

[21] Our conclusions are unchanged using a reduced model, Model (1) from Appendix 2 (available from the authors upon request).

[22] Masulis and Nahata (2011) use similar matching estimator when estimating ATT. We use the log of CEO ownership measures to account for the high skewness and kurtosis in the variables.

Table 7
Fixed effect two-stage regression of adoption on compensation.

VARIABLES	(1) LN CEO total annual compensation	(2) LN equity-based grant/compensation	(3) LN restricted stock/compensation
Adopting dummy	0.36	1.62	−1.16
	(0.44)	(1.03)	(1.09)
Adopting * Meet	−0.27	−1.23	0.90
	(0.35)	(0.82)	(0.87)
Prior year compensation	0.04*	−0.01	0.18***
	(0.02)	(0.01)	(0.02)
LN (market value)	0.27***	0.68***	0.08
	(0.09)	(0.20)	(0.19)
LN (market value)^2	0.01	−0.03**	−0.01
	(0.01)	(0.01)	(0.01)
Standard deviation	0.14	0.06	−0.11
	(0.09)	(0.19)	(0.16)
Prior year return	0.07***	−0.16***	0.03
	(0.02)	(0.03)	(0.02)
Tobin's Q	−0.01	0.07***	−0.00
	(0.01)	(0.02)	(0.02)
B/M	0.01	−0.26***	−0.10
	(0.04)	(0.08)	(0.07)
LN (debt ratio)	−0.00	−0.02	0.01
	(0.01)	(0.02)	(0.02)
LN (capital expenditure)	0.02	0.03	−0.00
	(0.02)	(0.04)	(0.03)
Free cash flow	0.00**	0.00	0.00
	(0.00)	(0.00)	(0.00)
Institutional ownership (percentage)	−0.00	0.00	−0.00
	(0.00)	(0.00)	(0.00)
Post-2002	0.31**	0.12	1.75***
	(0.14)	(0.25)	(0.23)
Chairman	0.04	−0.07	0.03
	(0.03)	(0.06)	(0.06)
CEO tenure	−0.00	−0.03***	−0.02***
	(0.00)	(0.01)	(0.01)
Board size	−0.00	0.01	−0.01
	(0.01)	(0.01)	(0.01)
Prop. Of non-independent board	−0.19**	−0.62***	−0.05
	(0.08)	(0.18)	(0.15)
Observations	11,620	11,597	11,582
Endogeneity test (p-value)	0.56	0.11	0.18
Weak IV test (F-stat)	12.83	12.88	13.22
R-squared	0.25	0.01	0.25
Number of firms	1607	1603	1603

This table presents estimates from fixed effect two-stage least squares regressions of Eqs. (1) and (2). To save the space, we only report the estimates of Eq. (1). The dependent variables are measures of CEO compensation. Adoption dummy is a dummy variable equal to 1 if the firm has adopted stock ownership guideline in a given year and zero otherwise. Adoption * Meet is an interaction term between Adoption and a dummy variable if the CEO's unrestricted stock ownership met the stock ownership guideline at the time of adoption ($t = 0$) and zero if the CEO's unrestricted stock ownership does not meet the stock ownership guideline at the time of adoption. Prior year compensation is a lagged dependent variable for the respective compensation measure. We use the proportion of industry firms that have already adopted a guideline as an instrument for stock ownership guideline adoption. The sample consists of 787 firms with complete data to determine whether CEO unrestricted stock ownership is below (Not-meet) or above (Meet) the stock ownership guideline at the time of adoption from 1992 to 2007. All control variables are explained in Section 4.1 and Appendix 2. All regressions include dummy variables year (the coefficients for year are not reported). The t-statistics are calculated using robust standard errors clustered at the firm level. Robust standard errors are given in parentheses. Endogeneity test is based on the C statistics, defined as the difference of two Sargan-Hansen statistics (Schaffer, 2010). Weak IV test is based on Kleibergen-Paap Wald F statistic (Stock and Yogo, 2005). The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively, in two-tailed tests.

CEO ownership with measures of CEO compensation. We control for the firm and CEO characteristics found to determine the level of executive compensation (Graham et al., 2012; Core et al., 2008, 1999; Tian, 2004; Murphy, 1999; Rose and Shepard, 1997). The sample includes both Not-meet and Meet stock ownership guideline adopting firms and all not-adopting firms. We use the log of CEO compensation measures to account for the high skewness and kurtosis in the variables.

Column (1) provides estimated results with CEO total annual compensation as the dependent variable. None of the estimated coefficients on the Adoption indicator or the interaction term of Adoption × Meet are significant. This suggests that total annual compensation does not change after guideline adoption and does not differ between Not-meet and Meet adopting firms after controlling for potential endogeneity and factors related to CEO compensation. Columns (2) and (3) provide estimated results with CEO total equity-based grants to total annual compensation and restricted stock grants to total annual compensation as the dependent variable, respectively. None of the estimated coefficients on the Adoption indicator or the interaction term of Adoption × Meet are significant. This suggests that the proportion of equity compensation does not change after stock ownership guideline adoption and does not differ between Not-meet and Meet adopting firms.[23]

Overall, after controlling for potential endogeneity and factors related to CEO compensation, CEO compensation does not change

[23] In univariate analyses of compensation, we find weak evidences that CEO total annual compensation increases after stock ownership guideline adoption for Not-meet firms but not for Meet firms. We also find that the proportion of restricted stock grants increases after adoption for both Not-meet and Meet firms. But the significantly changes in compensation largely disappear when we also use PSM to control for the potential selection bias based on observables and estimate the average treatment effect for the treated (ATT). We find the estimates of the average treatment effect for the treated of CEO compensation on guidelines adoptions are insignificant with two exceptions. The unreported results are available upon request.

Table 8
Long-run operating performance and stock performance following adoption.

Year	Mean						Median						Sample size
	ROA			AROA			ROA			AROA			
	(a) Not-meet	(b) Meet	(a)–(b) *p*-Value	(a) Not-meet	(b) Meet	(a)–(b) *p*-Value	(a) Not-meet	(b) Meet	(a)–(b) *p*-Value	(a) Not-meet	(b) Meet	(a)–(b) *p*-Value	
Panel A: long-run operating performance (ROA)													
1	12.66	13.75	0.08	1.36***	4.07***	0.03	12.15	13.53	0.05	0.07***	0.58***	0.01	367/386
2	12.74	12.59	0.84	3.65***	7.91***	0.14	11.6	12.82	0.69	0.70***	0.81***	0.98	331/340
3	13.02	12.97	0.95	7.34***	10.95***	0.24	11.68	13.67	0.61	1.49***	1.44***	0.83	256/236

Month	Mean						Median						Sample size
	BHR			BHAR			BHR			BHAR			
	(a) Not-meet	(b) Meet	(a)–(b) *p*-Value	(a) Not-meet	(b) Meet	(a)–(b) *p*-Value	(a) Not-meet	(b) Meet	(a)–(b) *p*-Value	(a) Not-meet	(b) Meet	(a)–(b) *p*-Value	
Panel B: long-run stock performance													
(1, 12)	0.09***	0.07***	0.56	−0.02	−0.02	0.98	0.09***	0.06***	0.50	0.00	−0.03	0.54	370/409
(1, 24)	0.06**	0.03	0.01	0.02	−0.04	0.22	0.10***	0.00	0.01	0.03	−0.05	0.19	368/404
(1, 36)	0.15***	0.06***	0.03	−0.04	−0.09***	0.45	0.03***	−0.02	0.08	0.00	−0.03**	0.38	362/396

Month	Mean AR			Median AR			Sample size
	(a) Not-meet	(b) Meet	(a)–(b) *p*-Value	(a) Not-meet	(b) Meet	(a)–(b) *p*-Value	
Panel C: long-run abnormal stock performance adjusted for three Fama-French factors and momentum factor							
(1, 12)	0.003	0.003	0.98	0.003	0.004	0.795	370/409
(1, 24)	0.003	0.003	0.583	0.003	0.003	0.933	368/404
(1, 36)	0.001	0.001	0.793	0.001	0.003	0.225	362/396

This table presents the effect of guideline adoption on long-run financial performance. Panels A and B/C report the long-run operating and stock performance post-adoption for ownership guideline firms. In Panel A, we measure ROA as operating income before depreciation (item 13) divided by total assets (item 6). Following Barber and Lyon (1996), we match adopting firms on their Fama-French 48 industry, and then select a not-adopting firm with an ROA closest to the sample firm in the year of adoption. We require that the control firm's ROA be within 90% and 110% of the sample firm's ROA. If a matching firm delists before the adopting firm, we use industry average ROA to replace it. When we cannot find a matching firm in the same industry with ROA in the range between 90% and 110% of the adopting firm, we select the firm with the closest ROA regardless of industry. AROA is the difference between the adopting firm ROA and the matched control firm ROA. In Panel B, buy-and-hold abnormal return (BHAR) is calculated as difference of buy-and-hold returns (BHR) between adopting firms and its matched firm. We compute the BHRs starting the first month of year 1, the fiscal year in which the firm releases the proxy statement announcement of the plan. Following Barber and Lyon (1997), each adopting firm is matched to a not-adopting firm with the closest book-to-market ratio within a subset of firms whose market value lies between 70% and 130% of the sample firm market value. If a matching firm delists before the adopting firm, we use CRSP value-weighted index return to replace it. Panel C reports long-run abnormal stock performance adjusted for the three Fama-French factors and momentum factor (Fama and French, 1992; Carhart, 1997). The monthly abnormal return (AR) for each adopting firm is the intercept of a time-series regression of monthly excess returns on three Fama-French factors and momentum factor over the past T months following its adopting fiscal year (T = 12, 24, and 36). The sample consists of 787 firms with complete data to determine whether CEO unrestricted stock ownership is below (Not-meet) or above (Meet) the stock ownership guideline at the time of adoption from 1992 to 2007. *p*-Values are from the *t*-tests for differences in means and Wilcoxon rank tests for differences in medians. The superscripts ***, **, * denote the statistical significance from zero at the 1%, 5%, and 10% level, respectively, in two-tailed *t*-tests for AROA and buy-and-hold return.

abnormally for Not-meet and Meet firms after guideline adoption. The significant increases in ownership post guideline adoption for Not-meet firms do not lead to abnormal increases in compensation.

4.4. Effect of stock ownership guidelines on accounting and stock performance

We find that CEO ownership and equity-based incentives increase and CEO total compensation and the proportion of equity based compensation paid to the CEO remain the same for Not-meet firms. CEO ownership, equity-based incentives, and compensation do not change abnormally for Meet firms. These results suggest that incentive alignment is a possible motivation for Not-meet guideline adoptions. We next examine the effect of guideline adoption on long-run financial performance.

We begin by examining the effect of guideline adoption on long run financial performance. We follow Barber and Lyon (1996) to match guideline adopting firms on their Fama-French 48 industry, and then select a not-adopting firm with an ROA closest to the sample firm in the year of adoption. Barber and Lyon (1996) demonstrate that matching on prior accounting returns is important because operating performance tends to be mean reverting. We require that the control firm's ROA be within 90% and 110% of the sample firm's ROA. If a matching firm delists before the adopting firm, we use industry average ROA to replace it. When we cannot find a matching firm in the same industry with an ROA in the range between 90% and 110% of the adopting firm, we select the firm with the closest ROA regardless of industry. When measuring the performance effects of stock ownership adoption on stock performance, we follow the methodology of Barber and Lyon (1997) and Barber et al. (1999) to select a control firm with a market value within 70% and 130% of the sample firm's market value and the closest book-to-market to the adopting firm in the year of the adoption. If a matching firm delists before the adopting firm, we use the CRSP value-weighted index return as a replacement.

Panel A of Table 8 presents evidence on accounting performance, while Panel B/C presents evidence on stock performance, for the 3 years after adoption. We report mean and median ROA and abnormal ROA (AROA: the difference between the adopting firm ROA and the matched control firm ROA). We report results for Not-meet and Meet guideline adopting firms and the difference between them. Table 8 shows that the accounting performance of Meet firms is significantly better than Not-meet firms. The performance gap continues to be significant the first year following adoptions as we find that the median ROA and AROA of Meet adopting firms is significantly better than Not-meet firms in year + 1 in Table 8. The accounting performance gap between Not-meet and Meet firms narrows and the difference in ROA and AROA is no

longer significant after the first year. In year 3, the median AROA for Not-meet firms is 1.49%, which is higher than the median AROA for Meet firms of 1.44%, though difference is not significant. The results using mean ROA and AROA are similar.

Panel B of Table 8 reports mean and median buy-and-hold returns (BHR) and buy-and-hold abnormal returns (BHAR: the difference between the adopting firm buy-and-hold return and the matched control firm buy-and-hold return). We report results for Not-meet and Meet adopting firms and the difference between them. We find that the mean BHR for Not-meet firms is significantly better than Meet firms in years + 2 and + 3. The BHAR of Not-meet firms is higher than Meet firms in years + 2 and +3, but the differences are not significant. Our results using median BHR and BHAR are similar. We also report long-run abnormal stock performance (AR) in Panel C. The monthly abnormal return (AR) for each adopting firm is the intercept of a time-series regression of monthly excess returns on three Fama-French factors and momentum factor over the past T months following its adopting fiscal year (T = 12, 24, and 36) (Fama and French, 1992; Carhart, 1997). We find no evidence that Not-meet firms have higher abnormal stock returns than Meet firms after adjusting for four risk factors.

Overall, we find that the adoption of ownership guidelines leads to improvement in operating performance of Not-meet firms relative to that of Meet firms as the significant gap in ROA and AROA between Not-meet and Meet firms disappears after guideline adoptions. There is weak evidence that Not-meet firms have better stock performance than Meet firms after adopting guidelines. Not-meet firms have better (not significant) stock performance (BHR and BHAR) than Meet firms but similar abnormal stock returns after adopting guidelines. This is consistent with the view that there is likely an incentive alignment motive for Not-meet adoptions versus a stakeholder management motive for Meet adoptions.[24,25]

5. Conclusion

Using a sample of 901 firms that adopt CEO stock ownership guidelines from 1992 to 2007, we examine the effect of guideline adoption on two distinct groups of firms, those where the board sets the guideline above the CEO's unrestricted (vested) stock ownership (Not-meet firms) and those where the board sets the guideline below the CEO's unrestricted stock ownership (Meet firms) at the time of adoption.

We find that the propensity of adoption is increasing in the quality of corporate governance and the proportion of industry firms that have already adopted a guideline, but decreasing in CEO ownership. Conditioning on adoption, Not-meet adoption is decreasing in the proportion of industry firms that have already adopted a guideline.

More importantly, we find that CEO ownership increases after stock ownership guideline adoption for Not-meet firms. This suggests that guideline adoption for Not-meet firms is effective at increasing the CEO's level of ownership and equity-based incentives. In contrast, CEO ownership stays the same after guideline adoption for Meet firms; consistent with the view that Meet adoption is primarily for stakeholder management. Further, we find that CEO total annual compensation and the proportion of equity based compensation paid to the CEO do not change after guideline adoption for Not-meet or Meet firms even controlling for potential endogeneity and other factors. This indicates that the higher levels of CEO ownership for Not-meet firms are not the result of changes in the level or the mix of CEO compensation.

Finally, we find that the adoption of ownership guidelines leads to improvement in operating performance of Not-meet firms relative to that of Meet firms as the significant gap in operating income before depreciation over total assets between Not-meet and Meet firms disappears after guideline adoptions. Further, we find that Not-meet adopting firms have significantly better buy-and-hold stock returns than Meet adopting firms in years 2 and 3 following the adoption of a stock ownership guideline.

Overall, our study contributes to the debate on the effectiveness of stock ownership guidelines. Our results suggest that stock ownership guideline adoption achieves the intended effect – an increase in CEO ownership and improvement in firm performance – but only for Not-meet firms. The absence of a significant effect of guideline adoption for Meet firms suggests that adoption by Meet firms is likely a response to pressure from stakeholders.

Appendix A.

See Appendix 1 and 2.

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[24] To control for the endogeneity problem of simultaneity bias and omitted variable bias, we run 2SLS regressions similar to Eq. (1) on operating performances and stock performances, respectively. The results are unchanged from univariate analyses. We also repeat all analyses from Tables 2 to 8 after excluding 95 firms with CEO turnover during the year of guideline adoption. For adopting firms without CEO turnover, the results on the effects of guideline adoption for Not-meet and Meet firms are similar to reported results using the full sample. Therefore, it is unlikely that CEO turnover drives the guideline adoption decision. We have run all analyses excluding firms from financial/regulated industry (with SIC codes 4800-4949 or 6000-6999). The results do not change qualitatively. Those results are not tabulated for brevity and are available upon request.

[25] We also examine the stock market's reaction to proxy statement announcements of stock ownership guideline adoption (firms disclose ownership guideline in their proxy statements), a noisy measure of the market's reaction to guideline adoption. We find weak evidence that the market reacts negatively to proxy statement announcements of guideline adoption for Meet firms and more positively to proxy statement announcements of guideline adoption for Not-meet firms. The CARs – adjusting for market returns or Fama-French 3 factors – for Not-meet firms are higher than those of Meet firms but the differences are only significant when CARs are adjusted for market returns. The results for CARs are not tabulated for brevity and are available upon request.

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