Pay Inequality and Public Sector Performance: Evidence from the SEC's Enforcement Activity*

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Abstract

I study the effects of pay inequality on job performance in the public sector, using new hand-collected datasets of employees and enforcement actions at the U.S. Securities and Exchange Commission. Estimates indicate that pay gaps among SEC enforcement staff are too moderate and decrease their enforcement activity, resulting in aggregate annual productivity losses exceeding $100 million. I identify the pay gap effects with an event study of managers' turnover; provide out-of-sample evidence from the SEC's bonus program; and apply tests to rule out explanations such as hierarchy and caseload. This is the first large-sample analysis of incentive compensation effectiveness in the U.S. public sector using an objective performance measure.

Key words: public sector performance; pay inequality; tournaments; security market regulation.

JEL classification: H83, J31, J33, J45, K22, M51, M52.

1 Introduction

Public sector employees play a vital role in the economy, from financial market regulation to rural development. Therefore it is essential to understand how civil servants' compensation incentives affect their productivity. This paper addresses this question by exploring the effects of pay inequality among U.S. financial regulators. I show empirically how the governance structure chosen by a regulatory authority generates compensation incentives for its individual employees, which seem to impact the employees' regulatory output.

Studies of financial regulation typically focus on the rules governing financial markets, implicitly assuming that any regulatory regime will be seamlessly implemented by a "faceless bureaucracy." Against this backdrop, my paper explores the role of compensation and career incentives in shaping financial regulators' decisions. I provide the first evidence that pay inequality among financial regulators matters: pay gaps among employees at the U.S. Securities and Exchange Commission (SEC) appear to be too moderate, and seem to decrease the enforcement activity of most enforcement staff. The results suggest a potential challenge to traditional perception of financial market regulation, implying that protection of investors' rights might be subject to organizational frictions at the SEC. Through its wage structure, which has become increasingly compressed since the mid-1990s (Figure 1), the SEC seems to provide inadequate incentives to its staff to pursue enforcement actions.

I focus on enforcement activity, an important segment of the SEC's production function. Enforcement, alongside other regulatory work products, protects main street investors by providing deterrence and signaling appropriate standards of conduct. At the same, in many cases "it is the lawyers, accountants, and other professionals from the SEC's enforcement and exam

programs who initially detect the misconduct and put the preliminary case together."[1] It follows that the efforts, and thus the incentives, of frontline SEC employees are essential to the enforcement process.

To study incentives and enforcement at the employee level I construct two novel datasets. The first documents individual enforcement activity, based on SEC press releases which disclose employee participation in enforcement. This allows me to overcome a key difficulty associated with studying civil servants: the lack of individual performance measures (Bertrand et al., 2016). The second is an administrative dataset, collected from publicly available sources and responses to Freedom of Information Act requests. It includes for example name, division, location, tenure, pay grade, and salary. The analysis focuses on employees at the Division of Enforcement and regional offices, who conduct the lion's share of enforcement activity.

The baseline results show a non-linear relation between pay gaps and enforcement: moderate pay gaps have a negative effect on enforcement, while large pay gaps have a positive effect. 75% of enforcement staff are below the estimated inflection point ($94,000-$97,000), and hence seem to be subject to negative effects. The estimated aggregate productivity loss exceeds $100 million annually. I then simulate new executive pay plans which would significantly increase pay gaps at the agency. For example, if pay gaps were brought back to 2004 levels, every $1 investment in the new plan is estimated to generate more than $100 revenues by enhancing enforcement activity. I also show similar non-linear relation between pay gaps and case outcomes, such as penalty size and criminal prosecution; and between pay gaps and bonus awards, which according to the SEC reflect exceptional job performance (out-of-sample evidence). Collectively, these findings

[1] A speech given by Mary Jo White, former SEC Chair, on 3/31/2014 (accessible here).

reinforce the notion that pay gaps generate incentives which induce effort, and that the current compensation scheme appears to provide inadequate incentives to the SEC's staff.

The results are consistent with general theories of incentive compensation. Tournament theory explains that employees compete to win a promotion, and pay gaps induce more effort (Lazear and Rosen, 1981; Lawler, 1971; Vroom, 1964; Kepes et al., 2009). Other theories argue that pay inequality brings negative cognitions and leads to worse performance (Adams, 1963; Adams, 1965; Lawler, 1971; Crosby, 1976; Sweeney et al., 1990). Monetary incentives may also crowd out intrinsic motivation and lead to worse performance (Weisbrod, 1983; Dewatripont et al., 1999; Houston, 2000; Dixit, 2002; Bénabou and Tirole, 2006). My results indicate that for moderate pay gaps the negative effect (inequity) crowds out the positive one (tournament, expectancy), but for large enough pay gaps the positive effect dominates.

The model controls, among other things, for tenure and hierarchy, and the results are robust to additional controls, different computations of the main variables and alternative clustering methods. I introduce specific tests to rule out potential concerns, for example that the results are driven by caseload or hierarchy. More broadly, I identify the tournament effect by exploiting exogenous shocks to promotion opportunities: the departure of the regional director, which is a harbinger of an internal shake-up in the managerial ranks while being plausibly orthogonal to each employee's performance. Consistent with a tournament setting, I find that the new promotion opportunities in the office increase the positive pay gap effect. Moreover, in a triple-diff test, I show how the increased effect during transition periods is concentrated among employees who are ex-ante more likely to be promoted. The results are consistent with tournament predictions, and seem to substantially raise the bar for alternative explanations.

My paper contributes to the literature on public sector performance, incentive compensation, and financial market regulation in three ways.

First, to the best of my knowledge, this is the first large-sample study of pay inequality and the U.S. public sector's performance. It illustrates potential welfare costs of distortions in the government's compensation scheme, thus contributing to the nascent empirical literature on public sector incentives. With few exceptions, all studies in this field of which I am aware focus on experiments with performance-based awards, mainly in developing countries (Dal Bo et al., 2013; Ashraf et al., 2014; Olken et al., 2014; Geys et al., 2016; Burgess et al., 2016; Rasul and Rogger, 2017). There is also a thriving literature regarding performance-based awards for teachers, with mixed results (Lavy, 2002; Muralidharan and Sundararaman, 2011; Jacob and Levitt, 2003; Behrman et al., 2015). My paper, on the other hand, uses a large panel to study the effect of pay gaps on the performance of U.S. regulators. Future research can study compensation incentives and the production of other public goods, such as civil rights enforcement.

Second, I uncover a novel channel which affects financial market regulation: pay inequality among SEC enforcement staff. Existing studies on the SEC's activity look for example into consequences of the SEC's actions (e.g., Kedia and Philippon, 2009), but I am not aware of any study of compensation incentives and the SEC's output. I show that frictions caused by the SEC's internal organization seem to affect enforcement, thus demonstrating how a study of "frontline regulators" can enrich the discussion of financial market regulation.

Third, I illustrate how seemingly opposing general compensation theories can materialize at the SEC. Many studies confirm the predictions of tournament theory in the private sector, focusing especially on wage dispersion between firm executives (Main et al., 1993; Hibbs and Locking, 2000; Kale et al., 2009; Kini and Williams, 2012; Burns et al., 2016; Hass et al., 2015; Mueller et

al., 2017a; Mueller et al., 2017b). Others document pay inequality and equity perceptions among lower-paid employees (Cowherd and Levine, 1992; Levine, 1993; Trevor and Wazeter, 2006; Salisu et al., 2016; Breza et al., 2017). My paper suggests that pay gaps at the SEC have a differential effect, depending on the gap's size, and that new promotion opportunities can increase the positive effect.

2 Background: Theory and Institutional Setting

2.1 Theoretical Framework and Related Literature

What are the effects of pay gaps among employees on their performance? One class of models predicts positive effects. In a *tournament* context, employees compete with each other and the best relative performer wins a promotion (Lazear and Rosen, 1981; Lazear and Oyer, 2012). Similarly, in a *rational updating* setting, employees use the information on other employees' salaries to update their future pay prospects (Card et al., 2012). In the psychology literature, *expectancy theory* states that employees believe that good performance will lead to a better pay (Lawler, 1971; Vroom, 1964; Kepes et al., 2009). A competing class of theories suggests negative effects of pay gaps on performance. This can be, for example, due to uncooperative behavior (Lazear, 1989), a sense of relative deprivation (Crosby, 1976; Sweeney et al., 1990), or perceptions of inequity and discomfort (Adams, 1963; Adams, 1965; Lawler, 1971).

Empirically, compensation theories have been tested primarily on private sector employees. Many studies show how tournament effects persist among corporate executives (Main et al., 1993; Kale et al., 2009; Kini and Williams, 2012; Burns et al., 2016; Hass et al., 2015; Jia et al., 2017), and among professional athletes (Ehrenberg and Bognanno, 1990; Becker and Huselid, 1992; Frick

et al., 2003; Simmons and Berri, 2011). Other studies report a mostly positive relationship between aggregated firm-level pay inequality and firm-level output (Hibbs and Locking, 2000; Connelly et al., 2013; Mueller et al., 2017a; Mueller et al., 2017b). There is also some empirical support for equity theories: underpayment to executives compared to the CEO is reportedly associated with greater turnover (Wade et al., 2006; Bloom and Michel, 2002; Messersmith et al., 2011), and there appears to be a negative relationship between pay inequality and job satisfaction, mainly among lower-paid employees (Cowherd and Levine, 1992; Levine, 1993; Clark et al., 1996; Trevor and Wazeter, 2006; Card et al., 2012; Breza et al., 2017).

Numerous theories lay out the unique challenges of designing an optimal incentive compensation scheme in the public sector.[2] For example, ambiguous task lists undermine the effectiveness of individual performance incentives (Wilson, 1989; Dewatripont et al., 1999; Dixit, 2002; Burgess and Ratto, 2003). Extrinsic monetary incentives can also crowd out the intrinsic motivation, which is presumably more prevalent among public sector employees (Weisbrod, 1983; Houston, 2000; Besley and Ghatak, 2005; Bénabou and Tirole, 2006; McGinnis Johnson and Ng, 2015; Bryson et al., 2017; see also Pfeifer, 2011; Dur and Zoutenbier, 2014).

Empirical study of incentive compensation in the public sector is still nascent. To the best of my knowledge, there is no large-sample study about pay gaps effects on the performance of the U.S. public sector. With few exceptions, the focus in the literature is on controlled experiments with performance-based reward schemes, mainly in developing countries. For example, Dal Bo et al. (2013) find that higher wages attract more able applicants to public sector positions in Mexico, and Ashraf et al. (2014) show that rewards improve performance of health services employees in

[2] See a thorough theoretical discussion in Wilson (1989) and Dixit (2002), and a recent review in Bryson et al. (2017).

Zambia (see also Ashraf et al., 2016; Burgess et al, 2016; Geys et al., 2016; Nath, 2016). Other studies report that monetary rewards had no positive effect on public sector performance (Belle and Cantarelli, 2014; Olken et al., 2014; Rasul and Rogger, 2017; Bryson et al., 2017), and in fact may crowd out the employees' intrinsic motivation (Belle, 2015; Deserranno, 2017). A related literature, regarding performance awards for public school teachers, provides mixed results (Lavy, 2002; Muralidharan and Sundararaman, 2011; Duflo et al., 2012; Luo et al., 2015; and Jacob and Levitt, 2003; Glewwe et al., 2010; Fryer, 2013; Macartney, 2014; Behrman et al., 2015).[3]

Lastly, in the SEC context, existing studies look primarily into the choice of target firms by the SEC and consequences of the SEC's actions (Kedia and Philippon, 2009). No study, to the best of my knowledge, has looked into the effect of compensation incentives on the SEC's output.[4]

2.2 Institutional Setting of the SEC

2.2.1 Compensation Scheme

The pay structure at the SEC has three main components:[5] *Base pay*, which is determined by the pay grade; *locality pay*, which is added to the base pay as a function of the employee's duty location; and a potential pay for performance (*bonus*).

How does performance affect compensation? The bonus is, of course, performance-dependent, whereas the locality pay is not. The relation between base pay and performance is more nuanced,

[3] The closest studies of which I am aware are Bertrand et al. (2016) and Karachiwalla and Park (2017), regarding promotion prospects in India and China respectively. I reach different conclusions in a markedly different setting (U.S. employees involved in financial market regulation), relying on a broader theoretical motivation and a new identification strategy.

[4] The closest are deHaan et al. (2015) and Choi and Pritchard (2017), who explore the career paths of SEC attorneys.

[5] Overtime payment is rarely observed in the data set (less than 0.9% in my final sample).

in the following way: the range of each pay grade is fixed. Non-managers, who are in the bargaining unit, get pay raises at the same rate upon clearing a minimum performance bar and up to the pay grade's cap. In addition, some non-managers may be on a ladder contract, and are promoted to the next pay grade within the non-managerial class as long as their performance is satisfactory. But promotion to managerial positions, and the accompanying pay raise, is competitive and typically needs to be applied for. Also, promotion within or across pay grades of managers positions is typically performance-based.

To summarize, exceptional performance is generally not required within the non-managerial ranks, where pay raises are mechanically governed by the collective bargaining agreement. However, an exceptionally good job performance can accelerate the speed of promotion across classes, and within the managerial pay grades, which would lead to larger pay.[6]

2.2.2 Organization and Enforcement Actions

The SEC consists of five Commissioners, appointed by the President of the United States. One of the Commissioners serves as Chairman. The Commission oversees SEC's operations, and also provides final approval over enforcement activities. The SEC's functional responsibilities are organized into 5 divisions and 23 offices. Each unit is headquartered in Washington D.C. In addition, the SEC maintains 11 regional offices throughout the United States.

An enforcement action, the main outcome variable, is a legal proceeding. It is filed by the SEC against a firm or an individual, for violations of federal securities laws such as insider trading, accounting fraud and inadequate disclosure. Some are civil actions, filed in U.S. District Court, and some are administrative actions, brought in front of an independent administrative law judge.

[6] See also Figure A.1 in the online appendix.

In either venue the SEC can seek injunctions, civil monetary penalties, and return of illegal profits (disgorgement). The SEC can also refer the case to the Department of Justice, a step which is usually reserved for cases of severe criminal misconduct.

The enforcement action is preceded by examination and investigation. The informal stage includes preliminary acts such as interviewing witnesses, examining records, and reviewing trading data. With a formal order of investigation, SEC may compel witnesses by subpoena to testify and produce relevant documents. Upon completion of the investigation, SEC staff present their findings to the Commission, which can authorize the staff to file an enforcement action.

3 Empirical Strategy

3.1 Pay Gaps and Enforcement

The main explanatory variable, pay gap, is defined as:

$$paygap_{i,j,g,t} = \bar{w}_{j,t} - w_{i,j,g,t}$$

Where $\bar{w}_{j,t}$ is the reference salary, and $w_{i,j,g,t}$ is the salary of employee i in office j, pay grade g and year t. In equity context, one could think of the reference salary as a benchmark used by employees to evaluate the "fairness" of their current compensation. In a tournament context, one could think of the reference salary as the expected value of the prize. I study "top," "senior" and "managers" pay gaps. For "top," the reference salary is that of the top-earner in the office. For "senior," the reference is to the average salary among senior officers. For "managers," the reference is to the compensation of managers in the next class: non-managers look up to supervisors, and supervisors to senior officers. In practice, the reference groups include the regional directors, associate directors, and division chiefs.

The second major component of my analysis is job performance, where I focus on enforcement actions. Enforcement is essential tool employed by the SEC "to protect main street investors by bringing bad actors to justice."[7] I was able to collect data on participation of *individual employees* in enforcement actions, thus overcoming a key difficulty associated with studying civil servants: the lack of reliable individual performance measures (Bertrand et al., 2016). Naturally, I restrict the analysis to the Enforcement Division and the SEC's regional offices, where the enforcement activity is being conducted.[8]

Specifically, I define the main outcome variable, $enforcement_{i,t}$, to be the number of enforcement actions in which employee i has participated during year t. This is a transparent and easily comparable summary of employee-level enforcement activity. At the same time, it abstracts from the heterogeneity among enforcement actions: some cases recover hundreds of millions of dollars and have large impact on market participants, while others do so to a lesser degree. I address this concern below in the section devoted to identification analysis.[9]

3.2 Baseline Model: Panel Regression

Theory offers contradicting predictions regarding the effect of pay gaps on performance. I therefore introduce a non-linear model, to study the relation between enforcement and pay gaps:

[7] "Message from the Chair", Agency Financial Report, Fiscal Year 2016.

[8] Pay gaps effects are similar in the Division and the regional offices (Table A.12 in the online appendix).

[9] A dummy outcome variable, which equals one if the employee participated in any enforcement action during the year, obtains similar results (Table A.10 in the online appendix). It implies that enforcement affects not only the level of enforcement, but the probability of joining an enforcement action as well.

$$enforcement_{i,j,g,t} = \alpha_1 paygap_{i,j,g,t-1} + \alpha_2 \left(paygap_{i,j,g,t-1}\right)^2 + \beta_1 tenure_{i,j,g,t-1} + \overrightarrow{FE} + \varepsilon_i \quad (1)$$

Where $enforcement_{i,j,g,t}$ is the performance measure for employee i from office j and pay grade g during year t; and $paygap_{i,j,g,t-1}$ is a pay gap measure ("top," "senior" or "managers"). The coefficients of interests would be α_1 and α_2, which capture the pay gap effects.

I control for tenure length, to capture time-variant effects of SEC experience.[10] I include fixed effects for employee; unit; pay grade; occupation; and year-office. It implies that the results reflect within-employee changes in performance when pay gaps change, thus controlling for talent and prior job experience. The comparison is made within the office, removing concomitant trends at the year-office level. I control for occupation, unit and rank, which naturally correlate with pay gaps and potentially correlate with enforcement activity.[11] The explanatory variables are lagged, to rule out reverse causality, and standard errors are clustered at the employee level.[12]

3.3 Identification Analysis and Alternative Hypotheses

The goal is to identify a story of incentives and efforts: pay gaps generate incentives, which affect efforts, which lead to productivity differences. A number of competing stories could undermine this hypothesis. *First*, enforcement activity may not reflect a meaningful productivity

[10] This might be overcautious, since tenure and enforcement are weakly correlated, conditional on controls (Figure A.7 in the online appendix). Indeed, one robustness test excludes *tenure* from the model and the results hardly change (Table A.5 in the online appendix).

[11] The results are robust to including additional controls (Table A.5 in the online appendix, Panel A). In another test I analyze the relative impact of the fixed effects, and find for example that time trends and rank play a significant role, whereas unit assignment does less so (Table A.5 in the online appendix, Panel B).

[12] Alternative clustering methods generate even smaller standard errors (Table A.6 in the online appendix).

metrics ("disconnection" hypothesis). *Second*, pay gap correlates with salary, which may be driving the results ("absolute income" hypothesis). *Third*, pay gaps correlate with hierarchy ranking, and it is possible that managerial effectiveness is a function of that ranking ("hierarchy" hypothesis). *Fourth*, pay gaps can correlate with an unobserved case allocation mechanism ("caseload" hypothesis).[13]

I report below a number of tests that reasonably rule out each of the first three stories. More broadly, I introduce a complimentary case study which exploits exogenous variation in the probability of promotion. According to tournament theory, the positive pay gap effect stems from promotion opportunities. Thus, an exogenous shock to the probability of promotion should increase that positive pay gap effect. Relying on this insight, I use the departure of regional director as an exogenous shock to the probability of promotion. I show that the positive effect is stronger among "treated" employees (steeper slope), consistent with tournament theory.

The validity of this event study relies on two identifying assumptions. *First*, the departure is a positive shock to promotion probabilities in the office. Indeed, the probability of promotion during transition periods is 1.1%-1.2% higher (Table A.15 in the online appendix), and hence the director's departure can be labeled as a treatment to the promotion probability of his or her (former) employees. *Second*, the departure is uncorrelated with unobserved variables that affect employee's performance. Indeed, Figure 2 confirms that there are no abnormal pre-event trends in pay gap effects. Note that the departure is likely correlated with aggregated enforcement activity in the office; for example, the director might leave after bringing a "sufficient" amount of actions. But this in itself is not an identification concern, as long as the departure is orthogonal to any

[13] To be precise, the first two hypotheses do not necessarily undermine the causal interpretation of the results, but rather highlight different channels and interpretations.

unobserved characteristic of the *individual* employee which is correlated with that employee's performance.

Lastly, to address the concern that the case study results are driven by an unobserved heterogeneity, I apply a triple-diff test. I distinguish between employees who have a lower ex-ante probability to be promoted ("treatment 1") to those with higher ex-ante probability ("treatment 2"). I proxy high probability with predicted values from a Probit regression of promotion on time-invariant characteristics, such as occupation and gender.[14] I show that the increased effect of pay gaps during transition periods is concentrated in the second treatment group, which is consistent with tournament predictions, and substantially raises the bar for alternative explanations.

4 Data and Demographics

I collect and merge two novel datasets: administrative data, and enforcement data. I use the former to construct the explanatory variables, including pay gaps, and the latter to construct the main outcome variable.

Using online sources and multiple Freedom of Information Act requests to the SEC and to the OPM (U.S. Office of Personnel Management), I compiled a comprehensive administrative dataset of all individuals who worked at the SEC at any point since 1973. It includes annual information on location, occupation, base salary, pay grade, age, education and supervisory status. For more recent years I have additional information on job title, tenure, overtime payments, bonus awards,

[14] The estimation of "high probability" should not be interpreted as a causal argument in itself, and I do not claim nor assume that any of the regressors in the Probit model cause either promotions or performance.

and promotions. I match it on a name basis with data on political contributions (Federal Election Commission website), and with public Census data to identify gender by name frequency.

The full administrative dataset, for 1973-2016, covers 17,303 employees and 123,471 employee-year observations.[15] I intend to use this data in a separate paper. The outcome variable in this paper, enforcement, is available only from 2009 onwards and is mostly relevant to employees at the Enforcement Division and regional offices. Therefore, the final administrative sample consists of 3,340 employees and 15,925 employee-year observations.

Since 2009, the SEC has become more forthcoming with the names of SEC personnel involved in enforcement actions. I therefore scraped all press releases which were posted on the SEC's website in 2009-2016 and involved enforcement actions.[16] I manually corrected for double-counting (duplicates etc.), and further collected information on the date of filing, venue, and case outcome, as well as SEC employees who participated in that case if those were available. My final enforcement sample includes 1,388 actions and 5,698 employee-case observations.[17]

Lastly, I merge the administrative and enforcement datasets to generate the final dataset. Table 1 provides details for key variables in the sample. The average employee earns $161,383 annually, has 11 years of tenure, and participates in 0.3 enforcement actions every year (and 2.1 actions, conditional on participating). The employee's salary is $75,400 lower than the top-earner in the

[15] Table A.1 and Figure A.2 in the online appendix provide more details on dataset construction.

[16] Earlier actions almost never mentioned individuals by name, and actions filed during 2017 cannot be matched with administrative data. The scraping was conducted on September 2017.

[17] The enforcement sample excludes actions that are not publicized at all, and actions that are publicized but do not mention individual SEC employees. In a sequence of tests I find that the actions which end up in the sample represent a significant share of the overall enforcement activity of the SEC, and especially of "high impact" cases (for example, cases with large civil penalties). See Table A.2 and Figure A.3 in the online appendix.

office, and $73,700 lower than the average senior manager in the office (see distribution of salaries and pay gaps in Figure 3). The median employee is male. 2.4% employees have made at least one political contribution to national races; 90.2% of those contributions were to candidates and super PACs identified with the Democratic Party. 56% of employees are between 35 to 49 years old. The rate of attrition is quite high: 28% of the employees left the agency before the end of the sample period, and 36% were hired in the years following the financial crisis (2009 or later). Even in the relatively uneventful environment of the Federal Government labor market, some tournament setting exists: the unconditional probability of promotion to the next pay grade is 12.6%, while only 1.7%-1.9% are promoted to managerial positions.[18]

Lastly, I look into the sources of the variation in pay gaps. To conserve space, the relevant tables and figures are in the online appendix (Table A.4 and Figure A.8). Two factors can explain most of the variation in pay gaps: starting salary, which pins down the origins of the current salary; and tenure, which plots the salary evolution over time. The correlation between those factors and contemporary pay gaps is evidently stronger among non-managers, for whom pay raises (and hence pay gap decreases) are almost mechanical. Further examination shows that political affiliation, male gender, age and prior work experience all predict a higher starting salary, and can jointly explain most of its variation.[19] The importance of this conclusion will be explained shortly once the baseline results are introduced.

[18] See Figures A.4, A.5, A.6 in the online appendix for more details.

[19] Note that this is not a causal argument; all variables are clearly endogenous.

5 Results

5.1 Baseline Model

Table 2 provides the baseline results (equation (1)). It shows that pay gaps have a differential effect on enforcement: the marginal effect is negative for moderate pay gaps, and turns positive only for large enough pay gaps. The inflection point, given by $\left|\frac{\alpha_1}{2\cdot\alpha_2}\right|$, is about $95,000. The result stands out regardless of the pay gap measure, and is statistically significant at the 1% level.

The differential effect of pay gap is intriguing, especially given the SEC's pay structure: lower pay gaps, which correlate with higher entry salary and hence presumably with better job qualifications, have *negative* effects on enforcement. But the unintuitive result is in fact consistent with the compensation literature I laid out earlier. For moderate pay gaps, the negative effect ("inequity") dominates the positive one ("tournament"). When pay gaps are large enough, the positive effect ("tournament") dominates the negative one ("inequity").

Figure 4 illustrates the mechanism, using the results from column 1: participation in enforcement actions, explained by the difference between the employee's salary and the top earner in the office. The estimated marginal effect of "top" pay gap on enforcement is $0.01Gap - 0.094$. It implies that the marginal effect is positive only for pay gaps beyond $94,000. Nearly three quarters of sample participants are below the threshold, and the results are quite similar for the two other measures, "senior" and "managers". The conclusion is that pay gaps appear to have a negative marginal effect on 74%-77% of the SEC sample.

I perform a battery of robustness tests to confirm the results. I add controls such as age, education level and past cases, and the main result regarding pay gaps effect remains nearly intact. I cluster the standard errors by year, office*X*year, unit*X*year and occupation*X*year, showing that

the choice to cluster by employee generates the largest standard errors. Computing pay gaps using the employee's total salary, instead of the fixed component, does not change the results either. Lastly, I replace the outcome variable with a dummy, which equals one if the employee participated in any enforcement action during the year. The significant results imply that pay gaps predict not only total enforcement activity, but also the probability of enforcement.[20]

Returning to the baseline results, the estimated economic magnitude of the effect is non-trivial. The average effect of the "top" pay gap on enforcement participation is (-0.0186), and the average employee participates in 0.3 enforcement actions annually.[21] Thus, in the current pay schedule, additional \$1 to "top" salaries would lead to an estimated 6.2% productivity loss ($\frac{0.0186}{0.3}$). During the sample period, the agency's enforcement actions obtained on average orders to pay \$3.38 billion annually (according to the SEC's annual reports). Therefore, 6.2% productivity loss translates to estimated \$210 million annually in foregone disgorgements and penalties. The two alternative pay gap variables show an estimated productivity loss of 8.7%-9.2%, and estimated monetary consequences of \$295-\$310 million annually.

This calculation does not take into account the fact that on average four employees participate in a single action. In a sequence of tests I replace the outcome variable with *enforcement_share*: number of actions scaled by participants. For example, if one action involved four employees, then each employee's share was $1/4$. I estimate the baseline model with *enforcement_share* and repeat the above calculations.[22] The estimated productivity loss is 3.0%-5.1%, and the estimated

[20] See Tables A.5, A.6, A.7, and A.8 in the online appendix for more details.

[21] Average effect of pay gap on enforcement was calculated by plugging each employee's pay gap into $0.01TopGap - 0.094$, and averaging across employees. Average enforcement participation was reported in Table 1.

[22] See regression results in Table A.8 in the online appendix. This outcome variable is positively and significantly correlated with the main outcome variable, *enforcement* (Table A.3 in the online appendix, Panel A).

monetary losses are $100-$171 million annually. Taken together, the results highlight a potentially important friction stemming from the SEC's current pay regime: a compressed wage distribution, with moderate pay gaps between employees and executives.

To further illustrate this point, Figure 5 simulates potential consequences of an exogenous shock to the pay levels of SEC executives. If the new executive pay plan is substantially more generous, the new large pay gaps are predicted to have a positive marginal effect on enforcement: additional $1 is expected to translate into additional enforcement actions and hence revenues (disgorgement and penalties). For each shock size I calculate the new pay ratio (top earner's new salary divided by the unchanged median salary) and the estimated return on investment (expected estimated revenues divided by the new pay plan's costs), and plot it against the historical distribution of pay ratios at the SEC since 1973. It appears that bringing pay ratios back to 2004 levels, when the ratio was at 1.6, could generate an estimated $113 revenues for every additional $1. Raising the pay ratio to 1.77, which is the long-run median ratio at the SEC, could generate an estimated $169.5 revenues for every additional $1.

5.2 Enforcement and Productivity

An important criticism of this paper is the "disconnection" hypothesis, which argues that enforcement may reflect only a partial aspect of the employee's workload. Thus, there might be a "disconnection" between bringing enforcement actions and being an overall productive SEC employee. I provide two pieces of evidence which are inconsistent with this hypothesis.[23]

[23] An additional piece of evidence is that pay gaps affect enforcement differentially, based on the degree to which enforcement is central to the employee's task list (Table A.9 in the online appendix): the effects are present among

First, I link pay gaps to productivity by computing a new outcome variable, which sums only "high-impact" enforcement actions: cases with parallel criminal proceedings; cases with civil money penalties; and cases with above-median number of participants. Bringing together large group of SEC enforcement staff, teaming up with criminal authorities, and obtaining an order to pay a significant money penalty seem to be a reasonable proxy for an especially impactful enforcement action. Indeed, the results (Table 3) show that pay gap effects can explain well not only the number of actions (the main outcome variable), but also in particular "high impact" cases. Presumably, it takes more effort to successfully conduct a complex investigation that leads to an impactful enforcement action. Therefore these results are consistent with a story of employees' effort and productivity.[24]

The second evidence is out-of-sample, and comes from the SEC's bonus award program. While the bonus is not particularly large in dollar value ($1,600 on average; see Table 1), its recipients are employees who according to the SEC's own judgment performed above and beyond normal job requirements (U.S. Government Accountability Office, 2013). It is therefore a self-proclaimed measure of successful job performance, computed by SEC managers, and can provide external test for this paper's central argument: if pay gaps truly affect employee efforts and productivity, then the effects should manifest themselves in a similar fashion when using this alternative measure of productivity. Relying on this insight, I estimate a version of the baseline model where the outcome variable is the bonus award instead of enforcement, and I use all SEC employees in 2002-2016. The results, reported in Table 4, show that pay gaps explain remarkably

the full SEC workforce, but are concentrated among employees at "core" enforcement units, and further concentrated among "revealed" employees (who were mentioned in at least one press release).

[24] Alternatively, I sum cases by penalty size: 0 for no penalty, 1 for penalty below median, and 2 for penalty above median, and obtain similar results (Table A.10 in the online appendix).

well exceptional performance of SEC employees.[25] Hence, the SEC's self-proclaimed performance evaluation program leads to very similar conclusions with regards to pay gap effects. This supports the notion that pay gaps are positively linked to successful job performance.[26]

5.3 Alternative Channels: "absolute income" and "hierarchy"

Yet another alternative explanation is the "absolute income" hypothesis, which states that the results are driven by the employee's salary. I rule this out with two tests. First, I hold the salary constant and replace the reference salary with a placebo one: the highest salary in the same pay grade, and the average and the highest salary in the next pay grade (for non-managers). None of these synthetic pay gaps is a reasonable incentive, since promotions within and across pay grades (especially for non-managers) are generally mechanical. Indeed, Table 5 shows how the synthetic pay gaps yield insignificant results. In a second test I instrument pay gaps with the respective reference salary. For example, I instrument "top" pay gap with the top salary in the office, and the square of "top" pay gap with the square of that top salary. The second-stage results reflect therefore variations in pay gaps stemming from the reference salary. Panel B compares this IV method with the baseline OLS regression, and shows that pay gaps effects are quite similar across specifications. Collectively, the tests limit the possibility that the baseline results were driven by

[25] The effects hold even when the sample is restricted to employees at the Enforcement Division and regional offices; when the bonus is expressed as percentage of the employee's total salary instead of dollar value; and with additional controls of past bonus and salary levels (Table A.11 in the online appendix).

[26] Bonus and enforcement are significantly correlated (Table A.3 in the online appendix, Panel B).

the employee's salary, because if that was true then the results should have remained intact with a placebo reference salary (1st test) or given changes in the reference salary (2nd test).[27]

The next alternative I consider is the "hierarchy" hypothesis. According to this story, pay gaps reflect an ordinal measure of hierarchy. Managers can better influence lower-ranked employees (with large pay gaps), but exert lesser authority over high-ranked employees (with low pay gaps). To rule out the hierarchy hypothesis I replace pay gap with pay ratio. For example, instead of using the dollar difference between the employee's salary and the top-earner's salary (*"top" pay gap*), I use the ratio between the two (*"top" pay ratio*). If the pay gap effect is driven by ordinal ranking, then we would expect the results to survive the change of unit. However, Table 6 shows that the effect disappears once the gaps are expressed in ratios instead of dollar value. This is consistent with this paper's hypothesis of incentives and effort, which emphasizes the size of the pay gap, and inconsistent with the "hierarchy" hypothesis, which abstracts from unit of measure and should apply to pay gaps and pay ratios equally.[28]

5.4 Enforcement and promotion probability

In this subsection I show that pay gaps effects on enforcement are concentrated among employees who are ex-ante more likely to be promoted. I start with the following Probit model:

$$promotion_i = X_i + \varepsilon_i \quad (2)$$

[27] An additional test runs a simple horse race by controlling explicitly for salary (Table A.13 in the online appendix).

[28] An additional reply is that the baseline model controls for pay grade and tenure, which should plausibly capture any hierarchy-based effect. Also, the "IV" results (see previous paragraph) seem inconsistent with the "hierarchy" story: this model captures variation from changes in the reference salaries, which do not change the ordinal ranking in the office. Since pay gap effects are present in the "IV" estimation, it implies that the size of the gap matters. Lastly, expressing pay gaps in constant 2009 USD yield similar results as in the baseline model, which indicates that the real value of the pay gap matters (Table A.14 in the online appendix).

Here $promotion_i$ equals one if the employee was promoted to a senior position at any time during his or her career at the SEC, and zero otherwise. The covariates vector X_i contains time-invariant characteristics, such as gender and occupation. Table 7 shows, for example, that male employees who made political contributions are more likely to be promoted to senior positions, and that higher entry salary, which presumably correlates with better job qualifications, predicts future promotions.[29]

Using the predicted values from the Probit model, I define "high probability" employees as those with above-median promotion probability. In a tournament context, they are expected to be more sensitive to pay gap effects, since they are more likely ex-ante to "win the prize." I test this prediction with the following model:

$$\begin{aligned} enforcement_{i,j,g,t} = \quad & \alpha_1 paygap_{i,j,g,t-1} + \alpha_2 \left(paygap_{i,j,g,t-1}\right)^2 + \\ & \gamma_1 HighProb \cdot paygap_{i,j,g,t-1} + \gamma_2 HighProb \cdot \left(paygap_{i,j,g,t-1}\right)^2 + \\ & \beta_1 tenure_{i,j,g,t-1} + \overrightarrow{FE} + \varepsilon_i \end{aligned} \tag{3}$$

Where *HighProb* equals one for "high probability" employees. The hypothesis is that $\gamma_2 > 0$. The results are presented in Table 8. They reveal that, not only is $\gamma_2 > 0$ and significant, but pay gaps affect almost exclusively "high probability" employees, and the rest do not react to pay gaps. The results are robust to all pay gaps measures. The implication is that pay gap effects are concentrated among employees who are ex-ante more likely to be promoted. This is consistent

[29] Predictive power is sufficient, and I do not take any stand with regards to causality.

with tournament-related stories, which predict that those employees should react more strongly to the potential "prize" (pay gap) associated with a future promotion.[30]

5.5 Event Study: Departure of Regional Director

This section identifies tournament effects through leadership transition. I utilize sixteen events of regional directors' replacements during the sample period (see Appendix B). The rationale behind this event study was discussed earlier, in Section 3.3. Briefly, I argued that when the regional director is replaced the probability of internal shake-up goes up. Hence, if tournament incentives matter, employees should be more sensitive to them during such periods. Another identifying assumption is that the director's replacement is orthogonal to the individual employee's performance.

I estimate the following version of the baseline model:

$$\begin{aligned} enforcement_{i,j,g,t} = \; & \alpha_1 paygap_{i,j,g,t-1} + \alpha_2 \left(paygap_{i,j,g,t-1}\right)^2 + \\ & \gamma_1 Trans_{\,t-1} \cdot paygap_{i,j,g,t-1} + \gamma_2 Trans_{\,t-1} \cdot \left(paygap_{i,j,g,t-1}\right)^2 + \\ & \beta_1 tenure_{i,j,g,t-1} + \overrightarrow{FE} + \varepsilon_i \end{aligned} \tag{4}$$

In this specification, $Trans_{\,t-1}$ equals one in the two-years period of regional director replacement. For example, George Canellos stepped down in June 2012 as head of the New York

[30] In additional tests I find that pay gap effects are significantly stronger among male employees, employees with a revealed political affiliation, and employees who hold core occupations (Table A.12 in the online appendix). As explained, these are more likely ex-ante to be promoted to managerial positions at the SEC.

regional office; for the New York office, $Trans_{t-1} = 1$ in 2012 and 2013. The hypothesis is that $\gamma_2 > 0$, i.e., the slope of the marginal effect increases during transition periods.[31]

Table 9 reports the results. It shows that, during transition periods, the slope of the marginal effect increases by 16%-40%, compared to non-transition periods. Put differently, during transition periods, pay gaps had a significantly stronger positive marginal effect on performance. This finding is consistent with tournament setting, since in transition period the likelihood of promotion increases, and the positive effect of pay gaps on performance should increase as well.

Lastly, I refine the event study in a triple-diff fashion, and distinguish between two treatment groups: "low probability" employees during transition periods (Treatment 1), and "high probability" employees during transition periods (Treatment 2). I estimate the following model:

$$\begin{aligned} enforcement_{i,j,x,t} = \; & \alpha_1 paygap_{i,j,x,t-1} + \alpha_2 \left(paygap_{i,j,x,t-1}\right)^2 + \\ & \gamma_1 Trans_{t-1} \cdot paygap_{i,j,x,t-1} + \gamma_2 Trans_{t-1} \cdot \left(paygap_{i,j,x,t-1}\right)^2 + \\ & \delta_1 Trans_{t-1} \cdot HighProb \cdot paygap_{i,j,x,t-1} + \delta_2 Trans_{t-1} \cdot HighProb \cdot \left(paygap_{i,j,x,t-1}\right)^2 + \\ & \beta_1 tenure_{i,j,x,t-1} + \overrightarrow{FE} + \varepsilon_i \end{aligned} \tag{5}$$

For the control group ($Trans_{t-1} = 0$), the slope of the marginal effect is given by $2\alpha_2$. For the first treatment group ($Trans_{t-1} = 1$ and $HighProb = 0$), it is given by $2(\alpha_2 + \gamma_2)$. For the second treatment group ($Trans_{t-1} = 1$ and $HighProb = 1$), it equals $2(\alpha_2 + \gamma_2 + \delta_2)$. The hypothesis is that $\delta_2 > \gamma_2 > \alpha_2$, which implies that the positive effect is larger for the treatment groups, and further concentrated in the second treatment group.

[31] I define transition to be a two years' period because my explanatory variables are lagged, and enforcement actions in 2013 are linked to incentives in 2012. The point estimates are similar when I limit the transition period to the year following departure, or to the year of departure, though the statistical significance somewhat declines. I do not include $Trans_{t-1}$ in the specification, since it is subsumed under the office × year fixed effects.

Table 10 reports the results, and Figure 6 plots the implied marginal effect for the different groups. During transition periods, the increase in positive effect among "high probability" employees (Treatment 2) is twice as large as that of "low probability" employees (Treatment 1), and both are significantly larger than the control group (no transition). Moreover, the inflection point for Treatment 2 is much smaller than that of the other two groups. It implies that more employees are subject to positive marginal effects (smaller inflection point), and that positive effect is stronger (steeper slope).

Collectively, the results imply that the increase in the positive effect during transition is concentrated among employees who are more likely to be promoted. This is consistent with tournament theory: in times of transition, which are ripe for change in leadership, employees who are especially likely to be promoted are indeed more sensitive to positive pay gap effects.[32]

6 Conclusion

This paper shows that pay inequality among SEC employees affects financial market regulation. For most employees, the available incentives are not large enough to induce greater effort. In fact, they appear to be counterproductive: pay gaps between SEC employees decreases

[32] Note that very moderate pay gaps among "high probability" employees generate even larger negative marginal effect ($\delta_1 < 0$). This is consistent with "crowd-out" theories (Frey and Oberholzer-Gee, 1997; Houston, 2000; Gneezy and Rustichini, 2000; Gneezy et al., 2011): during transitions, the tournament heats up especially for "high probability" employees. Pay gaps then become an extrinsic motivation, and crowd out the employees' intrinsic motivation. But for very moderate pay gaps, the new extrinsic motivation is not sufficient to generate an independent positive effect, which leads to worse performance.

the enforcement activity of most employees. The positive effect becomes more prevalent when there are new promotion opportunities, i.e., when the regional director departs.

Collectively, the results are consistent with the rich theoretical literature on compensation incentives. Focusing on the empirical literature, to the best of my knowledge, mine is the first large-sample study on the effect of incentive compensation on performance of U.S. public sector employees. Against the backdrop of the "revolving door" discussion, which typically emphasizes the discrepancy between public and private sector salaries (U.S. Securities and Exchange Commission, 2002; Greszler and Sherk, 2016), this paper shows how *internal* compensation incentives could incentivize better performance. It is a potential step toward understanding the social costs of distortions in the governmental compensation scheme. Relying on the methodology of this paper, future research can extend the analysis to study the effects of compensation schemes on the production of various public goods.

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Appendix A. Variable Definitions.

Variable	Description
Bonus	Dollar amount, in $10,000, of cash bonus.
Class	Category variable: non-managers, supervisors and senior executives.*
Cohort	Category variable, representing group of employees based on the year in which they joined the SEC.
Core occupation	Attorneys, accountants, and compliance examiners.
Core unit	Division of Enforcement and regional offices.
Enforcement	The number of enforcement actions in which the employee has participated during the year. The main outcome variable.
Enforcement_criminal	The number of "high-impact" enforcement actions in which the employee has participated during the year: cases with parallel criminal proceedings.
Enforcement_penalty	The number of "high-impact" enforcement actions in which the employee has participated during the year: cases with civil penalty.
Enforcement_staffed	The number of "high-impact" enforcement actions in which the employee has participated during the year: cases with more than four participants.
HighProb	Equals one for employees whose ex-ante probability of promotion to a senior position is above median. Based on predicted values from a Probit model (Table 7, column 4). Time invariant.
Male	Equals one for males and zero otherwise. Gender identified by matching surname to the publicly available Census files. Time invariant.
Occupation	Category variable. Represents the employee's occupation. Based on data provided by the SEC, employees were grouped into "attorneys," "accountants," "compliance examiners," and "other."
Office	Category variable. Represents the employee's location of duty, based on data provided by the SEC. Currently, the SEC has 11 regional office in addition to the Washington D.C. headquarters.

* Non-managers are in levels SK-1 to SK-14, and SK-16; supervisors are in SK-15 and SK-17; and senior officers are in SO-1 to SO-3. In the Division of Enforcement, SK-15 is a non-managerial level.

Overtime	Dollar amount, in $10,000, of overtime payments.
Pay gap	The difference, in $10,000, between the employee's *salary* and a reference salary. Can be either "top", "senior" or "managers" pay gap.
Pay gap ("managers")	The difference, in $10,000, between the employee's *salary* and the highest *salary* in the next *class*. For non-managers, the next class is supervisors. For supervisors, the next class is seniors. For seniors, this variable is blank.
Pay gap ("senior")	The difference, in $10,000, between the employee's *salary* and the average salary among senior employees in the office. Negative pay gaps were omitted.
Pay gap ("top")	The difference, in $10,000, between the employee's *salary* and the top-earner in the office.
Pay grade	Category variable, with values between 1 and 20. Represents the employee's pay grade: SK-1 to SK-17, and SO-1 to SO-3. Other pay plans are excluded from the sample.
Pay ratio	The ratio between the employee's *salary* and a reference salary. Can be either "top", "senior" or "managers" pay ratio.
Political	Equals one for employee who ever donated to a national political race, and zero otherwise. Contributions identified by matching name to the FEC's records. Time invariant.
Salary	The adjusted base pay of the employee, i.e. base pay plus locality pay, excluding bonus and overtime. This is the main variable I use to construct pay gaps.
Starting pay grade	First *pay grade* upon joining the SEC.
Starting salary	First *salary* upon joining the SEC.
Tenure	The number of years the employee has been working at the SEC, including the current year (in the first year *tenure* = 1). For employees who left the SEC and then returned, tenure includes the years accumulated prior to departure.
Transition	Equals one during regional director replacement: in the year of termination and in the following year. The variable is left blank for employees in Washington D.C.
Unit	Category variable. Represents the unit to which the employee is assigned, based on data provided by the SEC.

Appendix B. Replacement of Regional Directors

The following table lists all SEC regional director replacements during the sample period, 2009-2016: fifteen terminations and sixteen appointments. Data was collected from SEC press releases. *Appointment* and *Termination* refer to the regional director position. *Previous position* refers to the last position held before being appointed to regional director, and *Next position* to the one held immediately after being terminated.

Office	Name	Previous position	Appointment	Termination	Next position
Atlanta, GA	Katherine S Addleman	SEC, Associate Director (TX)	6/1/2007	9/1/2009	Haynes and Boone
Atlanta, GA	Rhea K Dignam	Ernst & Young	3/1/2010	10/1/2014	SEC (DC)
Atlanta, GA	Walter E Jospin	Paul Hastings LLP	2/1/2015	-	-
Boston, MA	David P Bergers	SEC (MA)	10/1/2006	5/2/2013	SEC (DC)
Boston, MA	Paul G Levenson	Assistant US Attorney	10/15/2013	-	-
Chicago, IL	Merri Jo Gillette	SEC, Associate Director (PA)	8/1/2004	7/15/2013	Morgan, Lewis, Bockius
Chicago, IL	David A Glockner	Stroz Friedberg LLC	11/5/2013	-	-
Denver, CO	Donald M Hoerl	SEC, Associate Director (CO)	12/2/2008	8/2/2013	(retired)
Denver, CO	Julie K Lutz	SEC, Associate Director (CO)	11/20/2013	-	-
Fort Worth, TX	Rose Linda Romero	Assistant US Attorney	3/1/2006	4/15/2011	Romero Kozub
Fort Worth, TX	David R Woodcock	Vinson & Elkins LLP	9/19/2011	6/1/2015	Jones Day
Fort Worth, TX	Shamoil T Shipchandler	Bracewell & Guiliani LLP	10/1/2015	-	-
Los Angeles, CA	Rosalind R Tyson*	SEC, Associate Director (LA)	5/29/2008	3/31/2012	(retired)
Los Angeles, CA	Michele Wein Layne	SEC, Associate Director (LA)	4/1/2012	-	-
Miami, FL	David P Nelson	SEC, Deputy director (FL)	2000	7/30/2009	Boies, Schiller & Flexner
Miami, FL	Eric I Bustillo	Assistant US Attorney	1/31/2010	-	
New York, NY	George S Canellos	Milbank Tweed	7/19/2009	6/4/2012	SEC (DC)

New York, NY	Andrew M Calamari	SEC, Associate Director (NY)	10/17/2012	-	-
Philadelphia, PA	Daniel M Hawke	SEC, Associate director (PA)	4/1/2006	2/20/2014	SEC (DC)
Philadelphia, PA	Sharon B Binger	SEC, Assistant director (NY)	2/20/2014	12/31/2016	Silver Lake
Philadelphia, PA	G Jeffrey Boujoukos	SEC, Associate director (PA)	12/31/2016	-	-
Salt Lake City, UT	Kenneth D Jr Israel	SEC, Office director (UT)	1/1/2007	10/3/2013	(retired)
Salt Lake City, UT	Karen L Martinez	SEC, Assistant director (UT)	10/10/2013	7/1/2015	(retired)
Salt Lake City, UT	Richard R Best	Chief Counsel, FINRA	7/1/2015	-	-
San Francisco, CA	Marc J Fagel**	SEC, Associate Director (SF)	5/29/2008	4/15/2013	Gibson & Dunn
San Francisco, CA	Jina L Choi	SEC, Assistant director (SF)	9/11/2013	-	-

* Interim Director since 7/10/2007.

** Co-Acting Director since 10/22/2007.

Figure 1. Pay Inequality at the SEC: a Historical Perspective.

The figure presents the evolution of pay inequality at the SEC since 1973. For each year, I plot the ratio between the highest and the median salary ("pay ratio") and the Gini coefficient, all calculated at the office level and averaged across offices. Generally, inequality at the SEC has been on a steep decline since the mid-1990s.

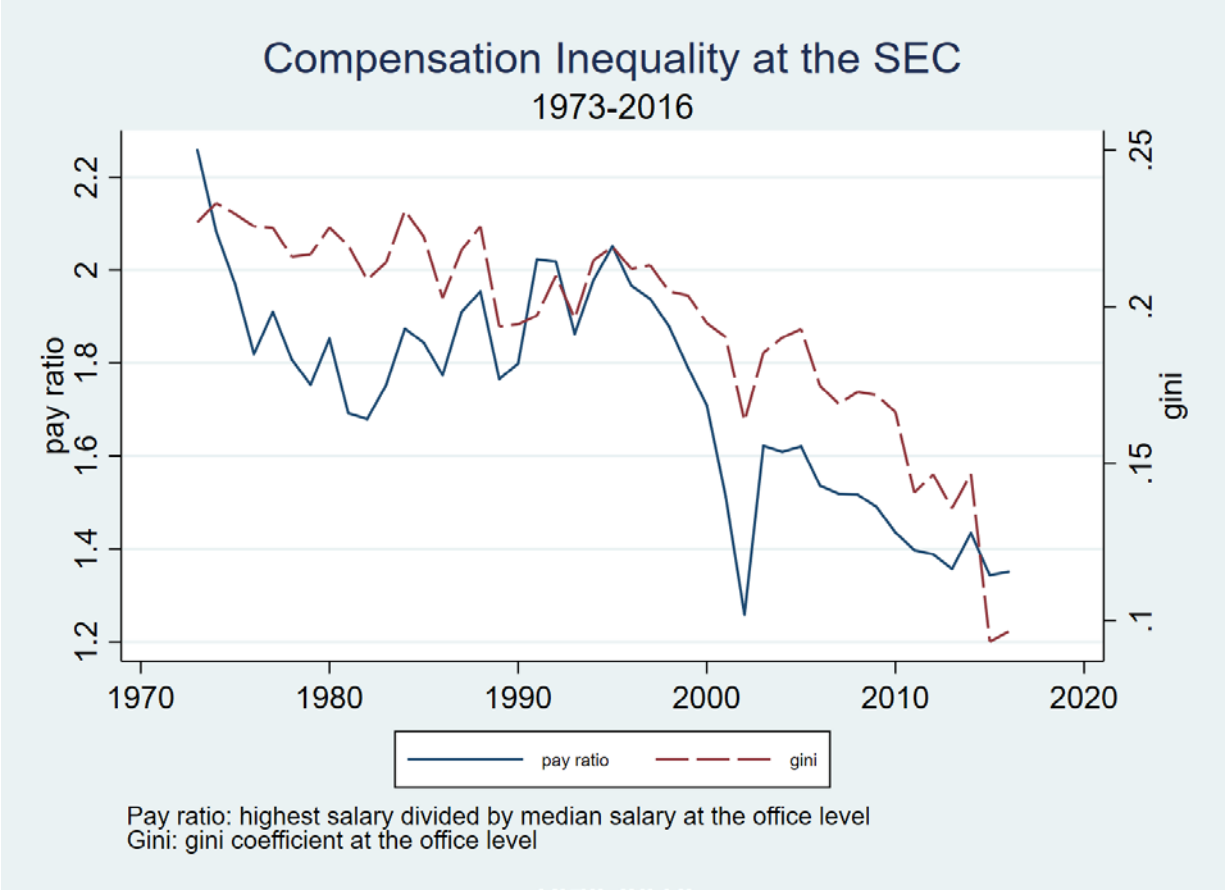


Figure 2. Pre-Trend Analysis.

The figure presents the dynamics of "top" pay gap effects around the transition event (replacement of regional director). The figure plots the marginal effect of pay gap for each year, i.e. the derivative of the estimated coefficients. The dashed lines show 95% confidence intervals. There seem to be no abnormal pre-event trends in pay gap effects.

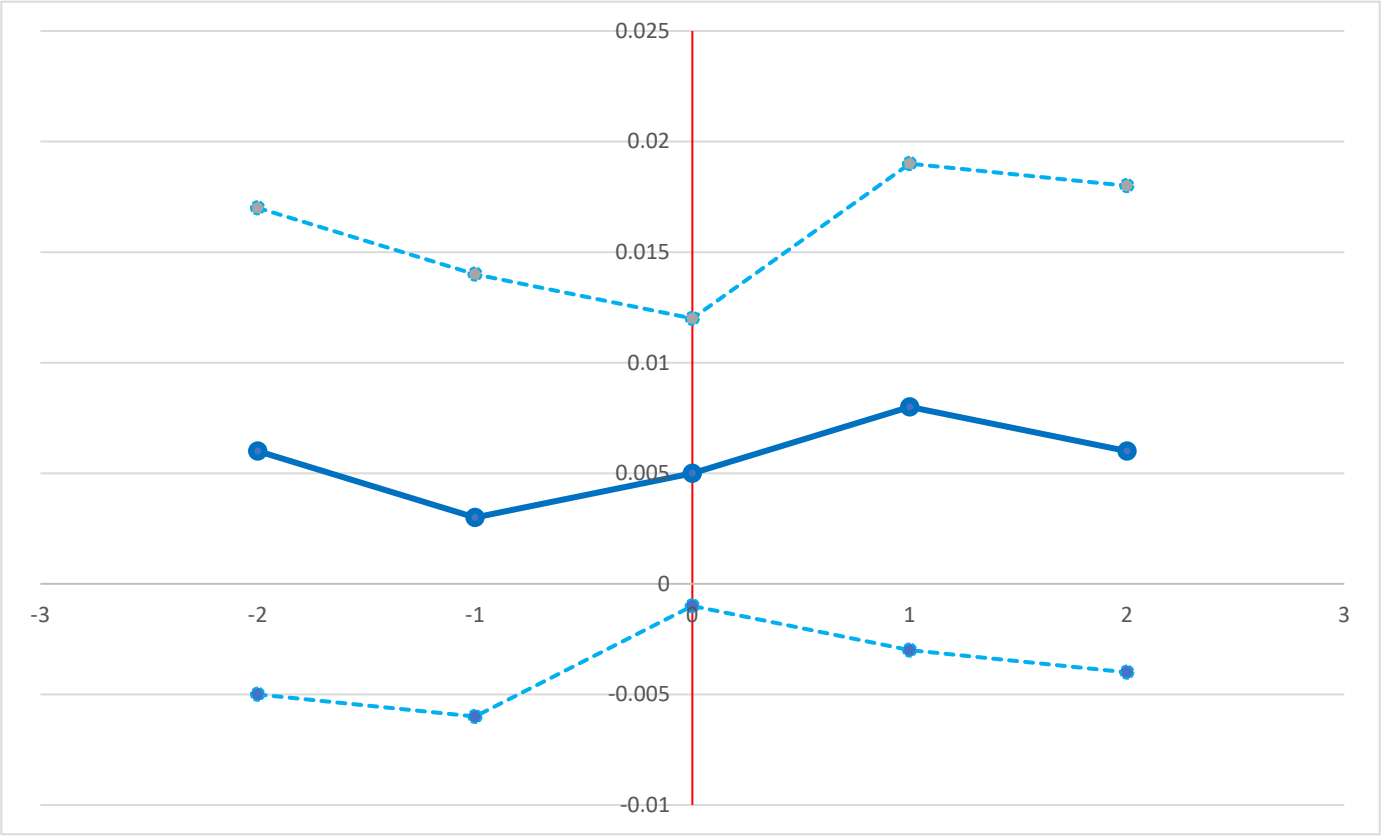


Figure 3. Distribution of Pay Gaps and Salaries.

The figure plots the kernel density of salaries and pay gaps at the SEC. Pay gap is the difference, in $10,000, between the employee's base pay and a reference salary in the office: the top-earner ("top"), the average salary among senior managers ("senior"), and the average salary among direct managers ("managers"). The sample includes all employees at the SEC's Enforcement Division and regional offices, 2009-2016.

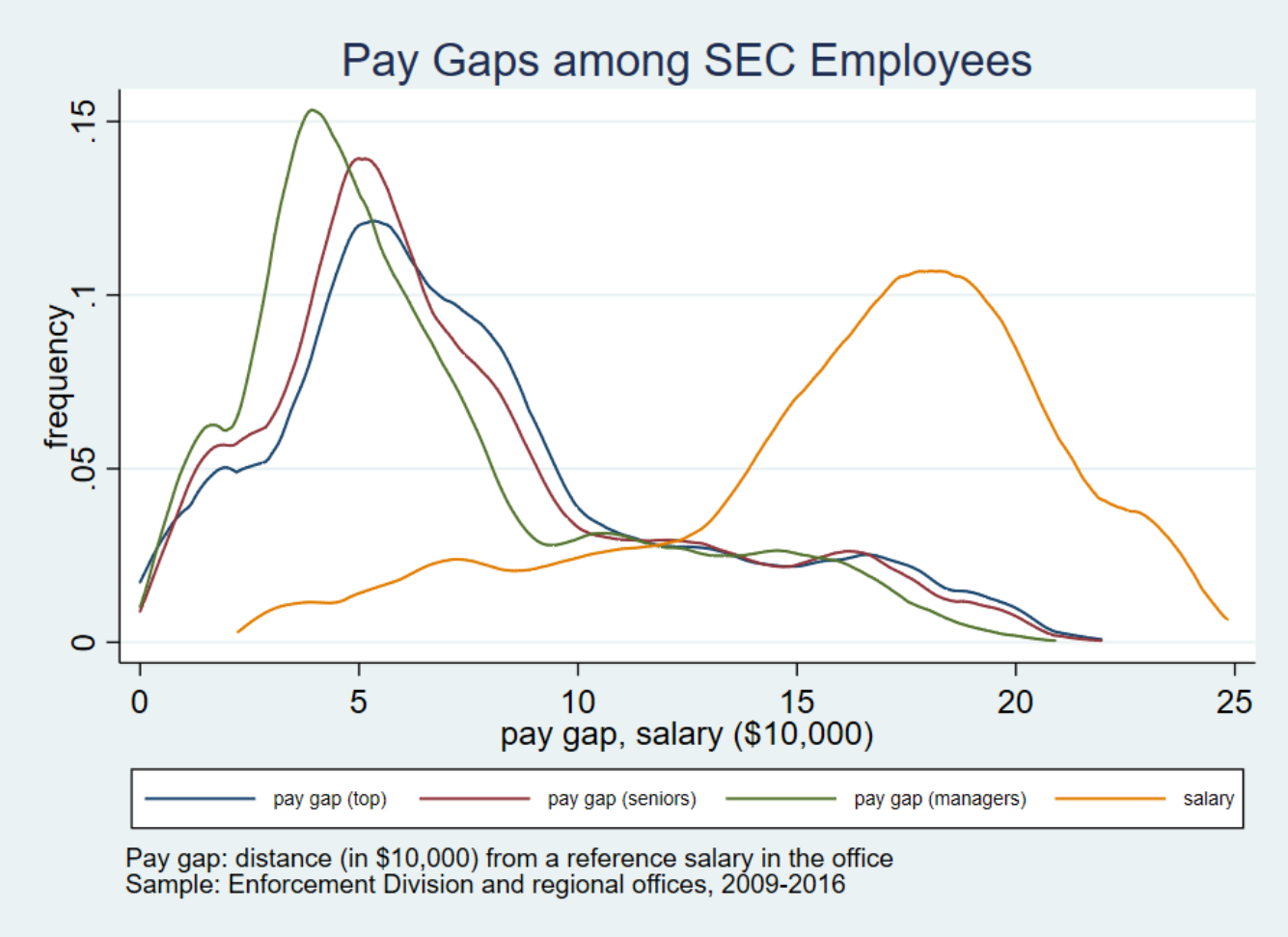


Figure 4. The Effect of Pay Inequality on Enforcement Actions.

The figure plots the marginal effect of pay gaps on enforcement, using regression coefficients from Table 6, column 1. I calculate each employee's marginal effect, and average within pay gap percentiles. For the majority of the sample (75%), pay gaps have a negative marginal effect on enforcement. At the inflection point, the average pay gap and salary are $95,000 and $141,000 respectively.

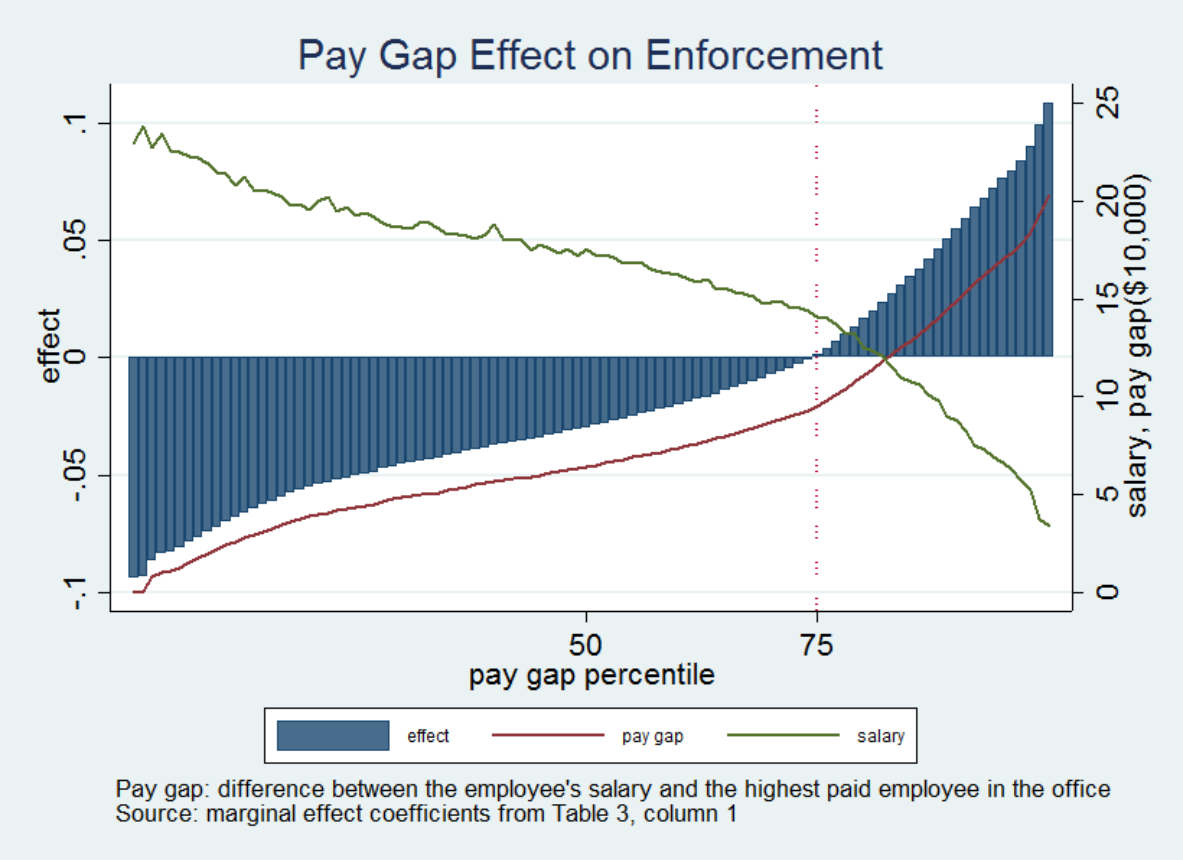


Figure 5. Implementing a New Executive Pay Plan at the SEC.

The figure summarizes a simulation of positive shocks to the salaries of SEC executives. A more lucrative executive pay plan would increase pay gaps for non-executive employees, which in turn would induce positive marginal effects on enforcement. The y-axis shows the ratio of expected revenues (orders to pay disgorgement and penalties) to costs (implementing the new executive pay), as a function of the new pay ratio. I plot the returns against the historical cumulative distribution of pay ratios at the SEC.

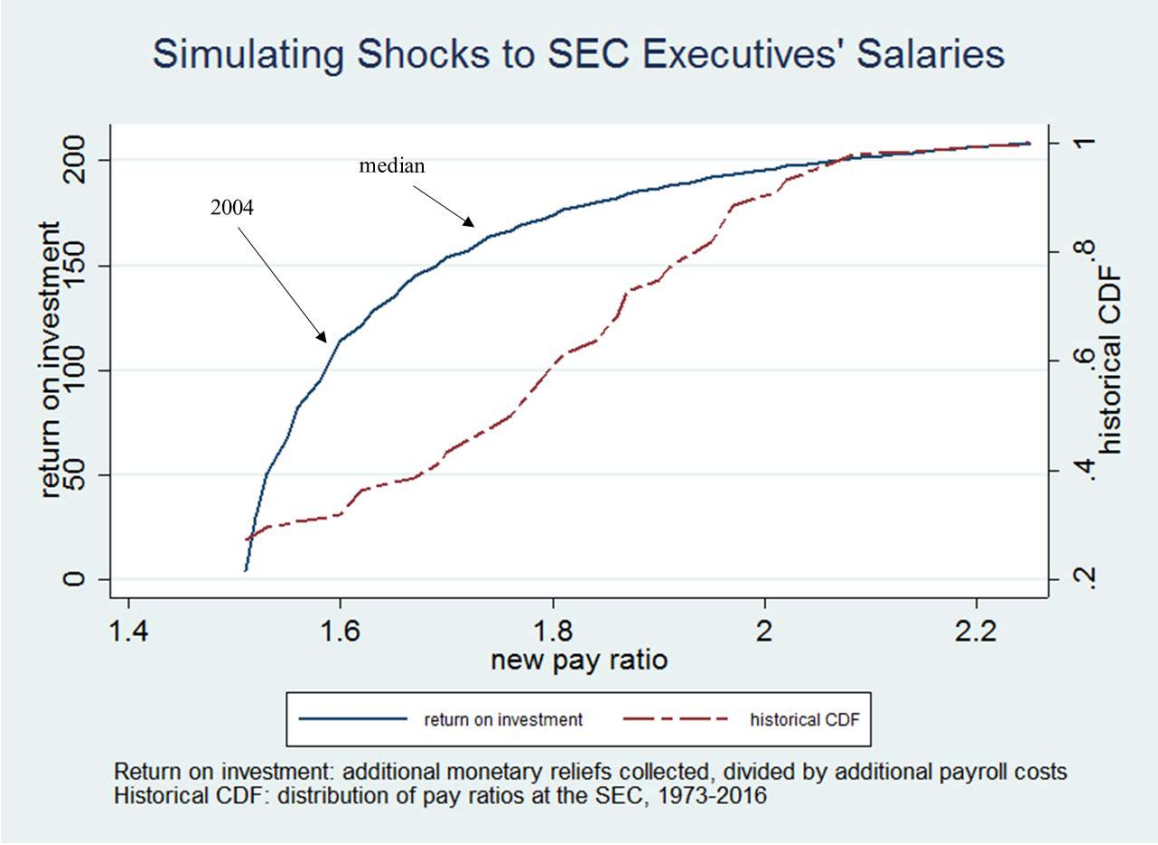


Figure 6. Pay Inequality and Enforcement Actions during Transition Periods.

The figure plots the marginal effect of "top" pay gap on enforcement for three groups: no replacement of regional director (control, blue); "low probability" employees during transition (Treatment 1, brown); and "high probability" employees during transition (Treatment 2, green). Regression coefficients are from Table 10, column 1. The treatment (director's departure) affects "high-probability" employees more than it does "low-probability" ones, consistent with tournament predictions.

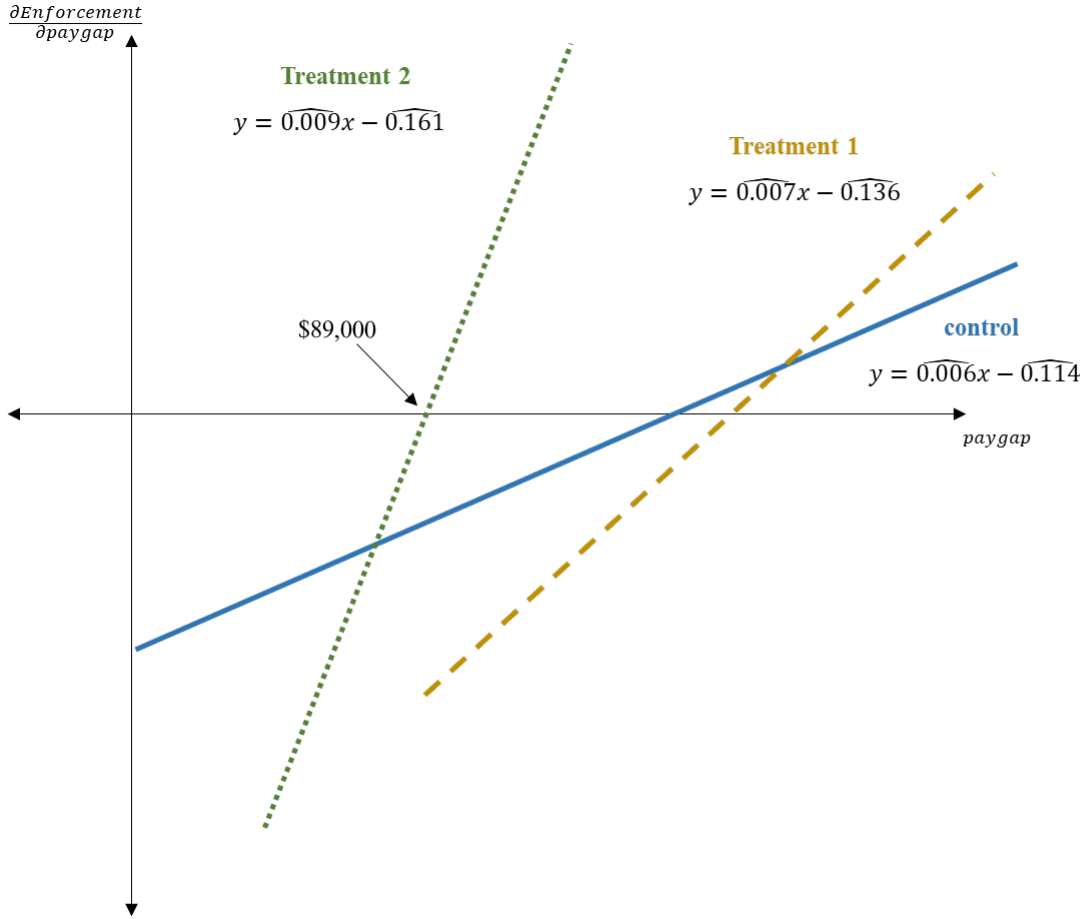


Table 1. Summary Statistics

The table presents summary statistics of all SEC employees in the Enforcement Division and regional offices, 2009-2016. For variable definitions see Appendix A.

	Average	Min	Max	Observations
Variable:				
Salary	$161,394	$22,327	$248,292	15,925
Pay gap ("Top")	$75,354	$0	$219,578	15,925
Pay gap ("Senior")	$73,741	$0	$219,578	15,319
Pay gap ("Managers")	$65,816	$0	$208,986	15,482
Enforcement	0.3	0.0	55.0	15,925
Tenure	11.2	1.0	51.0	15,925
Bonus	$111	$0	$8,000	15,925
Overtime payments	$24	$0	$11,665	15,925
Conditional on > 0:				
Enforcement	2.1	1.0	55.0	2,277
Bonus	$1,612	$200	$8,000	1,094
Overtime payments	$1,432	$5	$11,665	266

Table 2. Pay Inequality and the SEC's Enforcement Activity

The table shows the main results of the paper: differential effect of pay gaps on enforcement (equation (1)). The sample includes all employees in the Enforcement Division and regional offices, 2009-2016. The dependent variable is *enforcement*. All regressions include *tenure*, and fixed effects for year × office; employee; pay grade; occupation; and unit. For variable definitions see Appendix A. Robust standard errors, clustered by employee, are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. Each column reports the inflection point where the marginal effect of *pay gap* turns positive, and the sample share which is below the inflection point (too moderate pay gaps).

Dependent variable:	Enforcement		
Pay gap:	"top"	"senior"	"managers"
$PayGap_{t-1}$	-0.094***	-0.116***	-0.092***
	(0.030)	(0.024)	(0.025)
$(PayGap)^2{}_{t-1}$	0.005***	0.006***	0.005***
	(0.001)	(0.001)	(0.001)
$tenure_{t-1}$	0.064	0.129	0.120
	(0.286)	(0.109)	(0.110)
Pay grade FE	YES	YES	YES
Employee FE	YES	YES	YES
Unit FE	YES	YES	YES
Occupation FE	YES	YES	YES
Year × Office FE	YES	YES	YES
Within R^2	0.069	0.061	0.061
Obs.	12549	12104	12226
Inflection point	$94,000	$96,666	$92,000
% below threshold	73.9%	75.6%	77.2%

Table 3. Pay Inequality and Case Impact

The table shows that pay gaps affect the ultimate case outcome. The sample includes all employees in the Enforcement Division and regional offices, 2009-2016. The outcome is the number of "high-impact" enforcement actions: cases with parallel criminal proceedings (column 1); cases with civil money penalties (column 2); and cases with above-median number of participants (column 3). All regressions include *tenure*, and fixed effects for year × office; employee; pay grade; occupation; and unit (not reported, for brevity). Robust standard errors, clustered by employee, are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. Each column reports the inflection point where the marginal effect of *pay gap* turns positive, and the sample share which is below the inflection point (too moderate pay gaps).

Pay gap measure:	"top"			"senior"			"managers"		
Enforcement measure:	Staffed	Penalty	Criminal	Staffed	Penalty	Criminal	Staffed	Penalty	Criminal
$PayGap_{t-1}$	-0.052**	-0.038*	-0.020*	-0.062***	-0.053***	-0.020**	-0.051***	-0.041**	-0.021**
	(0.022)	(0.020)	(0.011)	(0.018)	(0.015)	(0.009)	(0.018)	(0.016)	(0.010)
$(PayGap)^2{}_{t-1}$	0.003***	0.002**	0.001***	0.003***	0.002***	0.001**	0.002***	0.002**	0.001**
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)
Within R^2	0.062	0.052	0.035	0.057	0.043	0.030	0.058	0.045	0.031
Obs.	12549	12549	12549	12104	12104	12104	12226	12226	12226
Inflection point	$86,667	$95,000	$100,000	$103,333	$132,500	$100,000	$127,500	$102,500	$105,000
% below threshold	69.6%	74.4%	76.4%	77.8%	86.3%	76.8%	87.4%	80.1%	81.0%

Table 4. Out-of-Sample Evidence: Pay Gaps and Top Performers

The table shows that pay gaps affect exceptional performance, captured by bonus awards. The dependent variable is the dollar value of the bonus. The sample includes all SEC employees, 2002-2016. I compare all employees (column 1) to employees in the Enforcement Division and regional offices (column 2), 2002-2016. All regressions include *tenure*, and fixed effects for year × office; employee; pay grade; occupation; and unit (suppressed, for brevity). For variable definitions see Appendix A. Robust standard errors, clustered by employee, are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

Dependent variable:	Bonus					
Pay gap:	"top"		"senior"		"managers"	
	Full	Core	Full	Core	Full	Core
$PayGap_{t-1}$	-0.019***	-0.022***	-0.030***	-0.034***	-0.025***	-0.024***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
$(PayGap)^2_{t-1}$	0.001***	0.001***	0.001***	0.001***	0.002***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Within R^2	0.225	0.257	0.255	0.282	0.256	0.279
Obs.	47004	23950	45162	22984	45503	23318

Table 5. Evaluating the "Absolute Income" Channel

The table shows that the employee's salary in itself cannot explain the paper's results. In panel A, I compare "managers" pay gap with placebo reference salaries: the highest salary in the same pay grade (2nd column); the average salary in the next pay grade (3rd column); and the highest salary in the next pay grade (4th column). At the SEC none of these "synthetic" pay gaps presents any reasonable incentive. In Panel B, the first column is the baseline model, and the second column instruments each pay gap with the respective reference salary. The sample includes all employees in the Enforcement Division and regional offices, 2009-2016. The dependent variable is *enforcement*. All regressions include *tenure*, and fixed effects for year × office; employee; pay grade; occupation; and unit. For variable definitions see Appendix A. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

Panel A. Placebo

Dependent variable:	Enforcement			
Pay gap:	"managers"	Placebo 1	Placebo 2	Placebo 3
$PayGap_{t-1}$	-0.092***	0.011	-0.035	-0.009
	(0.025)	(0.019)	(0.027)	(0.023)
$(PayGap)^2_{t-1}$	0.005***	-0.001	0.003	0.002
	(0.001)	(0.002)	(0.002)	(0.003)
	0.120	0.090	0.087	0.096
	(0.110)	(0.275)	(0.283)	(0.280)
Pay grade FE	YES	YES	YES	YES
Employee FE	YES	YES	YES	YES
Unit FE	YES	YES	YES	YES
Occupation FE	YES	YES	YES	YES
Year × Office FE	YES	YES	YES	YES
Within R^2	0.061	0.067	0.062	0.061
Obs.	12226	12549	11469	11469

Panel B. "Instrumenting" Pay Gaps

Dependent variable:	Enforcement					
Pay gap:	**"top"**		**"senior"**		**"managers"**	
Model:	OLS	IV	OLS	IV	OLS	IV
$PayGap_{t-1}$	-0.088***	-0.136***	-0.113***	-0.153***	-0.093***	-0.191***
	(0.028)	(0.039)	(0.023)	(0.041)	(0.024)	(0.037)
$(PayGap)^2{}_{t-1}$	0.005***	0.007***	0.006***	0.007***	0.005***	0.009***
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
$tenure_{t-1}$	0.048	0.014	0.107	0.015	0.095	0.040
	(0.279)	(0.284)	(0.121)	(0.283)	(0.123)	(0.131)
Pay grade FE	YES	YES	YES	YES	YES	YES
Employee FE	YES	YES	YES	YES	YES	YES
Unit FE	YES	YES	YES	YES	YES	YES
Occupation FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Office FE	YES	YES	YES	YES	YES	YES
Within R^2	0.047	0.046	0.037	0.047	0.036	0.038
Obs.	12549	12549	12104	12416	12226	12226
Inflection point	$88,000	$97,143	$94,167	$109,286	$93,000	$106,111
% below threshold	70.5%	75.3%	74.7%	79.5%	77.5%	81.4%

Table 6. Evaluating the "Hierarchy" Channel

The table shows that pay gaps are not a mere reflection of hierarchy. I compare pay gaps to pay ratios, which preserve the ordinal ranking while eliminating the value of the pay gap. The sample includes all employees in the Enforcement Division and regional offices, 2009-2016. The dependent variable is *enforcement*. All regressions include *tenure*, and fixed effects for year × office; employee; pay grade; occupation; and unit. For variable definitions see Appendix A. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

Dependent variable:	Enforcement					
Reference salary:	**"top"**		**"senior"**		**"managers"**	
Measure:	Gap	Ratio	Gap	Ratio	Gap	Ratio
$PayGap_{t-1}$	-0.094***		-0.116***		-0.092***	
	(0.030)		(0.024)		(0.025)	
$(PayGap)^2{}_{t-1}$	0.005***		0.006***		0.005***	
	(0.001)		(0.001)		(0.001)	
$PayRatio_{t-1}$		0.182		0.088		0.040
		(0.123)		(0.100)		(0.096)
$(PayRatio)^2{}_{t-1}$		-0.009		-0.000		0.002
		(0.012)		(0.010)		(0.011)
Within R^2	0.069	0.061	0.061	0.068	0.074	0.059
Obs.	12549	12104	12226	12539	12261	12224

Table 7. Predicting Promotions at the SEC

The table shows how employee fixed characteristics predict promotions at the SEC. Note that this table does not take a stand with regards to causality. The sample includes all SEC employees, 2002-2016. A dummy variable of promotion, which equals one if the employee was promoted to a senior position during his or her career, is regressed on various employee fixed characteristic using a Probit model (equation (2)). For variable definitions see Appendix A.

Dependent variable:	Promotion (to senior)			
	(1)	**(2)**	**(3)**	**(4)**
Political	0.003	0.004	0.006*	0.008*
	(0.003)	(0.004)	(0.003)	(0.004)
Male	0.002	0.002	0.002	0.003
	(0.001)	(0.002)	(0.002)	(0.002)
Accountant	-0.000	-0.000	-0.002	-0.003
	(0.001)	(0.001)	(0.002)	(0.002)
Attorney	0.007***	0.007***	0.002	0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Compliance Examiner	0.000	0.001	0.000	0.000
	(0.002)	(0.003)	(.)	(.)
Starting salary			0.003***	0.004***
			(0.001)	(0.001)
Starting pay grade			-0.003***	-0.005***
			(0.001)	(0.001)
Office FE	-	YES	-	YES
R^2	0.057	0.059	0.072	0.074
Obs.	8982	8107	5478	4255

Table 8. Pay Gap Effects and Ex-Ante Promotion Probability

The table shows that employees with higher ex-ante probability of promotion are more sensitive to positive pay gaps' effects (equation (3)). The sample includes all employees in the Enforcement Division and regional offices, 2009-2016. The dependent variable is *enforcement*. All regressions include *tenure*, and fixed effects for year × office; employee; pay grade; occupation; and unit. For variable definitions see Appendix A. Robust standard errors, clustered by employee, are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

Dependent variable:	Enforcement		
Pay gap:	"top"	"senior"	"managers"
$PayGap_{t-1}$	-0.004	-0.028	-0.020
	(0.033)	(0.025)	(0.025)
$HighProb \times PayGap_{t-1}$	-0.194***	-0.193***	-0.192***
	(0.048)	(0.047)	(0.050)
$(PayGap)^2_{t-1}$	0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)
$HighProb \times (PayGap)^2_{t-1}$	0.010***	0.009***	0.010***
	(0.002)	(0.002)	(0.003)
$tenure_{t-1}$	0.200	0.309*	0.336**
	(0.525)	(0.175)	(0.153)
Pay grade FE	YES	YES	YES
Employee FE	YES	YES	YES
Unit FE	YES	YES	YES
Occupation FE	YES	YES	YES
Year × Office FE	YES	YES	YES
Within R^2	0.067	0.056	0.054
Obs.	9702	9442	9453

Table 9. Pay Gap Effects during Transition Periods

The table shows that positive pay gap effect increase during transition periods, consistent with tournament predictions (equation (4)). The sample includes all employees in the SEC'S regional offices, 2009-2016. All regressions include *tenure*, and fixed effects for year × office; employee; pay grade; occupation; and unit (not reported, for brevity). For variable definitions see Appendix A. Robust standard errors, clustered by employee, are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively.

Dependent variable:	Enforcement		
Pay gap:	"top"	"senior"	"managers"
$paygap_{t-1}$	-0.085*	-0.112***	-0.083***
	(0.047)	(0.030)	(0.029)
$Trans_{t-1} \times paygap_{t-1}$	-0.054**	-0.024	-0.024
	(0.027)	(0.016)	(0.016)
$(paygap)^2_{t-1}$	0.005**	0.006***	0.005***
	(0.002)	(0.001)	(0.001)
$Trans_{t-1} \times (paygap)^2_{t-1}$	0.002*	0.001*	0.001
	(0.001)	(0.001)	(0.001)
Within R^2	0.079	0.064	0.064
Obs.	9559	9204	9325

Table 10. "High Probability" Employees during Transition Periods

The table shows that during transition periods the positive pay gap effect increases particularly among "high probability" employees, consistent with tournament predictions (equation (5)). The sample includes all employees in the SEC'S regional offices, 2009-2016. All regressions include *tenure*, and fixed effects for year × office; employee; pay level; and occupation (not reported, for brevity). For variable definitions see Appendix A. Robust standard errors, clustered by employee, are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. Each column reports the inflection point where the marginal effect of *pay gap* turns positive, and the sample share which is below the inflection point (too moderate pay gaps).

Dependent variable:	Enforcement		
Pay gap:	"top"	"senior"	"managers"
$paygap_{t-1}$	-0.114***	-0.111***	-0.083***
	(0.032)	(0.030)	(0.029)
$Trans_{t-1} \times paygap_{t-1}$	-0.022	-0.021	-0.022
	(0.016)	(0.017)	(0.016)
$HighProb \times Trans_{t-1} \times paygap_{t-1}$	-0.025	-0.022	-0.027
	(0.016)	(0.016)	(0.017)
$(paygap)^2_{t-1}$	0.006***	0.006***	0.005***
	(0.001)	(0.001)	(0.001)
$Trans_{t-1} \times (paygap)^2_{t-1}$	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
$HighProb \times Trans_{t-1} \times (paygap)^2_{t-1}$	0.002**	0.002*	0.003**
	(0.001)	(0.001)	(0.001)
Within R^2	0.067	0.064	0.065
Obs.	9333	9201	9322
Inflection points:			
Control:	$95,000	$92,500	$83,000
Treatment 1:	$97,143	$94,286	$87,500
Treatment 2:	$89,444	$85,556	$73,333