Complexity of CEO Compensation Packages

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Despite claims that CEO compensation contracts are increasingly complex, little is known about the extent to which they are, what drives that complexity, and its implications. We develop a new measure of compensation contract complexity and find that complexity relates to factors capturing firm complexity as well as the inclusion of contract provisions to address principal-agent conflicts. Firms that allow for ex-post renegotiation have simpler contracts, and external pressures are associated with greater contract complexity. We find that complexity has deleterious consequences; compensation complexity is associated with lower future firm performance. And, that relation is stronger when firms face extreme changes in business conditions, consistent with information overload hampering decision making. The unintended consequences of complexity confirm concerns raised by investors and the media, and our findings may be useful to boards as they design CEO pay packages.

Keywords: CEO compensation, contracts, complexity, incentives, information overload

JEL Classifications: J33, M52

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Despite claims that CEO compensation contracts are increasingly complex, little is known about the extent to which they are, what drives that complexity, and its implications. We develop a new measure of compensation contract complexity and find that complexity relates to factors capturing firm complexity as well as the inclusion of contract provisions to address principal-agent conflicts. Firms that allow for ex-post renegotiation have simpler contracts, and external pressures are associated with greater contract complexity. We find that complexity has deleterious consequences; compensation complexity is associated with lower future firm performance. And, that relation is stronger when firms face extreme changes in business conditions, consistent with information overload hampering decision making. The unintended consequences of complexity confirm concerns raised by investors and the media, and our findings may be useful to boards as they design CEO pay packages.

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1. Introduction

Investors, the media, and academics have all voiced concerns that Chief Executive Officer (CEO) compensation contracts have become too dense and detailed. A 2012 study conducted by PricewaterhouseCoopers that surveyed over 1,000 executives across different countries states that "Complex plans are a motivation killer. The idea that we can manage by incentives has led to evermore complex metrics frameworks and formulae. These have many consequences, most of them unintended. But a key one is the further reduction in value they cause in the eye of the executive."[1] *The Financial Times* noted: "The way executives are paid has become overly complex, with too many cash and share-based awards, long and short-term targets and a profusion of measures of success, ranging from earnings per share to total shareholder return to return on equity" (Skapinker 2015). Likewise, in *The Wall Street Journal*, "The fad for stock awards with complex performance triggers has gone too far" (Wilmot 2017)".[2] Even the 2016 Nobel Prize winner Bengt Holmstrom argues that pay plans are too complex, have become unwieldy, and should be simplified (Kerber 2016).

Compensation contracts are designed with many considerations in mind — among them are motivating effort, directing effort, inducing risk taking, and attracting and retaining executives. A byproduct of the board's potentially optimal decisions regarding these individual features is that the resulting contracts, in totality, can become quite complex. However, no study has examined this overall effect in a parsimonious way, nor explored the ensuing complexity that may result from it. Contracts (of any sort) fall along a continuum. At one end, they are complete and

[1] See p. 28 of "PwC, Making Executive Pay Work: The Psychology of Incentives." Available here: https://www.pwc.com/gx/en/hr-management-services/publications/assets/making-executive-pay-work.pdf.

[2] Responding to investors' calls for simpler, more transparent metrics, Credit Suisse replaced the 28 performance metrics used to evaluate its top executives with a few measures tied to the bank's group-wide performance (Noonan 2018). Unilever similarly redesigned its executive pay, citing simplicity as one of its lodestars. Unilever's 2019 remuneration policy for CEO pay refers to simplicity as a guiding principle. See https://www.unilever.com/Images/updated-statement-on-unilevers-remuneration-policy_tcm244-530551_en.pdf

incorporate many state contingencies. At the other, they are simple and allow for ex-post renegotiation as future states unfold. Hart (1988) suggests complete contracts are prohibitively costly to write, so a simpler compensation contract has merit. But it forgoes additional performance measures that can be potentially used to gauge the CEO's unobservable efforts (Holmstrom 1979). On the other hand, the benefits of having a complex contract is that by including multiple contingency provisions it leaves less room for renegotiation, which can weaken the contract's incentive efforts, ex ante. However, we argue there are two downsides of having a complex contract. First, too many performance conditions can lead to conflicting incentives. Holmstrom and Milgrom (1991) point out that when the agent has multiple tasks and a compensation contract tries to incorporate many possible outcomes, objectives in the contract may conflict with each other. Second, managers can suffer from information overload with too many measures on which to focus on (Jensen 2010). As a result, complex contracts may inhibit firm performance.

In this study, we develop a measure of compensation contract complexity, examine factors that may explain complexity, and investigate its implications for firm performance, which has not been studied before.[3] The ability to study compensation complexity has been hampered by the lack of a measure that quantifies that complexity. We first develop a novel measure based on details of compensation contracts from proxy statements. We define a contract as more complex when it contains more state contingencies (that is, multiple factors for the manager to consider) and is more complicated in a way that increases the CEO's cognitive load. So, in assessing complexity, we consider four dimensions of compensation contracts: types of compensation (e.g., cash or equity), the number of performance metrics used, the number of periods over which performance is measured, and the reference points for performance measures (absolute and relative). We

[3] We consider the complexity of compensation from the perspective of the manager. We acknowledge that contracts may be hard for investors to understand, which may have consequences for them, but that is not the focus of our study.

aggregate these features into a single measure and consider a contract as more (less) complex when it contains relatively more (fewer) of these features. We use this measure to examine firm, executive, and outside factors associated with that complexity and how these features have contributed to the increase in complexity over time.[4] We then consider the implications of complex contracts by examining their performance consequences.

Using a sample of firms from Incentive Lab from 2006–2019, we first document that complexity has, in fact, increased over time. This increase is driven by more performance measures and more periods over which performance is measured, as well as the use of relative performance conditions. We document that complexity resides in the components of pay that are more heavily weighted in CEO contracts, suggesting that CEOs are exposed, in a material way, to complexity. That is, compensation contracts don't just appear complex, they are economically complex.

We find that contract complexity is associated with factors related to organizational and operational complexity of the firm and provisions used to address principal-agent problems. We find evidence that contracts are more complex in firms that have less discretion in their contracts, consistent with attempts of firms to specify more state contingencies in contracts that do not allow for ex post renegotiation of compensation. We also find that complexity relates to the complexity of peer firms' compensation, suggesting that contract provisions spill across the labor market. We find that complexity is associated with increased frequency of compensation related terms in Institutional Shareholder Services (ISS) guidelines. Though not causal, this last result could be

[4] Black, Dikolli, and Dyreng (2014) examine whether the level of executive compensation relates to firm complexity. Murphy and Sandino (2020) examine the association between the level of CEO pay and the use of compensation consultants, acknowledging that the pay premium associated with consultants may be driven by their layering on different forms of pay or different performance measures (their constructs for complexity). Our study differs from these by examining the complexity of the contract in totality and the implications of that complexity for firm performance. Kole (1997) studies whether the form of pay and vesting periods relate to firm characteristics using a small sample of 371 firms in 1980. Our approach differs in that we consider the totality of contract characteristics, rather than two characteristics individually, and we examine a recent period in which contracts have allegedly become increasingly complex.

interpreted as the firm's trying to secure ISS approval, given the increased discussion of performance terms and timelines in ISS guidelines. We also find that compensation contracts are more complex when firms use compensation consultants. Finally, we find mixed evidence of the association between complexity and firms' attempts to obfuscate pay.

Examining the consequences of contract complexity, we find that complex contracts are associated with lower future firm performance (measured by both accounting and stock returns). This evidence points to the potential inefficiencies that can arise from contracts that are too complex and highlights unintended consequences of contracts with too many performance metrics or provisions, which can lead to cognitive overload and less desirable outcomes.[5]

We then investigate whether cognitive load is a mechanism through which contract complexity impacts firm performance. We examine whether the effect of complexity differs for firms exposed to extreme changes (positive or negative) in industry growth and find that these firms perform incrementally worse when their CEOs have more complex compensation. These results are consistent with complex contracts diffusing managerial attention and imposing cognitive costs on how CEOs think and process information when making quick decisions (Dutton and Jackson 1987). These findings also help to rule out an alternative explanation that our results merely capture the use of non-financial performance measures, or the addition of more performance measures, in lower performing firms. Second, we exploit the setting of TCJA as an exogenous shock to performance-based pay, which causes the complexity to drop, on average, as the number of performance measures is a key component driving complexity. A difference-in-differences estimation helps establish a causal link between compensation complexity and future

[5] As we discuss in more detail in Section 6.2, we find that our conclusions are unchanged when we examine alternative measures of complexity.

performance, mitigating concerns regarding endogeneity.

We contribute to the literature in four ways. We are the first to create a comprehensive measure of compensation complexity. Our measure may be used by future researchers interested in studying the implications of pay complexity. Second, we show that CEO compensation contracts have, in fact, become more complex over time. Third, we explain, at least partly, why this has happened. Finally, we show that overly complex contracts are associated with lower future performance. From a practical perspective, our study informs board members and compensation committees about the trade-offs between writing a complicated contract to direct a multi-tasking agent and the potential inefficiencies of doing so.

2. Background and research questions

In the principal-agent problem, an agent's actions are unobservable, and her objective is not the same as that of the principal. One solution to this conflict of interests is for the principal to offer the agent a compensation contract that ties her payoff to observable measures of performance. At one extreme, complete contracts anticipate and incorporate all possible contingencies. Such contracts provide more powerful incentives, as there is no need for, or possibility of, renegotiation with all possible states specified. However, Grossman and Hart (1986) argue that in practice, contracts will be incomplete because parties cannot foresee all possible contingencies and complete contracts are often impossible (or prohibitively expensive) to write (Hart 1988). Armstrong, Guay, and Weber (2010) build on that argument and highlight that the CEO's relationship with the firm is highly complex, precluding the writing of a contract that considers every possible future action. At the other end of the spectrum, incomplete contract theory suggests that, in a complex contracting environment, contracts should be simple but include the possibility of ex-post renegotiation (e.g., Williamson 1975, Segal 1999). However, compensation contracts typically do not allow for renegotiation because doing so weakens managerial incentives (Fudenberg and Tirole 1990; Williamson 1975).[6] While firms seek the best contracting terms to incentivize, reward, and retain talent, we observe that contracts (of any sort) fall along a continuum with some firms having simpler contract terms while others rely on more complex ones. This motivates our attempt to explain this complexity and its implications for firm performance.

2.1 Determinants of Compensation Complexity

When boards design compensation packages, they tailor the package to firm and CEO specific characteristics. These characteristics, in turn, may require and therefore result in more complex contracts. Outside pressure from shareholders, consultants or proxy advisors, as well as internal pressure to obfuscate pay, may also contribute to contract complexity. We discuss the potential determinants of complexity next.

2.1.1 Firm characteristics—organizational and operational complexity

Larger firms may be more complex and harder to manage, with more resources about which managers make decisions, a larger scope of operations (Smith and Watts 1992; Gaver and Gaver 1993; Himmelberg, Hubbard, and Palia 1999), and more decentralization (Christie, Joye, and Watts 2003). Thus, we expect that they have more complex contracts. Even smaller firms with complex business operations (more segments, foreign operations, or recent mergers or acquisitions) may have more complex compensation to match their business complexity.

Firms with higher growth opportunities may have more complex contracts for several

[6] There are several empirical reasons why renegotiating compensation contracts may not be optimal. First, changes to equity plans require firms to obtain shareholder approval. Second, renegotiations may be viewed unfavorably by proxy advisors (i.e., ISS recommends against repricings that aren't subject to shareholder vote) or shareholders (Ferri and Maber (2013) find that low pass Say-on-Pay votes in the U.K. are associated with the reduction or elimination of retesting provisions in performance vesting equity grants). Third, until 2018, Section 162(m) encouraged the use of performance measures and allowed negative, but not positive, discretion, an asymmetry imposed by the tax code that created friction for renegotiation.

reasons. First, CEOs are more difficult to monitor because outsiders cannot easily observe the firm's investment opportunities (Smith and Watts 1992). As a result, firms may rely on more performance measures including nonfinancial. Research shows that nonfinancial performance measures are used to determine executive incentive pay when growth opportunities are larger, when innovation matters more, and when financial measures are noisier (e.g., Bushman, Indjejikian, and Smith 1996; Ittner, Larcker, and Rajan 1997). In addition, if growth firms are research and development (R&D) intensive with longer investment horizons, their compensation contracts may link the performance measurement periods with the expected realization of project payoffs (Kole 1997; Gopalan Milbourn, Song, and Thakor 2014). If so, firms' use of performance measures over more periods will result in more complex compensation contracts.

Finally, fluctuation in performance measures inhibits the monitoring of CEOs' actions (Demsetz and Lehn 1985) and expose CEOs to more performance shocks outside their control. To alleviate the monitoring risk imposed on a CEO due to noisier performance measures, firms in more volatile businesses may include more metrics, including qualitative measures that are informative of CEO efforts, or may add relative, in addition to absolute, performance conditions.

2.1.2 CEO characteristics—addressing principal-agent conflicts

The need for incentive pay to mitigate principal-agent conflicts likely influences compensation contract complexity. We consider several CEO attributes that reflect the intensity of these agency conflicts. Long serving CEOs may be less subject to uncertainty about ability (Hermalin and Weisbach 1998; Dikolli, Mayew, and Nanda 2014), resulting in less need for incentive pay. Similarly, founder CEOs have lower principal-agent conflicts, due to their large undiversified equity positions, and longer investment horizons (Anderson and Reeb 2003: Brochet, Loumioti, and Serafeim 2015). On the other hand, older CEOs, who are likely closer to retirement, receive higher incentive pay to substitute for declining incentive alignment due to career concerns (Gibbons and Murphy 1992). Higher CEO ownership may capture CEOs whose interests are better aligned with shareholders, reducing the need for complex, incentive intensive contracts. Finally, we consider CEOs who also serve as board chairs, as their additional responsibility may increase compensation contract complexity. Alternatively, if the dual role enables the CEO greater control over the contract, it may result in lower complexity if that is what she desires.

2.1.3 Renegotiation

Segal (1999) introduces the concept that the more complex the environment, the more costly and difficult it is to write a contract; in this case, a simpler contract with renegotiation may be better. Armstrong et al. (2010) build on that argument and highlight that the CEO's relationship with the firm is highly complex, entailing various duties, abilities and incentives and precluding the writing of a contract that considers every possible contingency. If contracts allow for the possibility of renegotiation, we expect they will be less complex.

2.1.4 Other factors

External pressure may induce firms to incorporate more factors into compensation contracts. We consider four sources of such pressure. First, we consider the number of compensation consultants providing services to the firm in that year. We expect this to be associated with complexity for at least two reasons. Firms that need more complex contracts, due to characteristics of the CEO or the firm itself, may be more likely to hire consultants to help design such contracts. Alternatively, consultants may design complex contracts to help justify the need for their services. Second, we expect that peers' levels of compensation complexity will impact the firm's compensation complexity through benchmarking to alternative employment opportunities as a means to attract and retain talent (Cadman, Carter, and Peng 2021; Murphy and

Zabojnik 2007). Third, we consider institutional ownership. Firms may include more provisions in contracts to placate large investors and receive affirmative say-on-pay votes. Finally, we consider pressure to receive favorable recommendations from proxy advisors. Specifically, we expect that greater coverage of compensation details in ISS annual proxy voting guidelines may be reflected in compensation contracts (and thus be more complex), as firms seek to avoid an "Against" recommendation. Finally, firms with poor governance may be more likely to design contracts with greater complexity to mask CEO pay.

2.3 Implications of compensation complexity

The foregoing discussion suggests that firm, CEO and other factors may result in contracts that have become increasingly complex as boards include different types of pay, performance measures or absolute and relative conditions to address specific contracting concerns. While studies have examined individual features of compensation contracts, none that we know of has considered the *totality* of these features and the complexity that results from it. We study complexity from the standpoint of the executive, as we are interested in analyzing how complexity affects CEOs' actions and thus their firms' performance. We define a contract as complex if it contains many state contingencies that result from multiple features.[7]

Because contract features may cancel each other out or interact in ways that muddle decision-making, a consequence of contract complexity is that it requires more cognitive effort of the CEO to comprehend and respond to.[8] CEOs can suffer from information overload when they have to focus on too many performance goals (Ittner and Larcker 1998; Schick, Gordon, and Haka

[7] Posner, Eggleston, and Zeckhauser (2000) define legal contract complexity using three dimensions: (i) the expected number of payoffs, (ii) the variance of the individual payoffs, and (iii) the cognitive load required to understand the contract. We expect that more complex contracts will have more contingent payoffs and will require a higher cognitive load to understand it.

[8] As an example, if a contract includes both an EPS measure and non-financial measure encouraging sustainability investments, and the payoffs from those investments come in the future, actions to increase the non-financial measure can impair the ability to meet the EPS target.

1990; Lipe and Salterio 2000). Jensen (2010) argues that, because "it is logically impossible to maximize in more than one dimension, purposeful behavior requires a single-valued objective function." A clear objective enables agents to expend effort efficiently (Holmstrom and Milgrom 1991, 1994; Ittner and Larcker 1998). Absent this, managers can overly emphasize particular components of their firms' operations. (e.g., Jensen 2010). For example, if managers' compensation is based on numerous performance measures (as in a balanced scorecard framework), they will choose the easiest measures to achieve and ignore the more difficult tasks (Brickley, Smith, and Zimmerman 1995).

The CEO's job involves a substantial amount of information processing. The concept of information or cognitive overload occurs when the level of information that decision-makers face is greater than their ability to process all the information (Eppler and Mengis 2004). This affects their ability to set priorities and leads to less optimal decisions (Schick et al. 1990). The theoretical basis for information overload is borrowed from psychologists and cognitive scientists. When information overload occurs, a decision-maker faces "a wealth of information [which] creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it" (Simon 1971, pp. 40–41). More recently in a cross-disciplinary review of the literature, Roetzel (2019, page 484) defines information overload as:

> *Information overload is a state in which a decision maker faces a set of information (i.e., an information load with informational characteristics such as an amount, a complexity, and a level of redundancy, contradiction and inconsistency) comprising the accumulation of individual informational cues of differing size and complexity that inhibit the decision maker's ability to optimally determine the best possible decision.*

The concept of information overload has been applied in management accounting. The complexity of balanced scorecard programs is believed to result in cognitive overload and poorer decision-making (see Ding and Beaulieu 2011). Swain and Haka (2000) show that information load affects decision quality and its accuracy for matters regarding budgeting decisions.

If increasingly complex compensation contracts result in a higher cognitive load for the CEO, it follows from the above discussion that such contracts will be associated with lower future performance. On the other hand, if complex contacts do not affect cognitive load or if its effects are inconsequential to the CEO because she focuses on maximizing shareholder return as a summary measure that is correlated with the many features of the compensation contract, contract complexity should be unrelated to future performance. Thus, whether there are deleterious effects from contract complexity is an empirical question.

In summary, recent claims that compensation contracts are overly complex raise questions regarding the reasons for and implications of contract complexity. We aim to fill this void in the literature by (1) creating a measure of compensation complexity, (2) identifying economic (firm, CEO and outside) factors associated with that complexity, (3) considering its implications for firm performance, and (4) examining how and why complexity varies over time.

3. Complexity of compensation contracts

3.1 Sample and data

Our sample includes all firms on the Incentive Lab database in 2006–2019 with data to compute the determinants of compensation contract complexity (1,307 unique firms, 11,909 firm-years). We obtain data for our study from Compustat, CRSP, ExecuComp, ISS Incentive Lab, ISS Directors, Thomson Reuters Institutional (13f) holdings data, and annual ISS publications.

3.2 Measuring compensation contract complexity

Compensation contracts contain a variety of attributes. Firms can compensate executives with salary, cash bonuses, and equity. Even within equity, firms have choices about the type to offer (e.g., stock or stock options). To assess managerial effort, firms use financial performance measures in compensation contracts such as accounting and stock returns. (Lambert and Larcker 1987; Sloan 1993; Murphy 2000; Bettis, Bizjak, Coles, and Kalpathy 2018). Firms also frequently use nonfinancial performance measures when financial measures are noisy indicators of CEO effort, and when the need to link performance measures to the firm's strategy is important (Salter 1973; Govindarajan and Gupta 1985; Simon 1987; Ittner and Larcker 2002). The use of multiple measures are not uncommon as the Informativeness Principle suggests firms should incorporate any measure that provides incremental information about managerial effort (Holmstrom 1979; Banker and Datar 1989; Feltham and Xie 1994). To increase the informativeness of a performance measure, firms also include relative performance conditions to help insulate managers from systematic risk or factors beyond their control, thereby better capturing a measure of the manager's efforts (Holmstrom 1982; Holmstrom and Milgrom 1987). And, because determining the appropriate benchmark to use in assessing relative performance can be difficult (Albuquerque 2014), firms may opt for using both absolute and relative performance conditions. Finally, firms may incorporate contract features that focus managerial attention on a longer time horizon to avoid managerial myopia associated with short-term compensation (Dechow and Sloan 1991; Jenter and Lewellen 2011; Gopalan, et al 2014), which can be achieved through equity grants with longer term vesting provisions or inclusion of performance metrics measured over multiple time horizons. Our proxy for contract complexity considers the span of these attributes.

We use data from Incentive Lab to develop a new measure of contract complexity (see Appendix A Part 1 for details) that parsimoniously aggregates the many features of compensation contracts. We focus on four dimensions: form of pay, the use of both absolute and relative performance conditions, the number of performance measures, and the number of time horizons over which performance is measured.

Our first dimension captures the form of pay. Using four types of performance-based compensation (short-term cash bonus, long-term cash bonus, stock, stock options), we count the number of forms of pay the firm uses, as Kole (1997) suggests that the form of compensation is one aspect of complexity.

The second dimension is the use of absolute and/or relative performance measures. Within each form of compensation, we assign a point each for having a time-vesting provision (e.g., stock units that vest after a three-year service period), an absolute performance condition (e.g., quantitative measures such as ROA, RET, sales growth, EPS, or qualitative measures, such as successful completion of a merger), or a relative performance condition (e.g., ROA measured relative to the 75% of the peer's ROA).

The third dimension is the number of different performance measures included in the contract. Within each of the two performance conditions (absolute and relative) and within each form of pay (short term bonus, long term cash bonus, stock and stock options), we assign a point for each unique (qualitative or quantitative) performance measure used.

Our final dimension of complexity capture time periods. For each performance measure, we assign a point for each unique period over which performance is measured (e.g., 3 points for

RET measured over three years).

Our overall measure of complexity is the sum of the all the points assigned within each of the four dimensions.[9] In Appendix A Part 2, we provide an example of this computation using excerpts from ConocoPhilips's fiscal year 2010 proxy statement. As the concept of compensation complexity is new, and the simultaneous aggregation of these multi-dimensional features has not been considered in the literature before, we attempt to validate our measure using the receipt of SEC comment letters related to executive compensation issues in the proxy statement. We provide the details of our validation in Appendix A Part 3.

Table 1 Panel A presents descriptive statistics related to our compensation complexity measure as well as the inputs to the calculation of that measure. The mean (median) value of COMPLEXITY is 11.35 (11.00), with a standard deviation of 5.73. Its value at the first and 99th percentile is 1 and 30, respectively. In examining the inputs to the calculation of complexity, the mean (median) number of components of pay is 2.38 (2.00). The mean (median) number of performance measures is 5.17 (5.00). The mean (median) number of periods is 3.06 (3.00). And the proportion with both absolute and relative performance conditions is 41%.

Table 1 Panel B presents the mean values of our complexity measure by industry, and Panel C presents the mean values of the inputs to the calculation of complexity by industry. Compensation complexity is highest in the utilities industry (Panel B), driven primarily by a substantially higher number of performance measures, number of periods, and reliance on both absolute and relative performance conditions (Panel C). The consumer discretionary industry has the lowest value of complexity (Panel B), driven primarily by fewer performance measures and

[9] Our approach to construct a measure that is a linear aggregation of individual indicators for the presence of a characteristic resembles what others have done, for example, to capture extent of voluntary disclosure as do Botosan (1997) and Francis, Nanda, and Olsson (2008) or shareholder rights as do Gompers, Ishii and Mettrick (2003).

lower reliance on both absolute and relative performance conditions (Panel C).

3.3 Complexity of compensation over time

Figure 1 graphically presents our complexity measure by year over the sample period. The complexity of compensation packages increases steadily over the sample period, consistent with claims advanced in the popular media. The mean COMPLEXITY score increased from 8.4 in 2006 to 13.8 in 2019. To assess whether the increase we observe in Figure 1 is statistically significant, we compare the complexity value over the period of 2006 to 2012 to its value over the 2013 to 2019 period. The mean and median values of COMPLEXITY increase significantly from the earlier to the later period ($p < 0.01$) (untabulated). This trend is consistent with the perception by investors and other market participants that compensation contracts have become more complex.

Figure 2 shows the trends in the inputs to the calculation of our complexity measure over the sample period. The number of types of pay is stable over the sample period, but the number of performance measures, number of periods, and proportion of observations with both absolute and relative conditions increase dramatically. A comparison of the mean and median values of each between the 2006–2012 and the 2013–2019 periods confirms that they all increase significantly ($p < 0.01$) (untabulated). This trend is consistent with research documenting an increased use of RPE and nonfinancial performance metrics in executive compensation (see, e.g., Bettis, Bizjak, Coles, and Young 2014, among others).

3.4 Complexity of the different types of pay

To assess the CEO's exposure to complexity in compensation contracts, we (1) decompose the complexity score into the respective scores for each type of performance-based pay (short-term bonus, long-term bonus, stock options, and restricted stock) and (2) consider the weight placed on each type in the contract. Contracts may have high overall complexity scores but the CEO may not be exposed to complexity in a material way because different components of pay, with different scores, represent different proportions of compensation. For example, a contract can be complex based on our measure, but the high score can reside in a component of pay that represents a small proportion of overall pay. That is, the level of contract complexity may not translate into an economically material complex contract to the CEO that significantly impacts her decision-making progress. As reported in Table 2, both the complexity scores and the proportion of pay from short-term bonuses and stock awards are considerably higher than those for long-term bonuses and stock options.[10] These statistics suggest that pay is skewed toward more complex types of pay, as it is the most complex components that comprise the largest proportion of CEO pay.

Figure 3 Panel A suggests that, over the sample period, the complexity scores for short-term bonuses and stock increase, and those for long-term bonuses and stock options decrease. Figure 3 Panel B shows that the proportion of firms offering more complex types of compensation (according to statistics in Table 2) increases over the sample period, while the proportion of firms offering less complex types of compensation decreases. Figure 3 Panel C shows that the weight placed on stock (the more complex component of pay) increases over the sample period.

Collectively, these data suggest that the increased complexity over time is driven by firms incorporating more performance measures, more periods, and both absolute and relative performance conditions in later years. For CEOs, the exposure to complexity also rises, as the proportions of incentive pay from less complex forms of compensation (e.g., stock options and long-term bonuses) shift toward more complex stock awards and short-term bonuses (see Guay, Kepler and Tsui, 2019).

[10] Long-term bonuses are not frequently used by our sample firms (only 8.3% of our sample observations). For those observations, the mean (median) score is 4.88 (4.00), and the mean (median) weight is 0.24 (0.24).

4. Why are compensation contracts complex?

4.1 Multivariate regression

To examine what explains compensation complexity, we estimate the following regression of compensation complexity on firm characteristics, CEO characteristics, and outside factors.

$$\begin{aligned} COMPLEXITY_{jt} = \; & \alpha + \beta_1\, lnMV_{jt-1} + \beta_2\, MTBA_{jt-1} + \beta_3\, R\&D_{jt-1} + \beta_4\, lnSTDRET_{jt} \\ & + \beta_5\, SEGMTS\_HH_{jt-1} + \beta_6\, PIFO_{jt} + \beta_7\, M\&A_{jt} + \beta_8\, lnTENURE_{jt} \\ & + \beta_9\, RETIRE_{jt} + \beta_{10}\, FOUNDER_{jt} + \beta_{11}\, OWNSHIP_{jt} + \beta_{12}\, CHAIR_{jt} \\ & + \beta_{13}\, RENEG_{jt} + \beta_{14}\, CONSULT_{jt} + \beta_{15}\, IND\_SIZE\_COMPL_{jt} \\ & + \beta_{16}\, Top5\_INST\_OWN_{jt} + \beta_{17}\, lnGUIDELINES\_ISS_{jt-1} \\ & + \beta_{18}\, IND\_DIRECTOR_{jt} + \beta_{19}\, BUSYNESS_{jt} + \beta_{20}\, COOPTED_{jt} \\ & + \beta_{21}\, COOPT\_MISSING_{jt} + \beta_{22}\, lnCEO\_PERKS_{jt-1} + \beta_j\, IND_j + \beta_t\, YEAR_t + \varepsilon_{it}. \end{aligned} \tag{1}$$

Our firm characterstics include size measured as the natural log of the market value of equity (*lnMV*), growth opportunities measured as the ratio of the sum of the market value of equity and the book value of total liabilities to the book value of assets (*MTBA*), the ratio of R&D expenses to the book value of assets (*R&D*), the volatility of business operations measured as the natural log of the standard deviation of monthly stock returns (*lnSTDRET*), complexity of business operations measured as the proportion of revenues accounted for by each (*SEGMTS_HH*), whether the firm has foreign operations (*PIFO*), and whether the firm has recent merger or acquisition activity (*M&A*). For CEO characteristics we include CEO tenure (*lnTENURE*) at the firm, an indicator for whether the CEO is the company founder (*FOUNDER*), proximity to retirement (*RETIRE*), CEO ownership (*OWNSHIP*), and whether the CEO is also chairman of the board (*CHAIR*). To capture whether the contract allows for renegotiation, we use the instances of language in the CD&A that captures discretion and renegotiation, under the assumption that the interjection of discretion at the end of the fiscal year is a form of renegotiation (*RENEG*). Variables capturing outside pressure include the number of compensation consultants providing services to the firm in that year (*CONSULT*), the median value of compensation complexity for firms in the same industry and of similar size, excluding the sample firm (*IND_SIZE_COMPL*), the percentage of shares outstanding held by the top five institutional investors in that year (*Top5_INST_OWN*), and the occurrences of keywords related to pay components of the compensation complexity in the compensation section of the ISS annual summary proxy voting guidelines for each year (*GUIDELINES_ISS*). Finally, we include the percentage of independent directors (*IND_DIRECTOR*), the percentage of outside directors who hold three or more directorships (*BUSYNESS*), the percentage of board members appointed by the CEO (*COOPTED*), and the log dollar amount of perquisite income received by the CEO (*CEO_PERKS*) to capture corporate governance characteristics.

Specific details on how the variables are constructed are in Appendix B. We winsorize all the continuous variables (except logged variables) at the 1 and 99 percent level to mitigate the influence of outliers.[11] We include industry and year fixed effects to capture trends in complexity that are common to all firms in the same industry or over time. We compute standard errors that are cluster-adjusted by firm.

4.2 Descriptive statistics and correlations

We present descriptive statistics in Table 3. Sample firms are larger (average market value of equity of $14,719 million), with an average market-to-book ratio of assets of 1.96, and average R&D expense scaled by total assets of 0.02. Firms have an average of 2.32 business segments and have engaged in an average of 3.79 mergers or acquisitions in the prior two years. Over half of the firms (62%) report pretax income from foreign operations. Our sample CEOs have an average

[11] As compensation decisions are made prior to the beginning of the year, we measure firm characteristics and external factors at the beginning of the year (*t-1*). We measure CEO characteristics and compensation consultants at time *t*, since we are interested in the compensation contract of the individual that is CEO during year *t*. Finally, we measure our proxy for labor market pressure in year *t* to match the contract being offered in the labor market at year *t*.

tenure of 8.1 years, 11% are founders, and only 7% are approaching retirement. CEOs own an average of 1.44% of shares outstanding and 53% also chair the board of directors. Words related to renegotiation are 0.06% (average) of total CD&A words. The average firm has 1.09 compensation consultants and an average complexity score for its industry/size peers of 11.14. The five largest institutional shareholders own an average 30% of shares outstanding. On average, 195 keywords that we identify to relate to compensation complexity are used in the ISS guidelines. Independent directors comprise, on average, 82% of the board, while co-opted directors comprise 17%. Only 9% of outside directors serve on three or more boards. Annual perquisites for our sample CEOs are, on average, $258,200. Finally, the one-year ahead ROA (stock returns) is 5% (6%), on average, for our sample firms.

Table 4 presents Pearson correlations. We observe that complexity is correlated with many of our independent variables. Among the larger correlations, complexity is positively correlated with firm size (*lnMV*), the complexity score of industry/size peers (*IND_SIZE_COMPL*), and with percentage of independent directors (*IND_DIRECTOR*).

4.3 Regression results

Table 5 presents results from estimating Eq. (1). We estimate the regression including firm characteristics (Columns 1 and 2), firm and CEO characteristics (Columns 3 and 4), firm and CEO characteristics and the provision for contract renegotiation (Columns 5 and 6), and firm and CEO characteristics, the provision for renegotiation, and other factors that may influence complexity (Columns 7 and 8). Odd (even) columns exclude (include) industry and year fixed effects.

In Column 1, consistent with our expectations, larger firms have more complex contracts, as evidenced by the positive and significant coefficient on *lnMV,* as do firms with more R&D. The latter finding may reflect that firms with high R&D spending require more performance measures and periods to align their CEOs' horizon with the horizons of the research pipeline. Interestingly, we find that higher *MTBA* firms have less complex contracts. One explanation is that the board relies primarily on equity pay to capture the effect of the CEO's performance in managing those unobservable opportunities, resulting in less complex contracts.[12] More volatile firms have less complex contracts; the coefficient on *lnSTDRET* is negative and significant. Finally, we find that greater recent M&A activity relates to complexity but negatively. While we predict that recent M&A makes operations more complex, as targets are integrated into the acquirer, our findings suggest that these firms simplify compensation, possibly focusing on a summary measure associated with the success of the merger. When we include industry and year fixed effects (Column 2), the model fit increases significantly (adjusted-R^2 increases from 0.08 to 0.20), which suggests that contract complexity varies by industry and over time. We note that in this specification the coefficient on *lnSTDRET* is positive, as expected.

Contract complexity is also impacted by efforts to address principal-agent conflicts. As reported in Columns 3 and 4, founder CEOs and CEOs with higher ownership, where we would expect fewer agency conflicts, have less complex contracts. When we control for industry and year fixed effects (Column 4), we find that CEOs closer to retirement have significantly less complex contracts. Finally, CEOs who also chair the board have greater contract complexity, likely resulting either from increased responsibility or greater need for monitoring, due to agency concerns. The inclusion of CEO characteristics only marginally increases the explanatory power of the model beyond when only firm characteristics are included. The inclusion of industry and

[12] A univariate comparison of the proportion of pay from equity for high (above sample median) and low (below sample median) MTBA firms in our sample (not tabulated) shows that the proportion of pay from equity for high MTBA firms (54.6%) is significantly higher than for low MTBA firms (49.7%). This is consistent with equity being used to align incentives of CEOs with those of investors in firms where monitoring of management is harder (Smith and Watts 1992; Gaver and Gaver 1993; Himmelberg, Hubbard, and Palia 1999).

year fixed effects again increases the explanatory power of the model but has little impact on the effect of CEO characteristics, except for proximity to retirement, as noted above.

In Columns 5 and 6, we include our proxy for the possibility of renegotiation. Firms that discuss renegotiation and discretion more frequently in their CD&As have less complex contracts, consistent with theoretical predictions that ex-post renegotiation may limit the need for more contingencies in contracts.

Finally, in Column 7, we find that more consultants, more discussion of complexity inputs in ISS guidelines, and greater institutional ownership are associated with greater complexity. In addition, we find that complexity of peer firms' compensation contracts is a significant influence on contract complexity. After including industry and year fixed effects (Column 8), the relations between complexity and *IND_SIZE_COMPL, TOP5_INST_OWN,* and *GUIDELINE_ISS* are no longer significant at conventional levels. The coefficient on the complexity of peer firms' compensation (*IND_SIZE_COMPL*) becomes smaller (from 0.372 in Column 7 to 0.051 in Column 8), consistent with industry fixed effects capturing commonality of complexity within the industry. The loss of significance of the top five institutional ownership likely reflects its correlation with year and industry. The year fixed effects likely capture the trend in ever-increasing keyword coverage in ISS guidelines, and industry fixed effects capture the commonality of complexity within the industry. In untabulated analyses, we estimate the full model with industry fixed effects while excluding year fixed effects and confirm that year fixed effects absorbs the significance of *GUIDELINE_ISS*.[13] We find mixed evidence regarding firms' attempt to use

[13] In untabulated analyses, we include the percentage of votes in favor on executive pay packages as an additional determinant and estimate this regression model for the period of 2011–2019, after the enactment of the Dodd-Frank Act, using say-on-pay votes from ISS Voting Analytics. Because we need vote information, a firm-year observation only enters the sample when it first has a vote. However, this variable is not significantly associated with complexity, possibly due to lack of power due to the smaller sample size (4,361 firm-year observations).

complexity to obfuscate pay. The positive relation between complexity and *BUSYNESS*, *COOPTED* and *lnCEO_PERKS* is consistent with poor governance leading to more complex contracts to hide pay, but the positive relation between complexity and *IND_DIRECTOR* is not.

In untabulated tests, we estimate Equation (1) using each of the four components of our complexity measure (form of pay, number of performance measures, number of periods over which performance is measured, and use of both absolute and relative conditions) separately as the dependent variable. We observe that the results are not driven by any one particular component of complexity. As a further robustness (untabulated), we alternatively define COMPLEXITY as low (assuming a value of 1), medium (value of 2) and high (value of 3) if complexity is in the bottom, middle, or top tercile of the sample distribution, respectively. We obtain similar results if this alternative measure is used instead.

In summary, contract complexity reflects the need for contracts that capture the organizational and operational business characteristics of firms, address agency conflicts associated with CEO characteristics, and preclude the possibility of renegotiation. We also find that external pressure is associated with more complex contracts, but our evidence regarding the firm's attempt to obfuscate pay is somewhat mixed.

5. Compensation Complexity and Future Firm Performance

Overly complex contracts can introduce unintended complications and lead to information overload, resulting in lower future performance. We examine this next.

5.1 Examining contract complexity and future performance

We estimate the following model of pay complexity and future firm performance.

$$FirmPerformance_{i,t+1} = \alpha + \gamma_i Pay\ Complexity_{i,t} + \textstyle\sum_k \beta_k Controls_{i,t} + \delta_i\ Firm_i + \alpha_t\ Year_t + \varepsilon_{i,t}. \quad (2)$$

We capture future firm performance using return on assets (ROA) and stock returns (RET), measured over the year ahead and the average of one and two years ahead. ROA is computed as net income divided by the average of total assets at the beginning and at the ending of the year. RET is measured as the 12-month buy-and-hold returns. We estimate Eq. (2) using OLS regressions and include firm and year fixed effects to account for both time-invariant firm characteristics associated with firm performance and unobservable macroeconomic factors that vary over time.[14] When performance is measured by ROA (RET), we follow Core, Holthausen, and Larcker (1999) and include the natural logarithm of the standard deviation of ROA (RET), and the natural log of sales (natural log of market value and MTBA) as controls.[15] We also include the prior year ROA to control for its persistence over time. If there are costs associated with having complex contracts, we expect future performance to be lower for firms with higher complexity, predicting a negative relation between COMPLEXITY and future performance ($\gamma_j < 0$).

Table 6 presents the results. Columns 1-4 test the association between total complexity and future performance. Columns 5-8 test the association between total complexity and future performance, while controlling for the firm and CEO characteristics and our proxy for contract renegotiation as the economic drivers of pay complexity included in Eq. (1). In this case, the coefficient on complexity can be interpreted as capturing the relation between *excess* complexity (the portion of complexity not explained by the economic determinants) and performance (see Chen, Hribar, and Melessa 2018).[16] In Column 1, the coefficient on *COMPLEXITY* is -0.062 (*p*-

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[14] In untabulated analyses, we address concerns that CEOs' differing abilities and perceptions of complexity may affect performance by replacing firm fixed effects with CEO-firm fixed effects; our conclusions are unchanged.

[15] *RET*, *lnMV*, *MTBA*, and *lnSTDRET* are all measured at *t*-1, because those variables are also included as economic determinants of complexity. We obtain similar results if those variables are measured at time *t* instead.

[16] Examining the relation between the (raw) complexity and subsequent performance while controlling for the economic determinants allows us to interpret the coefficient on (raw) complexity as the relation between performance

value < 0.01), suggesting that complexity is associated with lower one-year-ahead *ROA*. We find a similar result in Column 3 using the average ROA ($AvgROA_{t+1,t+2}$), where the coefficient on *COMPLEXITY* is -0.063 (p-value < 0.01). In Column 2, the coefficient on *COMPLEXITY* is -0.209 (p-value < 0.01), suggesting that complexity is associated with lower one-year-ahead stock returns. The results using the $AvgRet_{t+1,t+2}$ (Column 4) show that complexity relates negatively to future two-year-average stock returns but is not significant at conventional levels. The weaker association between complexity and future stock returns is expected (Core et al. 1999); in efficient markets, within two years, investors would fully price the cash-flow implications of contract complexity such that these would not translate into differences in stock returns. In sum, these results show that the attempt by boards to write efficient contracts to address agency conflicts, information asymmetry and incentive effects can result in a level of complexity with undesirable consequences. The results (Columns 5-8) suggest that information overload resulting from complex contracts due to non-economic drivers of complexity (which could include external forces and obfuscation attempts, as those factors are not included in the regression, or other non-economic factors) are a significant driver of poor performance.[17]

5.2 Additional tests of the implications of complexity

To shed light on the mechanism by which complexity can affect firm performance, we conduct two additional tests. First, we examine extreme changes in industry growth. Firms facing extreme business conditions have both opportunities and challenges for executives to react to. But, navigating the firm during such circumstances can decrease decision-making performance for

and the portion of complexity not explained by the economic determinants. An alternative approach is to separate complexity into the portion explained (predicted) by economic determinants and the portion not explained by economic determinants (namely, the complexity due to external pressures and obfuscation, in addition to the residual complexity) and then examine the relation between unexplained complexity and performance. Both approaches yield the same coefficient estimates but the latter approach requires adjusting standard errors (Chen, et al. 2018).

[17] As discussed in Section 7.3, when we include our proxies for obfuscation, we continue to find a negative and significant coefficient on *COMPLEXITY*.

CEOs with complex contracts, if those contracts diffuse managerial attention and impose cognitive costs on how CEOs think and process information when making quick strategic decisions (Dutton and Jackson 1987; Pennington and Tuttle 2007). We predict that CEOs with more complex contracts and thus subject to information overload will exhibit lower performance than those with less complex contracts during periods of extreme increases or decreases in industry growth.

To identify extreme changes, we calculate total revenue for each industry-year (industry is defined as 2-digit GICS industry) using all Compustat firms in 2005-2019. We then calculate the percentage change in total revenue for each industry-year and define an industry experiencing extreme changes if the percentage change in revenue for that year is greater (smaller) than the mean plus (minus) two standard deviations for a given year. (This definition is similar to that used by Grullon, Lyandres, and Zhdanov 2012).[18]

We interact complexity with an indicator variable equal to 1 if the firm's industry is experiencing extreme (positive or negative) changes in growth and examine whether firms with more complex contracts perform worse than firms with less complex contracts during periods of extreme industry changes. Table 7 presents results of these tests. We find the coefficient *COMPLEXITY*Large_CHNG* is statistically negative when either ROA (Columns 1 and 3) or RET (Columns 2 and 4) is the performance measure.

These tests also help to rule out two alternative explanations for the relation between complexity and future performance unrelated to the impact complexity has on managerial decision making (overload). The first is that more complex contracts have more non-financial measures and non-financial meaures may encourage near term investments with long term payoffs. In this case,

[18] In our sample, there are 272 observations with large changes in industry growth as captured by *Large_Chng*. If, instead of using *Large_Chng*, we rely on the absolute value of the yearly percentage change in sales in a firm's primary industry (defined by a two-digit GICS code), we obtain similar results.

we expect a negative relation between complexity and future ROA until those investments payoff. For this explanation to hold in the presence of industry shocks, it must be the case that firms in industries with large future shocks are incrementally more likely to be the ones adding non-financial measures with long-term payoffs. We have no reason to believe this to be true. The second alternative explanation is that firms, anticipating lower future performance, add more performance measures (possibly non-financial) to ensure the CEO still receives her compensation payouts. Without considering the cross-sectional test, for this explanation to hold, the firm must anticipate at the beginning of year t that year t+1 performance will be low. For this explanation to hold in the presence of industry shocks, firms that will experience a future industry shock must be incrementally more likely to add additional measures. While this is potentially feasible for negative industry shocks, it seems unlikely for positive industry shocks since they will increase future performance. We find (untabulated) incrementally lower future performance in the presence of positive industry shocks for firms with more complex contracts for three out of the four columns when we examine only positive shocks relative to no industry shocks suggesting this explanation does not hold in our sample.

These findings help both to reinforce our interpretation that contract complexity has implications for firm performance through higher cognitive load and to alleviate concerns that the relation merely reflects the use of non-financial performance measures.

5.3 The Tax Cut and Jobs Act

In an effort to further establish causality and mitigate concerns regarding endogeneity between compensation complexity and future performance, we use the setting of the Tax Cut and Jobs Act (TCJA) as an exogenous shock to compensation complexity, as it affects incentive pay in a tight treatment window. The TCJA eliminated the deductibility of performance-linked incentive pay that was previously allowed under Section 162(m). After that, firms no longer had a tax motive for tying compensation to pre-specified performance measures. If this motivation led to more complex contracts because firms included performance measures to meet the deductibility requirement before TCJA, we would observe a decline in complexity after the Act's enactment, and this decline would be plausibly unrelated to firm or CEO characteristics.

Because the threshold for tax deductibility under Section 162(m) was $1 million, we limit our sample to firms that have total pay greater than $1 million in each of the three years leading up to the new law (2015-2017). We expect the effect of the law to be greater for firms with higher levels of performance-based pay (variable pay), so we define our treatment firms as those with higher than median percentage of variable pay over total compensation in the three-year period (2015-2017). We predict that treatment firms will reduce complexity more in the post period (2018-2019) and, as a result, will have higher performance than other firms. Because we expect the TCJA to affect the level of variable pay, we include this variable in our analyses when examining performance to control for the impact of variable pay on CEO's incentives and thus firm performance. We also include the standard control variables for firm performance.

Table 8 presents these results. We find that our treatment firms have lower complexity after the law's enactment, confirming our expectation that the TCJA provided an exogenous shock to complexity (Column 1) and that channel is through lower incentive pay (Column 2). Consistent with complexity negatively affecting performance, we also find that our treatment firms have higher performance in the post period relative to other firms (Columns 3-6). We argue that complexity, instead of variable pay, is the channel through which TCJA affects future performance because after TCJA, both the level of variable pay and complexity decrease. While the decrease in variable pay would lead to a decrease in future performance as incentives are reduced, the decrease in complexity would lead to an increase in future performance. We find an increase in future performance following TCJA, and therefore, attribute the effect of TCJA on future performance to complexity, rather than variable pay.

In summary, these results document that the TCJA led to a decrease in pay complexity for firms with higher levels of incentive pay prior to the Act, and that the exogenous reduction in pay complexity induced by TCJA is positively related to future performance, as expected. We acknowledge that endogeneity is inherent in compensation design; while we cannot fully rule out an endogenous relation, these tests provide some comfort that there is plausibly a causal relation between compensation complexity and firm performance.

6. Additional analysis

6.1 Alternative measures of complexity

In this section, we consider three alternative measures of complexity. First, while our measure captures complexity associated with flow compensation, *prior* grants may have vesting conditions that tie to performance measures over multiple periods. It may be the case that the CEO is influenced not only by the complexity of the current year's compensation, but also by the complexity of prior year components that are still "in flight" (i.e., still unresolved). We thus create a new measure that adds the complexity score from the current "flow" compensation to the complexity score from equity and long-term cash bonus granted in the *prior* two years (*t*-1 and *t*-2), as the average horizon and vesting period is three years. We do not include the complexity score of the short-term cash bonus as that component of pay does not carry over to subsequent periods. We replicate (untabulated) our analyses in Table 6 (columns 5-8) using this alternative measure and find that complexity continues to be significantly associated with lower future ROA and weakly associated with lower one-year-ahead stock returns (p-value of 0.127). When we decompose complexity into the current and past two years of complexity, we find that it is the current flow complexity, not the carryforward of the prior year's complexity, that is statistically significantly associated with lower future performance for all but $AvgRET_{t+1,t+2}$, as in Table 6.

Second, one could also argue that the complexity of pay components with the largest dollar amounts (i.e., the CEO's economic exposure to complexity) should drive CEO behavior.[19] To address this, we consider a measure that weights the complexity score per compensation component type by the proportion of pay for that component to capture the CEO's economic exposure to complexity. For cash compensation, we use the target value of payouts, and for equity grants, we use the fair value of the grant. This weighted complexity assumes that the CEO discounts contract complexity that derives from pay components that represent a small portion of her pay. Using this complexity measure, we repeat the analyses in Table 6 Columns 5-8 (untabulated) and our conclusions remain the same.

Finally, our aggregration across dimension could be adding noise to our proxy. To address this, we re-estimate (untabulated) the analyses in Table 6 (columns 5-8) using only the number of performance measures as our proxy for complexity. Being only one dimension of complexity, using this measure avoids concerns that aggregating multiple constructs introduces noise into the proxy. Using this alternative measure, our conclusion are unchanged.

6.2 Why has compensation complexity changed over time?

To understand what factors drive increased complexity, we perform two tests. First, following the approach of Juhn, Murphy, and Pierce (1993), we explore the following framework:

[19] In untabulated analyses, we include the level of total compensation (log of *TDC1*) as an additional control variable, and our conclusions are unchanged. This test provides some reassurance that the relation between compensation contract complexity and future performance is not driven by the level of compensation as a correlated omitted variable.

$$Y_{it} = \mathbf{X}_{it}\beta_t + u_{it},$$

where Y_{it} is the complexity of compensation contract for CEO at firm i in year t, $\boldsymbol{X}_{it}$ is a vector of characteristics (including firm, CEO, renegotiation, external factors and obfuscation), β_t represents the loadings of each characteristic, and u_{it} is the component of complexity unaccounted for by the observable characteristics included in the model. In this framework, changes in complexity come from three sources: (i) changes in the distribution of characteristics (i.e., changes in the distribution of the X's over time)), (ii) changes in the loadings of the characteristics (the relevance of each economic determinant in explaining complexity over time), and (iii) changes in the distribution of the residuals. Appendix C provides further details regarding this decomposition.

Figure 4, Panel A plots actual complexity overtime for comparison purposes. Panel B demonstrates how complexity would have changed over time due to changes in the distribution of observable characteristics. Changes in the distribution of these characteristics (firm and CEO characteristics, renegotiation, other factors, and obfuscation) over time appear to have a moderate impact on overall complexity. Panel C shows changes in complexity due to the changes in loadings over time (i.e., changes in the relevance of each economic determinant in explaining complexity), relative to the average loadings in the pooled sample. The figure suggests that changes in loadings have also impacted complexity over time.[20] Panel D shows changes in complexity due to changes in unmeasured loadings and characteristics (i.e., complexity changes due to unobservables). The figure suggests that the unobservables do not seem to contribute to the overall increase in complexity over time. This speaks to the model's goodness of fit in explaining complexity.

[20] Panel D requires yearly estimates of the loadings (i.e., coefficients from Table 5). Because we have only 67 observations for fiscal year of 2006, leading to very noise estimates of the loadings for that year of 2006, we drop the year of 2006 from these graphs. Panels B and C are similar if the year of 2006 is included.

Figure 4 Panel E quantifies the contribution of observed characteristics, loadings and unobservables to the increase in complexity over time. Changes in characteristics account for only 64% of the increase in complexity, whereas changes in loadings account for 36% of the increase in complexity, and changes in unobservables accounts for 0% for the full sample. While the increase in the first half of the sample period (2007 to 2012), 1.94, is almost identical to that in the second half of the sample period (2013 to 2019), 1.96, during the first half of the sample period, changes in both the characteristics and loadings account for the increase in complexity with 57% and 43%, respectively. But during the second half of the sample period, changes in characteristics seem to contribute more (71%) than loadings (29%) to the increase in complexity.

In our second test, we analyze how the influence of (i.e., coefficients on) the economic drivers of complexity changes over time. We replicate the results in Table 4 Columns (7) and (8) for two subsamples, 2006 to 2012 (the first half of the sample period) and 2013 to 2019 (the second half). Table 9 presents these results.[21] Examining across the two subsamples either excluding industry and year fixed effects (Columns 1 and 2) or including them (Columns 3 and 4), we find that size (*lnMV*), growth opportunities (*MTBA*) and *R&D* become significantly greater drivers of complexity in the most recent period. Business complexity (*SEGMENTS_HH*) is not significantly associated with complexity during the first half of the sample, but it becomes negatively associated with complexity during the second half of the sample, suggesting that after controlling for firm size, diversified firms prefer to rely on simpler and more focused contracts. Some CEO firm characteristics (*RETIRE, FOUNDER*) lose their relevance as a determinant of contract complexity in the later periods, while CEO ownership becomes more relevant. Among the other factors, the importance of consultants (*CONSULT*) and proportion of independent directors

[21] Our inferences are unchanged if we require a firm to appear in both sample periods.

(*IND_DIRECTOR*) increases in the later time period. Curiously, the significance of ISS declines after 2013 but that may be due to the fact that ISS guidelines plateau in their reference to the complexity parameters we measure in the later years.

Overall, the role of some firm characteristics, consultants and board independence in determining complexity have increased in our sample period, while the importance of some CEO characteristics and ISS guidelines has waned.[22]

6.3 Potential Alternative Explanation

Our analyses in Table 6 document a negative relation between contract complexity and future performance. To understand whether the relation results from an obfuscation motive, we estimate the model in Table 6 Columns 4-8 including our proxies for obfuscation. If obfuscation leads to both more complex contracts and lower future performance, controlling for it should moderate the relation between complexity and performance. Inconsistent with this, we find (untabulated) that *COMPLEXITY* remains related to lower future performance. This suggests that obfuscation, if a motive for complexity, is not the driver of our results. We perform two additional tests that further validate that obfuscating pay is not the primary objective of contract complexity. First, we examine (untabulated) the payouts from annual bonus contracts relative to target amounts. If the main purpose of a complex contract is to camouflage high pay, we would expect complexity to be positively associated with the ratio of the actual to target compensation that is paid to the CEO. This prediction assumes that firms disclose lower ex-ante targets to portray that the CEO is receiving a reasonable level of pay, with contract complexity attempting to obfuscate

[22] To provide further insight into the drivers of complexity over time, we analyze the goodness of fit (R^2) by estimating (untabulated) the complexity model by year and separately for each category of determinants: firm characteristics, CEO characteristics, renegotiation, external factors, and obfuscation. This analysis confirms that firm (CEO) characteristics become more (less) relevent in explaining complexity in recent times.

how the actual higher payout is achieved. Inconsistent with this motive, we find that there is no statistically significant association between this proxy for target difficulty and complexity.

Second, we examine FOG scores of the CD&A section of the proxy statement. If complexity is an outcome of attempts to obfuscate higher pay, we expect that firms might use more sophisticated language to describe compensation to further obfuscate, suggesting a positive relation between CD&A FOG and complexity. In untabulated tests, we regress the FOG score of the CD&A on contract complexity and the log of the market value of equity, a proxy for size (Li 2008), while including industry and year fixed effects. We further include the FOG score of the remainder of the proxy statement excluding the CD&A to control for the use of sophisticated language related to business complexity. We find that contract complexity is significantly negatively related to the CD&A FOG score, not supportive of an obfuscation motive.

In sum, our additional tests confirm that complexity relates negatively to future accounting and stock performance. Our findings are robust to other variations of complexity measurement, consistent with a causal effect, and likely not simply due to obfuscation motives. Our findings affirm the concerns of market participants that executive pay packages may have become too complex to be effectively implemented and that this may impede efficient management.

7. Conclusion

Research has extensively examined the determinants and effects of individual features of compensation contracts that independently contribute to those contracts in total. Yet a byproduct of decisions regarding these individual features is that the resulting contracts can be quite complex overall. No study has examined the amalgam of these individual features in a parsimonious way, the complexity that results from a contract with many individual features, and the implications for firm outcomes. Investors, the media, and academics have expressed concerns that CEO contracts have become so complex that even executives struggle to understand them. That is our focus.

We construct a measure of complexity using details from proxy statements and document that complexity has, in fact, increased over time. That increase stems from an increase in the number of performance measures and performance-measurement periods, as well as the use of relative performance conditions. Further, complexity resides in components of pay more heavily weighted in CEO contracts, and firms appear to be replacing less complex forms of compensation with more complex ones.

We find that the complexity of compensation contracts is associated with the organizational and operational complexity of the firm, attempts to address principal-agent problems, the use of compensation consultants, and the increased frequency of compensation terms in ISS guidelines. We also find that compensation is more complex in firms that have less discretion in their contracts, consistent with a lower possiblity of renegotiation requiring the inclusion of more contingencies. In addition, we find that complexity is associated with that of peers' compensation, suggesting that labor market conditions play a role, and with proxies for poor governance.

Examining the implications of compensation complexity for firm performance, we find that higher complexity is associated with lower future firm performance. This result highlights the unintended consequences that can arise with complex compensation contracts: too many provisions can result in a contract with incentives that conflict or become too difficult for the manager to parse. We find that when firms face extreme changes in business conditions, complexity is strongly negatively associated with firm performance, consistent with information overload hampering quick decision making. Finally, in order to provide evidence of a causal association between complexity and firm performance, we use the TCJA as a negative exogenous shock to complexity and find that the reduction of complexity induced by TCJA is positively associated with future performance, confirming our main results.

Appendix A

Part 1: Computation of Complexity

Pay Component	Characteristics	COMPLEXITY Score
Short-Term Cash Bonus	Has time conditions	1
	Has absolute performance conditions	1
	• Number of performance measures	Actual #
	• Number time periods	Actual #
	Has relative performance conditions	1
	• Number of performance measures	Actual #
	• Number time periods	Actual #
Long-Term Cash Bonus	Has time conditions	1
	Has absolute performance conditions	1
	• Number of performance measures	Actual #
	• Number time periods	Actual #
	Has relative performance conditions	1
	• Number of performance measures	Actual #
	• Number time periods	Actual #
Stock	Has time conditions	1
	Has absolute performance conditions	1
	• Number of performance measures	Actual #
	• Number time periods	Actual #
	Has relative performance conditions	1
	• Number of performance measures	Actual #
	• Number time periods	Actual #
Stock Options	Has time conditions	1
	Has absolute performance conditions	1
	• Number of performance measures	Actual #
	• Number time periods	Actual #
	Has relative performance conditions	1
	• Number of performance measures	Actual #
	• Number time periods	Actual #
	Potential Total Score	*N/A*

Part 2: Example Calculation of Complexity

ConocoPhillips (CIK 1163165) has a score of 25 for the fiscal year ended 12/31/2010 using our COMPLEXITY measure. Below, we provide details regarding how the information from the proxy statement (DEF 14A) about incentive contracts is used to calculate the score.

Summary:

Component	**Characteristics**	**COMPLEXITY**
ST Cash Bonus	Has absolute perf conds	1
	• Number of perf measures	3
	• Number time periods	1
	Has relative perf conds	1
	• Number of perf measures	4
	• Number time periods	1
LT Cash Bonus		0
Stock	Has time conditions	0
	Has absolute perf conds	1
	• Number of perf measures	2
	• Number time periods	3
	Has relative perf conds	1
	• Number of perf measures	3
	• Number time periods	3
Stock Options	Has time conditions	1
Total Score		25

Information from the Proxy Statement dated 03/31/2011 regarding **short-term cash bonus** is as follows:

"In determining award payouts under VCIP [the authors noted: Variable Cash Incentive Program] for 2010, the Committee considered the following performance criteria:

- *Company Performance for 2010— In 2010, our VCIP program used both quantitative and qualitative performance measures relating to the Company as a whole, including:*
  - *Ranking 1st in <u>relative annual total stockholder return</u> compared with our performance-measurement peer group (ExxonMobil, Royal Dutch Shell, BP, Total, and Chevron);*
  - *Ranking 2nd in percentage change and 3rd in absolute change in improvement in <u>relative annual adjusted return on capital employed</u> compared with the same peer group noted above;*
  - *Ranking 3rd in percentage and absolute change in <u>relative annual adjusted cash return on capital employed</u> compared with the same peer group noted above;*
  - *Ranking 2nd in <u>relative adjusted cash contribution BOE</u> [the authors noted: BOE stands for barrel of oil extracted]compared with the same peer group noted above;*
  - *Our <u>health, safety and environmental performance</u>; and*

- *Advancement and support of our key strategic initiatives and plans*.

- Business Unit Performance in 2010—In determining award unit performance [the authors noted: award unit here refers to business unit], management's determinations of performance by the Company's award units under their performance criteria were reviewed and approved by the Committee. Each executive participated in the operational and staff award units, respectively, over which they had responsibility, weighted to reflect their time of service within such units. The Committee determined that the combined corporate and award unit performance merited base awards of between 151% and 162% of target for each of our Listed Executive Officers, other than Mr. Mulva. As noted under "Business Unit Performance Criteria" beginning on page 37, Mr. Mulva's award, as CEO, is based on individual and overall Company performance.

- Individual Performance Adjustments—Finally, the Committee considered individual adjustments for each Listed Executive Officer's 2010 VCIP award based upon a subjective review of the individual's impact on the Company's financial and operational success during the year. The Committee considered the totality of the executive's performance in deciding the individual adjustments. Based on the foregoing, the Committee approved individual performance adjustments of between 10% and 30% for each of our Listed Executive Officers. The individual adjustments for these officers reflect the Committee's recognition of these individuals' contributions to the strong 2010 operational performance of their respective operating units.

Business Unit Performance Criteria

… Moreover, because our CEO is responsible for overall Company performance, his award is based solely on individual and overall Company performance.

Individual Performance Criteria

Individual adjustments for our Listed Executive Officers are approved by the HRCC, based on the recommendation of the CEO (other than for himself). The CEO's individual adjustment is determined by the Committee taking into account the prior review of the CEO's performance, which is conducted jointly by the HRCC and the Committee on Directors' Affairs."

ConocoPhillips uses both relative and absolute performance measures in their short-term cash program, which gives them 2 points. In addition, they have four relative performance measures at the company level (relative annual total stockholder return, relative annual adjusted return on capital employed, relative annual adjusted cash return on capital employed, and relative adjusted cash contribution BOE), two absolute performance measures at the company level (health, safety and environmental performance and key strategic initiatives and plans), and one absolute performance measures at the individual level (individual performance). Hence, we further assign 7 points. We assign 2 more points since absolute performance is measured over one time period and relative performance is measured over one time period.

Information from the Proxy Statement regarding **stock options** plans is as follows:

"Our program targets generally provide approximately 50 percent of the long-term incentive award in the form of stock options and 50 percent in the form of restricted stock units awarded under the PSP [the authors noted: the Performance Share Program].

- *Stock Option Program—The Stock Option Program is designed to maximize medium- and long-term stockholder value. .... Our stock options have three-year vesting provisions and ten-year terms in order to incentivize our executives to increase the Company's share price over the long term."*

Stock options granted are just time vested and thus receive a score of one.

Information from the Proxy Statement regarding **stock** plans is as follows:

" Performance Share Program—The PSP rewards executives based on their individual performances and the performance of the Company over a three-year period. Each year the Committee establishes a three-year performance period over which it compares the performance of the Company with that of its performance-measurement peer group using pre-established criteria. Thus, in any given year, there are three overlapping performance periods. Use of a multi-year performance period helps to focus management on longer-term results.

Each executive's individual award under the PSP is subject to a potential positive or negative performance adjustment at the end of the performance period. Although the HRCC maintains final discretion to adjust compensation in accordance with any extraordinary circumstances that may arise, and has done so in the past, program guidelines generally result in an award range between 0 to 200 percent of target. Final awards are based on the Committee's subjective evaluation of the Company's performance relative to the established metrics (discussed below under the heading "Measuring Our Performance under Our Compensation Programs") and of each executive's individual performance. The Committee considers input from the CEO with respect to Senior Officers. Targets for participants whose salary grades are changed during a performance period are prorated for the period of time such participant remained in each relevant salary grade.

Measuring Our Performance Under Our Compensation Programs

For PSP, the criteria for the 2010 program year required that the Company meet one of the following measures as a threshold to an award being made to any Listed Executive Officer: (1) Top two-thirds of specified companies in improvement in return on capital employed (adjusted net income); (2) Top two-thirds of specified companies in total stockholder return; (3) Top two-thirds of specified companies in cash per BOE; or (4) Cash from operations (normalized for the impact of asset sales and assumptions made in our budgeting process as to price for oil equivalents and excluding non-cash working capital) of at least $30.7 billion."

The performance shares are granted based on both relative and absolute performance metrics, which again gives them 2 points. In addition, they have three relative performance measures at the company level (return on capital employed, total stockholder return, and cash per BOE), one absolute performance measure at the company level (cash from operations), and one absolute performance measure at the individual level (individual performance). Hence, we assign 5 more points. Finally, both absolute and relative performance is measured over 3 time periods, so we assign 3 points to each.

There is no time-vesting conditions for the stock granted and thus receive a score of zero.

Part 3: External Validation of Complexity Proxy

Because our construct for complexity is self-constructed, we attempt to provide some external validity. First, we note that our proxy is associated with variables that have been shown to be related to economic determinants of compensation contracts when the firm is complex. Documenting these relations provides some reassurance that our measure of contract complexity is economically sound. Nevertheless, we attempt to validate our proxy as follows. We examine whether changes in contract complexity prompt SEC comment letters. Underlying this test is the assumption that if a compensation contract increases in complexity, it has more elements described in the proxy statement. The more elements described (details with respect to performance metrics, time periods, relative performance benchmarks), the more pieces of information the SEC might seek clarification on. This leads to the issuance of comment letters related to executive compensation, as comment letters typically ask for more clarity or explanation.[23]

For our sample of firms, we use Audit Analytics to identify all comment letters issued between January 2006 and December 2020 that are related to the proxy statements. We further parse these comment letters into whether they relate specifically to executive compensation or some other aspect of the proxy statement. We then examine whether the change in complexity from fiscal year *t*-1 to year *t* is associated with the number of comment letters received related to executive compensation in the year *t* proxy statement. As an example, we are testing whether an increase in complexity from fiscal 2015 to fiscal 2016 is associated with receiving comment letters on the fiscal 2016 proxy statement.

To examine this, we regress the number of comment letters received that related to executive compensation on the percentage change in contract complexity after controlling for firm size (log of market value of equity) to control for business complexity and including industry and year fixed effects. In a separate regression, we also control for the number of comment letters received related to non-executive compensation issues in the same proxy statement to control for a firm's general tendency to receive comment letters. In both regresssions, we find that increases in complexity are positively ($p < 0.10$) related to the number of executive compensation comment letters. Then, as a falsification test, we replace the dependent variable of compensation related comment letters with the number of non-executive compensation comment letters. We find no evidence that increases in complexity are positively related to the number of non-executive compensation comment letters. This falsification test provides some comfort that business complexity, associated with both contract complexity and the likelihood of receiving a comment letter, is <u>not</u> driving the relation we document. Although imperfect, we believe these tests provide some assurance that our proxy captures some dimension of contract complexity.

[23] https://www.sec.gov/divisions/corpfin/guidance/execcompdisclosure.htm

Appendix B
Variable Definitions

Variable name (in alphabetical order)	Variable definition
$BUSYNESS_{jt}$	= the percentage of outside directors that hold three or more directorships (i.e., are busy) (see Fich and Shivdasani 2006).
$CHAIR_{jt}$	= indicator variable equal to 1 if the CEO is also the chair of the board of directors.
$COMPLEXITY_{jt}$	= index of compensation complexity computed from Incentive Lab data, as described in Section 3.2.
$CONSULT_{jt}$	= number of different compensation consultants providing services to the firm for the design of the compensation contract for year *t*.
$COOPT\_MISSING_{jt}$	= indicator variable equal to 1 if *COOPTED* is missing and 0 otherwise.
$COOPTED_{jt}$	= the fraction of independent directors appointed after the CEO takes office, weighted by tenure; zero if missing (Coles, Daniel and Naveen 2014). This variable is obtained from Lalitha Naveen's website: https://sites.temple.edu/lnaveen/data/.
$FOUNDER_{jt}$	= indicator variable equal to 1 if the CEO of firm *j* in year *t* is a founder of the firm. We obtain information about whether the CEO is the founder either by extracting that information from the title of the CEO on Execucomp or by conducting a Google search by using the firm's and the CEO's name and the word "founder" to determine who founded the firm.
IND_{j}	= indicator variable for industry, based on Global Industry Classification codes for firm *j*.
$IND\_DIRECTOR_{jt}$	= the percentage of board of directors that are independent for firm *j* in year *t*.
$IND\_SIZE\_COMPL_{jt}$	= median value of *COMPLEXITY* for firms in the same industry and size quartile as the firm *j* (excluding the focal firm *j*), for year *t*.
$lnCEO\_PERKS_{jt-1}$	= natural log of 1 plus other compensation of a CEO in year *t*-1, data from ExecuComp.
$lnGUIDELINES\_ISS_{t-1}$	= natural log of the number of keywords related to components of compensation complexity in the guidelines issued by ISS in the previous calendar year (keywords are "bonus," "stock," "vesting," "vest," "vested," "period," "duration," "time," "metric," "performance," "goal," and "relative"). To ensure the keywords relate only to executive compensation, we exclude those relating solely to director or employee pay.
$lnMV_{jt-1}$	= natural log of the market value of equity of firm *j* at the end of year *t*-1.
$lnSTDRET_{jt-1}$	= natural log of the standard deviation of monthly stock returns for firm *j* for the two years leading to the end of year *t*-1.
$lnTENURE_{jt}$	= natural log of the CEO tenure for firm *j* in year *t*.
$M\&A_{jt-1}$	= the number of mergers and acquisitions the firm completed in year *t*-2 and *t*-1.
$MTBA_{jt-1}$	= (market value of equity plus book value of total liabilities)/ book value of assets of firm *j* at the end of year *t*-1.
$OWNSHIP_{jt}$	= CEO total ownership of firm stock (ExecuComp variable "shrown_tot_pct").
$PIFO_{jt-1}$	= indicator variable equal to 1 if pretax foreign income for firm *j* in year *t*-1 is nonmissing, 0 otherwise.
$R\&D_{jt-1}$	= research and development expenditures / total assets for firm *j* at the end of year *t*-1. If missing, we set equal to 0.
$RENEG_{jt}$	= the proportion of words in the CD&A related to renegotiation (keywords: "discretion,"

		"discretionary" (excluding "negative discretion," "negative discretionary," "no discretion," and "no discretionary"), "renegotiate," "renegotiated," "renegotiating," "renegotiation," "retest," "retested," "retesting," and "subjective" (but only if "subjective" appears in the same sentence with "performance," "measures" or "adjustment(s)")).
$RETIRE_{jt}$	=	indicator variable equal to 1 if the CEO is older than 65 in year *t*.
$SEGMTS\_HH_{jt-1}$	=	1 – (Herfindahl index computed based on the proportion of total revenues for firm *j* in year *t*-1 accounted for by each business segment). We use segment data from Compustat to calculate the proportion of revenues accounted for by each segment (see Jennings, Seo and Tanlu 2014).
$Top5\_INST\_OWN_{jt-1}$	=	percentage of shares outstanding owned by the top five institutional investors in year *t*-1.
$YEAR_t$	=	indicator variable for year *t*.

Appendix C

We follow the approach of Juhn, Murphy, and Pierce (1993) and explore the following framework in order to understand changes in complexity over time:

$Y_{it} = \mathbf{X}_{it}\, \beta_t + u_{it}$,

where Y_{it} is the complexity of compensation contract for CEO at firm i in year t, $\boldsymbol{X}_{it}$ is a vector of characteristics (including firm, CEO, renegotiation, external factors and obfuscation), β_t represents the loadings of each characteristic, and u_{it} is the component of complexity unaccounted by the observable characteristics included in the model. In this framework, changes in complexity come from three sources: (i) changes in the distribution of characteristics (i.e., changes in the distribution of the X's over time)), (ii) changes in the loadings of the characteristics (the relevance of each economic determinant in explaining complexity over time), and (iii) changes in the distribution of the residuals.

In order to explore the impact of each of these three sources in explaining complexity, we estimate the model above using both pooled and yearly regressions to obtain coefficients and distribution of the residuals, and then decompose Y_{it} into three components (in square brackets):

$$Y_{it} \quad = [\; Y_{it} = \boldsymbol{X}_{it}\overline{\beta} + \overline{F}^{-1}(\theta_{it}|\boldsymbol{X}_{it}) \;] \;+\; [\; \boldsymbol{X}_{it}(\beta_t - \overline{\beta}) \;] \;+\; [\; {F_t}^{-1}(\theta_{it}|\boldsymbol{X}_{it}) - \overline{F}^{-1}(\theta_{it}|\boldsymbol{X}_{it}) \;]$$

The first component predicts complexity when we only allow covariates to vary over time but fixate on the average effect of each covariate and the residual distribution function. Specifically, we predict complexity for each firm in year t, using the firm's actual covariates, with the average coefficients estimated in the pooled sample, and we compute a residual for each firm based on its actual percentile in that year's residual distribution and the average cumulative distribution over the pooled sample.

Next, we relax the fixation of the average effect of each covariate. In other words, we allow not only the covariates, but also the loading of each covariate, to vary over time, while still holding constant the residual distribution function. The second component captures the change in complexity due to such changes in the loadings over time.

Lastly, we allow the distribution of residuals to vary over time. The first element of the last component is the residual from the yearly regression. The second element is the as-if residual applying the actual percentile of the residual in the annual residual distribution to the average cumulative distribution function estimated using the pooled sample. The difference between the two elements captures the changes in complexity due to the changes in the unobservables.

Figure 4 Panel A plots actual complexity over time; Panel B plots complexity as predicted by changing characteristics with fixed loadings and a fixed residual distribution; Panel C plots the changes in complexity if the loadings are allowed to vary over time but the residual distribution is still fixed, incremental to the predicted complexity in Panel B; Panel D captures the additional changes in complexity if the residual distribution is no longer fixed, but allowed to vary over time, which is essentially changes in the distribution of unobservables (i.e., changes in unmeasured covariates and their loadings).

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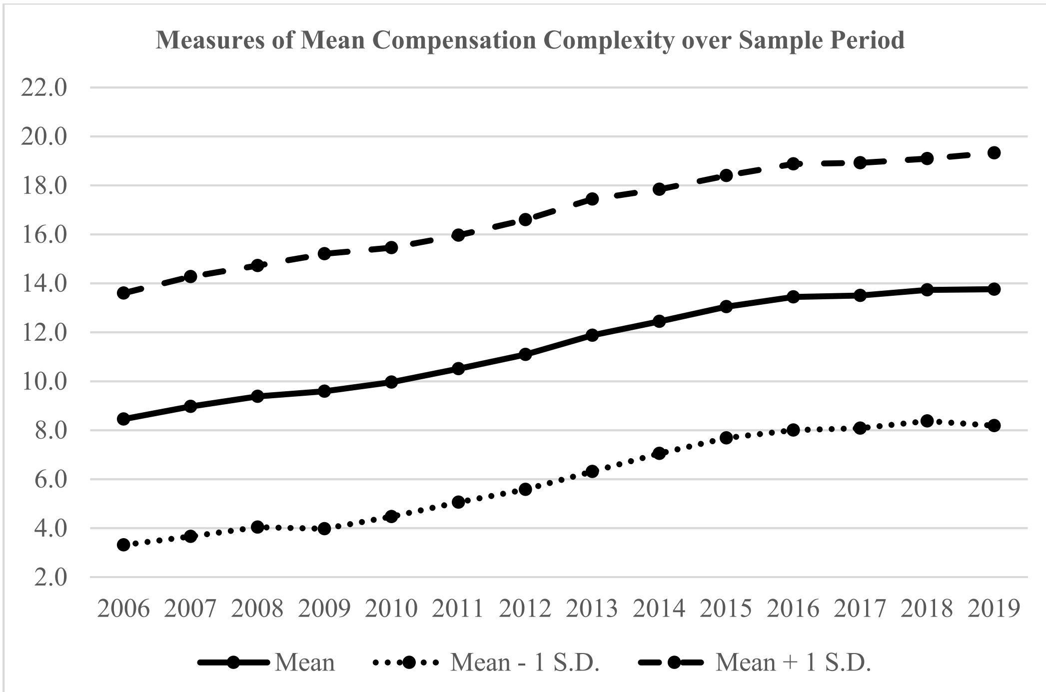
Figure 1
Measure of compensation complexity by year over the sample period 2006-2019



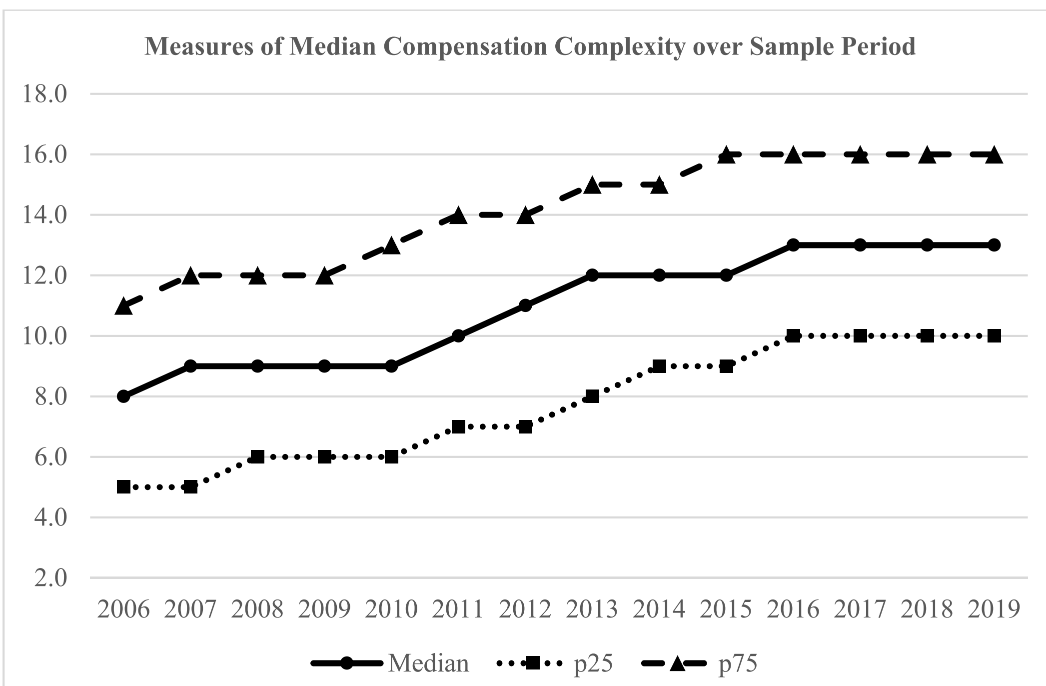


Figure 2
Inputs to the calculation of compensation complexity by year over the sample period 2006-2019

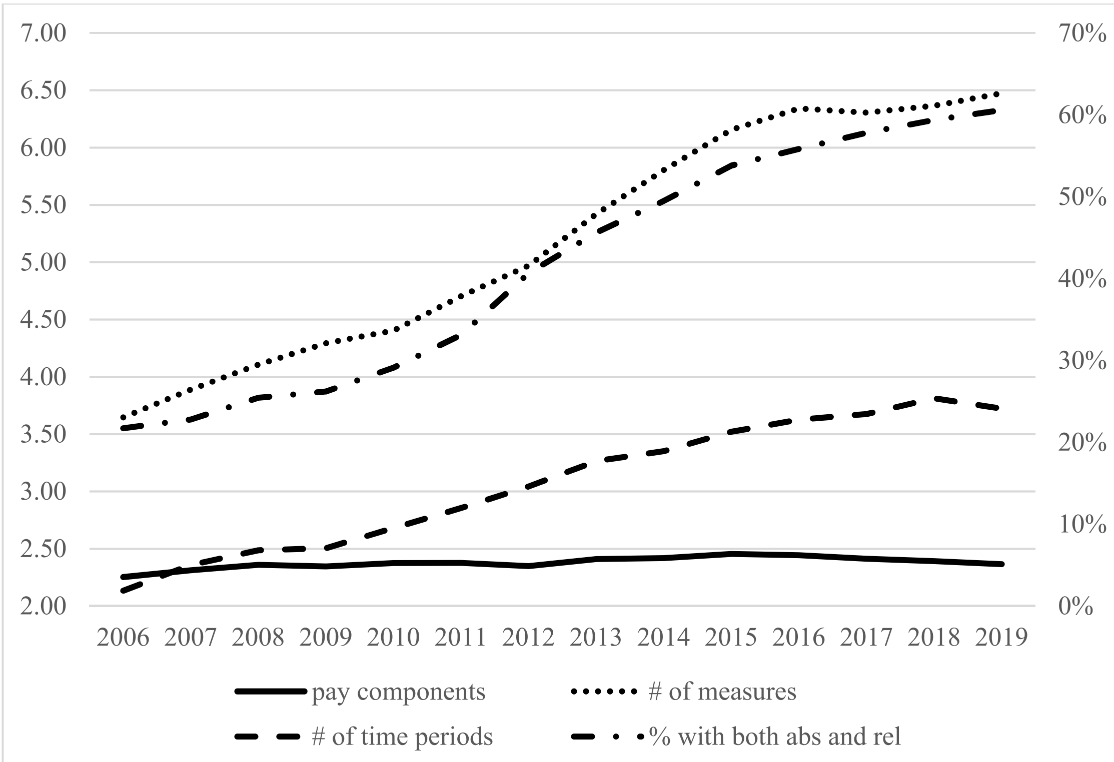
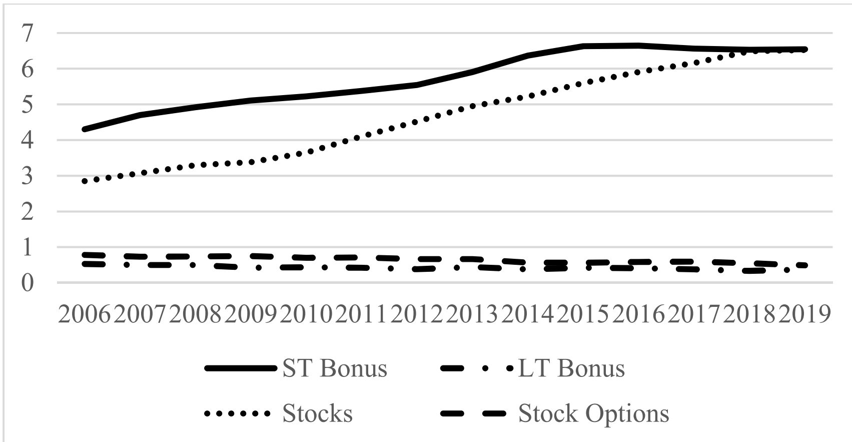
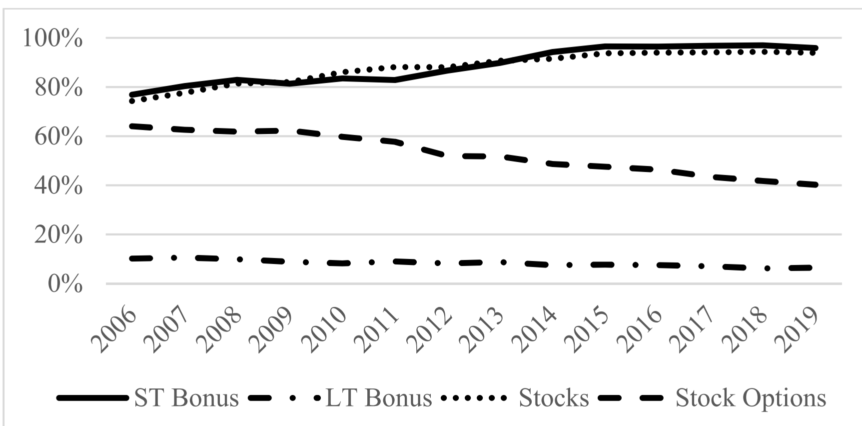


Figure 3
Complexity by type of compensation over the sample period 2006-2019

Panel A: Complexity score by type of compensation



Panel B: Proportion of firms offering type of compensation



Panel C: Weight by type of compensation

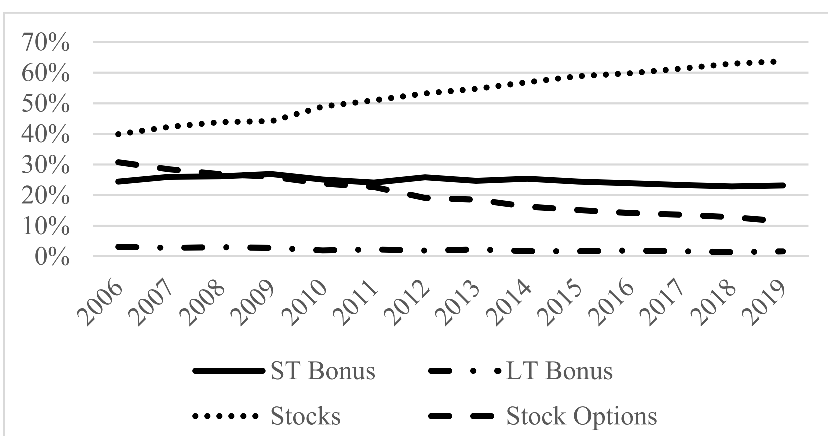
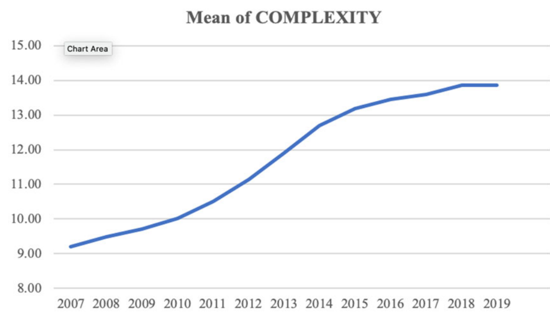
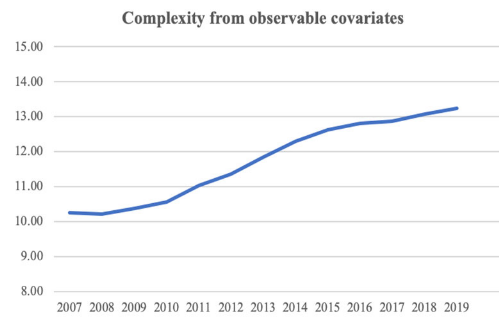


Figure 4
Observable and Unobservable Components of Changes in Complexity

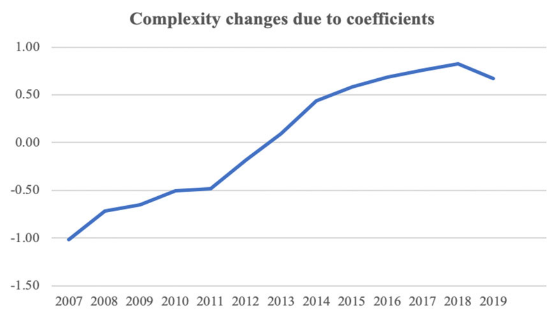
Panel A



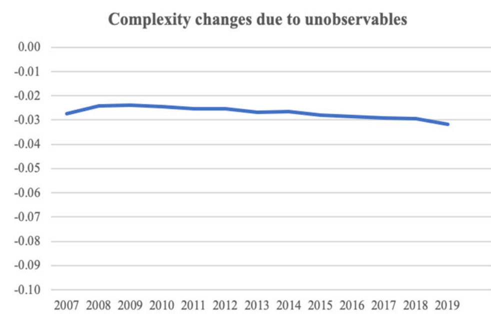
Panel B



Panel C



Panel D



Panel E

Time period	Total Change in Complexity	Change in Characteristics	Change in Loadings	Change in Unobserved Complexity
2007-2019	4.66	2.98 (64%)	1.68 (36%)	-0.004 (0%)
2007-2012	1.94	1.11 (57%)	0.83 (43%)	0.002 (0%)
2013-2019	1.96	1.39 (71%)	0.57 (29%)	-0.005 (0%)

Table 1
Descriptive statistics for contract complexity

This table provides descriptive statistics for our measure of contract complexity, defined in Section 3.2, and the inputs to its calculation. Panel A reports overall statistics. Panels B and C report statistics related by industry where industry is defined as Global Industry Classification Sectors.

Panel A: Descriptive statistics for complexity

Variable	N	Mean	Std. Dev.	1%	25%	50%	75%	99%
COMPLEXITY	11,909	11.35	5.73	1	7	11	15	30
# of pay components	11,909	2.38	0.73	1	2	2	3	4
# of measures	11,909	5.17	3.61	0	3	5	7	19
# of time periods	11,909	3.06	2.10	0	2	3	4	11
% with both abs and relative	11,909	41%	49%	0%	0%	0%	100%	100%

Panel B: Complexity by Global Industry Classification (GIC) Sector

GIC	Sector	N	%	Mean	Median	Std. Dev.
10	Energy	787	6.61	12.53	12	6.80
15	Materials	715	6.00	12.35	12	5.42
20	Industrials	1706	14.33	11.25	11	5.18
25	Consumer Discretionary	1661	13.95	9.89	10	4.65
30	Consumer Staples	586	4.92	11.63	11	5.03
35	Health Care	1228	10.31	11.52	12	5.29
40	Financial Services	1661	13.95	10.96	11	6.10
45	Information Technology	1856	15.58	10.65	10	5.36
50	Telecommunication Services	410	3.44	10.15	11	5.55
55	Utilities	590	4.95	15.91	15	6.19
60	Real Estate	709	5.95	11.85	11	6.83
	Total	11,909	100%			

Panel C: Mean values of inputs to the calculation of complexity by GIC Sector

GIC	Sector	# of components of pay	# of measures	# of time periods	% with both abs and relative
10	Energy	2.31	6.15	3.07	66%
15	Materials	2.56	5.49	3.33	54%
20	Industrials	2.54	4.95	3.05	38%
25	Consumer Discretionary	2.40	4.13	2.85	26%
30	Consumer Staples	2.59	5.33	3.03	36%
35	Health Care	2.58	5.46	2.84	32%
40	Financial Services	2.21	5.13	2.91	38%
45	Information Technology	2.30	4.46	3.21	31%
50	Telecommunication Services	2.20	4.64	2.71	34%
55	Utilities	2.30	8.25	4.11	87%
60	Real Estate	2.03	5.82	2.95	61%
	Total	2.38	5.17	3.06	41%

Table 2
Complexity scores and weights associated with different components of pay

This table provides descriptive statistics for the complexity score by component of pay and the proportion of total incentive pay represented by each component.

Variable	N	Mean	Std. Dev.	1%	25%	50%	75%	99%
Score – Short Term Bonus	11,909	5.67	3.63	0.00	4.00	5.00	7.00	19.00
Score – Long Term Bonus	11,909	0.41	1.45	0.00	0.00	0.00	0.00	8.00
Score – Stock	11,909	4.61	3.52	0.00	1.00	4.00	7.00	15.00
Score – Stock Options	11,909	0.63	0.81	0.00	0.00	1.00	1.00	5.00
Weight – Short Term Bonus	11,909	0.25	0.23	0.00	0.13	0.21	0.29	1.00
Weight – Long Term Bonus	11,909	0.02	0.07	0.00	0.00	0.00	0.00	0.42
Weight – Stock	11,909	0.53	0.30	0.00	0.34	0.56	0.77	1.00
Weight – Stock Options	11,909	0.20	0.25	0.00	0.00	0.11	0.34	1.00

Table 3
Descriptive statistics

This table reports descriptive statistics for our dependent, explanatory and control variables. Variable definitions are in Appendix B.

Variable	N	Mean	Std. Dev.	25%	50%	75%
MV (in millions)	11,909	14,719	28,257	2,388	5,021	13,508
lnMV	11,909	22.47	1.34	21.59	22.34	23.33
MTBA	11,909	1.96	1.20	1.17	1.55	2.25
R&D	11,909	0.02	0.05	0.00	0.00	0.02
lnSTDRET	11,909	0.09	0.05	0.05	0.07	0.10
SEGMTS	11,909	2.32	1.65	1.00	2.00	3.00
SEGMTS_HH	11,909	0.26	0.29	0.00	0.08	0.53
PIFO	11,909	0.62	0.49	0.00	1.00	1.00
M&A	11,909	3.79	4.98	1.00	2.00	5.00
CEOTENURE	11,909	8.08	6.92	3.33	5.92	10.58
LnTENURE	11,909	1.97	0.68	1.47	1.93	2.45
RETIRE	11,909	0.07	0.26	0.00	0.00	0.00
FOUNDER	11,909	0.11	0.32	0.00	0.00	0.00
OWNSHIP	11,909	1.44	3.32	0.16	0.43	1.13
CHAIR	11,909	0.53	0.50	0.00	1.00	1.00
RENEG	10,801	0.06	0.06	0.02	0.05	0.08
CONSULT	9,453	1.09	0.49	1.00	1.00	1.00
IND_SIZE_COMPL	9,453	11.14	3.01	9.00	11.00	13.00
TOP5_INST_OWN	9,453	0.30	0.09	0.24	0.30	0.36
GUIDELINES_ISS	9,453	195	33.78	192	200	215
lnGUIDELINES_ISS	9,453	5.26	0.20	5.26	5.30	5.38
IND_DIRECTOR	9,453	0.82	0.10	0.75	0.85	0.90
BUSYNESS	9,453	0.09	0.11	0.00	0.08	0.14
COOPTED	9,453	0.17	0.23	0.00	0.06	0.25
COOPT_MISSING	9,453	0.26	0.44	0.00	0.00	1.00
CEO_PERKS (in thousands)	9,453	258.20	503.30	31.00	102.60	265.50
lnCEO_PERKS	9,453	4.49	1.62	3.47	4.64	5.59
ROA_{t+1}	10,643	0.05	0.08	0.01	0.05	0.09
$AvgROA_{t+1,t+2}$	9,977	0.05	0.07	0.02	0.05	0.09
RET_{t+1}	10,629	0.06	0.37	-0.10	0.10	0.27
$AvgRET_{t+1,t+2}$	9,929	0.07	0.24	-0.05	0.09	0.21
ROA_{t}	10,801	0.05	0.07	0.02	0.05	0.09
$lnSTDROA_{t-1}$	10,782	0.04	0.06	0.01	0.02	0.05
SALE (in millions)	10,801	10,085	19,077	1,478	3,582	9,516
lnSALE	10,801	22.05	1.41	21.11	22.00	22.98

Table 4
Pearson correlations

This table reports the Pearson correlations of our measures of compensation complexity, firm, and CEO characteristic variables. Complexity is defined in Section 3.2. All other variables are defined in Appendix B. Significance at p-value < 0.05 is presented in bold.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
(1) COMPLEXITY	1.00																						
(2) lnMV	**0.22**	1.00																					
(3) MTBA	**-0.11**	**0.17**	1.00																				
(4) R&D	-0.02	**-0.08**	**0.35**	1.00																			
(5) lnSTDRET	**-0.13**	**-0.44**	**-0.08**	**0.14**	1.00																		
(6) SEGMENTS_HH	**0.05**	**0.07**	**-0.13**	-0.01	**-0.06**	1.00																	
(7) PIFO	0.00	**0.11**	**0.18**	**0.28**	**0.04**	**0.18**	1.00																
(8) M&A	0.01	**0.40**	**-0.05**	**-0.02**	**-0.15**	**0.17**	**0.18**	1.00															
(9) lnTENURE	**-0.11**	-0.02	**0.08**	0.01	**-0.05**	**-0.06**	**-0.08**	0.00	1.00														
(10) RETIRE	**-0.08**	0.00	0.00	**-0.04**	**-0.03**	**-0.02**	-0.02	0.00	**0.30**	1.00													
(11) FOUNDER	**-0.16**	**-0.07**	**0.13**	**0.07**	**0.06**	**-0.07**	**-0.04**	**-0.03**	**0.42**	**0.20**	1.00												
(12) OWNSHIP	**-0.20**	**-0.17**	**0.06**	**0.03**	**0.08**	**-0.06**	0.00	**-0.06**	**0.40**	**0.26**	**0.40**	1.00											
(13) CHAIR	**0.03**	**0.15**	**-0.07**	**-0.14**	**-0.08**	0.02	**-0.04**	**0.06**	**0.31**	**0.14**	**0.14**	**0.13**	1.00										
(14) RENEG	**-0.17**	**-0.12**	0.01	-0.01	**0.10**	**-0.08**	**-0.07**	**-0.03**	**0.09**	**0.05**	**0.09**	**0.13**	0.01	1.00									
(15) CONSULT	**0.13**	**0.07**	**-0.08**	**-0.03**	0.02	**0.06**	0.02	**0.02**	**-0.10**	**-0.04**	**-0.05**	**-0.10**	**0.03**	**-0.09**	1.00								
(16) IND_SIZE_COMPL	**0.33**	**0.40**	**0.03**	**-0.04**	**-0.28**	**0.09**	0.00	**0.04**	**-0.02**	-0.01	**-0.11**	**-0.17**	**0.02**	**-0.15**	0.02	1.00							
(17) TOP5_INST_OWN	0.00	**-0.29**	**0.03**	**0.10**	**0.11**	**-0.10**	-0.02	**-0.18**	**0.04**	-0.02	**0.07**	0.01	**-0.09**	0.00	**-0.02**	-0.01	1.00						
(18) lnGUIDELINES_ISS	**0.14**	**0.02**	**-0.05**	-0.01	**0.14**	-0.01	**0.07**	**-0.03**	**0.04**	**0.05**	**-0.03**	**-0.07**	**0.02**	**-0.06**	**0.03**	**0.27**	0.00	1.00					
(19) IND_DIRECTOR	**0.27**	**0.15**	**-0.09**	0.01	**-0.08**	**0.12**	**0.08**	**0.08**	**-0.15**	**-0.17**	**-0.16**	**-0.25**	**0.14**	**-0.18**	**0.15**	**0.19**	-0.01	**0.06**	1.00				
(20) BUSYNESS	**0.05**	**0.18**	0.01	**0.07**	**0.02**	**0.05**	**0.12**	**0.11**	**-0.06**	**-0.04**	**-0.02**	**-0.04**	0.01	-0.01	**0.04**	0.00	**-0.05**	**-0.08**	**0.08**	1.00			
(21) COOPTED	-0.02	**0.03**	**0.07**	**0.06**	-0.01	**-0.02**	**0.05**	**0.05**	**0.54**	**0.14**	**0.28**	**0.21**	**0.22**	0.01	-0.01	**-0.04**	**-0.03**	**0.02**	**0.06**	**0.04**	1.00		
(22) COOPT_MISSING	-0.02	**-0.08**	0.00	0.00	**0.06**	**-0.06**	**-0.09**	**-0.08**	0.01	-0.01	**0.04**	0.01	**-0.07**	0.02	**-0.04**	0.01	**0.14**	-0.01	**-0.06**	**-0.06**	**-0.44**	1.00	
(23) lnCEO_PERKS	**0.11**	**0.28**	**-0.17**	**-0.24**	**-0.14**	**0.09**	**0.02**	**0.12**	**-0.03**	**0.09**	**-0.08**	-0.02	**0.16**	**-0.05**	**0.11**	**0.08**	**-0.14**	**-0.03**	**0.09**	**0.05**	0.01	**-0.05**	1.00

Table 5

Regression of compensation complexity on firm characteristics, CEO characteristics, and other factors

This table provides results of OLS regressions of compensation complexity on proxies for firm characteristics, CEO characteristics, renegotiation, and other factors. Compensation complexity is defined in Section 3.2; independent variables are defined in Appendix B. Columns 1, 3, 5, and 7 do not include fixed effects. Columns 2, 4, 6, and 8 include industry and year fixed effects. Standard errors are clustered by firm. Robust *t*-statistics are reported in parentheses. ***, **, and * indicate significance at *p*-value < 0.01, *p*-value < 0.05 and *p*-value < 0.10, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Economic Determinants								
Firm Characteristics								
lnMV $_{t-1}$	1.222***	0.884***	1.079***	0.757***	1.038***	0.770***	0.580***	0.577***
	(11.67)	(8.48)	(10.48)	(7.33)	(9.95)	(7.39)	(4.96)	(4.94)
MTBA $_{t-1}$	-0.894***	-0.820***	-0.781***	-0.737***	-0.733***	-0.708***	-0.560***	-0.566***
	(-10.37)	(-9.70)	(-9.15)	(-8.90)	(-8.49)	(-8.47)	(-6.41)	(-6.57)
R&D $_{t-1}$	6.885***	8.269***	6.878***	8.063***	7.094***	8.152***	7.274***	8.147***
	(2.61)	(2.80)	(2.75)	(2.89)	(2.77)	(2.90)	(2.65)	(2.63)
lnSTDRET $_{t-1}$	-4.358*	4.609*	-3.986*	4.413*	-3.000	5.926**	-5.137**	4.263
	(-1.88)	(1.74)	(-1.75)	(1.68)	(-1.28)	(2.18)	(-1.97)	(1.42)
SEGMENTS_HH $_{t-1}$	0.483	0.094	0.311	0.050	0.249	0.017	-0.175	-0.295
	(1.26)	(0.25)	(0.83)	(0.14)	(0.64)	(0.05)	(-0.45)	(-0.77)
PIFO $_{t-1}$	0.183	0.281	0.147	0.232	0.065	0.183	-0.252	-0.000
	(0.73)	(1.14)	(0.60)	(0.96)	(0.26)	(0.74)	(-1.00)	(-0.00)
M&A $_{t-1}$	-0.143***	-0.069***	-0.137***	-0.067***	-0.128***	-0.065***	-0.085***	-0.070***
	(-5.37)	(-2.70)	(-5.23)	(-2.62)	(-5.01)	(-2.66)	(-3.46)	(-2.89)
CEO Characteristics								
lnTENURE $_t$			-0.011	-0.189	-0.019	-0.189	-0.311	-0.356*
			(-0.07)	(-1.20)	(-0.11)	(-1.17)	(-1.55)	(-1.79)
RETIRE $_t$			-0.675	-1.070**	-0.601	-1.018**	-0.413	-0.687
			(-1.43)	(-2.47)	(-1.27)	(-2.31)	(-0.93)	(-1.60)
FOUNDER $_t$			-1.383***	-1.005**	-1.356***	-1.005**	-0.859*	-0.805*
			(-3.10)	(-2.34)	(-3.01)	(-2.31)	(-1.87)	(-1.79)
OWNSHIP $_t$			-0.180***	-0.115***	-0.174***	-0.111***	-0.111***	-0.091**
			(-5.21)	(-3.67)	(-4.77)	(-3.29)	(-3.06)	(-2.50)
CHAIR $_t$			0.392*	0.734***	0.380*	0.676***	0.099	0.337
			(1.96)	(3.64)	(1.86)	(3.27)	(0.46)	(1.57)
Renegotiation								
RENEG $_t$					-11.279***	-6.784***	-6.977***	-5.048***
					(-6.75)	(-4.14)	(-4.02)	(-2.88)
Other Factors								
CONSULT $_t$							0.716***	0.759***
							(3.38)	(3.63)
IND_SIZE_COMPL $_t$							0.372***	0.051
							(10.36)	(1.44)
TOP5_INST_OWN $_t$							2.656***	0.265
							(2.75)	(0.27)
lnGUIDELINE_ISS $_t$							1.840***	-1.192
							(5.70)	(-1.33)
IND_DIRECTOR $_t$							7.734***	6.674***
							(7.12)	(5.99)
BUSYNESS $_t$							1.076	1.881**
							(1.13)	(2.03)
COOPTED $_t$							0.902	1.068*
							(1.47)	(1.76)
COOPT_MISSING $_t$							0.130	-0.415
							(0.54)	(-1.50)
lnCEO_PERKS $_{t-1}$							0.136**	0.207***
							(2.08)	(3.13)
Constant	-13.838***	-7.422***	-10.552***	-4.340*	-9.082***	-4.350*	-20.895***	-1.197
	(-5.91)	(-3.15)	(-4.61)	(-1.86)	(-3.89)	(-1.84)	(-6.90)	(-0.21)
Observations	11,909	11,909	11,909	11,909	10,801	10,801	9,453	9,453
Adjusted R-squared	0.08	0.20	0.11	0.21	0.12	0.21	0.20	0.24
Industry/Year FE	NO	YES	NO	YES	NO	YES	NO	YES

Table 6
Effects of compensation complexity on future ROA and future returns

This table reports the results of OLS regressions of future ROA and future returns on compensation complexity. ROA_{t+1} is measured as net income for fiscal year t+1 divided by the average of total assets at the beginning and at the ending of fiscal year $t+1$. AvgROA $_{t+1,t+2}$ is the average of ROA_{t+1} and ROA_{t+2}. RET_{t+1} is the annual stock returns for fiscal year $t+1$. AvgRET $_{t+1,t+2}$ is the average of RET_{t+1} and RET_{t+2}. $STDROA_{t-1}$ is the standard deviation of annual ROA from fiscal year t-5 to t-1. In columns (1) - (4) we include only controls for firm performance. In columns (5) - (8), we include the economic determinants (i.e., firm complexity and CEO characteristics). Compensation complexity is defined in Section 3.2 and divided by 100 for ease of interpretation. All other variables are defined in Appendix B. All regressions include firm and year fixed effects. Standard errors are clustered by firm. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at p-value < 0.01, p-value < 0.05 and p-value < 0.10, respectively.

VARIABLES	(1) ROA_{t+1}	(2) RET_{t+1}	(3) $AvgROA_{t+1,t+2}$	(4) $AvgRET_{t+1,t+2}$	(5) ROA_{t+1}	(6) RET_{t+1}	(7) $AvgROA_{t+1,t+2}$	(8) $AvgRET_{t+1,t+2}$
COMPLEXITY $_t$	-0.062***	-0.209**	-0.063***	-0.087	-0.050***	-0.217***	-0.050***	-0.088
	(-3.53)	(-2.54)	(-3.61)	(-1.39)	(-2.87)	(-2.64)	(-2.96)	(-1.40)
ROA $_t$	0.359***		0.245***		0.285***		0.174***	
	(16.52)		(11.14)		(13.07)		(8.10)	
lnSTDROA $_{t-1}$	0.047**		0.028		0.033		0.004	
	(2.07)		(1.04)		(1.48)		(0.15)	
lnSALE $_t$	-0.003		-0.008*		0.002		0.001	
	(-0.80)		(-1.94)		(0.53)		(0.28)	
Economic Determinants of Complexity								
lnMV $_{t-1}$		-0.108***		-0.087***	-0.005*	-0.107***	-0.011***	-0.086***
		(-9.89)		(-10.70)	(-1.83)	(-9.63)	(-3.86)	(-10.60)
MTBA $_{t-1}$		0.002		-0.002	0.017***	0.001	0.018***	-0.001
		(0.27)		(-0.31)	(8.69)	(0.18)	(8.88)	(-0.26)
lnSTDRET $_{t-1}$		-0.179		-0.127	-0.005	-0.191	-0.025	-0.134
		(-1.33)		(-1.18)	(-0.16)	(-1.41)	(-0.89)	(-1.24)
R&D $_{t-1}$					0.108	0.203	0.182*	0.044
					(1.39)	(0.66)	(1.96)	(0.19)
SEGMENTS_HH $_{t-1}$					-0.014***	0.024	-0.011*	0.033
					(-2.65)	(0.87)	(-1.83)	(1.57)
PIFO $_{t-1}$					0.001	0.026	0.001	0.024*
					(0.22)	(1.58)	(0.16)	(1.77)
M&A $_{t-1}$					-0.001***	-0.003**	-0.001***	-0.002*
					(-3.34)	(-2.37)	(-3.77)	(-1.88)
lnTENURE $_t$					-0.003	-0.002	-0.000	0.001
					(-1.62)	(-0.26)	(-0.27)	(0.18)
RETIRE $_t$					0.000	-0.015	-0.001	-0.008
					(0.04)	(-0.86)	(-0.24)	(-0.54)
FOUNDER $_t$					0.008	-0.003	0.005	0.017
					(1.16)	(-0.12)	(0.72)	(0.72)
OWNSHIP $_t$					-0.000	-0.000	-0.000	-0.000
					(-0.21)	(-0.04)	(-0.13)	(-0.03)
CHAIR $_t$					0.005**	0.028**	0.004*	0.001
					(2.08)	(2.53)	(1.67)	(0.13)
RENEG $_t$					-0.024	-0.044	-0.033**	-0.027
					(-1.58)	(-0.55)	(-2.13)	(-0.48)
Constant	0.100	2.520***	0.219**	2.048***	0.081	2.475***	0.242***	2.005***
	(1.25)	(10.41)	(2.40)	(11.31)	(1.11)	(10.14)	(3.04)	(11.12)
Observations	10,624	10,629	9,958	9,929	10,624	10,629	9,958	9,929
Adjusted R-squared	0.50	0.35	0.57	0.43	0.52	0.35	0.59	0.43
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Cluster	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm

Table 7

The Impact of Complexity on Performance During Periods of Extreme Changes in Industry Growth

This table presents the results of estimating the following regression: $Performance_{t+1} = b_0 + b_1 COMPLEXITY_t \times Large\_Chng_{t+1} + Controls + Year\ Fixed\ Effects + Firm\ Fixed\ Effects + e$. *Performance* takes the form of ROA_{t+1}, RET_{t+1}, $AvgROA_{t+1,t+2}$, or $AvgRET_{t+1,t+2}$. $AvgROA_{t+1,t+2}$ is the average of ROA_{t+1} and ROA_{t+2}. $AvgRET_{t+1,t+2}$ is the average of RET_{t+1} and RET_{t+2}. $COMPLEXITY_{t-1}$ is compensation complexity, defined in Section 3.2, in fiscal year *t*-1, divided by 100. $Large\_Chng_t$ is a dummy variable set to one if a firm's primary industry (defined by a two-digit GICS code) experiences a (positive or negative) annual percentage change in total sales in year *t* larger than two standard deviations from the mean of the sample. Remaining control variables are defined in Appendix B. All regressions include firm and year fixed effects. Standard errors are clustered by firm. Robust *t*-statistics are reported in parentheses. ***, **, and * indicate significance at *p*-value < 0.01, *p*-value < 0.05 and *p*-value < 0.10, respectively.

	(1) ROA_{t+1}	(2) RET_{t+1}	(3) $AvgROA_{t+1, t+2}$	(4) $AvgRET_{t+1, t+2}$
$COMPLEXITY_t$	-0.037**	-0.101	-0.039**	-0.060
	(-2.08)	(-1.12)	(-2.30)	(-0.91)
$Large\_Chng_{t+1}$ * $COMPLEXITY_t$	-0.253***	-1.096***	-0.224**	-0.949***
	(-2.78)	(-2.62)	(-2.49)	(-3.33)
$Large\_Chng_{t+1}$	0.040***	0.106*	0.043***	0.215***
	(4.00)	(1.79)	(3.91)	(5.56)
Observations	8,312	8,329	8,196	8,535
Adjusted R-squared	0.55	0.36	0.61	0.44
Control for performance included	YES	YES	YES	YES
Determinants of $COMPLEXITY_t$ included	YES	YES	YES	YES
Firm/Year FE	YES	YES	YES	YES
Cluster	Firm	Firm	Firm	Firm

Table 8
The Impact of Tax Cut and Jobs Act (TCJA) on Compensation Complexity and Future Performance

This table presents the results of TCJA on contract complexity and financial performance for firm-years. This analysis includes only firm-year observations for which total pay (TDC1) is greater than $1M in each year of 2015-2017 as those are the firms affected by TCJA. Col. 1 and 2 present the results of estimating the following regression: $COMPLX_t$ ($lnVarPay_t$) = b_0 + b_1*Treatment* + b_2*Treatment* x *Post* + *Economic Determinants* + *Year Fixed Effects* + *Industry Fixed Effects* + *e*. Col. 3-6 present the results of estimating the following regression: ROA_{t+1} (RET_{t+1}) = c_0 + c_1*Treatment* + c_2*Treatment* x *Post* + *Controls* + *Year Fixed Effects* + *Firm Fixed Effects* + *e*. $VarPay_t$ is the sum of non-equity incentive pay, option value, and performance shares. *Treatment* is defined as the three-year average of $VarPay_t$ over total compensation (*TDC1*) for the period 2015-2017. *Post* is a dummy variable that is set to one if the fiscal year is 2018 or 2019, and zero if the fiscal year is in the period 2015-2017. *E*conomic determinants for compensation complexity and control variables for financial performance are defined in Appendix B. Standard errors are clustered by firm. Robust *t*-statistics are reported in parentheses. ***, **, and * indicate significance at *p*-value < 0.01, *p*-value < 0.05 and *p*-value < 0.10, respectively, for two-tail tests.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	$COMPLEXITY_t$	$LnVarPay_t$	ROA $_{t+1}$	RET $_{t+1}$	AvgROA $_{t+1,t+2}$	AvgRET $_{t+1,t+2}$
Treatment	3.719***	5.198***				
	(3.55)	(12.19)				
*Treatment * Post*	-2.071**	-2.732***	0.024*	0.105**	0.019*	0.062
	(-2.29)	(-5.50)	(1.92)	(2.10)	(1.86)	(1.57)
LnVarPay $_t$			0.001	-0.004	-0.000	-0.004
			(1.43)	(-0.72)	(-0.38)	(-1.18)
Observations	2,938	2,938	3,374	3,391	2,917	2,933
Adj. R-squared	0.20	0.37	0.58	0.22	0.73	0.45
Determinants of COMPLEXITY included	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	NO	NO	NO	NO
Firm FE	NO	NO	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Cluster	Firm	Firm	Firm	Firm	Firm	Firm

Table 9

Regression of compensation complexity on proxies for economic determinants for two sample periods of 2006-2012 and 2013-2019.

This table provides results of OLS regressions of compensation complexity on proxies for firm characteristics, CEO characteristics, renegotiation, and other factors. Columns 1 and 2 do not include industry and year fixed-effects. Columns 3 and 4 include industry and year fixed-effects. Compensation complexity is defined in Section 3.2; independent variables are defined in Appendix B. Standard errors are clustered by firm. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

	(1) 2006-2012	(2) 2013-2019	Diff. (p-value)	(3) 2006-2012	(4) 2013-2019	Diff. (p-value)
$lnMV_{t-1}$	0.328**	0.709***	0.029 **	0.468***	0.803***	0.050 **
	(2.33)	(4.67)		(3.35)	(5.34)	
$MTBA_{t-1}$	-0.382***	-0.783***	0.004 ***	-0.360***	-0.688***	0.017 **
	(-2.95)	(-7.87)		(-2.77)	(-7.21)	
$R\&D_{t-1}$	4.871*	12.337***	0.025 **	3.569	13.065***	0.014 **
	(1.69)	(3.47)		(1.08)	(3.24)	
$lnSTDRET_{t-1}$	-2.966	3.527	0.184	2.030	9.128*	0.174
	(-1.01)	(0.78)		(0.60)	(1.93)	
$SEGMENTS\_HH_{t-1}$	0.609	-0.682	0.017 **	0.321	-0.719	0.050 *
	(1.28)	(-1.50)		(0.67)	(-1.60)	
$PIFO_{t-1}$	-0.191	-0.581*	0.269	-0.031	0.067	0.799
	(-0.68)	(-1.76)		(-0.10)	(0.20)	
$M\&A_{t-1}$	-0.077***	-0.086***	0.795	-0.065**	-0.084***	0.568
	(-2.66)	(-2.77)		(-2.25)	(-2.78)	
$lnTENURE_{t}$	-0.495*	-0.206	0.377	-0.456*	-0.188	0.407
	(-1.86)	(-0.82)		(-1.70)	(-0.77)	
$RETIRE_{t}$	-1.453***	-0.213	0.054 *	-1.462***	-0.155	0.039 **
	(-2.85)	(-0.39)		(-2.92)	(-0.29)	
$FOUNDER_{t}$	-1.377***	0.037	0.020 **	-1.413***	-0.078	0.028 **
	(-2.86)	(0.06)		(-2.90)	(-0.13)	
$OWNSHIP_{t}$	-0.059	-0.221***	0.003 ***	-0.041	-0.187***	0.008 ***
	(-1.63)	(-3.81)		(-1.12)	(-3.21)	
$CHAIR_{t}$	0.458*	0.269	0.574	0.403	0.234	0.611
	(1.66)	(0.98)		(1.46)	(0.87)	
$RENEG_{t}$	-4.205**	-7.187***	0.271	-3.406*	-7.300***	0.151
	(-2.11)	(-2.93)		(-1.72)	(-2.95)	
$CONSULT_{t}$	0.519**	1.173***	0.035 **	0.525**	1.181***	0.035 **
	(2.41)	(3.76)		(2.46)	(3.78)	
$IND\_SIZE\_COMPL_{t}$	0.207***	0.250***	0.469	-0.010	-0.023	0.844
	(4.48)	(4.92)		(-0.22)	(-0.48)	
$TOP5\_INST\_OWN_{t}$	-0.098	0.849	0.545	0.505	-0.149	0.673
	(-0.08)	(0.67)		(0.40)	(-0.12)	
$lnGUIDELINE\_ISS_{t}$	1.417***	-6.601***	0.000 ***	-1.903**	-3.937	0.819
	(4.04)	(-3.62)		(-2.04)	(-0.46)	
$IND\_DIRECTOR_{t}$	5.592***	8.458***	0.069 *	5.017***	8.051***	0.056 *
	(4.30)	(5.97)		(3.89)	(5.55)	
$BUSYNESS_{t}$	1.338	1.751	0.795	1.595	1.678	0.957
	(1.14)	(1.34)		(1.40)	(1.30)	
$COOPTED_{t}$	1.356*	0.562	0.404	1.333*	0.766	0.545
	(1.75)	(0.73)		(1.72)	(1.03)	
$COOPT\_MISSING_{t}$	-0.214	-0.241	0.943	-0.267	-0.574*	0.430
	(-0.62)	(-0.88)		(-0.79)	(-1.69)	
$lnCEO\_PERKS_{t-1}$	0.133	0.159**	0.785	0.175**	0.242***	0.477
	(1.65)	(2.00)		(2.14)	(2.98)	
Constant	-10.099***	22.512**		5.511	8.892	
	(-2.79)	(2.00)		(0.92)	(0.19)	
Observations	4,693	4,760		4,693	4,760	
Adjusted R-squared	0.12	0.20		0.14	0.23	
Industry/Year FE	NO	NO		YES	YES	

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