CHOICE OF PERFORMANCE MEASURES IN PERFORMANCE-VESTED EQUITY COMPENSATION AND FUTURE PERFORMANCE

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Abstract

This paper examines the choice of performance measures in performance-vested (p-v) equity compensation and its relation with future performance. Based on a sample of the S&P 500 industrial firms which granted p-v equity compensation to executives during 2006-2008, this paper presents several interesting results. While annual bonuses and p-v equity compensation both link payout to achievement of performance targets, firms use performance measures in different ways for these two types of compensation. Compared to annual bonuses, p-v equity compensation features fewer numbers of performance measures and a higher tendency to use market measures. The results of logistic regressions show that consistent with the Informativeness Hypothesis, the likelihood of a performance measure's usage in p-v equity compensation decreases with the relative noise of the measure. The choice of performance measures is also associated with financial performance, business complexity, and growth opportunities. Importantly, I find that firms choosing cash or non-financial measures for p-v equity compensation have worse operating and stock performance in subsequent years and firms using a sales measure for p-v equity compensation have better operating performance subsequently. This paper provides useful insights into academia and practice on the design and consequence of p-v equity compensation.

Keywords: Performance Measure, Executive Compensation, Performance-Vested Equity Compensation, Incentive, Performance-Vesting

1. INTRODUCTION

Performance measures play a critical role in the efficacy of a compensation contract. Using a wrong performance measure can distort managerial behaviors and result in adverse consequences in company performance (Baker 2000). Given the importance of performance measures, this paper investigates the choice of performance measures in performance-vested (p-v) equity compensation, a key long-term incentive plan which has demonstrated significant growth in practice in the past ten years. Among the top 250 companies, the proportion of firms granting p-v equity compensation increased from 44% in 2006 to 81% in 2013, and its frequency has surpassed that of traditional option grants since 2011 (F. W. Cook 2008; 2012; 2013). The growing popularity of p-v equity grant is attributed to the concerns that time-vested options cannot provide sufficient motivation for managers (Gerako et al. 2007). Dependent solely on the passage of time,

time-vested equity compensation allows managers to be generously rewarded when the market rises, even if the company underperforms the industry peers or the market (Kuang and Qin 2009). In response to shareholders' calls for a greater link between pay and performance, companies started to adopt p-v equity compensation which requires managers to achieve pre-determined performance targets before stocks or options can be vested. For example, Best Buy introduced p-v equity compensation to executive compensation during 2012, after its shareholders voted against its say-on-pay proposal. The following is an excerpt from its proxy statement.

"It is well known that at our Regular Meeting of Shareholders in June 2012, the majority of our shareholders voted against our "Say on Pay" proposal... In response to these voting results, the Company engaged in direct dialogue with its shareholders, including its top institutional shareholders, to determine the basis of this negative "Say on Pay" vote.... we took this feedback seriously

in shaping our subsequent compensation deliberations…In fiscal 2013, we conducted a comprehensive review of our long-term incentive program which resulted in us creating a greater link between pay and performance. Upon completion of that review, the Compensation Committee approved a redesigned LTI program for the NEOs starting in fiscal 2013. The redesigned program introduced a structure under which one-third of all officer awards will be contingent on business performance, in this case, relative Total Shareholder Return ("TSR") (relative to the S&P 500 Index). TSR was selected based on its prevalence in the market place and directly link to shareholder value creation."[9]

This example shows that under the redesigned compensation package, p-v equity compensation consists of one third of Best Buy's 2012 long-term incentive program, and Best Buy uses a single performance measure, Total Shareholder Return, for this type of compensation to determine the payout to executives.

The design of p-v equity compensation has received increasing scrutiny in practice. Proxy advisory firms such as Glass Lewis have issued voting guidelines that call for close examination of performance measures in p-v equity grants (Glass Lewis 2015). Specifically, Glass Lewis (2015) suggests that 'performance measures should be carefully selected and should relate to the specific business or industry in which the company operates and, especially, the key value drivers of the company's business.' In its guidelines, Glass Lewis (2015) also suggests using two or more performance measures that cannot be easily manipulated by management and recommends that performance measures should incentivize executives to achieve outstanding performance while not encouraging excessive risk-taking.

Given the growing importance of p-v equity compensation and the key role of performance measures in the efficacy of a compensation contract, it is critical to understand how firms choose performance measures for this incentive plan. However, there exists only limited research on the performance measures in p-v equity compensation, partially due to the insufficient disclosure in compensation contracts before 2006. Extant research on the p-v equity compensation mainly focuses on the adoption decision (Bettis et al. 2010), the interdependence of contractual features (Gao et al., 2017), or the consequence of adopting p-v equity compensation (Kuang and Qin 2009; Bettis et al. 2010; Bennet et al. 2015; Bizjak et al. 2015). This paper fills this gap by providing a thorough analysis on the choice of performance measures in this rapidly-growing compensation plan, with a goal of providing useful insight to academia and practice on the design of p-v equity compensation.

Prior literature on the choice of performance measures has largely focused on CEO bonus pay (Lambert and Larcker 1987; Ittner et al. 1997; Matejka et al. 2009), non-management employees incentive plans (Ittner and Larcker 2002), or performance-based pay (De Angelis and Grinstein 2014). This paper differs from these studies in

several ways. First, this paper focuses on the choice of performance measures in executives' long-term p-v equity compensation rather than annul cash bonuses. Although annual bonuses and p-v equity compensation both subject the vesting of compensation to the achievement of performance targets, they have different purposes and features. The goal of annual bonuses is to incentivize managers to improve corporate short-term performance, but p-v equity compensation is granted to align managerial incentives with shareholders' long-term interests and to enhance long-term performance of the firm. Also, while annual bonuses are paid in cash, p-v equity compensation can be paid in stocks or cash. Due to the difference in purpose and nature, the findings related to annual bonuses may not apply to p-v equity compensation. Moreover, this paper focuses on long-term p-v equity compensation and is different from De Angelis and Grinstein (2015) which incorporate both short-term bonuses and long-term p-v equity compensation in their analyses. This paper presents several distinctions between p-v equity compensation and short-term bonuses, suggesting that combining annual bonuses with p-v equity compensation in an analysis may not fully reveal the design of p-v equity compensation.

The sample of this paper is composed of S&P 500 industrial firms which granted p-v equity compensation to executives from 2006 to 2008. The data of performance measure choice are hand-collected from proxy statements. The findings are summarized below. First, there exist several differences in the choice of performance measures between the annual bonus and p-v equity compensation. Earnings measure is more commonly used in annual bonuses than in p-v equity compensation (89,37% vs. 59,1%), but market measure is more frequently used in p-v equity compensation than in annual bonuses (28.99% vs. 4.19%). On average, firms use more performance measures for annual bonuses than for p-v equity compensation. The majority of the sample firms (55.23%) use a single performance measure for p-v equity compensation, whereas only 25.18% of the sample do so for annual bonuses. Second, consistent with the Informativeness Hypothesis in Holmstrom (1979), the likelihood of a performance measure being used in p-v equity compensation is negatively associated with the relative noise of the measure. Third, the choice of performance measures is also related to financial performance, business complexity, and growth opportunities. Results show that firms tend to choose a performance measure which demonstrates good performance of the firm in the past. For example, firms with better stock returns in the past tend to choose stock returns as a performance measure for executive p-v equity compensation. One explanation is that when the previous performance is good, these performance measures are highly correlated with their long-term strategic plans and are therefore used for p-v equity compensation. An alternative explanation is that CEOs cherry-pick a performance measure that favors the vesting of their own equity awards. Importantly, the choice of performance measures is related to future performance. In particular, firms which use cash or

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[9]https://www.sec.gov/Archives/edgar/data/764478/000076447813000023/bby definitiveproxy2013.htm

non-financial measures for p-v equity compensation tend to have worse operating and stock performance in subsequent years and firms using a sale measure for p-v equity compensation have better operating performance subsequently. These results suggest that performance measures should be carefully selected to incentivize managers to improve firm performance. The results also have implications for shareholders, investors, and proxy advisory firms regarding their say-on-pay votes, investment decisions, and voting recommendations. The main results of performance measure choices are robust when an alternative methodology, the cluster analysis, is used and when the analyses control for the selection bias caused by the adoption of p-v equity compensation.

This paper contributes to the literature in executive compensation and the practice in several ways. First, this paper adds direct empirical evidence to the literature regarding the contractual designs of p-v equity compensation, a key component of executive pay that has grown rapidly in recent years. This paper shows that the performance measures used for p-v equity compensation are very different from those for annual bonus plans, even though both types of compensation are contingent upon the achievement of the performance target. Second, this paper identifies several key factors that are associated with a firm's decision to select performance measures for p-v equity compensation. An important finding of this paper is that the choice of performance measures in p-v equity compensation is consistent with the Informativeness Hypothesis. The findings are also consistent with Glass Lewis' (2015) suggestions that performance measures should relate to the key value drivers of the company's business. Third, this paper reports the financial consequences of performance measure choice, suggesting that firms should carefully select performance measures for p-v equity compensation to provide adequate incentives for managers. The results also provide support for the voting guideline of the proxy advisory firms (Glass Lewis 2015) that performance measures should be carefully selected.

The rest of the paper is organized as follows. Section 2 reviews the prior literature and develops hypotheses. The sample is described in section 3. Section 4 discusses the empirical analyses. Section 5 describes the robustness analyses, and Section 6 concludes.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

In a traditional time-vested equity compensation plan, the vesting is contingent simply upon the passage of time; as long as managers serve the firm for enough time (based on the vesting period), managers gain the right to exercise options or sell stocks. One concern about the time-vested equity compensation is that it provides a weak link between managerial compensation and firm performance (Gerakos et al. 2007), because managers may receive windfall gains when the whole stock market is performing well even if the firm underperforms the market average (Kuang 2008). In order to improve the link between

executive pay and firm performance and to induce higher managerial efforts, some firms started to grant p-v equity compensation where the payout is contingent upon the achievement of pre-determined performance targets. The granted p-v equity compensation will be voided if performance thresholds are not met.

P-v equity plans have been popular in the UK due to the influence of the corporate governance code issued by the Greenbury Committee in 1995. In 2004, 94% of the largest 244 UK non-financial firms granted p-v stock options (PVSOs) to CEOs (Kuang and Qin 2009). Several studies examine the use of p-v equity compensation in UK firms. For example, Kuang and Qin (2009) show that PVSO is better than time-vested stock options in aligning executives' interests with shareholders'. However, Kuang (2008) shows that managers are more likely to engage in earnings management when they hold a larger proportion of compensation in PVSOs. Carter et al. (2009) examine the use of RPE by UK firms and identify several determinants of RPE use in p-v equity awards. Abernethy et al. (2015) show that powerful CEOs influence the adoption and choice of performance targets for PVSOs. Specifically, powerful CEOs attach less challenging targets in the initial PVSOs granted to their CEOs and thus negate some of the beneficial effects of PVSOs.

In contrast to the prevalence of p-v equity compensation in the UK, the adoption of p-v compensation in the US only grew rapidly in recent years. Among the top 250 U.S. firms, the adoption of p-v equity grants rose from 44% in 2006 to 90% in 2015, and the weight of p-v equity grants in total long-term incentive pay increased from 15% in 2003 to 52% in 2015 (F.W. Cook 2008, 2015). Research on the p-v equity compensation based on US firms was limited due to the lack of detailed disclosure in the proxy statements before 2006. Based on a sample of 128 US firms which granted PVSOs to CEOs between 1993 and 2002, Gerakos et al. (2007) find a greater use of PVSOs in firms which have lower volatility, lower market-to-book ratios, and new external CEO appointments, suggesting that firms grant PVSOs for incentive and sorting purposes. In a larger sample, Bettis et al. (2010) find that the propensity to adopt p-v equity compensation is positively related to the appointment of a new CEO, suggesting that p-v equity compensation is used to minimize a firm's loss in case ex post performance proves that the new CEO is not a good fit for the company. Bettis et al. (2010) also show that the adoption of p-v equity compensation is positively related to the proportion of outsiders on the board of directors and negatively related to prior stock performance. Their results suggest that p-v equity compensation is not used by firms with weak governance, but instead is adopted to provide more incentives to managers to improve firm performance. Bettis et al. (2016) develop new methods to measure the value and incentives of p-v equity compensation and show that p-v equity compensation amplifies compensation delta and vega.

Several studies examine the consequences of adopting p-v equity compensation. For example, Kuang and Qin (2009) show that p-v equity compensation increases the interest alignments

between managers and shareholders and provide managers with stronger incentives to improve firm performance. Bizjak et al. (2017) find that firms granting p-v equity awards with accounting-based (stock price) performance measures to their CEOs have lower (higher) cost of debt. Bettis et al. (2010) find that firms which grant p-v equity compensation have higher operating performance in the future than firms which simply grant time-vested equity compensation to executives, and their higher operating performance is not driven by earnings management. However, some studies find that the grant of p-v equity compensation increases in the likelihood that firms engage in earnings management. Bennet et al. (2015) show that the distribution of reported performance exhibits a discontinuity around performance targets and that firms manage both accruals and discretionary expenditures to meet performance targets. Bizjak et al. (2015) find evidence that p-v awards are related to real earnings management, but not discretionary accruals management.

Informativeness of performance measure. According to the Informativeness Principle in Holmstrom (1979), a firm should choose a performance measure that is informative of managerial actions. In other words, firms should avoid using a performance measure that is too noisy and uninformative of executives' performance. Prior studies on the choice of performance measures focus on CEO's annual bonuses (Lambert and Larcker 1987; Ittner et al. 1997; Matejka et al. 2009) or nonmanagement employees' incentive plans (Ittner and Larcker 2002). These papers show that consistent with the Informativeness Principle, the choice of performance measures for CEO bonuses is related with the relative informativeness of a measure. For example, Lambert and Larcker (1987) show that when the variance of the accounting measure is larger than that of the market measure, firms place more weight on the market measure than the accounting measure for annual bonuses. Ittner et al. (1997) find that the use of nonfinancial measures in CEO cash bonuses increases with the noise of financial measures.

It is particularly important for firms to choose an informative measure for the p-v equity compensation. Compared to cash bonuses, equity awards subject executives to higher risk because of the link between the value of equity compensation (e.g. stock options and restricted stocks) and stock prices. Contingent the vesting upon the achievement of performance targets, p-v equity compensation further aggravates the risk level beyond what executives receive from the time-vested equity compensation. Therefore, it is very critical for firms to choose an informative performance measure so that excessive volatility in the p-v equity compensation can be minimized. This paper predicts that the Informativeness Principle applies to p-v equity compensation: a measure with higher informativeness (or less noise) is more likely to be used in p-v equity compensation to evaluate executives' performance and to decide the magnitude of equity compensation to be vested.

H1: The likelihood of a performance measure being used for p-v equity compensation decreases with the measure's relative volatility.

Financial performance. Financial performance can influence a firm's choice of performance measures for performance-based pay (Ittner et al. 1997). Matějka et al. (2009) show that financially distressed firms are more likely to use financial measures than non-financial measures in their CEOs' bonus plans so that CEOs are motivated to improve the firm's financial performance.

Similar to cash bonuses, p-v equity compensation requires executives to meet pre-determined performance targets and is used to incentivize managers to improve firm performance. Proxy advisory firms advocate that "we believe companies should disclose why the specific performance metrics were selected and how the actions they are designed to incentivize will lead to better corporate performance" (Glass Lewis 2015). Therefore, firms with poor financial performance should carefully select a performance measure for the p-v equity compensation to enhance company performance. I predict that firms which perform poorly in a specific area are more likely to use a corresponding measure for p-v equity compensation so that managers' attention is drawn to the area that is in need of improvement. In particular, firms suffering from the low stock performance are more likely to choose stock returns or a stock price as a performance measure for p-v equity compensation, and firms with poor accounting performance are more likely to link the vesting of p-v equity compensation to the achievement of accounting targets.

H2: The likelihood of a performance measure being used for p-v equity compensation is negatively associated with past performance gauged by the corresponding performance measure.

Business complexity. For firms with complex business operations, market measures are likely to be more informative of executives' performance than accounting measures, because stock prices/returns incorporate more comprehensive information and are more forward-looking than retrospective accounting measures such as earnings or sales (Collins et al. 1987; De Angelis and Grinstein 2015). Therefore, it can be predict that complex firms are more likely to use a market measure than an accounting measure for p-v equity compensation.

H3: Firms with high business complexity are more likely to use a market measure than accounting measures for the p-v equity compensation.

Growth opportunities. Performance measures used in a compensation contract should closely relate to a firm's business strategy to align managers' incentives with the firm's goals (Govindarajan and Gupta 1985; Simon 1987; Ittner et al. 1997). In a similar way, Glass Lewis (2015) suggests that in long-term incentive plans, performance measures should relate to the key value drivers of the company's business. Firms which follow a cost leader strategy pursue operating efficiency and cost controls, so short-term retrospective accounting measures are more informative of the executive's performance than market measures for such firms (Simons 1987; Govindarajan and Fisher 1990). In contrast, firms which adopt a product differentiation strategy have extensive investments in innovative products to

exploit growth opportunities. Because their investments depress short-term accounting performance, a forward-looking market measure is more able to reflect future outcomes of executives' strategic decisions and is less likely to distort executives' incentives than accounting measures. Consistent with this argument, Lambert and Larcker (1987) report that in cash bonuses, firms having high growth rates in assets and sales place more weight on market performance than accounting performance. Moreover, firms with extensive investment to gain market share may rely heavily on the *Sales* measure to align managers' efforts with corporate strategy (De Angelis and Grinstein 2015). These arguments lead to my next hypothesis.

H4: Firms with higher growth opportunities are more likely to use a market measure or a sale measure for the p-v equity compensation.

3. SAMPLE AND DESCRIPTIVE STATISTICS

The sample is composed of S&P 500 non-financial firms that granted p-v equity compensation to executives between 2006 and 2008. The sample starts from 2006 because it is the first year when SEC required companies to enhance the disclosure of executive compensation in proxy statements. This requirement allows the public to see the details of p-v equity compensation contracts, including the magnitude of grants, justification, and determination of grants, peer companies, how firms tie executive compensation to performance, choice of performance measures, length of performance periods, etc. Among these contractual features of p-v equity compensation, choice of performance measures plays a pivotal role in determining the efficacy of p-v equity compensation and is a key factor considered by proxy advisory firms when they evaluate a firm's compensation contract (Glass Lewis 2015).

The data of performance measures choice is hand collected from the Compensation Discussion and Analysis section of the proxy statements. Accounting data is obtained from Compustat, stock prices and returns from CRSP, and executive compensation data from ExecuComp. The final sample contains 621 firm-year observations with no missing values in the main variables.

Table 1 summarizes the frequency of p-v equity compensation and the choice of performance measures. Panel A shows that most of the p-v equity compensation is granted in the form of restricted stocks rather than stock options (95.7% vs. 4.3%). The frequency of p-v equity compensation adoption increases from 53.13% in 2006 to 59.89% in 2008, whereas the frequency of time-vested stock options decreases from 82.56% to 75.82% over the sample period. The decrease of time-vested stock options grants is likely attributed to FAS123(R) which require companies to expense stock options. Since most of the p-v equity compensation is granted in the form of restricted stocks, this paper focuses on p-v restricted stocks.[10]

Panels B and C of Table 1 reports the choice of performance measures in annual cash bonuses and p-v equity compensation awards, respectively. The *Earnings* measure is the most frequently used

measure in both types of compensation. It is used in 89.37% of the cash bonus plans and 59.10% of the p-v equity awards. A comparison of Panels B and C reveals several differences between these two types of compensation. First, cash bonuses rely more heavily on short-term accounting measures such as *Earnings* (89.37%), *Sales* (45.73%), and *Cash* (28.02%). The *Market* measure plays a more important role in p-v equity awards (4.19% in the cash bonus plans vs. 28.99% in the p-v equity awards). Second, the *Asset Utilization* measure plays an important role for p-v equity compensation. It is the second most used performance measure in p-v equity awards (31.08%). In contrast, under cash bonus plans, the *Asset Utilization* measure (25.76%) is less frequently used than the *Earnings* (89.37%), *Sales* (45.73%) and *Cash* (28.02%) measures. Third, nonfinancial measures such as customer satisfaction, safety, and innovation are more frequently used in cash bonus plans than in p-v equity awards (24.48% vs. 4.51%). These differences suggest that accounting measures, which are more retrospective than the *Market* measure, are more frequently used in annual cash bonuses to incentivize managers to improve short-term performance. The *Market* measure is too volatile over the short run, thus is more suitable for the long-term p-v equity compensation to align managers' long-term interests with shareholders' and to focus managers' efforts on long-term performance.

Table 2 reports the number of performance measures used in cash bonuses versus p-v equity compensation. Panel A shows that it is a common practice to use multiple performance measures in cash bonuses: 25.28% of the sample use a single performance measure for cash bonuses, whereas the rest of the firms (74.72%) use at least two performance measures. More than a quarter of the firms (26.73%) use three types of performance measures for cash bonus plans. In contrast, Panel B of Table 2 illustrates that the majority of the sample uses a sole performance measure for p-v equity compensation (55.23%), and less than 10% of firms use more than two types of performance measures. This result is in a stark contrast to Glass Lewis' recommendation that two or three performance measures be used for long-term incentive plans.

Overall, Tables 1 and 2 indicate that firms use performance measures in different ways for cash bonuses and p-v equity compensation, possibly due to the differences in their purpose and nature. The goal of annual bonuses is to incentivize managers to improve firms' short-term performance, but p-v equity compensation is granted to enhance long-term performance of the firm. Because the payout of annual cash bonuses is determined based on executive performance within a short period (mostly one year), using multiple accounting measures allows a firm to better assess executives' performance. In the p-v equity compensation, the performance period is extended beyond one year, so the precision of performance evaluation increases and fewer performance measures are needed to evaluate executive performance (Gao et al., 2017).

Panel A of Table 3 shows the characteristics of sample firms grouped by the choice of performance

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[10] The results are robust to the inclusion of p-v stock options in the analyses.

measures in p-v equity compensation. This panel compares the characteristics of firms which choose vs. not choose the specific performance measures. Choice of performance measures equals 1 if the specified performance measure is used, and zero otherwise. The results show several interesting patterns. First, firms which choose *Earnings* as a performance measure for p-v equity compensation have higher *ROE* and lower *Oscore*, *Segmt* and *Size* in the previous period than the rest of the firms. The results of the *Sales* measure are similar; except that firms with a *Sales* measure tend to have smaller abnormal returns (*BHAR*) and significantly higher investment intensity (*Invest*) than the rest of the firms. Second, firms choosing an *Asset Utilization* measure for p-v equity compensation tend to have higher asset turnover (*ATO*), smaller investment (*Invest*), and more complex business (*Segmt*) than firms not using this measure for p-v equity compensation. Third, firms using a *Market* measure have significantly higher *BHAR*, *Segmt*, and *Size*. And firms with the *Cash* measure tend to have lower sales growth (*Growth_S*), lower investment, and larger *Size*, suggesting that such firms are bigger and mature companies that have fewer growth opportunities. Firms with the *Non-financial* measure have significantly lower *BHAR*, but a higher investment. Overall, this panel provides some evidence that the choice of a performance measure is related to financial performance, business complexity, and growth opportunities.

Panel B of Table 3 reports the correlations of the key variables in this paper. The negative correlations between *M_Market* and *M_Earn* (-0.49), between *M_Market* and *M_AU* (-0.18), and between *M_Market* and *M_Sales* (-0.20) suggests that firms using a *Market* measure are less likely to use accounting measures at the same time for p-v equity compensation. The positive correlations between *BHAR* and other financial variables (*Growth_S, NPM, ROE, ATO*) are intuitive because firms with good accounting performance usually receive good market returns as well. The negative correlations between *Oscore* and some financial variables (*Growth_S, NPM, ROE, BHAR*) indicate that probability of bankruptcy is negatively associated with financial performance.

The correlation table also shows that *Invest* and business complexity (*Segmt*) are correlated with the choice of performance measures. Especially, higher *Invest* (i.e. more growth opportunities) is associated with higher likelihood of using the *Sales* measure, but lower likelihood of using the *Asset Utilization* measure. And higher business complexity is associated with higher likelihood of using the *Asset Utilization* and *Market* measures, but lower likelihood of using the *Earnings* and *Sales* measures.

Panel C of Table 3 presents the variation in the choice of performance measures across industries. *Earnings* are a key performance measure for p-v equity compensation in the Consumer non-durables, Consumer durables, Business equipment, and Healthcare, medical equipment, and drug industries. *Asset Utilization* is the most frequently used measure in industries that are highly competitive and mature, such as the Manufacturing, Chemicals and allied products, and Retail industries. Firms in the Energy

extraction/production industry rely heavily on the *Market* measures (72.5% of sample in this industry use the *Market* measure). The energy extraction/production industry has been known for having high risks and volatility, extensive investment, and long-term operating cycles. Therefore, in this industry, the *Market* measure provides a more comprehensive picture of managers' performance and is more suitable than the accounting measures for the p-v equity compensation.

4. RESULTS

4.1. Determinants of Performance Measure Choice

This paper hypothesizes that the choice of performance measures in p-v equity compensation is related to the relative volatility of a measure, and a firm's financial performance, business complexity, and growth opportunities. The following logistic regressions are used to test these hypotheses.

$$
\begin{aligned}
M\_Earn_t = a_0 &+ a_1\, Rvolt\_E_{t-1} + a_2 NPM_{t-1} \\
&+ a_3\, Segmt_{t-1} \\
&+ a_4\, Invest_{t-1} + a_5\, Size_{t-1} \\
&+ Controls + \varepsilon_{1,t}
\end{aligned} \tag{1a}
$$

$$
\begin{aligned}
M\_AU_t = b_0 &+ b_1 RVolt\_A_{t-1} + b_2 ROE_{t-1} + b_3 ATO_{t-1} \\
&+ b_4 Segmt_{t-1} + b_5 Invest_{t-1} \\
&+ b_6 Size_{t-1} + Controls + \varepsilon_{2,t}
\end{aligned} \tag{1b}
$$

$$
\begin{aligned}
M\_Market_t = c_0 &+ c_1 RVolt\_M_{t-1} + c_2 BHAR_{t-1} \\
&+ c_3 Segmt_{t-1} + c_4 Invest_{t-1} \\
&+ c_5 Size_{t-1} + Controls + \varepsilon_{3,t}
\end{aligned} \tag{1c}
$$

$$
\begin{aligned}
M\_Sale_t = d_0 &+ d_1 RVolt\_S_{t-1} + d_2\, Growth\_S_{t-1} \\
&+ d_3 Segmt_{t-1} + d_4 Invest_{t-1} \\
&+ d_5 Size_{t-1} + Controls + \varepsilon_{4,t}
\end{aligned} \tag{1d}
$$

$$
\begin{aligned}
M\_Cash_t = e_0 &+ e_1 RVolt\_C_{t-1} + e_2 Oscore_{t-1} \\
&+ e_3 CashCnt3_{t-1} + e_4 Segmt_{t-1} \\
&+ e_5 Invest_{t-1} + e_6 Size_{t-1} \\
&+ Conrols + \varepsilon_{5,t}
\end{aligned} \tag{1e}
$$

The dependent variables are dummy variables which capture a firm's choice of performance measures in p-v equity compensation. *M_Earn* (*M_AU, M_Market, M_Sale, M_Cash*) equals to one if a firm uses the *Earnings* (*Asset Utilization, Market, Sales, Cash*) measure for the p-v equity compensation, and zero otherwise.

The independent variables in Eq. (1a)-(1e) correspond to the hypotheses in this paper and are composed of four categories of variables. The first independent variable (*RVolt_E, RVolt_A, RVolt_M, RVolt_S, RVolt_C*) captures a measure's relative volatility and is related with Hypothesis 1 which predicts that the likelihood of a performance measure being used for p-v equity compensation decreases with the measure's relative volatility. *RVolt_E, RVolt_A, RVolt_M, RVolt_S, RVolt_C* measure the relative volatility of earnings, asset utilization, market returns, sales, and cash, respectively. In order to calculate a measure's relative volatility, I first compute the volatility of a measure as the standard deviation of the measure in the past twelve quarters scaled by its mean. The volatilities of the five performance measures are then ranked and the relative volatility of a performance measure

is calculated as the relative ranking of the measure's volatility. For example, if market returns volatility > earnings volatility > sales volatility > asset utilization volatility > cash volatility, $RVolt\_M$=5/5, $RVolt\_E$=4/5, $RVolt\_S$=3/5, $RVolt\_A$=2/5, and $RVolt\_C$=1/5. These variables capture the noise of a measure relative to that of the other measures.

Hypothesis 2 predicts that the likelihood of a performance measure being used for p-v equity compensation is negatively associated with past financial performance measured by the specific performance measure. In other words, I predict that firms performing poorly in a specific area are more likely to choose a corresponding performance measure for the p-v equity compensation. In each of the Eq. (1a-1e), the proxy variables of financial performance correspond to the measures in the dependent variable. In Eq. (1a) where the dependent variable is defined based on whether a company uses an *Earning* measure, financial performance is proxied by net profit margin (*NPM*). In Eq. (1b) where the dependent variable captures whether an *Asset Utilization* measure is used for p-v equity compensation, financial performance is proxied by return on equity (*ROE*) and asset turnover (*ATO*). In Eq. (1c)-(1e), financial performance is proxied by abnormal stock returns (*BHAR*), growth in sales (*Growth_S*), and *Oscore* and cash constraint (*CashCnt*), respectively. Table 4a (see appendix) summarizes the relative volatility variable and the proxies of financial performance in Eq. (1a)-(1e).

Hypothesis 3 predicts that firms with complex business are more likely to use a market measure than an accounting measure for p-v equity compensation. Hypothesis 4 predicts that firms with more growth opportunities are more likely to use a market or sale measure for p-v equity compensation. To test these two hypotheses, I measure the complexity of business as the number of business segments (*Segmt*) and a firm's growth opportunities as its investment intensity (*Invest*) which equals the sum of R&D, advertising, and capital expenditures, divided by average total assets and averaged over prior three years. Hypotheses 3 and 4 predict both *Segmt* and *Invest* to have positive coefficients in Eq. (1c) where *M_Market* is the dependent variable. A hypothesis 4 predicts *Invest* to have a positive coefficient in Eq. (1d) where *M_Sales* is the dependent variable.

In addition to the above independent variables, Eq. (1a)-(1e) also control for size, CEO characteristics, other corporate governance variables, including the dual role of CEO as the chair of board of directors (*Dual*), new CEO appointment (*NewCEO*), CEO ownership (*CEOshr*), institutional holdings (*IH*), and board independence (*BrdIndp*) (Abernethy et al. 2015; DeFeo et al. 2008), and fixed year effects.

Table 4 reports the empirical results of Eq. (1a)-(1e). The first variable, *M_Vol*, is a measure's relative volatility and is calculated as *RVolt_E, RVolt_A, RVolt_M, RVolt_S, RVolt_C* in Eq. (1a-1e), respectively. Consistent with the prediction of Hypotheses 1, the relative volatility of a measure plays an important role in the choice of performance measure for p-v equity compensation. The coefficient of *M_Vol* is negative in Eq. (1a), (1b),(1c), and (1e) (significant at 1%, 1%, 5%, and 10%,

respectively), suggesting that firms tend to choose a performance measure whose volatility is lower than other measures and thus more informative of executives' efforts. The results of Eq. (1d), however, show that the use of the *Sales* measure is not related to its relative volatility.

Hypothesis 2 predicts a negative relation between past financial performance and the likelihood of using a corresponding performance measure for p-v equity compensation. The results of Eq. (1b) and (1c) suggest the opposite, however. Firms with higher, instead of lower, asset turnover (*ATO*) tend to choose a related performance measure, *Asset Utilization*, for p-v equity compensation. The positive coefficient of *BHAR* in Eq. (1c) suggests that firms with higher abnormal stock returns are more likely to use a market measure than other performance measures for p-v equity compensation. Two reasons can explain the positive relation between past performance and the likelihood of a corresponding measure being used for p-v equity compensation. One explanation is that these performance measures are closely related to a firm's strategic plans and therefore are used in the p-v equity compensation. The other explanation is related to rent extraction: it is likely that executives believe past good performance will sustain to the future, so they select the same performance measures to increase the probability of getting a favourable evaluation (Gao et al. 2017).

The results of Eq. (1e) suggest that firms with higher financial distresses (i.e. higher *Oscore*) tend to choose a *Cash* measure for p-v equity compensation; the effect of cash constraint (*CashCnt*) is marginally significant at the 10% level when the equation does not control for corporate governance variables.

Table 4 also shows that firms with more complex business (i.e. higher *Segmt*) are more likely to choose a *Market* or *Cash* measure, but less likely to use an *Earnings* measure for p-v equity compensation. Because the *Market* measure is more comprehensive than accounting measures and provides more forward-looking information, it allows firms with complex business to better evaluate managers' performance. The positive coefficient of *Segmt* in the cash equation (Eq. 1e) suggests that cash flow is an important measure for firms with complex business. Moreover, Table 4 reports that firms with higher growth opportunities (proxied by *Invest*) are more likely to choose a *Sales* measure, but less likely to choose an *Asset Utilization* measure. Since market share is critical for a growing firm, choosing a *Sales* measure for the p-v equity compensation helps align manager's incentives with firms' strategy to expand market share.

To summarize, the results in Table 4 suggest that in p-v equity awards, the choice of performance measure depends on the relative volatilities of the performance measures, past financial performance, business complexity, and growth opportunities. The findings support the predictions of Hypothesis 1 that the likelihood of choosing performance measures is negatively correlated with its relative noise. Although Hypothesis 2 predicts that firms with poor performance would choose a corresponding measure to improve firm performance, the results

indicate that firms tend to choose a performance measure which has demonstrated good performance previously. One possible interpretation is that firms choose these measures because they are important and closely related with company strategies and goals. It is also likely that executives bargain in the compensation contracts for a performance measure that is in favour of themselves (Gao et al. 2017). Hypotheses 3 and 4 are also supported because the results show that firms with complex business are more likely to choose a *Market* or *Cash* measure, but less likely to choose an *Earnings* measure. And firms with higher growth opportunities tend to use a *Sales* measure to direct managers' attention to the expansion of market share.

4.2. Future Performance

Firms grant p-v equity compensation to provide stronger incentives to managers and to enhance the long-term interest alignment of managers and shareholder (Gerakos et al. 2007; Kuang and Qin 2009). Among the contractual features of p-v equity compensation, performance measure plays a key role in guiding managers toward the right directions of corporate targets and therefore should have implications for firm performance. In this section, I examine whether the choice of a performance measure is related to future performance of a firm.

Table 5 presents the operating and stock performance in the five years subsequence to the grant of p-v equity compensation. Panel A demonstrates several interesting results based on operating performance calculated as industry-adjusted return on assets (*AdjROA*). First, firms using the *Earnings*, *Assets Utilization*, or *Market* measure for p-v equity compensation have similar operating performance as the rest of the firms. Second, firms using a *Sales* measure for p-v equity compensation outperform the rest of the firms in year t+2 to t+4 (the differences in *AdjROA* are 0.027, 0.032, and 0.038, significant at 10%, 5%, and 5% levels, respectively). Third, in stark contrast, firms choosing a *Cash* measure for p-v equity compensation underperform the rest of the firms in all of the following five years (the differences in *AdjROA*, -0.039, -0.038, -0.035, -0.039, -0.050, are significant at the 10%, 10%, 5%, 5%, and 1% level, respectively). An untabulated result shows that firms using a *Cash* measure for p-v equity compensation also have worse performance before the grant year. This result suggests that firms choosing a *Cash* measure for p-v equity compensation tend to have poor operating performance both before and after the grant year; using a *Cash* measure for p-v equity compensation is not sufficient to help these firms improve performance.

Fourth, Panel A of Table 5 demonstrates that firms choosing a *Non-financial* measure for p-v equity compensation have worse performance in years t+1 and t+2 than the rest of the firms. It is possible that a *Non-financial* measure, when used for a long-term incentive plan such as p-v equity compensation, does not provide sufficient financial incentives for executives to improve firm performance. Last, firms using multiple performance measures for p-v equity compensation have similar future performance as the rest of the firms. Even though the proxy advisory firms suggest using two or more performance measures for p-v equity compensation (Glass Lewis 2015), results demonstrate that using multiple measures does not help firms improve operating performance.

Panel B of Table 5 shows future stock performance, measured as size-adjusted stock returns. Firms with an *Earnings* measure for p-v equity compensation have better stock performance in year t+5, but firms with the *Market*, *Cash*, or *Non-financial* measure have worse stock performance subsequently.

In sum, the results of operating and stock performance suggest that the choice of performance measures is related to future performance. Specifically, firms choosing *Cash* and *Non-financial* measures for p-v equity compensation underperform the rest of the firms in subsequent years, and firms using a *Sales* measure have better operating performance subsequently.

5. ROBUSTNESS ANALYSES

5.1 Cluster Analysis

The analysis in Section 4.1 uses a system of binary models to examine the choice of performance measures for p-v equity compensation. Under that methodological design, firms using multiple performance measures appear in multiple equations, which could create a problem of duplications. Since a significant portion of the sample uses multiple performance measures in p-v equity awards (44.77%; Panel B of Table 2), I next use an alternative methodology—cluster analyses—to mitigate the potential duplication issue in the main analyses of Section 4.1. In order to perform the cluster analysis, I first classify the sample into several groups/clusters based on their choice of performance measures; firms in the same group/cluster use a similar set of performance measures for their p-v equity compensation.

The cluster analysis results in four groups/clusters of firms that have different choices of performance measures. Panel A of Table 6 shows that among the 243 firm-year observations in Cluster 1, *Earnings* is the most frequently used performance measure (*M_Earn* = 87.65%). This subsample is labelled as having a key performance measure of *Earnings*. I use a dummy variable *C_Earn* to define the performance measure choice in this group: *C_Earn* equals one in these observations, and zero in the remaining observations. Similarly, the results indicate that the subsample in Cluster 2 has a key performance measure of *Asset Utilization*, as all of these firm-year observations use an *Asset Utilization* measure (*M_AU*=100%); *C_AU* equals one in this subsample and zero in the rest of the sample. In the same vein, all of the firm-years in Cluster 3 use a *Market* measure (*M_Market* = 100%); *C_Market* equal one in this subsample, and zero in the rest of the sample, and *C_Sale* equal one in the subsample in Cluster 4, and zero in the rest of the sample.

Definitions of the dependent variables in the cluster analysis are summarized in Table 6a. (see appendix).

The following equations are used to test the robustness of the main results under the cluster analysis.

$$C\_Earn_t = a_0 + a_1 Rvolt\_E_{t-1} \\ + a_2 NPM_{t-1} + a_3 BHAR \\ + a_4 Segmt_{t-1} \\ + a_5 Invest_{t-1} \\ + a_6 Size_{t-1} + \varepsilon_{1,t}$$ (2a)

$$C\_AU_t = b_0 + b_1 RVolt\_A_{t-1} \\ + b_2 ROE_{t-1} + b_3 ATO_{t-1} \\ + b_4 Segmt_{t-1} \\ + b_5 Invest_{t-1} \\ + b_6 Size_{t-1} + \varepsilon_{2,t}$$ (2b)

$$C\_Market_t = c_0 + c_1 RVolt\_M_{t-1} \\ + c_2 BHAR_{t-1} \\ + c_3 Segmt_{t-1} \\ + c_4 Invest_{t-1} + \varepsilon_{3,t}$$ (2c)

$$C\_Sale_t = d_0 + d_1 RVolt\_S_{t-1} \\ + d_2 Growth\_S_{t-1} \\ + d_3 Segmt_{t-1} \\ + d_4 Invest_{t-1} \\ + d_5 Size_{t-1} + \varepsilon_{4,t}$$ (2d)

These equations are parallel to Eq. (1a-1d), except that the dependent variables (*C_Earn, C_AU, C_Market, C_Sale*) are now generated from the cluster analyses, different from Eq. (1a)-(1d) where the dependent variables are measured based on the raw data of performance measure choices.

The results of Eq. (2a)-(2d) are reported in Panel B of Table 6. The main inferences are similar to those from Table 4 in general: the choice of performance measures is negatively associated with the relative volatility of a measure and positively related with past financial performance, and are related with a firm's business complexity and growth opportunities. However, the significance levels of some variables (e.g. *MVol*) decrease and the results now indicate that firms complex business are more likely to use an *Asset Utilization* measure, and firms with higher growth opportunities (proxied by *Invest*) tend to choose a *Market* or *Sale* measure, but are less likely to choose an *Earning* or *Asset Utilization* measure.

5.2. The Granting of P-V Equity Compensation

The previous analyses rely on a sample that grants p-v equity awards to executives. An issue of sample selection bias may arise if a firm's decision to adopt p-v equity compensation affects the choice of performance measures. In order to address the concerns of selection bias, I use the Heckman selection model to account for firms' decisions to grant p-v equity compensation. Specifically, the following equation is used to estimate a firm's decision of granting p-v equity compensation, and the inverse Mill's ratio generated from this equation is inserted into Eq. (1a) – (1d) to control for the sample selection bias:

$$PV_t = a_0 + a_1 Adjret_{t-1} \\ + a_2 Invest_{t-1} + a_3 Segmt_{t-1} \\ + a_4 BM_{t-1} + a_5 Size_{t-1} \\ + a_6 Dual_{t-1} \\ + a_7 CEONew_{t-1} \\ + a_8 CEOShr_{t-1} + a_9 IH_{t-1} \\ + a_{10} BrdIndp_{t-1} \\ + Fixed\ Year\ Effect + \varepsilon_t$$ (3)

The dependent variable in Eq. (3), *PV*, equals one if a firm grants p-v equity compensation, and zero otherwise. Based on Bettis et al. (2010), the following independent variables are included in Eq. (3) to capture their effects on firms' decisions to adopt p-v equity compensation: prior performance (*Adjret*), the intensity of investments (*Invest*), business complexity (*Segmt*), *BM, Size,* corporate governance variables (*Dual, CEONew, CEOShr, IH, BrdIndp*), and fixed year effect.

Panel A of Table 7 reports the estimation results of Eq. (3) regarding firms' decisions to grant p-v equity compensation. The results show that firms with complex businesses (*Segmt*) and CEOs with the dual role (*Dual*) are more likely to grant p-v equity awards, whereas firms with high investment intensity (*Invest*), high CEO shareholdings (*CEOShr*), and high institutional holdings (*IH*) are less likely to do so. Panel B of Table 7 re-estimates Eq. (1a)–(1d) in the presence of the inverse Mills ratio. In general, the results are qualitatively similar to those in the main analyses after controlling for the selection bias (except the weaker results in the *Segmt* variable).

6. CONCLUSION

This paper examines the choice of performance measures in an important component of executive pay - p-v equity compensation. The proportions of firms granting p-v equity compensation have grown rapidly in the past ten years; firms also increased the weight of p-v equity compensation in executive' compensation packages. Different from traditional time-vested equity compensation, p-v equity compensation provides more incentives for executives to improve firm performance because it requires executives to achieve performance targets before the vesting. SEC has required firms to disclose their selection criteria for performance measures and proxy advisory firms such as Glass Lewis also have issued voting guidelines which call for careful attention to the choice of performance measures. Despite the evolving practice of p-v equity compensation, limited research has been conducted to examine the choice of performance measures in this type of executive pay, partially due to the insufficient disclosure of compensation information before 2006.

Based on a sample of S&P 500 firms which granted p-v equity compensation to executives from 2006 to 2008, this paper shows several interesting results regarding the choice of performance measures in p-v equity compensation. First, firms choose performance measures in different ways for annual bonuses and p-v equity compensation. The *Earnings* measure is more commonly used in annual bonus plans than in p-v equity compensation, but the *Market* measure is more commonly used in p-v equity compensation than in

annual bonus plans. The majority of the sample firms use multiple performance measures for annual bonuses, but most of the firms choose a single performance measure for p-v equity compensation. Second, this paper identifies several key factors related to the firm's choice of performance measures for p-v equity compensation: the relative noise of a measure, financial performance, business complexity, and growth opportunities. Consistent with the Informativeness Hypothesis, the likelihood of using a performance measure in the p-v equity compensation is negatively associated with the measure's relative noise. And firms are more likely to choose a performance measure which reflects the firm's good performance in the past. One possible interpretation is that firms choose these measures because they are important and closely related to company strategies and goals. An alternative explanation is that executives have bargained in the compensation contracts for a performance measure that favors them to increase the payout of p-v equity compensation. Results further show that firms with complex business are more likely to choose a *Market* measure and less likely to choose an *Earnings* measure, and firms with higher growth opportunities tend to use a *Sales* measure to focus managers' attention on the expansion of market share. The main findings are generally robust under the cluster analysis and after controlling for the selection bias related to the adoption of p-v equity compensation. Importantly, the choice of a performance measure is related to subsequent operating and stock performance. The results show that firms choosing a *Cash* or *Non-financial* measure for p-v equity compensation underperform the rest of the firms in subsequent years, and firms using a *Sales* measure have better operating performance subsequently.

Overall, this paper presents empirical evidence on the determinants and consequences of performance measure choices in a key executive compensation component – p-v equity compensation. Given the importance of performance measures in the efficacy of compensation contracts, the findings in this paper are relevant to the practice and have important implications for managers and shareholders. Particularly, firms should carefully select performance measures for p-v equity compensation to provide proper incentives for managers. And shareholders should review the choice of performance measures for p-v equity compensation when they determine the say-on-pay votes, as the choice of performance measures is related to the firm's future performance. Future research can investigate the relationship between the choice of performance measures and managerial risk-taking behavior.

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APPENDIX

Variable definitions

Variable	Label		Computation
AdjROA	Industry-adjusted ROA	=	Return on assets (ROA) minus 2-digit SIC industry's average ROA, and then averaged over prior three years. ROA is calculated as income before extraordinary items / average total assets.
ATO	Asset turnover ratio	=	Asset turnover ratio, which is calculated as sales divided by average total assets, averaged over the previous three years.
BHAR	Abnormal returns	=	Market-adjusted buy-and-hold abnormal returns, cumulated over prior three years
BrdIndp	Board independence	=	Number of independent directors / total number of directors
CashCnt	Cash constraint	=	(cash dividend + investing cash – operating cash) / average total assets
CEONew	New CEO	=	1 if a new CEO is appointed within a year, and 0 otherwise
CEOshr	CEO wealth	=	The natural logarithm of the value of equity (including both stocks and stock options) held by CEO
Dual	Dual role of CEO	=	1 if CEO also holds the role of chairman of the board, and 0 otherwise
Growth_S	Growth in Sales	=	growth in sales averaged over the previous two years.
IH	Institutional holdings	=	Number of shares held by institutional investors/total number of shares outstanding
Invest	Investment intensity	=	(R&D + advertising + capital expenditures)/average total assets averaged over prior three years
M_AU	Use of asset utilization measure	=	1 if a firm uses a performance measure related to asset utilization, including return on equity, return on assets, return on invested capital, EVA, and working capital; 0 otherwise.
M_Cash	Use of Cash measure	=	1 if a firm uses a performance measure related to cash, such as cash from operations; 0 otherwise.
M_Earn	Use of earnings measure	=	1 if a firm uses a performance measure derived from earnings, such as net income, adjusted net income, earnings per share, operating income, and earnings growth; 0 otherwise.
M_Market	Use of market measure	=	1 if a firm uses stock prices or stock returns as a performance measure; 0 otherwise.
M_NonF	Use of nonfinancial measure	=	1 if a firm uses a non-financial performance measure, such as customer satisfaction, safety, innovation, etc.; 0 otherwise.
M_Sale	Use of Sales measure	=	1 if a firm uses a performance measure related to sales/revenue, both level, and growth; 0 otherwise.
M_Vol	A measure's relative volatility	=	the relative ranking of a measure's volatility
Multiple	Use of multiple metrics	=	1 if more than one performance measure is used in p-v equity compensation, and 0 otherwise
NPM	Net profit margin	=	net income divided by sales
Oscore	O-Score	=	the bankruptcy score based on Ohlson (1980)
PV	Granting p-v equity awards	=	1 if a firm grants p-v equity awards to its executives, and 0 otherwise.
ROE	Return on equity	=	Income before extraordinary items / average stockholder's equity averaged over the previous three years.
Segmt		=	Number of business segments
Size	Size	=	Natural log of market capitalization

Table 1. Descriptive statistics for the adoption of performance-vested equity compensation and choice of performance measures

Panel A. Frequency of performance-vested and time-vested equity awards

		Performance-vested		Time-vested	
	N	Restricted Stocks	Stock Options	Restricted Stocks	Stock Options
2006	367	195 (53.13%)	6 (1.63%)	209 (56.95%)	303 (82.56%)
2007	362	208 (57.46%)	7 (1.93%)	201 (55.52%)	281 (77.62%)
2008	364	218 (59.89%)	15 (4.12%)	199 (54.67%)	276 (75.82%)
2006-2008	1093	621 (56.82%)	28 (2.56%)	609 (55.72%)	860 (78.68%)

Panel B. Choice of performance measures in annual cash bonuses

	N	Earnings	Asset utilization	Market	Sales	Cash	Non-financial
2006	195	175 (89.74%)	58 (29.74%)	7 (3.59%)	83 (42.56%)	59 (30.26%)	52 (26.67%)
2007	208	191 (91.83%)	52 (25%)	11 (5.29%)	98 (47.12%)	60 (28.85%)	58 (27.88%)
2008	218	189 (86.70%)	50 (22.94%)	8 (3.67%)	103 (47.25%)	55 (25.23%)	42 (19.27%)
2006-08	621	555 (89.37%)	160 (25.76%)	26 (4.19%)	284 (45.73%)	174 (28.02%)	152 (24.48%)

Panel C. Choice of performance measures in performance-vested equity awards

Year	N	Earnings	Asset utilization	Market	Sales	Cash	Non-financial
2006	195	116 (59.49%)	67 (34.36%)	51 (26.15%)	37 (18.97%)	20 (10.26%)	11 (5.64%)
2007	208	119 (57.21%)	65 (31.25%)	59 (28.37%)	44 (21.15%)	22 (10.58%)	8 (3.85%)
2008	218	132 (60.55%)	61 (27.98%)	70 (32.11%)	48 (22.02%)	17 (7.80%)	9 (4.13%)
2006-08	*621*	*367 (59.10%)*	*193 (31.08%)*	*180 (28.99%)*	*129 (20.77%)*	*59 (9.50%)*	*28 (4.51%)*

Note: This table reports the grants of equity awards and the choice of performance measures. The sample is based on S&P 500 industrial firms which granted performance-vested equity compensation to executives between 2006 and 2008. Panel A summarizes the grants of equity awards. An equity award is considered as performance-vested if its vesting conditions contain performance criteria and as time-vested if the vesting is based on the service time. The percentage of firms granting each type of award is provided in parentheses. Panels B and C documents the choice of performance measures in annual cash bonuses and p-v equity compensation, respectively. The Earnings category includes all performance measures directly derived from earnings, such as net income, adjusted net income, earnings per share, operating income, and earnings growth. The Asset Utilization category includes return on equity, return on assets, return on invested capital, EVA, and working capital. The Market category includes stock prices or stock returns. The Sales category includes all performance measures directly related to sales/revenue, both level, and growth. The Cash category includes all performance measures related to cash, such as cash from operations. The Non-financial category includes all non-financial measures, such as customer satisfaction, safety, innovation, etc. The percentage of firms using each type of performance measures is provided in parentheses.

Table 2. Number of performance measures types used in cash bonus and p-v equity compensation

Panel A. Number of performance measures types used in cash bonuses

Year	N	1	2	3	4	5
2006	195	49 (25.13%)	71 (36.41%)	50 (25.64%)	22 (11.28%)	1 (0.51%)
2007	208	57 (27.4%)	73 (35.1%)	48 (23.08%)	27 (12.98%)	3 (1.44%)
2008	218	51 (23.39%)	92 (42.2%)	68 (31.19%)	2 (0.92%)	0 (0.00%)
2006-08	*621*	*157 (25.28%)*	*236 (38%)*	*166 (26.73%)*	*51 (8.21%)*	*4 (0.64%)*

Panel B. Number of performance measures types used in performance-vested equity awards

Year	N	1	2	3	4	5
2006	195	106 (54.36%)	73 (37.44%)	14 (7.18%)	2 (1.03%)	0 (0.00%)
2007	208	118 (56.73%)	74 (35.58%)	14 (6.73%)	1 (0.48%)	1 (0.48%)
2008	218	119 (54.59%)	80 (36.7%)	18 (8.26%)	1 (0.46%)	0 (0.00%)
2006-08	*621*	*343 (55.23%)*	*227 (36.55%)*	*46 (7.41%)*	*4 (0.64%)*	*1 (0.16%)*

Note: This table reports the number of performance measure types used in cash bonuses (Panel A) and p-v equity compensation (Panel B) by year. The sample is based on S&P 500 industrial firms which granted performance-vested equity compensation to executives between 2006 and 2008. The frequency is provided in parentheses.

Table3. Correlations and characteristics of firms adopting performance-vested equity compensation

Panel A. Firm characteristics by choice of performance measures

Value of measure choice	Choice of performance measures (0=performance measure not used, 1= performance measure used)											
	M_Earn		M_AU		M_Market		M_Sales		M_Cash		M_Non-financial	
	0	1	0	1	0	1	0	1	0	1	0	1
N	254	367	428	193	441	180	492	129	562	59	593	28
Variables												
Growth_S	0.097	0.108	0.108	0.093	0.107	0.095	0.104	0.102	0.109	0.052***	0.103	0.110
NPM	0.086	0.093	0.096	0.078**	0.089	0.094	0.093	0.081	0.093	0.068	0.092	0.058
ROE	0.164	0.191*	0.187	0.165*	0.183	0.172	0.177	0.193	0.185	0.133	0.180	0.173
ATO	1.052	1.033	0.998	1.135**	1.053	1.011	1.045	1.025	1.071	0.752	1.049	0.875
BHAR	0.407	0.299	0.332	0.368	0.289	0.476**	0.393	0.154***	0.355	0.231	0.363	-0.069***
Oscore	-2.663	-2.828*	-2.812	-2.647*	-2.838	-2.571***	-2.711	-2.947**	-2.772	-2.649	-2.764	-2.675
CashCnt	-0.028	-0.039	-0.038	-0.026	-0.043	-0.013***	-0.035	-0.033	-0.033	-0.045	-0.035	-0.020
Invest	0.090	0.093	0.098	0.080***	0.091	0.096	0.085	0.118***	0.094	0.075***	0.091	0.112**
Segmt	4.031	3.471***	3.586	3.953**	3.494	4.206***	3.780	3.395**	3.585	4.797	3.685	4.036
Size	4.168	4.080**	4.117	4.113	4.087	4.186**	4.121	4.099	4.093	4.339***	4.112	4.198

Panel B. Correlations of key variables

	M_Earn	M_AU	M_Market	M_Sales	Growth_S	NPM	ROE	ATO	BHAR	Oscore	CashCnt	Invest	Segmt	Size
M_Earn	1	-0.30***	-0.49***	0.09**	0.05	0.08**	0.05	-0.04	-0.07*	-0.06	-0.01	0.03	-0.12***	-0.08*
M_AU	-0.3***	1	-0.18***	0.02	-0.03	-0.15***	-0.02	0.16***	0.06	0.09**	0.06	-0.12***	0.07*	0.00
M_Market	-0.49***	-0.18***	1	-0.20***	-0.07*	0.01	0.00	-0.04	0.10**	0.10**	0.05	0.02	0.15***	0.07*
M_Sales	0.09**	0.02	-0.20***	1	0.04	-0.03	-0.04	0.01	-0.09**	-0.08**	0.00	0.18***	-0.06	-0.02
Growth_S	0.03	-0.04	-0.03	0	1	0.25***	0.09**	-0.02	0.37***	-0.32***	0.17***	0.09**	-0.10***	0.10***
NPM	0.03	-0.08**	0.02	-0.05	0.24***	1	0.35***	-0.40***	0.21***	-0.50***	-0.15***	0.21***	-0.06	0.29***
ROE	0.07*	-0.05	-0.03	0.04	0.07*	0.27***	1	0.44***	0.19***	-0.27***	-0.17***	0.17***	-0.05	0.16***
ATO	-0.01	0.1**	-0.03	-0.01	0	-0.21***	0.25***	1	0.15***	-0.03	-0.11***	0.02	-0.02	-0.17***
BHAR	-0.06	0.02	0.1**	-0.11***	0.31***	0.16***	0.08*	0.15***	1	-0.23***	0.02	-0.07*	-0.04	0.08**
Oscore	-0.08*	0.07*	0.11***	-0.09**	-0.29***	-0.53***	-0.18***	-0.07	-0.23***	1	0.31***	-0.34***	0.02	-0.52***
CashCnt	-0.04	0.05	0.12***	0.01	0.2***	-0.21***	-0.12***	-0.08**	0.02	0.35***	1	-0.04	0.06	-0.02
Invest	0.02	-0.14***	0.04	0.23***	0.06	0.14***	0.1**	0	-0.02	-0.29***	0.04	1	-0.17***	0.14***
Segmt	-0.13***	0.08**	0.16***	-0.08*	-0.04	-0.04	-0.07*	-0.08*	-0.06	-0.01	0.06	0.11***	1	0.17***
Size	-0.09**	0	0.09**	-0.02	0.12***	0.24***	0.07*	-0.1**	0.02	-0.51***	-0.04	-0.15***	0.22***	1

Panel C. Choice of performance measures by industry

Fama-French Industry	Performance Measures				
	Earnings	Asset utilization	Market	Cash	Total
Consumer non-durables (Row %)	38 (52.8)	12 (16.7)	17 (23.6)	5 (6.9)	72 [12.3]
Consumer durables	12 (75.0)	1 (6.3)	3 (18.8)	0 (0.0)	16 [2.7]
Manufacturing	18 (20.7)	48 (55.2)	13 (14.9)	8 (9.2)	87 [14.9]
Energy extraction/production	1 (2.5)	10 (25.0)	29 (72.5)	0 (0.0)	40 [6.8]
Chemicals and allied products	7 (17.1)	28 (68.3)	6 (14.6)	0 (0.0)	41 [7.0]
Business equipment	66 (62.9)	14 (13.3)	7 (6.7)	18 (17.1)	105 [17.9]
Telecoms	6 (24.0)	3 (12.0)	8 (32.0)	8 (32.0)	25 [4.3]
Retail	32 (42.1)	34 (44.7)	9 (11.8)	1 (1.3)	76 [13.0]
Healthcare, medical equipment, and drugs	32 (55.2)	11 (19.0)	14 (24.1)	1 (1.7)	58 [10.0]
Others	20 (30.3)	26 (39.4)	15 (22.7)	5 (7.6)	66 [11.3]
Total	232 (39.6%)	187 (31.9%)	121 (20.6%)	46 (7.9%)	621

Note: This table shows firm characteristics by choice of performance measure (Panel A), the correlations of the key variables (Panel B), and distribution of performance measure choice by industries (Panel C). Growth_S is the growth in sales, smoothed over the previous two years. NPM is the net profit margin, which equals net income divided by sales. ROE is the return on equity over the previous three years. ATO is the average asset turnover ratio, which is calculated as sales divided by average total assets, smoothed over the previous three years. BHAR is the buy-and-hold market-adjusted abnormal returns over the previous 36 months. Oscore is the bankruptcy score based on Ohlson (1980). CashCnt is the cash constraint, calculated as (cash dividend + investing cash – operating cash) / average total assets. Invest equals (R&D + advertising + capital expenditures)/average total assets, averaged over prior three years. Segmt is the number of business segments. Size is the natural logarithm of market capitalization. In Panel B, the upper right is Spearman correlations and the lower left is Pearson correlations. ***, **, * indicate the differences' significance levels of 1%, 5%, 10%, respectively. In Panel C, the definition of industry is based on Fama and French (1997). Row percentages are shown in parentheses, whereas column percentages are in brackets.

Table 4. Choice of performance measure in performance-vested equity compensation

	M_Earn (1a)		M_AU (1b)		M_Market (1c)		M_Sale (1d)		M_Cash (1e)	
Intercept	4.312*** (17.79)	3.021** (5.61)	-0.004 (0.00)	0.141 (0.01)	-2.506*** (8.84)	-1.080 (0.84)	-1.475 (2.30)	-2.004 (2.08)	-5.613*** (10.93)	-7.076*** (10.00)
Measure's relative volatility										
MVol	-2.470*** (10.40)	-2.241*** (8.11)	-2.510*** (8.51)	-2.851*** (9.72)	-2.074** (3.95)	-2.217** (4.39)	0.167 (0.04)	0.254 (0.09)	-1.858* (2.79)	-2.200* (3.69)
Past Performance										
NPM	1.045 (1.47)	1.100 (1.54)								
ROE			-0.861 (2.34)	-1.017* (3.14)						
ATO			0.364*** (7.03)	0.333** (5.27)						
BHAR					0.261*** (6.98)	0.275*** (7.33)				
Growth_S							-0.287 (0.19)	-0.406 (0.37)		
Oscore									0.539*** (8.86)	0.564*** (9.27)
CashCnt									-2.723* (3.23)	-2.457 (2.62)
Complexity and Growth										
Segmt	-0.113*** (7.14)	-0.120*** (7.54)	0.074 (2.67)	0.073 (2.36)	0.177*** (14.46)	0.177*** (14.24)	-0.044 (0.70)	-0.049 (0.86)	0.183*** (6.93)	0.184** (6.56)
Invest	0.287 (0.04)	-0.677 (0.20)	-4.451** (6.48)	-4.000** (4.48)	1.794 (1.33)	2.430 (2.32)	8.440*** (26.43)	8.144*** (23.92)	-4.792 (1.92)	-5.308 (2.32)
Size	-0.314* (2.85)	-0.095 (0.23)	0.020 (0.01)	-0.295 (1.80)	0.239 (1.49)	0.061 (0.09)	-0.171 (0.59)	-0.099 (0.17)	1.402*** (14.59)	1.772*** (19.08)
Corporate Governance										
Dual		-0.875*** (19.50)		1.397*** (34.04)		0.370* (3.06)		-0.398* (3.16)		-0.798** (5.97)
CEONew		-0.289 (1.15)		-0.043 (0.02)		0.395 (1.92)		-0.166 (0.27)		-0.893 (2.69)
CEOshr		4.551 (1.30)		-24.274** (5.12)		-5.700 (1.14)		-11.009 (1.71)		8.472* (3.73)
IH		1.056* (3.14)		-0.309 (0.23)		-1.370** (4.63)		0.459 (0.39)		1.845* (3.22)
brdIndp		0.197 (0.12)		0.751 (1.41)		-0.017 (0.00)		0.316 (0.19)		-0.633 (0.47)
Fixed year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Likelihood ratio	26.415	50.108	34.223	90.129	33.710	43.107	31.563	38.737	43.510	56.779
p-value of χ2 test	0.0004	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	.0001	<.0001	<.0001
N	621	621	621	621	621	621	621	621	621	621

Note: This table reports the logistic regressions of the determinants of performance measures choices. The sample is based on 621 firm-year observations which granted p-v equity compensation between 2006 and 2008. MVol, calculates a measure's volatility relative to other measures. Growth_S is the growth in sales, smoothed over the previous two years. NPM is the net profit margin, which equals net income divided by sales. ROE is the return on equity over the previous three years. ATO is the average asset turnover ratio, which is calculated as sales divided by average total assets, smoothed over the previous three years. BHAR is the buy-and-hold market-adjusted abnormal returns over the previous 36 months. Oscore is the bankruptcy score based on Ohlson (1980). CashCnt is the cash constraint, calculated as (cash dividend + investing cash – operating cash) / average total assets. Segmt is the number of business segments. Invest equals (R&D + advertising + capital expenditures)/average total assets, averaged over prior three years. Size is the natural logarithm of market capitalization. Dual equals one if the CEO is also the chairperson of the board, and zero otherwise. CEONew equals to one if a firm hires a new CEO, and zero otherwise. CEOShr measures CEO share ownership, equal to the number of shares owned by CEO (excluding options), scaled by the total number of shares outstanding. IH is institutional holdings, which equals the number of shares held by institutional investors, scaled by the total number of shares outstanding. BrdIndp is board independence, calculated as the number of independent directors, scaled by the total number of directors. Wald χ^2 are reported in parentheses. ***, **, * indicate significance levels of 1%, 5%, 10%, respectively.

Table 4a. The summary of the relative volatility variable and the proxies
of financial performance in Eq. (1a)-(1e)

Equation	Dependent Variable	MVol (relative volatility of a measure). Test of H1	Proxies of financial performance Test of H2
(1a)	M_Earn	Rvolt_E	Net profit margin (*NPM*)
(1b)	M_AU	Rvolt_A	Return on equity (*ROE*) and asset turnover (*ATO*)
(1c)	M_Market	RVolt_M	Abnormal stock returns (*BHAR*)
(1d)	M_Sale	Rvolt_S	Growth in sales (*Growth_S*)
(1e)	M_Cash	Rvolt_C	*Oscore* and cash constraint (*CashCnt*)

Table 5. Choice of performance measures and future performance

Panel A. Future operating performance

	Year t+1	*Year t+2*	*Year t+3*	*Year t+4*	*Year t+5*
M_Earn=1	0.068	0.055	0.058	0.068	0.084
M_Earn=0	0.084	0.066	0.065	0.073	0.092
Diff	*-0.016*	*-0.010*	*-0.006*	*-0.004*	*-0.008*
M_AU=1	0.079	0.066	0.063	0.080	0.096
M_AU=0	0.072	0.057	0.060	0.065	0.083
Diff	*0.007*	*0.009*	*0.004*	*0.016*	*0.013*
M_Market=1	0.075	0.061	0.058	0.062	0.084
M_Market=0	0.075	0.059	0.062	0.074	0.089
Diff	*0.000*	*0.001*	*-0.004*	*-0.012*	*-0.005*
M_Sale=1	0.095	0.081	0.087	0.100	0.114
M_Sale=0	0.069	0.054	0.054	0.062	0.080
Diff	*0.026*	*0.027**	*0.032***	*0.038***	*0.034*
M_Cash=1	0.039	0.025	0.029	0.035	0.042
M_Cash=0	0.078	0.063	0.064	0.074	0.092
Diff	*-0.039**	*-0.038**	*-0.035***	*-0.039***	*-0.050****
M_NonF=1	-0.030	-0.057	0.033	0.044	0.029
M_NonF=0	0.078	0.063	0.062	0.071	0.089
Diff	*-0.108****	*-0.120***	*-0.028*	*-0.027*	*-0.060*
Multiple=1	0.071	0.060	0.062	0.075	0.089
Multiple=0	0.078	0.060	0.060	0.066	0.086
Diff	*-0.006*	*0.001*	*0.002*	*0.008*	*0.004*

Panel B. Future stock performance

	Year t+1	*Year t+2*	*Year t+3*	*Year t+4*	*Year t+5*
M_Earn=1	0.098	0.095	0.033	0.029	0.046
M_Earn=0	0.049	0.062	0.008	-0.002	-0.004
Diff	*0.048*	*0.033*	*0.025*	*0.031*	*0.050**
M_AU=1	0.095	0.079	0.034	0.023	0.015
M_AU=0	0.067	0.082	0.015	0.011	0.028
Diff	*0.028*	*-0.003*	*0.019*	*0.012*	*-0.013*
M_Market=1	0.025	0.064	0.027	0.001	0.003
M_Market=0	0.099	0.088	0.020	0.021	0.033
Diff	*-0.074**	*-0.025*	*0.008*	*-0.020*	*-0.030*
M_Sale=1	0.111	0.074	0.024	-0.015	0.002
M_Sale=0	0.068	0.083	0.021	0.023	0.030
Diff	*0.043*	*-0.009*	*0.003*	*-0.039*	*-0.028*
M_Cash=1	-0.031	0.099	-0.061	0.080	0.084
M_Cash=0	0.087	0.079	0.030	0.009	0.017
Diff	*-0.118***	*0.019*	*-0.092***	*0.072*	*0.067*
M_NonF=1	0.021	0.307	0.273	-0.128	-0.111
M_NonF=0	0.078	0.075	0.015	0.019	0.028
Diff	*-0.058*	*0.232*	*0.258*	*-0.148*	*-0.139**
Multiple=1	0.083	0.093	0.040	0.018	0.019
Multiple=0	0.072	0.070	0.006	0.013	0.028
Diff	*0.011*	*0.023*	*0.033*	*0.005*	*-0.008*

Note: This table reports future performance subsequent to the choice of performance measures for p-v equity awards. Panel A shows the industry-adjusted return on assets (ROA), which equals a firm's ROA minus two-digit SIC industry's average ROA. Panel B shows size-adjusted stock returns by year. The difference is tested by two-sided t-test and ***, **, and * denote significance at less than 1%, 5%, and 10% levels, respectively.

Table 6. Cluster analysis on of performance measure choices in performance-vested equity compensation

Panel A Choice of performance measures by clusters

	Cluster1	*Cluster2*	*Cluster3*	*Cluster4*	*Total*
M_Earn	87.65%	36.43%	24.81%	66.67%	
M_AU	4.53%	100.00%	1.50%	38.10%	
M_Market	8.23%	19.29%	100.00%	0.00%	
M_Sales	4.53%	0.00%	9.77%	100.00%	
M_cash	23.05%	0.00%	0.00%	2.86%	
M_nonf	10.70%	0.00%	0.75%	0.95%	
N	243	140	133	105	621
(%)	(39.13%)	(22.54%)	(21.42%)	(16.91%)	(100.00%)

Panel B Cluster analysis on the determinants of performance measure

	C_Earn (2a)	*C_AU (2b)*	*C_Market (2c)*	*C_Sale (2d)*
Intercept	0.374 (0.15)	-0.512 (0.28)	-2.187** (5.53)	-0.272 (0.06)
MVol	-1.216* (2.96)	-1.819* (3.77)	-1.577 (1.88)	0.579 (0.42)
NPM	1.514 (2.53)			
ROE		-0.346 (0.35)		
ATO		0.262* (3.25)		
BHAR			0.281*** (7.19)	
Growth_S				-0.681 (0.84)
segmt	-0.063 (2.16)	0.089* (3.30)	0.047 (0.84)	-0.051 (0.80)
Invest	-5.368*** (11.00)	-3.795** (3.88)	3.973** (5.94)	6.275*** (13.89)
Size	0.234 (1.52)	-0.048 (0.05)	0.076 (0.12)	-0.509** (4.17)
fixed year effect	yes	yes	yes	yes
N	621	621	621	621

Note: This table reports the choice of performance measures using the cluster analysis. Panel A shows the frequency of performance measure usage in the four clusters, where performance measures include earnings, asset utilization, market, sales, cash, and non-financial measures. Panel B reports the estimation results of the determinants of performance measures based on the cluster analysis. See the Appendix for the detailed definitions of the variables. ***, **, * indicate significance levels of 1%, 5%, 10%, respectively.

Table 6a. Definitions of the dependent variables in the cluster analysis

Equation	*Dependent Variable*	*Cluster1*	*Cluster2*	*Cluster3*	*Cluster4*
(2a)	*C_Earn*	1	0	0	0
(2b)	*C_AU*	0	1	0	0
(2c)	*C_Market*	0	0	1	0
(2d)	*C_Sale*	0	0	0	1

Table 7. Choice of performance measures, controlling for the decision to grant performance-vested equity awards

Panel A Logistic regressions of p-v equity awards adoption on determinants

	Coeff	*t*
Intercept	0.732	(1.46)
Adjret	-0.180	(-1.38)
Invest	-1.056	(-1.76)*
Segmt	0.049	(2.45)**
BM	0.237	(1.49)
Size	-0.099	(-1.03)
Dual	0.241	(2.96)***
CEONew	0.111	(0.96)
CEOshr	-4.343	(-3.76)***
IH	-0.872	(-3.41)***
brdIndp	0.292	(1.15)
Fixed year effect	Yes	

Panel B Determinants of performance measure choices, controlling for decision to grant p-v equity awards

	M_Earn	**M_AU**	**M_Market**	**M_Sale**
Intercept	1.168** (2.29)	0.569 (1.46)	-0.509 (-1.13)	-0.770 (-0.97)
Mvol	-0.924*** (-2.82)	-0.992*** (-3.32)	-0.910** (-2.04)	0.086 (0.18)
NPM	0.440 (1.15)			
ROE		-0.346*** (-2.66)		
ATO		0.160*** (3.10)		
BHAR			0.135*** (2.86)	
Growth_S				-0.183 (-0.46)
Segmt	-0.018 (-0.8)	-0.010 (-0.47)	0.045* (1.67)	-0.031 (-0.80)
Invest	-1.116 (-1.55)	0.074 (0.11)	1.926*** (2.59)	4.994*** (4.05)
Size	-0.132 (-1.36)	-0.003 (-0.03)	0.091 (0.93)	-0.114 (-0.89)
Fixed year effects	yes	yes	yes	yes

Note: This table reports the choice of performance measure using the selection model. The sample is based on 621 firm-year observations that granted p-v equity awards between 2006 and 2008. See the Appendix for the detailed definitions of the variables. t-values are reported in parentheses. ***, **, * indicate significance levels of 1%, 5%, 10%, respectively.