Do Informative Stock Prices Simplify Executive Compensation?

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Abstract

We study the effects of stock price informativeness (SPI) on compensation complexity. Using textual analysis of SEC proxy statements to construct compensation complexity measures, we find informative stock prices reduce pay complexity. Using mutual fund redemption as an exogenous decrease in SPI, we find when fund flow pressure is high (SPI is low), CEO pay is more complex and links more with long-term stock performance, short-term accounting performance, and peer firm performance. Compensation complexity leads to more excess pay, more perquisite pay, and lower future ROA. Shareholders show concerns about complex pay and require more frequent Say-on-Pay votes.

Keywords: Compensation complexity, Stock price informativeness, Market monitoring, Proxy statements, Say-on-Pay

JEL classification: G14, G30, J33, M12

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"*Shareholders want to know that the size, structure, and performance targets used in executive compensation contracts are appropriate. Our research shows that, across the board, they are dissatisfied with the quality and clarity of the information they receive about compensation in the corporate proxy*."

--David Larcker et al (2015)

"*It is logically impossible to maximize in more than one dimension at the same time unless the dimensions are monotone transformations of one another, Thus, telling a manager to maximize current profits, market share, future growth in profits, and anything else one pleases will leave the manager with no way to make a reasoned decision. In effect, it leaves the manager with no objective. The result will be confusion and lack of purpose that will fundamentally handicap the firm in its competition for survival*."

--Michael Jensen (2002)

1. Introduction

Many compensation packages are multi-dimensional and often downright confusing, as articulated by Bengt Holmstrom in his 2016 Nobel Prize press conference. Investors also complain that executive compensation is too complicated and that the link between pay and performance lacks transparency.[1] Investors also generally believe that the proxy statements in which firms disclose their executive compensation plans are too long and do not help them understand how executives are paid.[2]

Running a large enterprise is complicated business, and there are many strategic choices that top management must take regularly. Consequently, shareholders may choose to rely on multiple performance goals to incentivize top executives. In particular, firms can link executive compensation with metrics related to current profit, market share, sales growth and customer satisfaction, or use multi-year payment schemes to alleviate any concerns over myopia. Bennett, Bettis, Gopalan, and Milbourn (2017) document both the frequency with which such multi-measure schemes are used and importantly, highlight many distinct benefits of using them.

[1] See the Financial Times article at https://www.ft.com/content/1c1bebe8-37b2-11e0-b91a-00144feabdc0

[2] See the survey study by Larcker et al (2015) at https://www.gsb.stanford.edu/faculty-research/publications/2015-investor-survey-deconstructing-proxy-statements-what-matters

However, such incentive plans do significantly increase compensation complexity, which may not be costless. Notably, multiple goals in complex pay schemes inevitably conflict (Holmstrom and Milgrom, 1991) or even distract managers' attention from shareholder value maximization (Jensen, 2010). Furthermore, complex pay could in some cases simply be used to camouflage excess pay (Bebchuk and Fried, 2003). These potential costs of compensation complexity can motivate firms to simplify their executive compensation structure.

In this paper, we study how price discovery in the stock market affects the complexity of executive compensation. A longstanding result in the literature shows that private information over firm performance is eventually incorporated into stock prices (e.g., Grossman and Stiglitz, 1980, Glosten and Milgrom, 1985, and Kyle, 1985). Moreover, the amount of private information in stock prices varies across firms (e.g., Morck, Yeung, and Yu, 2013). Holmstrom and Tirole (1993) propose a theoretical model showing that more informative stock prices make managerial actions more observable, which at least in theory facilitates the monitoring role for the stock market.

Our idea in this paper is as follows. When a firm's stock price is more informative, the performance of top management's efforts and strategic choices across projects and time horizons is better summarized by the stock price. More informative stock prices make it easier for boards to observe and evaluate managers' performance. Therefore, when stock price informativeness is high, it is less necessary to design such complex pay structures involving long-term performance metrics or multiple goals.[3] Market monitoring can also be a substitute for complex compensation. In short, we expect the informativeness of a firm's stock to reduce the complexity of its executive compensation. Our empirical analysis shows that this hypothesis is strongly confirmed by the data.

[3] For example, when a firm has a very informative stock price, managers know their actions and efforts will be reflected in the stock price promptly. If they take actions that destroy shareholder value, the stock price will decrease quickly and investors and the board will easily discern that the manager mis-stepped. Stock price informativeness is thereby a substitute for complex compensation.

One of the main challenges of our empirical analysis is to measure compensation complexity. Complexity is by definition multi-dimensional and difficult to capture directly. We propose compensation complexity measures that relate to the difficulty or frictions investors face in understanding firms' executive compensation practices. The main information source for executive compensation is the annual proxy statement (DEF 14A) filed by each firm with the SEC. Accordingly, we utilize textual analysis on proxy statements to measure the complexity of firms' executive compensation by its file length and the volume of compensation related words in the filing. We call this *Proxy complexity*.

In order to quantify *Proxy complexity*, we start with Loughran and McDonald's (2014) observation that the file size of firms' disclosures indicates the frictions in the communication between firms and investors and is a good measure for document complexity. Larcker and Tayan (2015) document investor complaints that proxy statements are difficult to read, which makes it difficult to determine whether senior management is paid appropriately.[4] A long proxy statement, say thirty pages on compensation alone, indicates that the firm has complex executive pay. We further refine the file-size complexity measure by concentrating on compensation-related words. We create two lists of compensation-related words: one includes the common compensation-related words, such as *salary* and *bonus*, and the other includes compensation-related words linked with more complicated compensation design, such as *target*, *threshold*, and *peer*. We parse proxy statements of US public firms from 1996 to 2015 and count the words on these two lists in the compensation section of the statements. One significant advantage of these proxy-based measures is that they are available for *all* US public firms, which is a sample much larger than the widely-used Execucomp data that only covers S&P 1500 firms.

[4] See the survey study "The ideal proxy statement" at https://www.gsb.stanford.edu/sites/gsb/files/publication-pdf/cgri-closer-look-47-ideal-proxy-statement.pdf

With these measures of pay complexity in hand, we now turn to our empirical question of how the amount of private information conveyed by firms' stock prices drives the observed heterogeneity in pay complexity. In the past three decades, the development of the empirical research on price informativeness allows researchers to better measure the informativeness of stock price (e.g., Roll, 1988, Easley, Kiefer, O'Hara, and Paperman, 1996, Morck, Yeung, and Yu, 2000, Bai, Philippon, and Savov, 2016). We measure SPI using the probability of informed trading (PIN). PIN is originally proposed by Easley, Kiefer, O'Hara, and Paperman (1996) and refined by follow-on research in the field. In particular, one of our SPI measure is the PIN following Easley, Hvidkjaer, and O'Hara (2002). Duarte and Young (2009) propose an adjusted-PIN (APIN) model that filters out the market and industry related components from stock price variations. This is our second SPI measure. More recently, Duarte, Hu, and Young (2019) suggest a generalized PIN model (GPIN) as a promising alternative to PIN and APIN. We use GPIN as our third SPI measure. Larger PIN, APIN or GPIN means a more informative stock price, which we hypothesize to be associated with less complex pay.

We first show that at the industry level, SPI and pay complexity are negatively associated. Specifically, within each Fama-French 12 industry, we calculate the average of both the number of complex compensation words and SPI (measured by GPIN) and illustrate them in Figure 1.[5] The evidence shows that when firms in an industry have high SPI on average, these firms tend to use less complex compensation words in their proxy statements. In particular, we find Healthcare and Finance industries have high SPI and low pay complexity. In contrast, Utilities, Oil/Gas, and Chemicals represent industries that have low SPI and high pay complexity.

[5] Such figures using PIN or APIN are also drawn by not reported here. These figures show a similar negative correlation between SPI and pay complexity at the industry level.

Regression analyses based on a large sample of US public firms confirm that SPI significantly reduces compensation complexity. When a firm's stock price is more informative, pay complexity is lower. Specifically, we find that all three SPI measures have negative effects on all three measures of Proxy complexity, i.e., the size of the compensation portion of proxy statements, the number of common compensation words, and the number of complex compensation words in the compensation portion of proxy statements. Our results are robust to alternative complexity measures, such as the complexity measure proposed by Albuquerque, Carter, and Lynch (2018) and Murphy and Sandino (2019).

There might be endogeneity concerns about the negative association between SPI and pay complexity. For example, Ferreira and Laux (2007) show that fewer antitakeover provisions lead to a more informative stock price. Consequently, the fewer antitakeover provisions may increase firms' takeover pressure, which could give managers additional incentives, thereby complex incentive plans may be less necessary. To alleviate such concerns about omitted variables or any other endogeneity issues, we use mutual fund redemption as an exogenous decrease in SPI (Alok, Cortes, and Gopalan, 2016, Cai, Cremers, and Wei, 2017, Dessaint, Foucault, Frésard, and Matray, 2018).

In particular, when mutual funds holding firms' stocks experience large redemption pressure, the funds have to liquidate their holdings and the selling pressure can drag down the price of the holding stocks. This means the price of affected stocks becomes less informative because the variation in stock price does not reveal information on managerial performance (Coval and Stafford, 2007, Edmans, Goldstein, and Jiang, 2012). Specifically, following Edmans, Goldstein, and Jiang (2012) we use mutual funds' hypothetical trades mechanically induced by their investor

flows and find compensation complexity increases when firms experience mutual fund redemption shocks. This supports the causal effect that SPI reduces compensation complexity.

Relying on the same shock also allows us to specifically identify the concrete channels through which price informativeness affects compensation complexity. When stock prices become less informative temporarily due to the mutual fund flow pressure, boards may have to consider alternative metrics to evaluate and motivate managers. In particular, we expect boards would rely more on accounting performance metrics, especially the short-term ones (within one year). As stock price is an important instrument to align the interests between managers and shareholders, when the stock price in short run is less informativeness, we expect boards to rely more on long-term stock performance. Boards may also rely more on the performance of peer firms as benchmark (relative pay). All these changes in compensation would make pays more complex. Indeed, the real data confirm that facing the higher mutual fund flow pressure, boards use more long-term stock performance based pay, more short-term accounting based pay, and more relative pay.

Our findings show that stock price informativeness may improve pay efficiency through reducing pay complexity. Specifically, our findings show that more complex pay is related with higher total pay and perquisite pay, which is consistent with existing theoretical evidence that contract complexity may lead to rent extraction by agents (Hart and Holmström, 1987). In particular, we show that the unexplained portion of CEO pay increases in pay complexity, where unexplained pay is the residual when regressing total pay on firm size, Tobin's Q, stock return, ROA and other factors related to pay level, while also controlling for industry and year fixed effects (similar to the excess pay in Core, Guay, and Larcker, 2008; Faleye, Hoitash, and Hoitash, 2011). We also find that more complex pay is associated with worse future firm performance

(measured by ROA). Combined with our findings that price informativeness reduces pay complexity, the evidence implies that price discovery in the stock market improves market monitoring and the overall efficiency of compensation design.

We further investigate the attitude of shareholders on pay complexity. In particular, we study the concerns shown by shareholders on pay complexity through their votes on the frequency of shareholder Say-on-Pay. According to Section 951 of the Dodd-Frank Act, shareholders can vote to ratify executive compensation in firms' proxy statements. One item to vote on is the frequency of vote about executive compensation (i.e. do shareholders want to approve executive compensation every year, every two years, or every three years). A more frequent vote occupies more attention of shareholders, which shows larger concerns of shareholders. Our findings show that a more complex pay makes shareholders prefer more frequent Say-on-Pay votes, which shows larger concerns about complex pays. We also find that such an effect can be alleviated by better governance.

Our paper contributes to a relatively new research field on compensation complexity, which has triggered increasingly larger concerns among both academics and practitioners. Albuquerque, Carter, and Lynch (2018) construct a measure of pay complexity and examine the determinants and implications of CEO pay complexity. Murphy and Sandino (2017) show that firms using compensation consultants have more complex incentive plans in their CEO pays. In this paper, we find that firms with more informative stock prices have less complex pay schemes. We also propose new complexity measures using textual analysis on SEC proxy statements of US public firms, which generates a sample much larger than the widely-used Execucomp database that only covers the S&P 1500 firms.

Second, our paper contributes to the literature on the effects of price informativeness and market information on corporate policies. For example, Holmstrom and Tirole (1993) study the value of the stock market as a monitor of managerial performance. Ferreira, Ferreira, and Raposo (2011) find a negative relation between SPI and board independence and propose that stock market monitoring is a potential substituting mechanism. Cai, Cremers, and Wei (2017) show that lower price informativeness caused by the mutual fund flow pressure makes boards reply more on accounting and less on stock performance in setting CEO bonus. Bennett, Garvey, Milbourn, and Wang (2019) study the effects of SPI on the level of equity compensation. In this paper, we show that SPI reduces the complexity of executive compensation.

Third, our paper contributes to the literature on the real effects of financial markets (Bond, Edmans, and Goldstein, 2012). Existing literature shows that SPI affects corporate decisions (e.g. Bond, Goldstein, and Prescott, 2010, Chen, Goldstein, and Jiang, 2007, Edmans, Goldstein, and Jiang, 2015, Edmans, Jayaraman, and Schneemeier, 2017, Foucault and Frésard, 2014, Frésard, 2012) and improves efficiency (Bennett, Stulz, and Wang, forthcoming). Our paper uncovers an additional link in that SPI helps simplify executive compensation design.

The remainder of the paper is organized as follows. Section 2 introduces our measures of compensation complexity. Section 3 describes our data and empirical variables. Section 4 demonstrates the effect of price informativeness on compensation complexity. Section 5 addresses potential endogeneity concerns and illustrates concrete channels affecting compensation complexity using mutual fund redemption as an exogenous decrease in price informativeness. Section 6 studies the relationship between compensation complexity and excess pay, perquisite pay, and future firm performance. Section 7 shows the effect of compensation complexity on the frequency of shareholder Say-on-Pay votes. Section 8 shows robustness tests. Section 9 concludes.

2. Measures of compensation complexity: proxy complexity

In this section, we introduce the measures of compensation complexity for our empirical analysis. Specifically, we propose three complexity measures directly based on firms' SEC proxy statements.

In the US public firms are obligated to file annual proxy statements (form DEF 14A) with the Securities and Exchange Commission (SEC). The largest portion of proxy statements is related to executive compensation, which is the main source of information for investors on executive compensation.[6] This allows us to construct measures of compensation complexity for US public firms, rather than just for S&P 1500 firms covered by the widely-used Execucomp database (about 25% of all public firms). To construct these measures, we focus exclusively on the executive compensation section of firms' proxy statements.

Loughran and McDonald (2014) propose that the file size of firms' SEC mandated disclosures is a better measure of their complexity or understandability compared with traditional measures like the *Fog Index*.[7] They argue that such a measure is straightforward, less prone to measurement error, easily replicated, and the best gauge of how effectively managers convey relevant information to investors and analysts. Following this logic, our first measure of pay complexity is the size of the executive compensation section of a firm's proxy statement. In particular, we define a complexity measure *Proxy size*, which is the natural logarithm of the size of the compensation section in proxy statements.

[6] Other parts of a proxy statement generally include shareholder proposals, shareholder-voting information, background information about directors, and approval of directors/auditors.
[7] The Fog Index is defined as (average number of words in sentences + percentage of words of three or more syllables) x 0.4.

We refine this file-size measure by counting compensation-related words in the executive compensation section of firms' proxy statements. The more frequently a firm mentions compensation-related words, the more lengthy the compensation description tends to be, and the more complex the overall pay design likely is. Specifically, we construct two lists of the compensation-related words. One list includes commonly used compensation related words, such as salary, bonus, options, and compensation, which is called *Common-compensation list*. The other list includes compensation words related to more complex structures, such as target, threshold, peer, relative, absolute, and goal, which is called *Complex-compensation list*.[8]

We then define the other two complexity measures, *Compensation (common)* and *Compensation (complex)*. Specifically, *Compensation (common)* is the natural logarithm of the number of common compensation words mentioned in the compensation-related part of a firm's proxy statement. *Compensation (complex)* is the natural logarithm of the number of complex compensation words mentioned in the compensation-related part of a firm's proxy statements.

3. Data and variables

Firms' accounting data are from Compustat. Proxy statements (in particular, the executive compensation section) are from the SEC.gov website. Compensation data are also drawn from Execucomp and IncentiveLab. We use CRSP and TAQ to calculate our SPI measures (PIN and APIN). The GPIN model parameter estimations are from Edwin Hu's webpage.[9] Mutual fund data are from Thomson-Reuters and the CRSP mutual fund holdings database. Shareholder Say-on-Pay data are from Institutional Shareholder Services (ISS). Our sample period is from 1996 to

[8] The words on the Common-compensation list and the Complex-compensation list are shown in Internet Appendix Tables IA 1 and IA 2.
[9] We thank Duarte, Hu, and Young for making the estimations publicly available at https://edwinhu.github.io/pin/

2015. We begin in 1996 because that is when electronic filing of SEC documents became mandatory.

The stock market is more transparent when more private information is incorporated into stock price. We use three measures of SPI to gauge the degree of market transparency. The first measure is the probability of informed trading (PIN), following Easley, Hvidkjaer, and O'Hara (2002). When there is more informed trading in a stock, new information is more likely to be incorporated into that stock's price, which improves the stock's price informativeness and intensifies market monitoring. The construction of PIN has a micro foundation as it is based on a structural market microstructure model. Following research shows concerns about model assumptions and revised the model settings of the original PIN model. In particular, we use two PIN-like SPI measures: APIN and GPIN. APIN is based on the Adjusted PIN model proposed by Duarte and Young (2009). GPIN is based on the generalized PIN model proposed by Duarte, Hu, and Young (2019), who recommend GPIN as one alternative for PIN.

Table 1 presents summary statistics for our complexity measures, SPI measures, and firm-level controls. In our tests, all variables (except dummies) are winsorized at the 1st and 99th percentiles. Variable definitions are in the Appendix.

4. Empirical results

In this section, we present evidence of the effect of market transparency on compensation complexity, in which the degree of market transparency is measured through stock price informativeness. We use three measures of Proxy complexity: *Proxy size*, *Compensation (common)* and *Compensation (complex)*. The specification of our baseline tests is as follows.

$$\text{Proxy Complexity}_{i,t} = \beta_0 + \beta_1 \cdot \text{SPI}_{i,t-1} + \text{X}_{i,t} \cdot \Gamma + \mu_j + \vartheta_t + \varepsilon_{i,t}$$

where i is the firm index, j is the industry index, t is the year index, Proxy Complexity is one of the three Proxy complexity measures, SPI is the firm's SPI (PIN, APIN, or GPIN), X is the vector of control variables, Γ is the coefficient vector for the control variables, μ_j is the industry fixed effect where industry is based on 2-digit SIC, ϑ_t is the year fixed effect, and ε_{it} is the error term. We expect the coefficient of SPI, β_1, to be negative.

Table 2 presents the results of these tests. We include control variables following the literature on compensation: Log(assets), Tobin's Q, ROA, R&D/assets, Cash/assets, Debt/assets, Stock volatility, and Stock return. We also control the size of firms' 10K annual report, which is a proxy for firms' general report style and firms' business complexity. In all nine columns, the coefficients of SPI, β_1's, are all negative and statistically significant at the 1% (seven columns) or 5% (two columns) level. The evidence consistently reveals the negative effect of SPI on compensation complexity. It means that the transparency of stock market helps reduce the complexity of compensation schemes.

5. Endogeneity tests: mutual fund flow pressure

In this section, we use mutual fund redemptions as the exogenous shock to SPI to address potential endogeneity concerns and illustrate concrete channels through which SPI may affect compensation complexity.

5.1 Endogeneity tests

A firm's stock can be held by mutual funds that experience large fund outflows. This fund flow pressure forces the mutual funds to sell their holding stocks for liquidity reason. The large selling pressure on these affected stocks have a negative effect on their price (Coval and Stafford, 2007, Edmans, Goldstein, and Jiang, 2012). However, this drop in stock price is not related with firm

fundamentals or managerial performance. Therefore, these mutual fund flow events serve well as exogenous shocks to stock price informativeness. As mutual fund redemptions reduce SPI, we expect the executive compensation of affected firms to be more complex.

We follow Edmans, Goldstein, and Jiang (2012) and measure the fund flow pressure by the hypothetical sales of firms' stock by mutual funds experiencing large redemptions (i.e. outflow above 5% of a fund's total assets). For each mutual fund with a large redemption, we calculate the hypothetical sales of each holding stock. Then for each stock, we calculate the mutual fund flow pressure as the sum of hypothetical sales across all mutual funds holding this stock and experiencing large redemptions. Compared with the real sales by mutual funds, this hypothetical-sales based measure alleviates the endogeneity concerns that mutual funds may select selling stocks based on firm characteristics, as justified by Edmans, Goldstein and Jiang (2012). Firms facing higher fund flow pressure is expected to have a decrease in SPI, and in turn an increase in compensation complexity.

To study the effect of mutual fund pressure on compensation complexity, we use the following specification:

$$\text{Complexity}_{i,t} = \beta_0 + \beta_1 \cdot \text{MFPressure}_{i,t-1} + \text{X}_{i,t} \cdot \Gamma + \mu_j + \vartheta_t + \varepsilon_{it}$$

where *i* is the firm index, *j* is the industry index, *t* is the year index, Complexity is a measure of Proxy complexity, MFPressure is a dummy variable equal to one if a firm's mutual fund flow pressure is above the median in a given year and zero otherwise, X is the vector of control variables, Γ is the coefficient vector for the control variables, μ_j is the industry fixed effect, ϑ_t is the year fixed effect, and ε_{it} is the error term. The coefficient β_1 captures the effect of mutual fund flow pressure on compensation complexity. We expect β_1 to be positive, which means a decrease in SPI leads to a more complex pay.

Results are reported in Table 3. The results show that the coefficients of MFPressure, β_1's, are positive across all three Proxy complexity measures, i.e. Proxy Size, Compensation (Common), and Compensation (Complex), and statistically significant at the 1% level. This evidence shows that mutual fund flow pressure increases compensation complexity, which supports the causal effect of SPI on compensation complexity.

5.2 Concrete channels: how mutual fund flow pressure reshapes executive compensation

We further illustrate how mutual fund flow pressure reshapes compensation packages and use them as the evidence for concrete channels through which SPI affects compensation complexity. When a firm's stock price drops due to mutual fund redemptions pressure, the lower stock price has little to do with managers' performance. To evaluate managers' performance fairly, boards and compensation committees may alter compensation structure accordingly. In particular, we expect that the executive pays would be linked more with accounting performance, especially in a short run. In the meanwhile, the boards may expect the flow-driven low price to be temporary. To better align the interests between managers and shareholders, the long-term stock performance may be more used in the compensation. Furthermore, boards are more likely to use peer firms' performance as benchmark in the relative pay of the compensation. These accounting performance-based, long-term, and relative pay in the compensation increase the complexity of compensation.

We use IncentiveLab data to investigate these specific changes in executive compensation. Specifically, we investigate changes in the three types of performance-based pay following mutual fund redemptions. All measures are the percent of a specific type of pay makes up as a part of the executive's compensation. In particular, the first measure linked to long term stock price performance is defined as pay linked to long term (greater than 12 months) stock price performance

scaled by total pay. The second measure is short term accounting pay (12 months or less). As an example, this would be compensation linked to specific accounting measures like: revenue, ROA, EPS, etc. The third measure is pay that is tied to peer firms, called relative performance pay.[10] Our specification is as follows.

$$\text{Performance pay}_{i,t} = \beta_0 + \beta_1 \cdot \text{MFPressure}_{i,t-1} + \text{X}_{i,t} \cdot \Gamma + \mu_j + \vartheta_t + \varepsilon_{it}$$

where *i* is the firm index, *j* is the industry index, *t* is the year index, Feature is one of the three compensation features defined above, MFPressure is a dummy variable equal to one if a firm's mutual fund sale pressure is above median in a given year and zero otherwise, X is the vector of control variables, Γ is the coefficient vector for the control variables, μ_j is the industry fixed effect, ϑ_t is the year fixed effect, and ε_{it} is the error term. The effect of mutual fund flow pressure on compensation features is captured by the coefficient β_1.

Results are reported in Table 4. The coefficients on MFPressure, β_1's, are positive and statistically significant at the 5% level in all three columns. Specifically, following mutual fund redemptions, executives have a higher portion of their pay tied to long-term stock price performance, short-term accounting performance, and relative performance. This implies that an exogenous decrease in SPI induces boards to reshape executive compensation packages through using more performance-based pay linking with multiple goals. These results illustrate concrete channels through which changes in SPI can affect compensation complexity.

6. Compensation complexity and efficiency

6.1 Compensation complexity and excess pay

[10] Relative performance pay is in contrast to absolute performance pay. An example of absolute performance metric would be ROA greater 12%. An example of a relative performance metric would be ROA greater than the median firm in the firm's peer group.

Pay complexity may have negative effects on the efficiency of compensation design. For example, managers could use complex pay to disguise rent extraction. Existing research on contract theory shows that the more complex the pay structure, the more opportunity there is for manipulation (Hart and Holmstrom, 1987). Our findings on the negative effect of price informativeness on pay complexity imply that the price discovery in the stock market can play a monitoring role to help inhibit such rent extraction. In this section, we show evidence on the relation of complexity and rent extraction by CEOs using two different pay measures. The first measure, *unexplained pay*, is the residual when regressing CEO total compensation on well-accepted determinants of pay (firm size, Tobin's Q, stock return, ROA, and other related factors), similar to the excess pay in Faleye, Hoitash, and Hoitash (2011).[11] The second measure is (the natural logarithm of) *perquisite pay*. Specifically, we use the following specification

$$\mathrm{Y}_{it} = \beta_0 + \beta_1 \cdot \mathrm{Complexity}_{it-1} + \mathrm{X}_{it} \cdot \Gamma + \mu_j + \vartheta_t + \varepsilon_{it}$$

where *i* is the firm index, *j* is the industry index, *t* is the year index, Y is unexplained pay or perquisite pay, Complexity is one of our three proxy complexity measures, X is the vector of control variables, Γ is the coefficient vector for the control variables, μ_j is the industry fixed effect, ϑ_t is the year fixed effect, and ε_{it} is the error term. The relation between pay complexity and the level of unexplained (or perquisite) pay is captured by the coefficient β_1. We expect β_1 to be positive.

The results on unexplained (perquisite) pay are reported in Table 5. The coefficients of Complexity, β_1's, are positive in all three columns and statistically significant at the 1% level. After controlling for CEO and board characteristics, as well as a proxy for governance, we find

[11] The full list of controls include: log(assets), Tobin's Q, stock return, ROA, stock volatility, cash/assets, debt/assets, R&D/assets, sales growth, 10-K size.

that unexplained pay increases in compensation complexity. These results are consistent with the findings by Albuquerque, Carter, and Lynch (2018) and Murphy and Sandino (2019). This evidence is consistent with the concern that managers could take advantage of complex pay structures to manipulate the level of their pay, a form of rent extraction.

The results on perquisite pay are reported in Table 6. Perquisite pay includes the personal use of the corporate jet, low-interest loans, club memberships, hunting lodges, yachts, etc. The expensing of perquisite pay is not straightforward which leaves room for manipulation and therefore could be used for rent extraction. The results show that the coefficients on Complexity, β_1's, are positive in all three columns and statistically significant at the 1% level. This indicates that pay complexity is strongly associated with higher perquisite pay.

Combined with our findings in previous sections, stock price informativeness helps inhibit the potential for such rent extraction, which is consistent with the monitoring role of stock market and the argument by Holmstrom and Tirole (1993) that price informativeness facilitates market monitoring.

6.2 Compensation complexity and firm performance

It might be argued that compensation complexity could increase contract efficiency. If this is the case, pay complexity would be positively associated with future firm performance. In contract, if pay complexity is motivated by rent extraction, we would expect a negative association between compensation complexity and firm performance. To investigate the relationship between pay complexity and firm performance, we regress firms' ROA on compensation complexity and the specification is as follows.

$$\mathrm{ROA}_{it} = \beta_0 + \beta_1 \cdot \mathrm{Complexity}_{it-1} + \mathrm{X}_{it} \cdot \Gamma + \mu_j + \vartheta_t + \varepsilon_{it}$$

where *i* is the firm index, *j* is the industry index, *t* is the year index, ROA is net income scaled by total assets, Complexity is one of our three proxy complexity measures, X is the vector of control variables, Γ is the coefficient vector for the control variables, μ_j is the industry fixed effect, ϑ_t is the year fixed effect, and ε_{it} is the error term. The relation between pay complexity and ROA is captured by the coefficient β_1.

Results are reported in Table 7. All $\beta_1's$ are negative and statistically significant at the 1% level. The results show that compensation complexity is negatively correlated with firm performance. The evidence is not consistent with the argument that compensation complexity increases contract efficiency and shows that pay complexity reduces firm performance and efficiency.

7. Compensation complexity and shareholder say-on-pay

In this section, we investigate shareholders' attitude on compensation complexity through the effect of pay complexity on the frequency of say-on-pay votes. A more complex pay would trigger larger concerns of shareholders, which may lead to more shareholder attention to compensation and more frequent say on pay votes.

7.1 Compensation complexity and the frequency of shareholder say on pay votes

Since January 25, 2011 and the passage of Section 951 of the Dodd-Frank Act, shareholders vote to ratify executive compensation in firms' proxy statements. One item shareholders vote on is how often shareholders want to vote about executive compensation (i.e. do shareholders want to approve executive compensation every year, every two years, or every three years). A more frequent vote occupies more attention of shareholders, which shows larger concerns of shareholders. We define a variable *frequent SoP*, which is the fraction of votes for one-year approval in all votes (i.e. approve every year, approve every two years, approve every three years). If complex compensation triggers shareholder concerns, we would expect that shareholders prefer

to review and approve more complex pay at higher frequency, say every year. Our specification is as follows.

$$\text{Frequent SoP}_{it} = \beta_0 + \beta_1 \cdot \text{Complexity}_{it-1} + \text{X}_{it} \cdot \Gamma + \mu_j + \vartheta_t + \varepsilon_{it}$$

where *i* is the firm index, *j* is the industry index, *t* is the year index, Frequent SoP is as defined above, Complexity is one of our three proxy based complexity measures, X is the vector of control variables, Γ is the coefficient vector for the control variables, μ_j is the industry fixed effect, ϑ_t is the year fixed effect, and ε_{it} is the error term.

The results of these tests are reported in Table 8. The coefficients of all complexity measures are positive and statistically significant at the 1% or 5% level. It confirms that shareholders pay more attention to more complex pays. This is consistent with the shareholders' complaint on pay complexity in practice.

7.2 The role of governance in the relationship between compensation complexity and say on pay vote frequency

Would better governance alleviate shareholders' concern about complex pay? To answer this question, we add the interaction between compensation complexity and the number of blockholders, which is a measure of governance quality. A shareholder is defined as a blockholder when the shareholder hold at least 5% of shares outstanding. The existence of blockholders has a positive effect on the quality of governance. A larger number of blockholders is associated with better governance. Our specification is as follows.

$$\begin{aligned}\text{Frequent SoP}_{it} &= \beta_0 + \beta_1 \cdot \text{Complexity}_{i,t-1} \times \text{Blockholders}_{i,t-1} + \beta_2 \cdot \text{Complexity}_{i,t-1} + \beta_3 \\ &\cdot \text{Blockholders}_{i,t-1} + \text{X}_{it} \cdot \Gamma + \mu_j + \vartheta_t + \varepsilon_{it}\end{aligned}$$

where *i* is the firm index, *j* is the industry index, *t* is the year index, Frequent SoP is the fraction of votes desiring a yearly vote, Complexity is one of our three proxy complexity measures, Blockholders is the number of blockholders, X is the vector of control variables, Γ is the coefficient vector for the control variables, μ_j is the industry fixed effect, ϑ_t is the year fixed effect, and ε_{it} is the error term.

Results are reported in Table 9. The coefficients of the interaction term, β_1, is negative and statistically significant at the 5% in all three columns. This signifies that better governance indeed alleviate shareholders' concern and leads to a lower frequency of say on pay votes.

8. Robustness tests

In this section, we briefly discuss robustness tests included in the internet appendix. In our first tests in Table IA 3, we rerun our main tests using two additional SPI measures: PSI (Roll, 1988) and OWR (Odders, White, and Ready, 2008). Our results are robust to using these additional SPI measures. Higher SPI leads to less complex pay. In our second set of tests in Table IA 4, we include additional control variables that might affect our results. Specifically, we rerun our main analysis in Table 2 while controlling for: the presence of a compensation consultant, the number of business segments, and then number of geographical segments. Our results are unchanged in this setting.

The robustness tests in Table IA 5 use alternative measures of compensation complexity to test the effect of SPI on pay complexity. The setting for these tests is identical to those in Table 2. Specifically, the first measure in robustness tests is *Dispersion EC*. This measure is calculated as in Albuquerque, Carter and Lynch (2016) is defined as one minus the Execucomp Herfindalh (HHI), where the Execucomp HHI is calculated using the seven Execucomp components of pay (salary, bonus, nonequity incentive, stock awards, option awards, perquisite, and deferred). The second measure, *Complexity EC*, is a count variable calculated using the seven components of pay

found in Execucomp. A pay package is given a score of one for each of the seven types of compensation. For example, if a CEO in a given year receives her pay via salary, bonus and stock awards, her Complexity EC value would be 3. The last measure, *Complexity IL*, is calculated following Albuquerque, Carter and Lynch (2018). The specifics of the calculation are in Appendix A of Albuquerque et al (2018). This measure is a count variable calculated using IncentiveLab data. Executive pay packages are given scores based on different compensation contract characteristics, such as the number of performance metrics, the number of vesting periods, the number of pay types, and so on. Greater values of these measures are related to more complex pay. All of the results are consistent with our main results, and consistently show a negative effect of SPI on compensation complexity.

9. Conclusion

When stock price is more informative, the monitoring role of stock market is stronger, which decreases the value of more complex incentive plans. We provide consistent empirical evidence. We show that stock price informativeness has negative effects on the complexity of executive compensation packages.

We use mutual fund redemptions as exogenous decreases in price informativeness to address potential endogeneity concerns and illustrate the underlying mechanism. The results support the causal effect of price informativeness on pay complexity. When firms experience mutual fund redemption shocks, price informativeness is negatively affected. Their boards tend to use more short-term accounting performance-based pay, more long-term stock performance-based pay, and more relative pay using peers' performance as benchmark. These changes show the concrete channels through which lower price informativeness leads to more complex compensation.

We find that compensation complexity leads to larger excess pay and perquisite pay, and lower future ROA. These findings are consistent with the idea that pay compensation may camouflage rent extraction and reduce efficiency. We also find that shareholders show larger concerns about more complex pay. They prefer more frequent say on pay votes and better governance alleviates such concerns.

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Appendix: definition of variables

10-K Size	the natural log of a firm's 10-K (Annual Report) size measured in bytes. This measure follows Loughran and McDonald (2014)
Accounting Pay - ST	the portion of CEO total compensation linked to accounting goals that vest in 12 months or less
APIN	Adjusted PIN by Duarte and Young (2009)
Blockholders	the number of owners holding more than 5% of the firm's outstanding equity
Board Independence	the number of independent directors on a firm's board scaled by the total number of directors
Cash/Assets	the ratio of cash and short-term assets to the book value of total assets
CEO Age	the age of the firm's CEO
CEO Age Squared	the age of the firm's CEO squared
CEO-Chairman	a dummy variable equal to one if the CEO is also the firm's Chairman
CEO Tenure	the number of years the current CEO has been in his role as CEO
Common	the natural log of the number of common compensation words in a firm's proxy filing. The words in this list are available in the internet appendix.
Complex	the natural log of the number of complex compensation words in a firm's proxy filing. The words in this list are available in the internet appendix.
Complexity (EC)	a compensation structure complexity measure calculated as a count of the number of pay types a CEO receives in Execucomp. One point is awarded for every pay type received from the following EC categories of pay (salary, bonus, non-equity

	incentives, option awards, stock awards, other compensation, deferred compensation)
Complexity (IL)	the compensation structure complexity measure from Albuquerque, Carter and Lynch (2018)
Debt/Assets	the ratio of the sum of long-term and short-term debt to the book value of total assets
Dispersion (EC)	equal to one minus the Execucomp (EC) Herfindahl Index (HHI) of the proportions of all components in the total compensation (Albuquerque, Carter and Lynch, 2015). The Herfindahl index is $\sum_{x \in C} \left(\frac{x}{TDC1}\right)^2$, where TDC1 is the total compensation for CEO, and C={salary, bonus, non-equity incentives, option awards, stock awards, other compensation, deferred compensation}. The equation for EC HHI is in the footnote.[12]
E-Index	the governance index measure constructed following Bebchuk, Cohen, and Ferrell (2008)
Frequent Say-on-Pay (SoP)	the number of votes in favor of ratifying executive compensation on an annual basis scaled by the total votes for ratification across all three time frequencies (annual review, review every two years and review every three years)
GPIN	Refined PIN following the Generalized PIN model by Duarte, Hu, and Young (2019)
Log(Assets)	the natural log of (total) book assets
Log(Perquisite)	the natural log of CEO perquisite pay
Log(Unexplained Pay)	the residual when regressing the log of TDC1 (Execucomp) on log(assets), Tobin's Q, stock return, ROA, stock volatility, cash/assets, debt/assets, R&D/assets, sales growth, 10-K size and industry and year fixed effects

[12] $EC\ HHI = \left(\frac{Salary}{TDC1}\right)^2 + \left(\frac{Bonus}{Total\ Pay}\right)^2 + \left(\frac{NonEq\ Incent}{Total\ Pay}\right)^2 + \left(\frac{Stock\ Pay}{Total\ Pay}\right)^2 + \left(\frac{Option\ Pay}{Total\ Pay}\right)^2 + \left(\frac{OtherComp}{Total\ Pay}\right)^2 + \left(\frac{DeferredComp}{Total\ Pay}\right)^2$

MFPressure	a dummy variable which equals one if a stock's hypothetical fund sales are above the yearly annual median and zero otherwise, where the hypothetical fund sales are constructed following Edmans, Goldstein, and Jiang (2012)
PIN	Probability of informed trading following Easley, Hvidkjaer, and O'Hara (2002). More details are available in the Internet Appendix.
Proxy Size	the natural log of a firm's proxy size measured in bytes. This measure follows Loughran and McDonald (2014)
R&D/Assets	the ratio of research and development (R&D) expenditures to the book value of total assets
ROA	the ratio of net income to (total) book assets
Relative Pay	the portion of CEO total compensation that is linked to relative goals (in contrast to absolute goals) associated with peer firm performance
Sales Growth	the percentage change in revenue with respect to the previous fiscal year
Stock Price Pay - LT	the portion of CEO total compensation linked to stock price goals that vest in greater than 12 months
Stock Return	the one-year percentage return for the firm's stock over the previous fiscal year
Stock Volatility	the stock return volatility calculated as the annualized volatility of daily stock returns during the previous year
Tobin's Q	the sum of total assets plus market value of equity minus book value of equity divided by total assets

Figure 1: Industry-level evidence: Complex compensation words and SPI

These figures show industry (Fama-French 12) level yearly averages of GPIN and the number of complex-compensation words in the compensation section of proxy statements. Average GPIN is plotted in the dashed line and complex-compensation words in the solid line. The time series are between 1996 and 2015. The list of complex compensation words is in the Internet Appendix.

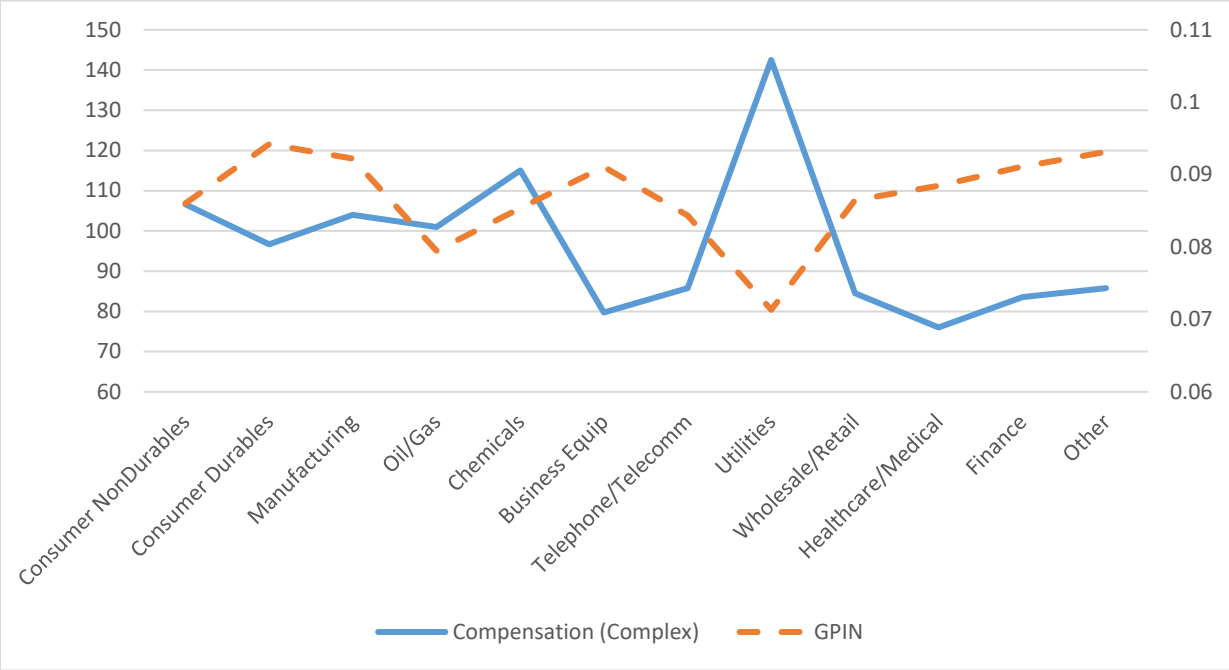

Table 1: Summary Statistics

This table presents summary statistics for compensation complexity measures, stock price informativeness measures and firm-level characteristics from 1996 to 2015. All variables are winsorized at the 1st and 99th percentile values. Variable definitions are in Appendix.

Variable	Mean	SD	P25	P50	P75	N
Proxy Size	10.076	1.424	9.587	10.331	10.961	40594
Common	5.354	1.474	4.820	5.668	6.317	40594
Complex	3.658	1.446	2.944	3.807	4.625	40594
PIN	0.200	0.107	0.125	0.182	0.260	40594
APIN	0.150	0.084	0.097	0.135	0.188	40594
GPIN	0.083	0.062	0.049	0.068	0.100	12532
Approval	0.903	0.133	0.889	0.957	0.981	7110
Frequent SoP	0.683	0.278	0.486	0.805	0.906	2186
10-K Size	12.645	0.547	12.289	12.620	12.982	40594
Log(Assets)	6.227	1.919	4.832	6.201	7.549	40594
RD/Assets	0.047	0.102	0	0	0.0488	40594
ROA	-0.015	0.176	-0.024	0.027	0.069	40594
Tobin's Q	1.923	1.770	1.080	1.414	2.120	40594
Cash/Assets	0.184	0.214	0.028	0.094	0.265	40594
Debt/Assets	0.224	0.234	0.023	0.173	0.345	40594
Sales Growth	0.142	0.600	-0.033	0.070	0.193	40594
Volatility	0.034	0.019	0.021	0.030	0.044	40594
Return	0.170	0.678	-0.214	0.072	0.373	40594

Table 2: Proxy Complexity and Stock Price Informativeness

This table presents panel regressions of Proxy complexity on stock price informativeness (SPI) and other firm-level controls. *Proxy Size* is the natural logarithm of the size of the compensation section in a firm's proxy statement. *Common (Complex)* is the natural log of the number of common (complex) compensation words in the compensation section of a firm's proxy statement. The panel uses PIN, APIN, and GPIN as its SPI measures. All specifications include industry (2-digit SIC) and year fixed effects. Our sample is from 1996 to 2015. Robust standard errors are clustered at the firm level. Variable definitions are in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	Proxy Size	Common	Complex	Proxy Size	Common	Complex	Proxy Size	Common	Complex
PIN	-0.170**	-0.327***	-0.372***						
	[-2.48]	[-3.86]	[-4.59]						
APIN				-0.188**	-0.315***	-0.387***			
				[-2.41]	[-3.22]	[-4.16]			
GPIN							-0.539***	-0.672***	-0.749***
							[-2.66]	[-3.11]	[-3.66]
Log(10-K Size)	0.128***	0.137***	0.141***	0.122***	0.131***	0.141***	0.092***	0.089***	0.092***
	[8.14]	[7.02]	[7.50]	[7.68]	[6.64]	[7.35]	[2.81]	[2.62]	[2.68]
Log(Assets)	0.050***	0.057***	0.111***	0.048***	0.056***	0.108***	0.046***	0.048***	0.087***
	[7.10]	[6.60]	[13.13]	[6.82]	[6.37]	[12.62]	[3.06]	[3.08]	[5.78]
R&D/Assets	0.167	0.283*	0.476***	0.194	0.322**	0.491***	0.701	0.722	0.755
	[1.36]	[1.85]	[3.19]	[1.55]	[2.05]	[3.24]	[1.33]	[1.31]	[1.39]
ROA	-0.167***	-0.223***	-0.155**	-0.163***	-0.213***	-0.155**	0.205	0.209	0.255
	[-3.17]	[-3.43]	[-2.47]	[-3.00]	[-3.18]	[-2.41]	[1.06]	[1.06]	[1.33]
Tobin's Q	-0.002	-0.002	-0.006	-0.005	-0.004	-0.010*	-0.004	0.003	-0.000
	[-0.40]	[-0.33]	[-1.21]	[-0.89]	[-0.77]	[-1.88]	[-0.17]	[0.16]	[-0.02]
Cash/Assets	-0.104*	-0.083	-0.152**	-0.104*	-0.075	-0.141**	-0.415**	-0.396**	-0.588***
	[-1.87]	[-1.18]	[-2.28]	[-1.88]	[-1.07]	[-2.14]	[-2.16]	[-1.96]	[-3.07]
Debt/Assets	-0.035	-0.018	-0.023	-0.034	-0.005	-0.020	0.099	0.109	0.119
	[-0.81]	[-0.35]	[-0.46]	[-0.76]	[-0.10]	[-0.38]	[0.98]	[1.03]	[1.09]
Sales Growth	-0.018	-0.013	-0.026*	-0.017	-0.011	-0.024*	-0.032	-0.021	-0.029
	[-1.48]	[-0.93]	[-1.93]	[-1.37]	[-0.73]	[-1.73]	[-0.77]	[-0.49]	[-0.66]
Stock Volatility	-1.942***	-2.398***	-3.743***	-2.261***	-2.864***	-4.164***	-1.902	-2.852	-3.111*
	[-3.48]	[-3.48]	[-5.65]	[-3.98]	[-4.08]	[-6.25]	[-1.07]	[-1.52]	[-1.69]
Return	-0.000	0.010	0.015	-0.004	0.006	0.010	0.016	0.021	0.023
	[-0.04]	[1.00]	[1.50]	[-0.44]	[0.56]	[0.96]	[0.55]	[0.67]	[0.77]
Observations	35,418	35,418	35,418	35,434	35,434	35,434	10,389	10,389	10,389
R-squared	0.080	0.070	0.092	0.079	0.070	0.089	0.095	0.087	0.080
Ind FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table 3: Endogeneity Tests: Mutual Fund Redemptions

This table presents panel regressions of Compensation complexity on mutual fund flow pressure and other firm-level controls. *Proxy Size* is the natural log of the size of the compensation section in a firm's proxy statement. *Common (Complex)* is the natural log of the number of common (complex) compensation words in the compensation section of a firm's proxy statement. *MFPressure* is a dummy variable which equals one if a stock's hypothetical previous year's mutual fund sales are above annual median and zero otherwise, where the hypothetical sales follows Edmans, Goldstein, and Jiang (2012). All specifications include industry (2-digit SIC) fixed effects and year fixed effects. Our sample is from 1996 to 2015. Robust standard errors are clustered at the firm level. Variable definitions are in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
VARIABLES	Proxy Size	Common	Complex
MF Pressure	0.048***	0.055***	0.090***
	[2.69]	[2.61]	[4.16]
Log(10-K Filesize)	0.129***	0.141***	0.147***
	[8.57]	[7.84]	[8.09]
Log(Assets)	0.053***	0.065***	0.119***
	[8.19]	[8.58]	[15.20]
R&D/Assets	0.181	0.295**	0.487***
	[1.50]	[2.02]	[3.32]
ROA	-0.172***	-0.231***	-0.171***
	[-3.34]	[-3.82]	[-2.79]
Tobin's Q	-0.006	0.000	-0.006
	[-1.03]	[0.04]	[-0.84]
Cash/Assets	-0.085	-0.077	-0.128**
	[-1.56]	[-1.18]	[-1.97]
Debt/Assets	-0.029	-0.029	-0.022
	[-0.68]	[-0.59]	[-0.45]
Sales Growth	-0.014	-0.009	-0.023*
	[-1.24]	[-0.67]	[-1.77]
Stock Volatility	-1.765***	-2.003***	-3.340***
	[-3.46]	[-3.35]	[-5.53]
Return	-0.002	0.005	0.012
	[-0.28]	[0.50]	[1.27]
Observations	39,278	39,278	39,278
R-squared	0.080	0.069	0.092
Ind FE	Y	Y	Y
Year FE	Y	Y	Y

Table 4: Mutual Fund Redemptions and Performance-Based Compensation

This table shows the effects of mutual fund sales pressure on CEO incentive-based pay. The dependent variables are the percent of the CEO's total compensation that is linked to long-term stock price performance (Specification 1), short-term accounting performance (Specification 2), and relative goals linked to peer firms (Specification 3). *MFPressure* is a dummy variable which equals one if a stock's hypothetical previous year's mutual fund sales are above annual median and zero otherwise, where the hypothetical sales follows Edmans, Goldstein, and Jiang (2012). All specifications include industry (2-digit SIC) fixed effects and year fixed effects. Our sample is from 2006 to 2015. Robust standard errors are clustered at the firm level. Variable definitions are in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
VARIABLES	Stock Price Pay - LT	Accounting Pay - ST	Relative Pay
MF Pressure	0.007**	0.011**	0.008**
	[1.97]	[2.39]	[2.27]
Log(10-K Filesize)	-0.001	0.005	-0.005
	[-0.22]	[0.92]	[-1.49]
Log(Assets)	0.003**	-0.000	0.003**
	[1.98]	[-0.07]	[2.41]
R&D/Assets	-0.010	-0.000	0.009
	[-0.35]	[-0.01]	[0.37]
ROA	-0.015	0.051*	0.021
	[-0.78]	[1.84]	[1.51]
Tobin's Q	-0.001	-0.001	-0.000
	[-1.30]	[-0.65]	[-0.22]
Cash/Assets	0.015	0.012	0.015
	[1.30]	[0.62]	[1.53]
Debt/Assets	-0.004	0.006	-0.003
	[-0.74]	[0.71]	[-0.59]
Sales Growth	0.008	0.005	0.001
	[1.38]	[1.14]	[0.68]
Stock Volatility	0.282*	0.463*	0.030
	[1.67]	[1.87]	[0.21]
Return	0.001	-0.014**	0.000
	[0.18]	[-2.26]	[0.14]
Observations	4,901	4,901	4,901
R-squared	0.024	0.015	0.017
Ind FE	Y	Y	Y
Year FE	Y	Y	Y

Table 5: Proxy Complexity and the Unexplained Pay

This table presents panel regressions of CEO compensation on lagged proxy complexity measures and other firm-level controls. *Log(Unexplained Pay)* is the residual when regressing CEO total pay on the economic determinants of pay (firm size, Tobin's Q, Stock return, ROA, and other related factors), similar to the excess pay in Faleye, Hoitash, and Hoitash (2011). *Proxy Size* is the natural logarithm of the size of the compensation section in a firm's proxy statement. *Common (Complex)* is the natural log of the number of common (complex) compensation words in the compensation section of a firm's proxy statement. All specifications include industry (2-digit SIC) fixed effects and year fixed effects. Our sample is from 1996 to 2015. Robust standard errors are clustered at the firm level. Variable definitions are in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
VARIABLES	Log(Unexplained Pay)	Log(Unexplained Pay)	Log(Unexplained Pay)
Proxy Size	0.021***		
	[3.49]		
Common		0.026***	
		[4.17]	
Complex			0.022***
			[3.53]
CEO Age	0.015*	0.015*	0.015*
	[1.78]	[1.74]	[1.72]
CEO Age Squared	-0.000**	-0.000*	-0.000*
	[-1.97]	[-1.93]	[-1.92]
CEO-Chairman	0.093***	0.092***	0.092***
	[4.61]	[4.57]	[4.59]
CEO Tenure	-0.002	-0.002	-0.002
	[-1.24]	[-1.23]	[-1.20]
Board Independence	0.441***	0.437***	0.432***
	[5.63]	[5.57]	[5.49]
E-Index	0.040***	0.040***	0.040***
	[4.16]	[4.15]	[4.13]
Observations	11,543	11,543	11,543
R-squared	0.034	0.035	0.034
Ind FE	Y	Y	Y
Year FE	Y	Y	Y

Table 6: Proxy Complexity and Perquisite Pay

This table presents panel regressions of CEO perquisite compensation on lagged proxy complexity measures and other firm-level controls. *Log(Perq)* is the natural logarithm of CEO perquisite pay. *Proxy Size* is the natural logarithm of the size of the compensation section in a firm's proxy statement. *Common (Complex)* is the natural log of the number of common (complex) compensation words in the compensation section of a firm's proxy statement. All specifications include industry (2-digit SIC) fixed effects and year fixed effects. Our sample is from 1996 to 2015. Robust standard errors are clustered at the firm level. Variable definitions are in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
VARIABLES	Log(Perq)	Log(Perq)	Log(Perq)
Proxy Size	0.048***		
	[4.42]		
Common		0.048***	
		[4.65]	
Complex			0.057***
			[5.26]
Log(10-K Filesize)	0.136***	0.135***	0.133***
	[3.48]	[3.47]	[3.43]
Log(Assets)	0.391***	0.391***	0.389***
	[20.24]	[20.22]	[20.10]
R&D/Assets	-1.525***	-1.531***	-1.547***
	[-3.19]	[-3.19]	[-3.22]
ROA	-0.142	-0.143	-0.145
	[-0.84]	[-0.85]	[-0.86]
Tobin's Q	-0.028	-0.028	-0.028
	[-1.61]	[-1.62]	[-1.60]
Cash/Assets	-0.643***	-0.641***	-0.630***
	[-3.85]	[-3.84]	[-3.79]
Debt/Assets	0.299**	0.300**	0.296**
	[2.26]	[2.27]	[2.24]
Sales Growth	-0.281***	-0.282***	-0.279***
	[-5.89]	[-5.91]	[-5.84]
Stock Volatility	-11.751***	-11.754***	-11.644***
	[-6.72]	[-6.72]	[-6.66]
Return	0.034	0.034	0.033
	[1.36]	[1.36]	[1.34]
Observations	20,170	20,170	20,170
R-squared	0.244	0.244	0.245
Ind FE	Y	Y	Y
Year FE	Y	Y	Y

Table 7: Complexity and Firm Performance

This table presents panel regressions of firm accounting performance (ROA) on lagged proxy complexity measures and other firm-level controls. *Proxy Size* is the natural logarithm of the size of the compensation section in a firm's proxy statement. *Common (Complex)* is the natural log of the number of common (complex) compensation words in the compensation section of a firm's proxy statement. All specifications include industry (2-digit SIC) fixed effects and year fixed effects. Our sample is from 1996 to 2015. Robust standard errors are clustered at the firm level. Variable definitions are in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
VARIABLES	ROA	ROA	ROA
Proxy Size	-0.002***		
	[-3.01]		
Common		-0.002***	
		[-3.59]	
Complex			-0.002***
			[-2.75]
Log(10-K Filesize)	-0.030***	-0.030***	-0.030***
	[-14.99]	[-14.95]	[-14.97]
Log(Assets)	0.018***	0.018***	0.018***
	[19.91]	[19.90]	[19.86]
R&D/Assets	-0.803***	-0.803***	-0.803***
	[-32.22]	[-32.21]	[-32.21]
Tobin's Q	0.008***	0.008***	0.008***
	[6.24]	[6.24]	[6.23]
Cash/Assets	-0.015	-0.015	-0.015*
	[-1.64]	[-1.63]	[-1.65]
Debt/Assets	-0.120***	-0.120***	-0.120***
	[-14.33]	[-14.32]	[-14.32]
Sales Growth	0.012***	0.012***	0.012***
	[4.47]	[4.48]	[4.47]
Stock Volatility	-1.926***	-1.927***	-1.929***
	[-21.96]	[-21.97]	[-22.00]
Return	0.029***	0.029***	0.029***
	[21.03]	[21.01]	[21.02]
Observations	36,889	36,889	36,889
R-squared	0.416	0.416	0.416
Ind FE	Y	Y	Y
Year FE	Y	Y	Y

Table 8: Proxy Complexity and Frequent Say-on-Pay

This table presents panel regressions of say-on-pay shareholder votes on lagged proxy complexity measures and other firm-level controls. Shareholders vote on how often they wish to approve/ratify executive compensation: every year, every two years, or every three years. Our dependent variable, *Frequent Say-on-Pay* (SoP) is the number of votes seeking pay approval every (one) year scaled by the total number of votes for pay approval across all three years. *Proxy Size* is the natural logarithm of the size of the compensation section in a firm's proxy statement. *Common (Complex)* is the natural log of the number of common (complex) compensation words in the compensation section of a firm's proxy statement. All specifications include industry (2-digit SIC) fixed effects and year fixed effects. Our sample is from 1996 to 2015. Robust standard errors are clustered at the firm level. Variable definitions are in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
VARIABLES	Frequent SoP	Frequent SoP	Frequent SoP
Proxy Size	0.009**		
	[2.18]		
Common		0.008**	
		[2.08]	
Complex			0.012***
			[3.02]
Log(10-K Filesize)	0.003	0.003	0.002
	[0.18]	[0.19]	[0.13]
Log(Assets)	0.037***	0.037***	0.037***
	[6.73]	[6.70]	[6.65]
R&D/Assets	0.143	0.140	0.137
	[1.47]	[1.44]	[1.41]
ROA	0.004	0.003	0.003
	[0.08]	[0.07]	[0.05]
Tobin's Q	-0.003	-0.003	-0.003
	[-1.30]	[-1.27]	[-1.24]
Cash/Assets	-0.001	-0.001	0.001
	[-0.01]	[-0.01]	[0.02]
Debt/Assets	-0.061*	-0.060*	-0.060*
	[-1.72]	[-1.71]	[-1.71]
Sales Growth	-0.017*	-0.018*	-0.018*
	[-1.78]	[-1.80]	[-1.80]
Stock Volatility	-1.418**	-1.417**	-1.378**
	[-2.13]	[-2.14]	[-2.08]
Return	0.021*	0.021*	0.021*
	[1.72]	[1.73]	[1.75]
Observations	2,010	2,010	2,010
R-squared	0.154	0.154	0.156
Ind FE	Y	Y	Y
Year FE	Y	Y	Y

Table 9: Proxy Complexity, Frequent Say-on-Pay, and Governance

This table presents panel regressions of say-on-pay shareholder votes on lagged proxy complexity measures interacted with the number of 5% blockholders and other firm-level controls. Shareholders vote on how often they wish to approve/ratify executive compensation: every year, every two years, or every three years. Our dependent variable, *Frequent Say-on-Pay* (SoP) is the number of votes seeking pay approval every (one) year scaled by the total number of votes for pay approval across all three years. *Proxy Size* is the natural logarithm of the size of the compensation section in a firm's proxy statement. *Common (Complex)* is the natural log of the number of common (complex) compensation words in the compensation section of a firm's proxy statement. All specifications include industry (2-digit SIC) fixed effects and year fixed effects. All specifications include all control variables used in Table 2, but their coefficients are suppressed for brevity. Our sample is from 1996 to 2015. Robust standard errors are clustered at the firm level. Variable definitions are in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
VARIABLES	Frequent SoP	Frequent SoP	Frequent SoP
Proxy Size	0.020**		
	[2.45]		
Blockholders * Proxy Size	-0.005**		
	[-2.26]		
Common		0.019**	
		[2.51]	
Blockholders * Common		-0.005**	
		[-2.34]	
Complex			0.024***
			[3.09]
Blockholders * Complex			-0.006**
			[-2.57]
Observations	1,814	1,814	1,814
R-squared	0.218	0.218	0.220
Other Controls	Y	Y	Y
Ind FE	Y	Y	Y
Year FE	Y	Y	Y

Internet Appendix

Table IA 1: Common Compensation Words

401k	forfeiture	plan based
analyst	grant	restricted
award	long term	rsu
benefits	ltip	salary
bonus	nonequity	severance
cash	option	shares
compensation	outstanding equity	short term
consultant	pay	stock
deferred	payout	tax considerations
equity	pension	time
exercise	per share	unexercised
fair value	perquisite	vest

Table IA 2: Complex Compensation Words

absolute
accelerated
accounting
actual
at risk
benchmarking
business unit
cash flow
clawback
customer satisfaction
discretion
earnings
ebit
ebitda
ebt
eps
eva
fda approval
ffo
goal
growth
incentive
margin
maximum
metric
objectives
operating income
peer
performance based
potential
profit margin
provision
relative
roa
roe
roi
roic
target
threshold
tsr

Table IA 3: Proxy Complexity and Stock Price Informativeness

This table presents panel regressions of Proxy complexity on stock price informativeness (SPI) and other firm-level controls. *Proxy Size* is the natural logarithm of the size of the compensation section in a firm's proxy statement. *Common (Complex)* is the natural log of the number of common (complex) compensation words in the compensation section of a firm's proxy statement. The SPI measures used are PSI and OWR. All specifications include industry (2-digit SIC) fixed effects and year fixed effects. Our sample is from 1996 to 2015. Robust standard errors are clustered at the firm level. Variable definitions are in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Proxy Size	Common	Complex	Proxy Size	Common	Complex
PSI	-0.017**	-0.029***	-0.043***			
	[-2.27]	[-3.53]	[-5.41]			
OWR				-0.151**	-0.153**	-0.140**
				[-2.17]	[-2.15]	[-2.00]
Log(10-K Filesize)	0.121***	0.129***	0.131***	0.091***	0.089***	0.092***
	[6.63]	[6.52]	[6.89]	[2.80]	[2.60]	[2.67]
Log(Assets)	0.042***	0.048***	0.096***	0.053***	0.056***	0.097***
	[4.44]	[4.61]	[9.47]	[3.56]	[3.70]	[6.55]
R&D/Assets	0.171	0.255*	0.445***	0.734	0.761	0.797
	[1.22]	[1.66]	[2.99]	[1.39]	[1.38]	[1.47]
ROA	-0.191***	-0.239***	-0.168***	0.208	0.212	0.260
	[-3.17]	[-3.61]	[-2.64]	[1.07]	[1.08]	[1.35]
Tobin's Q	-0.002	-0.003	-0.009	-0.002	0.005	0.002
	[-0.39]	[-0.53]	[-1.64]	[-0.12]	[0.25]	[0.08]
Cash/Assets	-0.109*	-0.078	-0.153**	-0.405**	-0.384*	-0.574***
	[-1.67]	[-1.10]	[-2.30]	[-2.10]	[-1.90]	[-2.99]
Debt/Assets	0.004	-0.010	-0.003	0.096	0.106	0.115
	[0.07]	[-0.20]	[-0.05]	[0.95]	[1.00]	[1.06]
Sales Growth	-0.016	-0.011	-0.022	-0.036	-0.025	-0.033
	[-1.13]	[-0.73]	[-1.62]	[-0.87]	[-0.60]	[-0.77]
Stock Volatility	-1.923***	-2.004***	-3.252***	-1.195	-2.184	-2.548
	[-2.96]	[-2.87]	[-4.84]	[-0.66]	[-1.14]	[-1.36]
Return	-0.001	0.007	0.012	0.011	0.014	0.015
	[-0.15]	[0.67]	[1.22]	[0.37]	[0.44]	[0.50]
Observations	33,868	33,868	33,868	10,389	10,389	10,389
R-squared	0.081	0.070	0.092	0.095	0.087	0.079
Ind FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

Table IA 4: Additional controls

This table presents panel regressions of Proxy complexity on stock price informativeness (SPI) and other firm-level controls. *Proxy Size* is the natural logarithm of the size of the compensation section in a firm's proxy statement. *Common (Complex)* is the natural log of the number of common (complex) compensation words in the compensation section of a firm's proxy statement. Panel A (B) uses PIN, APIN, and GPIN (PSI and OWR) as its SPI measures. All specifications include all control variables used in Table 2 as well as industry (2-digit SIC) and year fixed effects. Our sample is from 1996 to 2015. Robust standard errors are clustered at the firm level. Variable definitions are in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: PIN, APIN, GPIN

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	Proxy Size	Common	Complex	Proxy Size	Common	Complex	Proxy Size	Common	Complex
PIN	-0.173**	-0.325***	-0.358***						
	[-2.53]	[-3.85]	[-4.42]						
APIN				-0.189**	-0.311***	-0.368***			
				[-2.43]	[-3.18]	[-3.97]			
GPIN							-0.532***	-0.663***	-0.739***
							[-2.62]	[-3.06]	[-3.61]
Comp Consultant	0.005	0.037	0.136***	0.011	0.043*	0.139***	0.001	0.022	0.083**
	[0.26]	[1.46]	[5.52]	[0.54]	[1.67]	[5.63]	[0.03]	[0.56]	[2.07]
Business Segments	0.016*	0.015	0.018	0.018**	0.019*	0.023**	0.027*	0.033**	0.032**
	[1.81]	[1.42]	[1.62]	[2.03]	[1.70]	[2.07]	[1.82]	[2.06]	[2.00]
Geographical Segments	0.102	0.065	0.039	0.084	0.049	0.034	-0.090	-0.042	-0.129
	[0.91]	[0.55]	[0.29]	[0.75]	[0.40]	[0.26]	[-0.83]	[-0.35]	[-1.26]
Observations	35,418	35,418	35,418	35,434	35,434	35,434	10,389	10,389	10,389
R-squared	0.080	0.070	0.093	0.080	0.070	0.091	0.096	0.088	0.081
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ind FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

Panel B: PSI, OWR

VARIABLES	(10) Proxy Size	(11) Common	(12) Complex	(13) Proxy Size	(14) Common	(15) Complex
PSI	-0.018**	-0.029***	-0.041***			
	[-2.32]	[-3.51]	[-5.23]			
OWR				-0.151**	-0.154**	-0.143**
				[-2.18]	[-2.17]	[-2.04]
Comp Consultant	0.002	0.035	0.131***	0.003	0.023	0.084**
	[0.08]	[1.32]	[5.18]	[0.07]	[0.60]	[2.10]
Business Segments	0.021**	0.018	0.020*	0.027*	0.033**	0.033**
	[2.03]	[1.60]	[1.87]	[1.84]	[2.09]	[2.03]
Geographical Segments	0.107	0.066	0.041	-0.089	-0.041	-0.128
	[0.96]	[0.56]	[0.30]	[-0.84]	[-0.35]	[-1.29]
Observations	33,868	33,868	33,868	10,389	10,389	10,389
R-squared	0.081	0.070	0.093	0.096	0.088	0.081
Other Controls	Y	Y	Y	Y	Y	Y
Ind FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

Table IA 5: Additional Complexity Measures

This table presents robustness tests using additional complexity measures. *Dispersion EC* is one minus the Execucomp Herfindahl Index. *Complexity EC* is a count of the number of pay types in Execucomp that a CEO receives in a given year. *Complexity IL* is the compensation complexity measure constructed following Albuquerque, Carter and Lynch (2018). All specifications include all controls used in Table 2 as well as industry (2-digit SIC) and year fixed effects. Our sample is from 1996 to 2015. Robust standard errors are clustered at the firm level. Variable definitions are in the Appendix. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	Dispersion EC	Dispersion EC	Dispersion EC	Complexity EC	Complexity EC	Complexity EC	Complexity IL	Complexity IL	Complexity IL
PIN	-0.033*			-0.168*			-1.269		
	[-1.68]			[-1.90]			[-1.36]		
APIN		-0.142***			-0.249*			-2.286*	
		[-4.56]			[-1.67]			[-1.69]	
GPIN			-0.117***			-0.368**			-2.803*
			[-2.96]			[-2.06]			[-1.73]
Observations	17,698	17,504	8,464	16,366	16,631	8,079	9,465	9,433	5,681
R-squared	0.230	0.235	0.256	0.165	0.163	0.151	0.214	0.224	0.216
Other Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ind FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y