Escaping Pay-for-Performance*

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How do regulators respond to performance pay? We address the question using a unique dataset of 24,000 senior federal regulators, the highest-ranking bureaucrats overseeing federal regulatory activities. We exploit a major reform that switched most senior regulators to a pay-for-performance system. In a difference-in-differences framework, we find that the reform increased voluntary resignations by affected regulators, especially high-ability ones. We document a similar response to independent reforms targeting different populations: the staggered adoption of performance pay by financial agencies, and the expansion of performance pay within the Federal Aviation Administration. We explain this dynamic with a structural model, where regulators prefer the public sector, but they have an outside option to earn an uncapped pay in the private sector. A shift to performance pay weakens the public sector preference and induces more effort. The latter increases the salary potential in the private sector and the risk of hitting the government pay cap. Combined, the outside option value increases, motivating high-productivity regulators to resign. Estimating our model, we find that executives exert 4.5% more effort after the reform and 24% of their pay is tied to performance. We evaluate alternative policies to increase regulatory effort and quantify the resulting self-selection in and out of the public sector. Overall, our paper highlights the unintended consequences of paying regulators for performance and the joint impact on effort and on the revolving door between the public and private sectors.

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Introduction

Since the 2024 Presidential elections, federal regulators are under a harsh spotlight. The Department of Government Efficiency (DOGE) seeks to terminate many regulators and monitor the performance of the remaining ones. As a warning shot, in February 2025, DOGE ordered all regulators to report their top five accomplishments. More fundamentally, the new administration considers tightening the link between pay and performance.[1] This would presumably put the public sector on par with the private sector, where employees must often demonstrate satisfactory performance to justify their pay. However, since performance pay among regulators is rare, little is known about the unintended consequences of changing the status quo. For instance, while performance pay may encourage more effort, it may cause dissatisfaction among regulators which would limit the potential efficiency gains.

This background motivates our research question: how do regulators respond to performance pay? Using employee-level dataset on 24,000 senior federal regulators, we show that a shift to performance pay in 2004 increased voluntary resignations by senior regulators, especially high-ability ones who moved to the private sector. We document a similar response among financial agencies and the Federal Aviation Administration, which gradually shifted to performance pay in earlier periods. To understand the economic mechanisms, we build a structural model with a regulator who has a preference for the public sector and an outside option in the private sector. Introducing performance pay in the government increases effort but also the relative value of the outside option via multiple channels. First, it weakens the regulator's preference for the public sector. Moreover, since they now exert more effort, regulators have a higher potential salary in the private sector and simultaneously a higher risk of hitting the government pay cap. Combined, those factors increase the outside option value which causes regulators to quit. We quantify the various factors and evaluate alternative policies to induce effort. Overall, our results uncover an important link between pay, effort, and the revolving door connecting the public and private sectors.

[1] See, for instance, a Presidential Memorandum from January 2025 (90 FR 8481).

In the first part of the paper, we document a link between pay-for-performance and turnover. Our main analysis is centered on federal executives: a selective group of career bureaucrats, roughly 0.5% of the federal workforce, who hold the leadership positions in their respective agencies and oversee the plurality of regulatory activities in the United States.[2] For instance, the Financial Crimes Enforcement Network is run by seven federal executives. Rising through the ranks of the Treasury Department over many decades, they now oversee the agency's activities to safeguard the financial system. We source a comprehensive employee-level dataset on 24,000 individuals who held an executive position at any point between 1973 and 2013. Crucially, we observe the executive's pay, hiring date, and exit date, even before and after their elevation to the executive rank. We then exploit an executive pay reform which aimed to retain executive talent and motivate greater effort. The reform took effect in 2004, covered most federal executives, and included two key aspects: it tied future pay raises to performance, and doubled the maximum allowable pay for executives. Our dataset spans the decade before and after the reform, and it includes agencies that were exempt from the reform because they use independent pay systems for their executives, such as the Office of the Comptroller of the Currency.

In a difference-in-differences specification, we find that the reform increased exits among treated executives by 3.8-4.5 percentage points. Exit rates rose sharply within the first three years following the reform, and they were not driven by forced retirement. Next, we estimate executive ability, captured by individual fixed effects from a wage regression that accounts for office$\times$year fixed effects and tenure.[3] We divide the sample into terciles of executive ability and estimate the reform's treatment effect separately by group. We find that only high-ability executives show a significant increase in exit rates, with an effect size approximately twice that of the other groups. Finally, we collect additional data on the outside option of executives who left federal service by matching our payroll data to LinkedIn-based career

[2] In the government parlance they are referred to as Senior Executive Service, SES for short.

[3] This approach follows Abowd, Kramarz, and Margolis (1999) and it is similar to estimating judicial leniency using judge fixed effects (e.g., Bernstein, Colonnelli, and Iverson (2019)) and CEO styles using CEO fixed effects (e.g., Bertrand and Schoar (2003)).

records from Revelio Labs. Among 201 matched individuals, 60% joined for-profit firms and received an average pay increase of 66%. Most transitioned into senior roles, with over 60% holding director- or executive-level positions.

Our findings suggest that performance pay increases exits, especially by high-ability executives who accepted lucrative private sector positions. To support the causal link between performance pay and turnover, we source additional data and document a similar response in two independent settings. The first setting is the staggered adoption of performance pay by 10 financial agencies, between 1981 and 2006. We estimate a stacked differences-in-differences framework, comparing in each cohort the agency adopting performance pay to those adopting it later. We find a substantial rise in exit rates among treated agencies, ranging from 25% to 55% relative to the sample mean. Since these reforms were implemented in different years by comparable agencies, any non-causal explanation must account for the high turnover rates in treated agencies during each adoption period, a fairly high bar. The second setting is the Federal Aviation Administration (FAA), which in 2004 expanded the share of air traffic controllers whose pay was tied to performance, from 37% to 75%. We estimate a difference-in-difference specification, and find a significant increase in exit rates among treated FAA employees, relative to a comparable control group within the FAA. Since this test compares employees within the same agency, any non-causal explanation cannot rely on agency-wide changes such as downsizing or change in leadership.

The second part of the paper digs deeper into the primary empirical finding: performance pay increases exit rates. At first blush, this seems puzzling. The pay reforms intended to retain talented regulators, not to drive them out. Moreover, pay in the private sector is even more sensitive to performance, and poor performance can in fact lead to pay cuts (which are extremely rare in the public sector). Thus, government wage contracts with a performance component resemble a call option, where performance pay increases the volatility and hence the contract value. Nevertheless, our results clearly suggest that performance pay in the public sector raises the value of the outside option even more, resulting in exits. To understand this dynamic, and to account for potential changes in the unobservable effort, we develop and estimate a structural model centered on a federal regulator. In addition to clarifying the economic mechanisms, the model allows us to quantify important economic parameters, such as the extent to which regulators are paid for performance.

In our model, the regulator has an outside option in the private sector. Pay in both sectors increases with tenure and productivity. However, the public sector pay has a floor and a ceiling: it never decreases, even with dismal performance, and it never exceeds a government-wide cap, even with excellent performance. In contrast, in the private sector, poor performance yields deep pay cuts and good performance is rewarded with substantial pay raises. Importantly, the regulator has a preference for the public sector and thus discounts any private sector salary.[4] The federal regulator chooses effort and exit to maximize lifetime utility. Effort increases productivity and hence wages but is also costly. Exit to the private sector can offer higher pay, since there is no pay cap, but also greater exposure to negative productivity shocks, resulting in lower pay.

Our model sheds new light on the response to performance pay. While performance pay induces more effort in the public sector, it also raises the relative value of the outside option via three related channels. First, performance pay reduces the preference for a public sector job. Measuring performance in the government is not easy, and employees may perceive performance pay as unfair.[5] In addition, a performance-driven culture may diminish the "quiet life" quality and crowd out the intrinsic motivation to serve the public interest. Second, since performance pay induces more effort, it increases the salary potential in the private sector. This is similar to numerous studies on the revolving door, where regulators take actions during their government career to improve their outside option.[6] Third, by exerting

[4]For instance, they may have an intrinsic motivation for public service (Frey and Oberholzer-Gee, 1997; Pitts, Marvel, and Fernandez, 2011; Bond and Glode, 2014; Lepper and Greene, 2015).

[5]For example, a survey found that only 12% of the FDIC workforce believe that the now-suspended system fairly rewards their performance and contributions (link).

[6]In our model we focus on effort, which in practice could translate to leniency ("regulatory capture") or to strictness ("regulatory schooling"). As we do not observe performance in the data, separating those two is beyond the scope of this paper.

more effort, the regulator is more likely to hit the government pay cap and cease reaping the benefit of the extra effort. Combined, those three channels motivate regulators to resign following the adoption of performance pay.

More broadly, our model highlights the crucial link between effort and exit. First, a policy that induces effort will incentivize regulators to quit. The upside of the private sector pay is even higher, as is the risk of maxing out government pay. Second, based on a similar logic, a policy that encourages regulators to exit will increase their effort: regulators value their outside option more, where effort is better rewarded. Third, cross-sectional differences across regulators matter. In particular, performance pay triggers a self-selection process. High-productivity regulators are more likely to hit the government pay cap, and they have more to gain from the uncapped private sector pay. By choosing to quit, they will change the composition of the government workforce.

In the third part of the paper, we estimate the model using the executive-level dataset and the results from the difference-in-differences specifications.[7] We begin by quantifying the unobserved consequences of the executive pay reform. After the reform, executives exert 4.5% more effort and 24% of their pay is tied to performance. This is substantially lower than the private sector, where bonus and incentive pay account for 75-80% of total CEO pay and 40-50% of non-CEO executives pay.[8] At the same time, federal executives who remain in the government have a 13.5% higher preference for the public sector. Since performance pay reduced the utility from the public sector, only executives with stronger ex-ante preference for the public sector chose to stay. In contrast, executives with weaker ex-ante public sector preference, who were already ambivalent about their government position, left.

Finally, we evaluate alternative policies aiming to increase effort among regulators, while explicitly taking into account the impact on exits. Our findings can be summarized as fol-

[7]We use the federal executives data to estimate our model, but the model and its insights apply broadly to any public sector employee with a similar pay structure.

[8]See, for instance, Frydman and Jenter (2010); Murphy (2013); Edmans, Gosling, and Jenter (2023); Humphery-Jenner et al. (2016); Deloitte Consulting LLP, and WorldatWork (2014); Compensation Advisory Partners and WorldatWork (2021); Gartenberg and Wulf (2013).

lows. *First*, introducing performance pay will increase effort but also motivate exits. If the central planner seeks to avoid excess exits, especially by high-productivity regulators, performance pay should be combined with a substantial raise of the pay cap. We propose several combinations of performance pay and pay cap to achieve this goal. *Second*, introducing performance pay will weaken the public sector preference and further incentivize exits. This can be attenuated by directly increasing the utility from public sector service, for example, by developing clear performance metrics. *Third*, and perhaps counterintuitively, a flat across-the-board cut in government pay will also boost effort. By directly increasing the incentive to exit, executives will also be motivated to exert effort, because it now has a greater impact on the compensation in the imminent private sector job.

Overall, our paper highlights the unintended consequences of performance pay in the government and the challenges of finding the right mix. Performance pay contributes to greater effort by regulators, but it also raises the value of their outside option and motivates them to quit. As more productive regulators leave, the public sector will attract less productive regulators. Those insight can inform the policy discussions around regulatory pay and regulatory performance. The design of regulatory pay does not exist in a vacuum, since regulators compare their expected cash flows in the public sector to those offered by private employers. Thus, any pay policy will have a joint impact on effort and exits, sometimes in the opposite direction. Finally, an attempt to boost effort may motivate productive regulators to quit, leaving behind regulatory agencies with less productive employees. Alternative policies can boost effort while taking these dynamics into account.

Two final observations are in order. First, the bulk of our analysis is centered on high-level federal executives. However, we provide reduced-form evidence from two independent settings (financial regulators and the FAA), and our model is not restricted to high-level or low-level regulators. Thus, we believe our conclusions may apply to many other regulators. Second, we do not take a stand on how performance pay in the government affects total welfare. For instance, we do not observe performance, and thus cannot assess the improvement in public good production. Moreover, we develop a partial equilibrium model, focusing on the optimization problem of a representative regulator, and we cannot for example compute changes in total productivity or output. We leave those important questions for future follow-on studies.

Our work relates primarily to the literature on the revolving door, regulatory incentives, and regulatory performance. Concretely, we make three contributions. *First*, studies tend to link performance to the level of pay (Dal Bó, Finan, and Rossi, 2013; Kalmenovitz, 2021) and to organizational features such as field offices (Gopalan, Kalda, and Manela, 2021), supervision hours (Hirtle, Kovner, and Plosser, 2020), and jurisdictional overlap (Kalmenovitz, Lowry, and Volkova, 2025). Our paper highlights the importance of the pay structure in both the public and private sectors, and specifically the role of pay floor, pay ceiling, and performance-based pay.

Second, we link the revolving door to the pay structure. Studies typically focus on the prevalence of the revolving door and whether it induces regulatory leniency, without considering how it is affected by the design of regulatory pay (deHaan et al., 2015; Lucca, Seru, and Trebbi, 2014; Shive and Forster, 2017; Cornaggia, Cornaggia, and Xia, 2016; Kempf, 2020; Lambert, 2019; Kalmenovitz, Vij, and Xiao, 2022). Our work shows that pay design directly affects the revolving door: the incentive to switch sectors increases with performance pay and decreases with the pay ceiling. More broadly, the pay structure affects the joint decision on exit and effort: a pay policy which increases effort will raise the value of the outside option, motivating regulators to quit.

Third, we highlight the self selection induced by the pay structure. Related papers show that performance pay serves as a screening mechanism for high-ability workers (Lazear (1986); Lazear and Rosen (1981); Lazear (2000); Goldmanis and Ray (2015)). Our paper finds that performance pay can motivate productive regulators to leave, a dynamic that arises given the broader context: performance pay exists in both sectors (albeit in different intensities), pay cap and floor exist only in the public sector, and regulators have a public sector preference. A related theoretical literature studies how workers sort into private and public sector jobs based on intrinsic motivation, skills, and performance pay (Macchiavello, 2008; Bond and Glode, 2014; Delfgaauw and Dur, 2010). Our empirical approach combines reduced-form evidence with a structural model, to quantify how changes to performance pay affect the incentives of regulators and to analyze the policy implications. Moreover, we study how changes in the government pay structure affect effort and the revolving door between the public and private sectors.

Our paper also contributes to the growing literature which uses structural estimation to study corporate governance (e.g., Morellec, Nikolov, and Schürhoff, 2012; Nikolov and Whited, 2014). Studies in this area examine CEO career concerns (Wu, 2017), career decisions of finance professionals (Gao, Wang, and Wu, 2024), CEO ownership (Coles, Lemmon, and Meschke, 2012), and CEO turnover and CEO-board dynamics (e.g., Taylor, 2010, 2013; Page, 2018). We contribute to this literature by developing and estimating a model of a public sector executive. Our model sheds light on the differential compensation and incentives of top executives in the private and public sectors, and how this affects the revolving door between the two sectors.

Lastly, our work adds to the robust literature on executive pay. Studies are exclusively focused on executives in the private sector,[9] and we extend it by looking into federal executives. We uncover the pay structure of those federal executives, which differs sharply from private sector executives. We further utilize a rare reform in executive pay, and highlight how even small changes to incentive pay can induce significant changes in effort and turnover. While our findings may not apply equally to private sector executives, at the minimum they contribute to our understanding of an understudied group of executives, who manage large organizations with significant economic impact.

[9] See Frydman and Jenter (2010) and Yermack (2004), among others.

1 Federal executives and pay-for-performance

1.1 Institutional setting

Our paper is focused on the executives of the federal government.[10] In the government parlance they are known as the Senior Executive Service, or SES for short, but we simply refer to them as federal executives. They play a crucial role in the federal bureaucracy: they hold key leadership positions just below the top Presidential appointees, manage the activities of the federal government, and serve as a link between the political appointees and the rest of the federal workforce. For instance, the Administrator and the Deputy Administrator of the Environmental Protection Agency are political appointees, picked by the President for a limited term. They oversee more than 200 federal executives who rose through the EPA ranks over many decades. Those federal executives manage the EPA's 15,000-strong workforce, and assist the political leadership in mobilizing the agency's resources to achieve the administration's priorities.[11]

The Senior Executive Service was established in 1979, following the Civil Service Reform Act of 1978.[12] The goal was to "attract and retain highly competent senior executives," by designing an executive pay package that would be contingent on "executive success." The newly-designed executive pay had a lower and upper bound, corresponding to 120% of GS-15 and 100% of EX-IV.[13] Executives also received a small cash bonus and a locality pay adjustment, based on their geographic location.[14] Importantly, executives received virtually automatic and identical annual pay raises. Thus, while executive pay was generally higher than non-executive pay, it followed the same principles: bound between a floor and a ceiling,

[10] This section is based primarily on Government Accountability Office (1980); Congressional Research Service (2007); Congressional Research Service (2012); and Congressional Research Service (2021).

[11] Note that some federal agencies are not part of the SES system and manage their executive talent independently. We rely on those cross-agency differences in Section 2.

[12] P.L. 95-454, Title IV, amending various sections of the U.S. Code, Title 5, Chapters 31, 33, and 35.

[13] GS is the General Schedule, the most common pay system in the federal government. EX is the Executive Schedule, reserved for political appointees and organized in reverse order, such that EX-IV is the lowest rank and EX-I is the highest. SES is reserved for career bureaucrats, who are the focus of this paper.

[14] Locality pay for federal employees was introduced in 1994.

with salary progression determined by tenure rather than by performance.

By the late 1990s, the executive pay system came under scrutiny for two related reasons. First, there was no meaningful pay-for-performance system. In other words, executives were not rewarded for good performance, nor were they penalized for inadequate performance. For instance, the Director of the Office of Personnel Management (OPM)[15] stated:

> "[...] agencies rated 85% of their executives at the highest level their system permits. I believe most executives provide quality service to our citizens. However, these statistics suggest that agencies are not making meaningful distinctions between those who merely do what's expected and those with a consistent track-record of outstanding performance" (Office of Personnel Management, 2001).

A related challenge was a severe compression of executive pay: the lower bound of the SES pay was climbing with GS-15 pay levels, but the upper bound did not increase at the same rate. Thus, even if a pay-for-performance system will be installed, agencies will not be able to reward executives properly for good performance.

To address these challenges, a comprehensive executive pay reform was implemented in 2004. Agencies were required to establish new performance appraisal systems for their executives and to make meaningful distinctions in compensation based on performance. Once an agency adopted an appraisal system certified by the Office of Personnel Management (OPM), the pay cap for its executives was substantially increased.[16] Specifically, the pay cap for executives was raised from Executive Level IV (EX-IV) to either Executive Level III (EX-III) or Executive Level II (EX-II), with the higher cap reserved for agencies with a robust, OPM-certified performance appraisal system. Furthermore, the reform replaced automatic annual pay raises with performance-based pay adjustments.

1.2 Data

Our goal is to study how federal executives respond to pay-for-performance. To that end, we source a comprehensive dataset covering all federal employees who held an executive position

[15] This federal agency acts as the chief human resources officer of the entire Federal government.
[16] §1322 of the Homeland Security Act of 2002 (P.L. 107-296).

at any point between 1973 and 2013. The dataset was released by BuzzFeed News following a Freedom of Information Act request. It includes details on the employee's agency, occupation, original hiring date, location, and compensation. To the best of our knowledge, the data set is free from selection bias and includes the universe of executives from that period. For the main analysis, we focus on executives who can be unambiguously tracked over time. We therefore remove observations with incomplete names or names that appear more than once in a given year. Our final sample includes 23,763 unique executives working in 397 agencies, total of 156,634 executive×year observations. Parts of the analysis require information on the executive's career before and after their elevation to the executive position. This broader sample includes 383,892 employee×year observations.

Table 1 reports descriptive statistics of federal executives. Compensation variables are adjusted for inflation and expressed in constant 2023 USD. In Panel A we focus on the executive stage, that is, when the employee held an executive position. The average executive has 16 years of experience in the government and is 52 years old. The unconditional turnover rate among executives is 10.8%. 94% of executives have a college degree and three quarters have received postgraduate education. The average executive earns $212,929 and their salary grows by 1.3% on average. This level of salary about $30,455 or 14.2% below the government-wide executive pay cap. For comparison, other studies find 23%-33% promotion incentives among enforcement attorneys at the SEC and the EPA (Kalmenovitz, 2021; Chen and Kalmenovitz, 2021). Thus, it appears that federal executives face limited pay growth opportunities. Of course, those comparative promotion incentives were calculated among non-executives who can get promoted to the next rank. Executives, on the other hand, by definition have reached the top rank in the federal bureaucracy. Taking into account the executive's entire career (Panel B), the average executive earns $179,367 in salary and spends three-quarters of their government careers assuming a managerial role.

1.3 Pay-for-performance and realized pay

In Figure 1, we plot the evolution of executive pay in the federal government from 1979 to 2023.[17] Each year, we compute the upper and lower bounds of executive pay (1^{st} and 99^{th} percentiles), and the mean and standard deviation of pay across all federal executives. The gray line indicates the year in which performance pay was implemented. Two important facts emerge. First, the reform significantly increased the range of executive pay. Before the reform (2000-2003), the upper bound of executive pay was $15,000 (12%) higher than the lower bound. After the reform (2005-2007), the upper bound was $47,000 (40%) higher than the lower bound. In other words, the reform relieved the pay compression for federal executives and more than doubled the pay growth potential.[18] Second, the reform significantly increased the variation in pay across executives. The standard deviation of realized pay was $4,200 before the reform, and it more than doubled to $10,000 after the reform. The reform aimed to create meaningful distinctions between executives based on performance, and the substantially higher variation in pay is consistent with this goal.[19]

In sum, the reform led to substantial changes in executive pay. The pay ceiling has been raised and the variation in pay across executives has increased. Both outcomes are indicative of a pay-for-performance system, with opportunities for pay growth in accordance with performance. This is helpful, because it provides clear evidence that the new pay-for-performance system was not merely "cheap talk:" it was implemented on a large scale and had a demonstrable impact on executive compensation. This pivot toward pay-for-performance was intended to retain executive talent and to improve their productivity, and we now turn to investigate those goals. The analysis is conducted in three steps. In Section 2,

[17] Information on the years 2014-2023 comes from a separate data set beginning in 1996, provided by Kalmenovitz and Vij (2021) and Kalmenovitz, Vij, and Xiao (2022).

[18] The decline in the pay floor is not driven by pay cuts for incumbents. Of the 5,050 executives who remained in government before and after the reform, only 4 experienced a pay cut. Instead, the decline reflects lower starting pay accepted by new entrants. In Figure A.1, we reproduce the figure using only executives who were already in government prior to the reform. This version confirms that the pay floor for incumbents exhibits no visible decline.

[19] As we show in Section 3.4, when executives are paid for performance, the volatility of their productivity (σ) leads to higher variation in their wages.

we implement a difference-in-differences test to see how pay-for-performance affected exits from the public sector to the private sector. In Section 3, we develop a structural model that ties pay-for-performance to the executive's joint decision on effort and exit. Finally, in Section 4, we estimate the model based and study the quantitative implications of pay-for-performance.

2 Impact on exits

In this section, we turn to study how pay-for-performance pay schemes affect the decision to resign. We find a substantial increase in turnover rates among federal executives following the 2004 executive pay reform (Section 2.1). Moreover, we document the same pattern among financial regulators (Section 2.2) and the Federal Aviation Administration (Section 2.3), where a separate set of pay-for-performance reforms were followed by higher turnover rates. Combined, those results provide a plausible causal evidence, whereby pay-for-performance induces exits.

2.1 Federal executives

2.1.1 Main evidence

Our first analysis exploits the adoption of performance pay for executives with SES pay rank in 2004. Specifically, we estimate the following difference-in-differences specification:

$$Exit_{i,t+1} = \beta \cdot Post_t \cdot Treated_i + X^{'}_{i,t} + \alpha_t + \alpha_a + \epsilon_{i,t} \tag{1}$$

Where $Exit_{i,t+1} = 1$ if executive i left the government at time $t+1$, and $Post_t = 1$ if year t is greater than or equal to 2004. We limit the analysis to the years 2001-2007, creating a symmetric window of ± 3 years around the treatment year. $Treated = 1$ if the executive was on the SES pay scale before the reform.[20] To construct the control group, we note that the treatment (executive pay reform) was implemented only among agencies that were part of the SES system. Therefore, our control group includes agencies that have never been part of the SES system, instead implementing independent pay systems for their managers. We further exclude agencies that were opened or closed within ±5 years of the reform, since agency openings and closures often cause abnormal turnover. This leaves a sample of 26 agencies (see list in Table A.1). Within those agencies, we include in the control group only employees who are comparable to our treated group of federal executives. To that end, we focus on employees who held a managerial position before the SES reform, defined as those with supervisory level 2 through supervisory level 7.[21] This ensures that control group consist of relative senior employees, who are comparable to our treated group of executives. The coefficient β captures the impact of the reform on turnover rates among treated executives. We control for the executive's tenure and average pay in the pre-reform period, both in logs. Note that we use pre-treatment values to avoid inclusion of "bad controls" in our specification. We add agency (α_a) and year (α_t) fixed effects, which absorb $Post$ and $Treated$, respectively. Standard errors are clustered at the agency level.

Table 2, Panel A, reports the findings. Column (1) reports estimates from our baseline specification, showing a substantial rise in exit rates among treated executives following the reform. In column (2) we add occupation×year fixed effects. This addresses a concern that some occupations were affected by contemporaneous shocks, for instance, increased demand for accountants and attorneys following the passage of Sarbanes-Oxley Act in 2002. In column (3) we includes age bin×year fixed effects, allowing us to compare exit rates of people with similar age. This addresses a concern that differential exit rates across age groups drive of our results. Finally, column (4) includes city×year fixed effects, addressing the possibility that employment opportunities may vary by location and affect turnover decisions. Across

[20] Executives who joined the government after the reform may have preference for pay-for-performance, and therefore have self-selected into the treatment group.

[21] Here we rely on the definitions used by the Office of Personnel Management.

all specifications, we find that treated executives experienced a 3.8 to 4.5 percentage point increase in their propensity to leave the government relative to executives in control agencies. This effect is economically meaningful, representing a 37% to 44% increase compared to the sample mean.

A key identifying assumption for our analysis is that, absent of the SES reform, the exit rates of treated and control groups would have followed parallel trends. While this assumption is untestable by definition, we examine potential pre-trends by estimating a dynamic version of Equation 1:

$$Exit_{i,t+1} = \sum_{k=2001}^{2007} \eta_k \cdot Treated_i \cdot [\mathbb{1}(Year_t = k)] + \alpha_a + \alpha_{o,t} + \epsilon_{i,o,a,t}, \tag{2}$$

where $Exit_{i,t+1} = 1$ if executive i exits the public sector in year $t+1$, α_a is agency fixed effects, and $\alpha_{o,t}$ is occupation-year fixed effects. Here, $\mathbb{1}(Year_t = k)$ is an indicator variable that equals one when the year t equals k. We plot the resulting coefficients in Panel A Figure 2. The figure reveals a sharp increase in turnover immediately following the reform, suggesting that the effects are not driven by secular trends. Exit rates peak within the first three years after implementation and then decline toward the end of the event window. These patterns provide support for a causal interpretation of the findings.

2.1.2 Additional evidence

In this section, we briefly describe additional analyses expanding our baseline results. First, we re-estimate our main specification using all employees (not just managers) in the control group. The results in Table A.2, Panel A, are similar to the baseline ones. Next, we re-estimate Equation 1 with two separate outcome variables: exit by an executive who is below (above) the age of 60. Intuitively, executives who exit while still young are more likely to obtain a private sector job. The results in Panel B of Table A.2 indicate that exits are driven by younger executives, less than 60 years old. The point estimates for this group (columns

1–3) range from 0.038 to 0.042 and are all statistically significant, while the point estimates for older executives (columns 4-6) are small and become statistically insignificant in tighter specifications. Comparing these estimates to the baseline estimate in column (1) of Table 2, we infer that 90% of the increase in exits (0.041/0.045) are driven by younger executives who likely switch to a private sector job.

Our second test examines the cross-sectional impact of performance pay. In particular, we would like to see whether the treatment effect is concentrated among high-ability executives. This is important from a policy perspective. Moreover, our model predicts that exits are concentrated among high-ability regulators who have a better outside option (see Section 3.3). To study this question, we first estimate the executive's ability in the spirit of Abowd, Kramarz, and Margolis (1999):[22]

$$\log(\text{Wage})_{it} = \alpha_i + \alpha_{ot} + \log(\text{Tenure})_{it} + \epsilon_{iot} \tag{3}$$

In this specification, $\log(\text{Wage})_{it}$ is the log of pay for individual i in year t; α_{ot} denotes office-by-year fixed effects,[23] $\log(\text{Tenure})_{it}$ captures the (log) tenure of the executive, and α_i represents individual fixed effects. We use the estimated individual fixed effects $\hat{\alpha}_i$ as a proxy for ability. Intuitively, after accounting for office-wide pay trends and tenure-based compensation growth, these fixed effects capture persistent differences in pay across individuals, which are likely to reflect underlying differences in individual ability. We estimate Equation 3 in the decade preceding the reform (1993–2003),[24] divide the sample into low-, medium-, and high-ability groups based on yearly terciles of estimated ability, and estimate Equation 1 separately for each subsample. The results in Table 2, Panel B, show that the increase in exits rates was driven by high-ability executives. The point estimate is statistically significant only for this group. Moreover, the magnitude (8.3 percentage points)

[22] This is similar to estimating judicial leniency using judge fixed effects (e.g., Bernstein, Colonnelli, and Iverson (2019)) and CEO styles using CEO fixed effects (e.g., Bertrand and Schoar (2003)).

[23] An office is defined as a unique agency-by-city combination.

[24] The result from this regression are in Table A.3.

equals the sample mean, and is approximately twice as large as the estimates for low- and medium-ability groups.[25]

Finally, we collect additional data on the outside options of federal executives who left the government. To that end, we match the executives from our payroll dataset to career records from Revelio Labs which are based on LinkedIn profiles. The matching process, which we outline in Appendix A.1, yields a sample of 201 federal executives. Table A.5 summarizes our findings. The majority (60%) join for-profit firms, nearly half of which (25%) are publicly listed firms. More interestingly, federal executives obtain a substantial pay raise after their departure: their final government pay is $232,000, compared to $386,000 they make in the private sector, equivalent to 66% pay increase.[26] Following their departure from government, nearly 80% of federal executives transition into high-ranking roles. In particular, more than 60% assume either director-level positions (e.g., head of legal) or executive-level roles (e.g., managing partner). Finally, federal executives enter a wide range of industries, many of which can leverage their prior government experience – such as public sector management, defense, consulting, and legal services.

2.2 Financial regulators

In this section, we provide independent evidence on how pay-for-performance affects employee resignations. Our focus here is on the staggered adoption of pay-for-performance schemes by 10 financial agencies, between 1981 and 2006. We provide the list of financial agencies, their respective adoption dates, and additional institutional details in Table A.6. As opposed to the executive pay reform, these reforms were implemented in different years by comparable agencies that share similar structures and mandates. Consequently, any alternative explanation must account for the high turnover rates in treated agencies during

[25] For robustness, we consider two alternative specifications to estimate ability: (1) replacing office-by-year fixed effects with agency-by-year and city-by-year fixed effects, and (2) augmenting the model with occupation-by-year fixed effects. The results, reported in Table A.4, are very similar.

[26] These figures are based on the first job after leaving the government, and they are consistent with our structural estimates in Section 4.1, which suggest that executives heavily discount private sector pay.

each adoption period, significantly raising the bar for such alternative explanations.

Concretely, we estimate a version of Equation 1, adapted to a stacked differences-in-differences framework:

$$Exit_{c,i,a,t} = \beta \cdot Post_{c,t} \times Treated_{c,a} + \gamma^{'} X_{c,pre,i} + \alpha_{c,t} + \alpha_{c,a} + \varepsilon_{c,i,a,t} \tag{4}$$

$Exit_{c,i,a,t} = 1$ if individual i, working in agency a during year t and belonging to cohort c, exits government employment in $t + 1$, and 0 otherwise. $Treated_{c,a} = 1$ if agency a adopted pay-for-performance in cohort c, and $Post_{c,t} = 1$ in the post-adoption period of cohort c. $\alpha_{c,a}$ and $\alpha_{c,t}$ represents agency×cohort and year×cohort fixed effects, respectively, subsuming $Post_{c,t}$ and $Treated_{c,a}$. Additionally, we control for the employee's pre-reform pay and tenure, to account for individual-level differences. We gradually add tighter fixed effects, similar to Section 2.1, with one addition described below. Standard errors are clustered at the agency level to address potential within-agency correlation in the errors.

To build the sample for this analysis, we focus on a seven-year event window surrounding each P4P adoption (±3). The control agencies include those that did not switch to a P4P regime before the treated agency. This group is comprised of yet-to-be-adopters, as well as never adopters (Financial Crimes Enforcement Network) and always adopters (Office of Thrift Supervision).[27] Note that nearly all agencies in the control group eventually adopted P4P but at different time periods. As a result, we compare turnover rates at agencies that adopt P4P to those that adopt it in different time periods, which helps mitigate selection concerns. We exclude control agencies that made substantial changes to their pay structure within five years before the event window (regardless of whether or not they adopted to P4P). For instance, the FDIC was affected by a reform in 1989 that aligned its pay with other financial regulators; therefore, we exclude the FDIC from the control group for the 1991 and 1993 cohorts.[28]

[27]We do not have a separate agency code for the OTS prior to 1991, the exact year in which the agency adopted pay-for-performance. Therefore, for practical purposes, we consider the OTS an "always adopter."

[28]For similar reasons, the Farm Credit Administration is excluded from the 1991 cohort, because it intro-

Our results are summarized in Table 3, Panel A. Column (1) estimates the baseline specification, showing a substantial rise in exit rates among treated agencies. Column (2) adds occupation×year×cohort fixed effects, to address the concern that exit is driven increased demand by the private sector for financial regulator. Column (3) adds manager×year×cohort fixed effects. This is different from Section 2.1, where the sample is limited to managers. Here, adding those fixed effects helps remove time-varying shocks that have larger impact on employees in managerial positions. Column (4) includes age bin×year×cohort fixed effects, and column (5) includes city×year×cohort fixed effects, similar to Section 2.1. Across all specifications, we find a positive and statistically significant coefficient on *Treated*×*Post*, indicating that employees in treated agencies are more likely to exit after the adoption of pay-for-performance, compared to their counterparts in control agencies. The estimated effects are economically meaningful, with an increase in exit propensity ranging from 25% to 55% relative to the sample mean. This result is consistent, both in its direction as well as the magnitude, with our findings from the executive reform in Section 2.1.

To support the causal interpretation, Panel B of Figure 2 illustrates the turnover dynamics following the implementation of performance pay reforms in financial agencies. The results closely mirror those observed in the SES reforms: an initial increase in turnover that gradually dissipates toward the end of the event window. We also assess the similarity between the treated and control groups via a balancing test. The results, reported in Table A.7, reveal no significant differences in observable characteristics between employees in the treated and control groups. While similarity between the treated and control groups is not a necessary condition for the validity of a difference-in-differences framework, observing such similarities strengthens the causal interpretation of our findings. Concretely, it supports our claim that the financial agencies in our samples are comparable.

duced the the VE pay plan in 1991, and the CFTC is excluded from the 2002 and 2003 cohorts, because it switched from GS to CT pay plan in 2003.

2.3 Federal Aviation Agency

In this section, we discuss another independent evidence on how pay-for-performance affects turnover rates. We now exploit the Federal Aviation Administration's (FAA) expansion of performance pay in 2004 as an alternative identification strategy. Specifically, in 2004, the FAA and the National Air Traffic Controllers Association reached an agreement to expand the share of air traffic controllers whose pay was tied to performance, from 37% to 75%. Performance was measured based on operational errors, runway intrusions, on-time performance, and arrival efficiency rates.[29] This reform treated some, but not all, employees within the same agency. In contrast, the executive reform (Section 2.1) treated a class of employees working in different agencies, and the financial reforms (Section 2.2) treated entire agencies at different points of time.

With that in mind, to study the FAA reform, we estimate the following version of Equation 1 and Equation 4:

$$Exit_{i,o,t} = \beta \cdot Post_t \times Treated_{i,t} + \gamma' X_{pre,i} + \alpha_t + \alpha_o + \varepsilon_{i,o,t} \tag{5}$$

$Exit_{i,t} = 1$ if individual i exits government employment in $t+1$ and 0 otherwise. $Treated_{i,t} = 1$ if individual i is an air traffic controller in year t, and $Post_t = 1$ for years 2004 and beyond. α_o and α_t denote occupation and year fixed effects, respectively, subsuming $Treated_{i,t}$ and $Post_t$. Consistent with previous strategies, we control for employees' pre-reform pay and tenure. Standard errors are clustered at the occupation level to account for potential within-occupation correlation in the errors. To assemble the sample for this analysis, we focus on FAA employees during a symmetric window of ± 3 years around the 2004 reform. To ensure a more comparable control group, we exclude non-traffic controllers with salaries below the 1st percentile of air traffic controllers' pay in a given year (the results are almost identical without this filter).

[29] For background information, see here.

Our findings are summarized in Table 3, Panel B. Column (1) presents the baseline specification. Column (2) adds manager×year fixed effects to control for time-varying shocks that disproportionately affect managerial employees. Column (3) includes age bin×year fixed effects to compare exit rates among employees of similar age. Finally, column (4) incorporates city×year fixed effects to account for geographic variation in employment opportunities.[30] Across all specifications, we find a positive and statistically significant coefficient on *Treated*×*Post*, indicating that air traffic controllers experienced an increase in likelihood of leaving the government after the adoption of P4P compared to other FAA employees. These results complement our prior findings, since in this setting the higher exit rates are identified within agency. Thus, they cannot be attributed to agency-wide changes, such as downsizing or change in leadership. Note that exit rates increased by 59%-102% relative to the sample mean, a larger effect than the ones we document in for executives (Section 2.1) and financial agencies (Section 2.2). One possibility is that air controllers did not see an increase in the pay ceiling, a channel we explore in greater detail in the next sections.[31]

3 Structural model

In Section 2, we have shown that pay-for-performance reforms increase exit rates. We found a similar pattern in three independent settings: federal executives (Section 2.1), financial agencies (Section 2.2), and the FAA (Section 2.3). This response is surprising, since the reforms were designed to reward and retain productive workers. In this section, we develop a structural model to better understand the mechanisms driving this finding. The model will also help us formalize the link between pay, turnover, and the unobservable effort. Note that the model describes the optimization problem of a federal executive, but it is quite general, and applies to any public sector employee with a similar pay structure. In practice,

[30]As opposed to Panel B, here there is no need for agency or agency×year FE, since the FAA is the only agency in the sample.

[31]See, for instance, complaints by FAA employees on how their salary hits the pay cap after performance pay was implemented.

we estimate the model using the sample of federal executives for two key reasons: this reform affected many agencies (not just the FAA), and our model is better suited for analyzing a single event (rather than a sequence of staggered reforms).

3.1 Setup

3.1.1 Public sector wage

A government executive earns a realized wage, which we model as:

$$\widetilde{w}_t^g = \min \{\overline{w}_t,\ w_t^g\} \tag{6}$$

The left-hand side term, $\overline{w}_t$, is a government-wide pay cap which applies uniformly to all executives. The right-hand side term, w_t^g, is an executive-specific uncapped pay. This uncapped pay can exceed the pay cap, but the realized pay ($\widetilde{w}_t^g$) cannot. This fundamental tension has important implications in our model.

The executive's uncapped pay (w_t^g) is a function of tenure and performance:

$$\log(w_t^g) \ = \ \underbrace{\alpha_{Base} TenurePay_t}_{\text{deterministic}} \ + \ \underbrace{\alpha_{P4P} \max\{0,\ \ \log(z_t)\}}_{\text{stochastic}} \tag{7}$$

In words, the uncapped pay consists of two factors: a deterministic component which depends on tenure, $TenurePay_t$, and a stochastic pay-for-performance component which depends on productivity, z_t. The weights of the two parts sum up to one and are given by α_{Base} and α_{P4P}, respectively. The parameter α_{P4P} represents the exposure to pay-for-performance. If $\alpha_{P4P} = 0$, there is no pay-for-performance, meaning that wages are deterministic and based solely on tenure. As α_{P4P} increases, the executive is more exposed to pay-for-performance. Crucially, bad performance can never reduce the executive's pay, while good performance can increase his pay beyond the deterministic tenure-based component (up to the pay cap). This condition is captured by the right-hand side term in Equation 7.

The executive's productivity (z_t) evolves according to:

$$\log(z_{t+1}) = \underbrace{\rho \log(z_t)}_{\substack{\text{past}\\\text{productivity}}} + \underbrace{\mu_t(1-\rho)}_{\text{drift}} + \underbrace{\sigma\varepsilon_{t+1}}_{\text{shock}}, \quad \varepsilon_{t+1} \sim \mathcal{N}(0,1), \tag{8}$$

such that the next period productivity z_{t+1} is a function of last period productivity z_t, a drift μ_t, and a productivity shock ε_{t+1}. The drift is influenced by the executive's tenure and their coice of effort, f_t:

$$\mu_t(f_t) = \log(f_t) + TenurePay_t. \tag{9}$$

Looking jointly at Equation 7, Equation 8, and Equation 9, note the following. First, productivity is expected to increase with effort (f_t) and over time ($TenurePay_t$). Furthermore, the importance of the pay-for-performance component grows over time, through the influence of $Tenure_t$ on the drift μ_t.[32] When exerting a neutral level of effort (defined as $\log(f_t) = 0$), the executive expects to be paid as if there was no pay-for-performance, since the expected value of $\mathbb{E}(z_t) = TenurePay_t$. The parameters ρ and σ represent the persistence and volatility of the productivity process. By exerting more effort today, the executive expects to increase productivity moving forward. However, the realization of productivity also depends on the shock ε. In other words, the executive can be rewarded for performance that's either due to effort f_t or the random noise ε.

3.1.2 The outside option

The government executive has an outside option, meaning a potential job in the private sector. We model the expected value of the outside option as:

$$o_t = \frac{1}{\theta} \cdot \phi_t \cdot w_t^o, \tag{10}$$

where w_t^o is the private sector wage, ϕ_t is the private sector pay differential, and θ is

[32] This ensures that the deterministic component does not outgrow the stochastic one over time.

the public sector preference. The private sector wage w_t^o evolves differently than the public sector wage w_t^g. Concretely, we model it as:

$$\log(w_t^o) = \underbrace{\alpha_{Base}^o TenurePay_t^o}_{\text{deterministic}} + \underbrace{\alpha_{P4P}^o z_t.}_{\text{stochastic}} \tag{11}$$

There is some similarity between the private sector wage (Equation 11) and the public sector wage (Equation 6 and Equation 7): they are both determined by tenure and productivity. However, there are three important differences. *First*, tenure-based pay ($TenurePay_t$) could grow at a different rate, and performance pay could have a different weight (α_{P4P}). *Second*, the realized public sector wage never decreases, even with dismal performance. Private sector executives, on the other hand, could experience cuts in the variable component of their salary due to poor performance, which is captured by the right-hand side term in Equation 11. *Third*, the realized public sector wage is capped from above, meaning that the upside of good performance is limited. The realized private sector wage, on the other hand, has no such cap. Thus, unlike in the government pay, pay-for-performance in the private sector has no floor or ceiling.

To derive the value of the outside option in Equation 10, we consider two additional adjustments. First, we include a private sector multiplier (ϕ_t), to account for the substantial wage differential between the public and private sector. Second, we include the parameter $\theta \in [1, \infty)$, representing a preference for the public sector. Equivalently, $\frac{1}{\theta}$ is a discount of the private sector. If $\theta = 1$, the executive has no particular preference for the public sector. As θ increases, the executive discounts the private sector wage even more. The addition of θ is motivated by earlier studies, both theoretical and empirical, arguing that employees in the public sector have a strong intrinsic motivation to serve the public interest (Macchiavello, 2008; Jaimovich and Rud, 2014; Pitts, Marvel, and Fernandez, 2011; Bond and Glode, 2014). Federal executives, in addition, hold powerful positions which affect large sections of the economy. They enjoy various benefits,[33] and post-employment restrictions could limit the financial gains during the first years in the private sector (Law and Long, 2012; Strickland, 2020; Kalmenovitz, Vij, and Xiao, 2022).

3.1.3 Decision on effort and resignation

At time t, after observing the pay for this period, the executive jointly makes two decisions: the level of effort and the employer for the next period. In other words, they choose whether to continue working in the public sector for one more period ($q_t = 0$), or exercise their outside option and quit ($q_t = 1$).When deciding whether to quit today, the executive also considers how much effort they will exert tomorrow, since that would affect the performance pay component and the evolution of productivity going forward. Let t_Q denote the time at which the executive voluntarily quits to join the private sector. The executive also faces a mandatory retirement age at t_R. Retirement income is non-stochastic and and defined by the replacement rate λ of the final wage $\lambda\widetilde{w}^g_{t_R}$. The executive collects the retirement income for t_N more years upon retirement. Therefore, $\lambda\widetilde{w}_{t_R}$ determines the terminal value at the retirement age, V^R. Given this restriction, $t_Q < t_R$. Let $t_E \in \{t_Q, t_R\}$ indicate the time at which the executive exits the public sector, either by choice (t_Q) or due to mandatory retirement age (t_R).

We assume that the executive is risk averse and effort averse, with a constant relative risk aversion over their period t wage (similar to Hirshleifer and Suh, 1992; Page, 2018):

$$u(w, f) = \frac{(w-1)^{1-\gamma}}{1-\gamma} - \xi(\overline{f} - f)^{-1}, \tag{12}$$

where $\gamma > 0$ and $\xi > 0$ represent risk aversion and cost of effort, respectively, and $\overline{f}$ is the maximum possible effort. This specification implies that the executive prefers receiving a certain wage w over a risky wage with the same expected value. Moreover, high levels of effort induce strong disutility for the executive.

[33] See, for instance, a description of benefits for SES positions by the Department of Energy and the media.

The executive's salary is set at the beginning of period t and consumed during the period. The executive's expected utility at time t is then:

$$U_t \;=\; \underbrace{\mathbb{E}_t \sum_{s=t}^{t_E} \beta^{s-t} u(\widetilde{w}^g_s, f_{s+1})}_{\text{gov't period}} \;+\; \underbrace{\beta^{t_E+1-t} q_{t_E} U^E}_{\text{post-gov't period}}, \tag{13}$$

where β is the discount factor. The left-hand side term captures the expected utility from government pay, until the exit point t_E (whether by choice or due to retirement).[34] The right-hand side term captures the next period's expected utility from receiving non-government pay. This includes the executive's retirement benefits or the private sector income, if the executive quits before the retirement age. We assume that, when deciding whether to exit the public sector, the executive chooses how much effort to exert in the private sector ($f^q_{t_E}$) and expects to keep his effort at this level throughout the private sector career.[35]

We consider two cases of Equation 13. In the first scenario, the executive retires from the public sector at the mandatory age. In other words, $t_E = t_R$ and $q_{t_R} = 1$. In this case, the term U^E is:

$$U^E = U^R = \sum_{s=t_R}^{t_N} \beta^{s-t_R} u(\lambda \widetilde{w}^g_{t_R}).$$

which is the present value of retirement paychecks, based on the executive's terminal wage in the public sector $\widetilde{w}_{t_R}$ (which depends on the terminal level of effort t_R chosen at time t_{R-1}) and the replacement factor λ. In the second scenario, the executive chooses to quit at time $t_Q = t_E < t_R$ and $q_{t_Q} = 1$. In other words, their government career is followed

[34] Note that period s effort f_s was chosen at time $s-1$ and affects wages at time s. However, it is the decision about next period's effort f_{s+1} that affects the executive's utility today.

[35] This is a simplifying assumption at the point of exit, when the executive calculates the value of the outside option. We do not track the executive's post-government career, and they may decide to change the level of effort at some point.

by a private sector career and then retirement. In this case, U^E is:

$$U^E = U^Q = \underbrace{\sum_{s=t_Q}^{t_R} \beta^{s-t_Q} \mathbb{E}_{t_Q}[u(o_s, f_{t_Q})]}_{\text{private sector career}} + \underbrace{\sum_{s=t_R}^{t_N} \beta^{s-(t_R-t_Q)} \mathbb{E}_{t_Q}[u(\lambda o_{t_R}, f_{t_R})]}_{\text{retirement period}},$$

where $\mathbb{E}_{t_Q}[u(o_s, f_{t_Q})]$ captures the expected utility of the private sector wage at time s, if the executive quits the government job at time t_Q, and $\mathbb{E}_{t_Q}[u(\lambda o_{t_R}, f_{t_Q})]$ is the expected utility of the retirement benefits when quitting the government job at time t_Q.[36]

3.2 Model solution

Every period, the executive faces three state variables: current level of effort f_t, current realization of private sector premium ϕ_t, and current productivity z_t. The executive then chooses whether to quit or continue (q), and the level effort if staying (f) or quitting (f^q). Their goal is to maximize the present value of discounted future income. This decision is summarized in the following Bellman equation:

$$\begin{aligned} U(f_t, \phi_t, z_t) = \max_{f_{t+1}, f^q_{t+1}, q_{t+1}} \Big\{ & u(\widetilde{w}^g_t, f_{t+1}) + (1 - q_{t+1})\beta \mathbb{E}\left[U(f_{t+1}, \phi_{t+1}, z_{t+1})\right] \\ & + q_{t+1}\beta \mathbb{E}\left[U^E(f^q_{t+1}, \phi_{t+1}, z_{t+1})\right] \Big\}. \end{aligned} \tag{14}$$

The problem in Equation 14 is solved by discretizing the state variables f, ϕ and z and then applying backward induction, starting at $t = T$. The solution consists of two decision rules: whether to quit the public sector job and how much effort to exert, with respect to the next period. Each decision rule is a function of the three state variables: productivity z, effort f, and tenure t.

[36] For tractability, we assume that productivity is transferable and that effort in public sector increases the value of the outside option.

3.3 Optimal effort and exit policies

We illustrate the optimal effort and quitting choices in Figure 3. For illustration purposes, we use the parameters from Table 4 and Table 5, which we discuss in the next section.

Starting with effort, note that greater effort yields a short-term disutility due to cost of effort ξ. On the other hand, greater effort will increase productivity and hence the expected wages in the next period. This dynamic is captured in Panel A. First, effort decreases with tenure (the areas become darker), as the upside of effort is limited: the deterministic component of pay pushes the realized pay closer to the cap, which reduces the incentive to exert additional effort. Second, there is a non-linear relation between effort and productivity. For low-productivity employees, the deterministic component and the pay floor ensures that they get sufficient compensation, resulting in no incentive to exert effort. For high-productivity employees, the pay-for-performance component pushes the realized pay closer to the cap, and the executive will stay close to the cap due to the persistence of the productivity process. Therefore, they also have a weak incentive to exert effort. However, as they approach the area in which they optimally exit, they again try to exert more effort so as to maximize their uncapped pay in the private sector.

Exit policy involves a different trade-off. The private sector can offer higher pay, due to pay differentials ϕ and the lack of pay cap. On the other hand, the private sector pay is more exposed to performance shocks, resulting in lower pay during periods of bad performance. We capture this dynamic in Panel B. First, exits increase with productivity.[37] Productive executives prefer the uncapped pay of the private sector, since the upside from being a top performer in the public sector is capped and the value of their outside option is higher. Second, as the executive is close to retirement age, two opposing factors emerge. On the one hand, the executive is more likely to reach the maximum allowable pay in the public sector. Thus, the upside from staying in the government is even lower. On the other hand, adverse

[37] This is consistent with our results in Section 2.1.2 and Panel B of Table 2, showing that performance pay triggered voluntary exits by high-ability federal executives rather than low- or medium-ability ones.

productivity shocks can lower his last wage, which would be the benchmark for his entire retirement income stream. On balance, as the executive gets especially close to retirement, quitting rates decrease.

Panel B also captures the interdependence between exit and effort. We do so by plotting the exit policy in two scenarios, with high and low levels of effort (light and dark shades, respectively). We find that effort increases the incentive to quit: as we shift from the dark shade to the light one, the quitting region expands to younger and less productive employees. This is because the private sector rewards effort more extensively, without imposing an upper bound on salaries. Younger employees with higher effort are more likely to hit the pay cap, even though the deterministic component of their wages is relatively smaller, and thus their incentives to quit increase. Moreover, greater effort increases the expected productivity, and thus even medium-productivity employees prefer to exit.

As an extension, in Figure A.2 we demonstrate another potential link between effort and exits. We do so by investigating changes in the pay differentials (ϕ) and the pay-for-performance component (α_{P4P}). We see that higher pay differentials (moving from dark to light shade) expand the exit region: less productive and less experienced employees become more likely to quit. Anticipating their move to the private sector, employees choose to exert more effort. Similarly, higher performance pay also increases the exit region. It induces more effort, which results in higher turnover as the compensation for effort in the private sector is more substantial.[38]

3.4 Estimation

Having established the model, we turn to the the structural estimation. We focus on the sample of treated executives on the SES pay plan over the sample period of 1996–2012, that is, ±8 years around the reform. We first estimate several parameters outside of the model, such as the deterministic components of wages. Those are reported in Table 4. We then estimate

[38]For this analysis, we hold the public sector preference (θ) constant. However, changes to α_{P4P} and ϕ will likely weaken the preference, which will further increase effort and exit.

the remaining parameters of interest: pay-for-performance (α_{P4P}), public sector preference (θ), cost of effort (ξ), and the persistence (ρ) and volatility (σ) of productivity. We start by estimating the parameters describing the public sector wage. We model $TenurePay_t$, the deterministic component of public sector wages (Equation 7), as a linear function of tenure:

$$TenurePay_t = l_0 + l_t \times t \tag{15}$$

We scale each executive's wage by their first available salary in the public sector.[39] As a result of this scaling, the executive's wage at time 0 is 1, which implies that $l_0 = 0$. To estimate l_t, we regress the log of the relative salary on tenure while controlling for executive, agency, city, and occupation fixed effects to remove unobserved heterogeneity. Based on the results, which are presented in Table A.8, we set the deterministic trend (l_t) to be 0.0320. This means that the annual pay raise is 3.2%.

Next, we turn to the executive pay cap ($\overline{w}$). As with wages, we normalize it by the executive's first initial salary. The scaled variable represents the growth potential of the executive's salary. We model the growth potential as growing linearly with time t, starting at the initial level $\overline{w}_0$:

$$\log(\overline{w}_t) = \overline{w}_0 + \overline{w}_t \times t \tag{16}$$

To estimate $\overline{w}_0$, we calculate the average initial log growth potential in the year of hiring (for executives whose initial tenure year is in our sample), and find that the starting salary is 10.5% lower than the maximum allowable salary in that year. We then regress the log growth potential on time trend while controlling for executive, agency, city, and occupation fixed effects. Based on the results, which are presented in the second column of Table A.8, we set the deterministic trend ($\overline{w}_t$) to be 0.0234. This estimate implies that, on average, growth potential is increasing by 2.37% with each year of tenure.

[39] We thus effectively focus on the evolution of salary within executive, rather than across executives.

Next, we model the private sector pay differential as a lognormal random variable:

$$\log(\phi_t) \sim \mathcal{N}\left(\mu_\phi, \sigma_\phi^2\right) \tag{17}$$

To obtain μ_ϕ and σ_ϕ, we source data from the Federal Salary Council, which recommends annual adjustments the federal pay due to changes in the private sector labor markets.[40] We obtain all the reports for the years 2001-2012, and calculate the average and standard deviation of the pay differential across all years. The average pay differential is 21.97% with a standard deviation of 5.91%. We use these values for μ_ϕ and σ_ϕ, respectively.

To estimate the private sector wage w_t^o, we assume that the pay-for-performance in private sector α_{P4P}^o is 50%. This is based on the private sector compensation structure estimates of Humphery-Jenner et al. (2016) for non-CEO executives. For the deterministic part of private sector wage, $TenurePay_t^o$, we assume that, upon exiting the government, the executive's new private sector salary grows at a rate of $l_t + p_t$, where l_t is the growth rate of the deterministic component in the government (Equation 15). This means that it is exceeds the public sector salary growth rate by p_t. The estimated incremental growth rate of pay p_t is 0.0230 and we calculate it as the difference between the average salary growth of private sector workers in management, business, and financial occupations (which plausibly correspond to the federal executives in our sample) from the BLS Employment Cost Index, and the average growth of log wages of sample executives over the sample period.

We set the executive's risk aversion coefficient at $\gamma = 3$.[41] The risk-free interest rate r equals 2.75%, which is the average 3-month Treasury bill rate over the sample period. We assume that the executive works for a maximum of $T = 25$ years[42] and lives for additional $t_N = 15$ years after retiring from the public sector. Similar to Briggs et al. (2021), we set

[40] Its reports can be retrieved from the OPM website.

[41] It is close to, but higher than, the value of 2.05 reported in Page (2018) using CEOs in the private sector. This is because public sector employees are likely more risk averse. In Figure A.3, we demonstrate that lower risk aversion results in greater effort and more turnover.

[42] According to Office of Personnel Management (2019), the average length of service at retirement was 24.9 years in 2019.

the retirement replacement factor (λ) to 60%.

Finally, we turn to the key parameters of the model: the pay-for-performance (α_{P4P}), the public sector preference (θ), the persistence and volatility of productivity (ρ and σ), and cost of effort (ξ). We estimate those using the Simulated Method of Moments (SMM). We first solve the model numerically, given the parameters, and generate simulated data from the model. Then, we compute a set of moments from the simulated and the actual data. The SMM estimation procedure determines the parameter values that minimize the weighted distance between the model-implied moments and their empirical counterparts.[43]

3.5 Identification

The Simulated Method of Moments estimators are identified when the empirical moments equal the simulated moments if and only if the structural parameters are at their true value. A sufficient condition for this is a one-to-one mapping between a subset of structural parameters and the selected moments. In other words, the moments must vary when the structural parameters vary. Note that all the moments are somewhat sensitive too all the parameters, because effort and exit decisions are intertwined with the wage dynamics. However, some relationships are strongly monotonic in the underlying parameters, and are thus useful for identifying the corresponding parameter. When structurally estimating the model, we include all the meaningful moments generated by our model to understand which features of the data it can and cannot explain. Concretely, we focus on exit rate; variance and serial correlation of wages; mean, variance and serial correlation of pay gaps (difference between the executive's pay and the maximum allowable pay); and covariance between wages and pay gaps.[44]

The public sector preference θ is identified by the exit rate. Intuitively, for any level of salary we can find a value of θ such that the executive is indifferent between staying in the

[43] Appendix A.2 provides further details on the estimation procedure.

[44] In A.2 we discuss how these moments are calculated and how we remove unobserved heterogeneity from the data to make it comparable to the model.

government or switching to the private sector. The volatility of productivity σ is identified by the variance of the detrended wages: when σ is higher and the executive is paid for performance, the variation in detrended wages increases. The productivity persistence ρ is identified by the serial correlation of detrended wages, since high persistence yields a higher serial correlation. The pay-for-performance parameter α_{P4P} is identified by the mean pay gap: the greater the exposure to pay-for-performance, the greater the incentive to exert effort, and thus the higher the chance of hitting the pay cap (low pay gap).[45] Finally, the cost of effort ξ is identified by the covariance between wages and pay gaps, and the serial correlation of wages and pay gaps. When the cost of effort is high, employees exert less effort, making the noise component of productivity more prominent. As a result, wages and pay gaps become less persistent, and the correlation between them weakens.

4 Quantitative implications

In the previous sections, we presented empirical evidence on executive behavior (Section 2) and developed a structural model to formalize their decisions (Section 3). We now combine the two strands and study the quantitative implications of our findings.

4.1 The average federal executive

We first estimate the structural parameters that describe federal executives in the full sample. Table 5, Panel A, summarizes the results. We find that the persistence and volatility of productivity parameters are 0.7245 and 0.1613, respectively. This implies that the productivity process is fairly persistent and smooth. We estimate the cost of effort ξ at 0.0029. While this value alone does not have an intuitive interpretation, we can quantify its importance by looking at the elasticity of wages to ξ. We find that, for every 1% increase in the

[45] Importantly, α_{P4P} and σ have the opposite effect on effort, and thus the value of the outside option, and affect wage dynamics. Consequently, they influence the executive's optimal decisions differently. For example, they distinctively affect the mean of pay gaps, which helps separately identify the two parameters.

cost of effort, log wages decline by 0.02%, since the executive exerts less effort.

Perhaps more interestingly, we find that the pay-for-performance weight for federal executives is 9% ($\alpha_{P4P} = 0.0918$), while the deterministic component weight is the remaining 91%.[46] It implies that performance pay for federal executives is significantly lower than performance pay for private sector executives.[47] Early literature (Murphy, 1985, 1999) suggested that bonus and incentive pay accounted for 40% of total CEO compensation. Its importance has, however, steadily increased in the past decades and reached up to 75-80% in late 2000s (Frydman and Jenter, 2010; Murphy, 2013) and even up to 90% in 2019 (Edmans, Gosling, and Jenter, 2023). For example, as noted by Frydman and Jenter (2010), the incidence of option compensation has increased more than twofold, as it comprised 20% of total pay in early 90s and about half in early 2000s. To provide another benchmark, bonus and incentive pay account for 40-50% of non-CEO executives pay.[48]

Finally, we turn to the public sector preference (θ). We estimate θ at 2.11, which means that federal executives discount the outside option by 53% ($1 - 1/2.11$). To provide some context, an executive earning the average salary in our sample expects to earn \$282,060 in the private sector (constant 2023 USD; ignoring deterministic wage growth), which is about 25% higher than his salary in the public sector when taking into account the average pay differential μ_ϕ. However, due to the strong preference for the public sector, he behaves as if the private sector only paid $1/\theta$ of this amount, which is \$133,678.[49]

Note that the estimated parameters are all statistically significant with low standard errors, suggesting that the model is well identified. Furthermore, in Panel B of Table 5 we compare the data-implied and model-implied (simulated) moments. We find that the

[46] To be clear, we can only show that executives behave as if the pay-for-performance component in their wage is 9%. In other words, we are unable to estimate the true magnitude of pay-for-performance but can only provide one which is consistent with the behavior of executives in the data.

[47] Note that in our model the weight of pay-for-performance in the private sector is $\alpha_{P4P} = 50\%$. However, in addition the private sector wage has no floor and it also includes the multiplier ϕ. Because of that, the effective pay-for-performance sensitivity is substantially higher in the private sector.

[48] See, for instance, Humphery-Jenner et al. (2016); Deloitte Consulting LLP, and WorldatWork (2014); Compensation Advisory Partners and WorldatWork (2021); Gartenberg and Wulf (2013).

[49] See also the discussion in Section 2.1.2, based on LinkedIn data for a sample of federal executives.

estimated model fits the data fairly well, as the differences between the simulated and actual moments are small. For example, the simulated mean of pay gaps is 5.85% vs. 5.53% in the data while the simulated mean turnover rate is 13.99% vs. 12.18% in the data. Finally, in Table A.9, we find that the model parameters are locally identified by the moments, using the diagnostic measure of Andrews, Gentzkow, and Shapiro (2017). See a detailed discussion of those diagnostic tools in Appendix A.2.

4.2 Interpreting the executive pay reform

In the previous section, we discussed the average executive (Section 4.1). In this section, we study the subsample of executives working in the government after the reform's implementation, that is, between 2005 and 2012. The results are summarized in Table 5, Panel B. The persistence and volatility are largely similar to the estimates above (Section 4.1), but the parameters we are most interested are considerably different. First, pay-for-performance α_{P4P} is estimated at 24% (rather than 9%). This is in line with the reform's intent and we view this as a helpful validation of our model.[50] Moreover, we find that executives exerted 4.5% more effort after the reform as compared to the full sample. This effect is quantitatively large, and highlights that the reform did succeed in inducing more effort from the executives who chose to stay.

We further document a 13.5% increase in public sector preference θ (from 2.11 to 2.39), which corresponds to five percentage-points increase in the private sector discount (from 53% to 58%). Moreover, the cost of effort decreases.[51] In light of the discussion in Section 3.1.2, the reform has likely weakened the public sector preference. A performance-driven culture may diminish the "quiet life" quality and crowd out the intrinsic motivation to serve the public interest. Moreover, measuring performance in the government is not easy, and employees may perceive performance pay as unfair. For example, a survey found that only 12% of the

[50]Related to that, we have also re-calculated the parameters estimated outside of the model. We find that the initial pay cap $\overline{w}_0$ increases and the deterministic trend of wages l_t decreases, which is also consistent with the reform's intentions.

[51]As mentioned, the direction of change in ξ is more informative than its absolute value.

FDIC workforce believe that the now-suspended system fairly rewards their performance and contributions (link).[52] Thus, the stronger post-reform θ likely reflects an additional sorting effect. The shift to performance pay induced greater effort and potentially reduced the public sector preference. Both changes raised the value of the outside option. Executives with weaker ex-ante public sector preference, who were ambivalent about their government position, decided to leave. In contrast, executives with stronger ex-ante public sector preference chose to stay, even if their preferences may have been weakened by the pay reform. This selection effect is also evident in Figure 1 and Figure A.1, where we show that new entrants accept lower compensation, potentially due to a stronger preference for government work (see Section 1.3).

In sum, our model can shed new light on the response to performance pay. While performance pay induces more effort in the public sector, it also raises the relative value of the outside option via three related channels. First, performance pay reduces the preference for a public sector job. Second, by inducing more effort, performance pay increases the salary potential in the private sector. This is similar to numerous studies on the revolving door, showing that regulators can take actions during their government career to improve their outside option.[53] Third, by exerting more effort, the regulator is more likely to hit the government pay cap and cease reaping the benefit of the extra effort. Combined, those three channels motivated regulators to resign, especially those with low ex-ante preference for the public sector. This explains the results from the post-reform estimates: higher performance pay, more effort, and stronger public sector preference.

4.3 Heterogeneous executives

In the previous section (Section 4.1) we discussed the average executive. In this section, we compare the structural parameters in several subsamples, to sharpen our understanding of

[52] Indeed, in Section 5.2.2 we show that the results are consistent with a 0.75-1% decline in θ.

[53] In our model we focus on effort, which in practice could translate to leniency ("regulatory capture") or to strictness ("regulatory schooling"). As we do not observe performance in the data, separating those two is beyond the scope of this paper.

the underlying channels. The results are summarized in Table 7.

First, we investigate the differential impact on executives based on their pay. We split executives into two groups, based on their average pre-reform real wage, and estimate the model separately in each subsample.[54] Table 7, Panel A, documents substantial differences between the two groups. For high earners, the pay-for-performance is close to zero. Intuitively, since these executives are at or very close to the cap, their growth potential is limited. For similar reasons, they have a stronger preference for the public sector (higher θ), which explains their choice to stay in the government.

Next, we investigate the differential impact on executives based on their level of educations. Concretely, we separate those holding postgraduate degrees from all other executives (college degree or less). Table 7, Panel B, presents the results. We find that executives with postgraduate degrees are less exposed to pay-for-performance (α_{P4P} is 8.5% vs. 19% for college-educated executives). This is primarily due to their relatively higher salaries, which makes them less responsive to performance pay. Interestingly, we also find that federal executives with postgraduate degrees have much higher preference for public sector θ. Intuitively, since their outside options are likely more valuable, they must derive additional utility from their public sector job to account for their observed exit rates. Finally, we note that the cost of effort is substantially lower for highly-educated executives, which we can interpret as them being able to deploy their abilities more easily.

5 Alternative executive pay policies

In this section, we study how alternative executive pay policies would jointly influence effort and exit. In particular, we propose policies that aim to increase effort while considering the potential implications on turnover and the composition of the federal workforce. We first revisit our model to understand how its components relate to exit and effort. Those results

[54] We use pre-reform values for simplicity, since the reform had a large impact on pay which would complicate the interpretation.

are in Figure 4. We then turn to study a range of counterfactual policies for executive pay. Those results are summarized in Figure 5 and Table 8.

5.1 Conceptual framework

Looking back at our model, we focus on the two key components of executive pay: pay-for-performance (α_{P4P}) and pay cap ($\overline{w}_0$). We then gradually change each parameter by ±30% relative to its baseline value (from Section 4.1), while holding all other parameters constant. This is akin to a series of counterfactual experiments, where the goal is to see how effort and exit would have changed if the underlying structural parameters would have been different. The results are in Figure 4.

First, Panel A shows that both components of executive pay increase effort: pay-for-performance increases the reward for effort, and higher pay cap increases the upside from exerting effort. Visually, as we move from the bottom of the figure to the top (more pay-for-performance), or from left to right (higher pay cap), the area lightens which indicates greater effort. In contrast, Panel B shows that the two components of executive pay have the opposite effect on exit. Pay-for-performance increases the incentive to switch to the private sector, since with the same level of effort the executive can earn an uncapped pay in the private sector. Moreover, more performance pay increases the volatility of wages, which risk-averse executives dislike. On the other hand, a higher pay cap reduces the incentive to quit, since there are better salary growth opportunities in the government. Visually, as we move from the bottom of the figure to the top (more pay-for-performance), the area becomes darker which indicates higher exit rates. As we move from left to right (higher pay cap), the area becomes lighter which indicates lower exit rates. At the bottom of Figure 4, we quantify the relative importance of each pay component. Consider, for example, a 1% increase in pay-for-performance, holding all else equal. It would increase exits by 0.8% and increase effort by 0.11%. A similar rise in the pay cap, holding all else equal, would reduce exits by 0.98% and increase effort by 0.02%. In other words, pay-for-performance has a greater impact on effort than pay caps, but pay caps have a greater impact on exits than pay-for-performance.

Finally, we will take into account the potential negative impact of performance pay on public sector preference (θ). This occurs because a shift to performance pay changes office culture and crowds out the intrinsic motivation to serve in the public sector, which plausibly lowers θ (see Section 4.2).

5.2 Counterfactual policies

Armed with those insights, we turn to study various policies that aim to increase effort. We will consider the joint impact on effort and exit, as well as the potential implications for the composition of the federal workforce.

5.2.1 Accepting abnormal turnover

The first policy is similar in spirit to the reform we study in this paper. The goal is to induce greater effort, by raising the pay cap and the performance pay. The policymaker is willing to accept (or perhaps even welcomes) the inadvertent rise in exit rates. Concretely, the policy targets a 3.8-4.5 percentage points increase in exit rates and a 33.3% increase in the pay cap.[55] The policy will raise performance pay (α_{P4P}), acknowledging that this will further decrease the public sector preference (θ). There are infinite combinations of (θ, α_{P4P}) we can choose from, and we propose two specific options in Panel A of Table 8. To achieve the lower bound of exits (3.8 p.p. increase), we propose a policy that increases pay-for-performance by 11.4% and weakens public sector preference by 0.85%, relative to their respective baseline values. To achieve the upper bound of exits (4.5 p.p.), we propose a more aggressive policy that increases pay-for-performance by 27.1% and reduces public

[55] The target exit rate corresponds to the treatment effect we document in Table 2, Panel A. The target pay cap is the difference between $\overline{w}_0$ in the post-reform sample and in the full sample (see Table 4). To be precise, our model predictions pertain to higher initial pay cap ($\overline{w}_0$) or, equivalently, to higher pay cap growth rate ($\overline{w}_t$).

sector preference by 0.95%.[56]

How would the revised executive pay package affect effort? All three factors will contribute to greater executive effort. Concretely, the higher pay cap will increase effort by 0.1% and higher pay-for-performance will increase effort by 1.3-2.7%. Intuitively, performance pay directly incentivizes effort via the productivity process, while the pay cap only does so indirectly, if the executive was close to the original cap (see Section 4.3). Finally, the weaker public sector preference will increase effort by 0.7-0.8%: with a weakened public sector preference, executives exert more effort to increase their potential private sector salary. Combining all parameters, we find that the reform we propose will increase the average effort by 2.0-3.5%.[57]

5.2.2 Avoiding abnormal turnover

The next policy we consider seeks to induce greater effort without inducing changes in turnover rates. Given the different elasticities, the policy should increase the performance pay (α_{P4P}) more than it increases the pay cap ($\overline{w_0}$). Moreover, one would need to prevent θ from declining; otherwise, the lower θ will induce even more turnover. For simplicity, we keep θ at the baseline level from Table 5, and propose a range of (α_{P4P}, $\overline{w_0}$) that would increase effort without affecting turnover. The results are in Figure 5, Panel A. For instance, a combination of 11.5% pay cap and 14.5% pay-for-performance will have a net zero effect on exits. This corresponds to 15% increase in the pay cap and 58% increase in the performance pay, relative to their baseline values. For comparison, the policy we consider in Section 5.2.1 raised the pay cap by 33% and performance pay by 10-31.4%, but also included a decline in the public sector preference. Combined, those changes led to higher exit rates.

[56] The percentage effect on turnover is similar to the percentage effect we calculate in Table 2, Panel A, even though here we estimate the policy on the full sample period.

[57] The total effect is not a linear combination of the three separate effects, due to interactions in the model.

5.2.3 Lowering cost of effort

A third policy seeks to reduce the cost of effort (ξ). For instance, allowing federal executives to work from home, or adopting AI technologies to streamline some of the more mundane tasks. Our results are summarized in Figure 5, Panel B. We find that lowering the cost of effort will increase effort, as expected, but will also increase exits. Intuitively, as the executive exerts more effort, the upside from staying in the public sector is limited (due to the pay cap) while the potential compensation in the private sector is higher. As a result, exits increase.[58] Quantitatively, the corresponding elasticities are in Table 8, Panel B. We calculate that a 1% decrease in the cost of effort would translate to 0.1% increase in effort relative to the mean and 2.4% increase in exit rates.

5.2.4 Lowering public sector preference

The next policy aims to increase effort by reducing the public sector preference (θ). For instance, prohibiting federal executives from advertising their government position. While the effect on effort may seem counterintuitive at first, it is in fact a direct outcome of our model. The primary effect of a lower θ is that the executive discounts the outside option less. Consequently, the incentive to exit the government is stronger.[59] The secondary effect of a lower θ is that the executive is more inclined to exert effort, because it now has a greater impact on the value of the outside option: since they discount private sector wages at a lower rate, they have stronger incentives to exert effort upon exit. This joint effect is summarized in Figure 5, Panel B: weakening the public sector preference will increase exits and also increase effort. Quantitatively, the corresponding elasticities are in Table 8, Panel B. We find that 0.1% decrease in θ (which corresponds to 0.1% increase in $\frac{1}{\theta}$) will increase exit rates by 6.3% and increase effort by 0.1%. These changes are also reflected in wages. For the executives who choose to stay, the small increase in effort will somewhat increase their

[58] This is consistent with the optimal exit policy (Figure 3): the exit region expands with effort.

[59] In the model, θ is explicit component of utility when calculating the value of the outside option, and thus any change to θ result in large changes to the utility.

pay (relative to its previous level). However, since productive executives leave, the average pay among all executives will decline.

5.2.5 Increasing pay differentials

Lastly, we suggest a policy to increase effort by widening the pay differential between the public and private sector (ϕ). Effectively, this would require a substantial across-the-board pay cut in the public sector, without changing the pay-for-performance sensitivity. As in Section 5.2.4, the positive effect on effort may seem counterintuitive but is a direct outcome of our model. The flat pay cut increases turnover, since the private sector becomes more attractive. Low-productivity executives, who were previously less prone to exit, are now more likely to quit (see Figure A.2). Consequently, executives will now exert more effort, since it has greater impact on their outside opportunities. This dynamic is summarized in Figure 5, Panel B. Quantitatively, the corresponding elasticities are in Table 8, Panel B. We find that a 1% increase in pay differential will increase exit rates by 14.8% and increase effort by 0.2%.

5.3 Summary of insights

Our findings from the policy analysis can be summarized as follows. First, higher pay caps and more performance pay will increase effort, and the impact on exits depends on the relative magnitudes. To avoid abnormally high turnover, pay caps should rise more than performance pay does. Second, greater performance pay will likely reduce the preference for the public sector, which would encourage even more exits and even greater effort. Third, one could induce greater effort via alternative policies: lowering the cost of effort, limiting the preference for the public sector, and imposing a flat cut in executive pay. All three policies will increase effort while triggering a wave of exits.

More broadly, our analysis uncovers the fundamental link between effort and exit. A policy that motivates executives to exert more effort (for instance, by reducing the cost of effort) will incentivize executives to quit, since now the upside of the private sector pay is even higher. As a result, exits will increase. Conversely, a policy that encourages executives to exit (for instance, by cutting pay across the board), will increase the benefit of effort: executives value their outside option more, where effort is better rewarded. As a result, effort will increase.

Our analysis also provides insight on the heterogeneous impact of such policies. In general, a policy that induces greater effort will expand the exit region, motivating productive executives to exit earlier.[60] The excess effort will increase the average productivity in the government in the short term. In the longer term, the type of executives will change: those who choose to stay, and those who choose to join, have a lower productivity and higher preference for the public sector, which offsets the increased monetary benefit of the private sector. For instance, they may have a particularly high intrinsic motivation for public service.

6 Conclusions

We study pay-for-performance in the public sector. We source a comprehensive data set on the senior executives of the federal government, who hold the leadership positions in their respective agencies. We then exploit an overhaul of the compensation packages of federal executives meant to retain executive talent and motivate greater effort, which doubled their pay ceiling and tied their pay to performance. In a difference-in-differences specification, we find that the reform triggered a wave of exits among treated federal executives, increasing their turnover rates by 3.3-5.1 percentage points.

To understand the dynamic which leads to this behavior, we develop a structural model that links executive pay to exit and effort. In our model, a federal executive has an outside option in the private sector. The pay in both sectors increases with tenure and productivity. However, the public sector pay is capped from above while the private sector pay has no cap. Because of that, pay-for-performance will motivate more effort but also increase the

[60] Our model implies that those who exit are always more productive than those who stay; see Section 3.3.

incentive to exit: with the same level of effort, the executive would prefer the private sector where pay is uncapped. We structurally estimate our model, and find that 24% of federal executive pay after the reform is performance-based (compared to 75-80% in the private sector). Despite the relatively small incentive, we find that executives exert 4.5% more effort after the reform and discount the private sector pay by an additional 5 percentage points, suggesting that the reform changed the composition of federal executives.

Our paper highlights the consequences of performance-based pay in the public sector. With stronger performance pay, executives exert more effort and thus should find the outside option more lucrative. Executives with lower public sector preference were especially sensitive to those changes and quit. Executives with higher public sector preference, who discount their outside option more heavily, chose to stay. Those findings contribute to the nascent literature on regulatory incentives and performance.

We are the first to study the structure of regulatory pay, and specifically the role of pay ceiling and performance-based pay. We also show how the pay structure directly affects effort: greater pay-for-performance will stimulate effort, but also exits, because it increases the incentive to accept a private sector job. Our quantitative analysis can inform the debate on how to improve the performance of regulatory agencies further. In particular, our paper highlights the unintended consequences of performance pay in the government and the difficulty of selecting the right pay structure. Performance pay contributes to greater effort by regulators, but it also raises the value of their outside option and motivates them to quit. This is not necessarily a negative outcome, but to our knowledge it is a surprising one, and our model highlights the forces behind it. Moreover, our model explains the heterogeneous response by executives to such changes.

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Figure 1: **Trends in executive pay**

The figure shows the evolution of pay for all federal executives in the Senior Executive Service who entered government at any point between 1979 and 2023. On the left, we plot the upper and lower bounds (1^{st} and 99^{th} percentiles) and the gap between the two. On the right, we plot the mean and standard deviation of pay across all executives. The grey bar represents the executive pay reform, which was implemented in 2004. See Section 1.3.

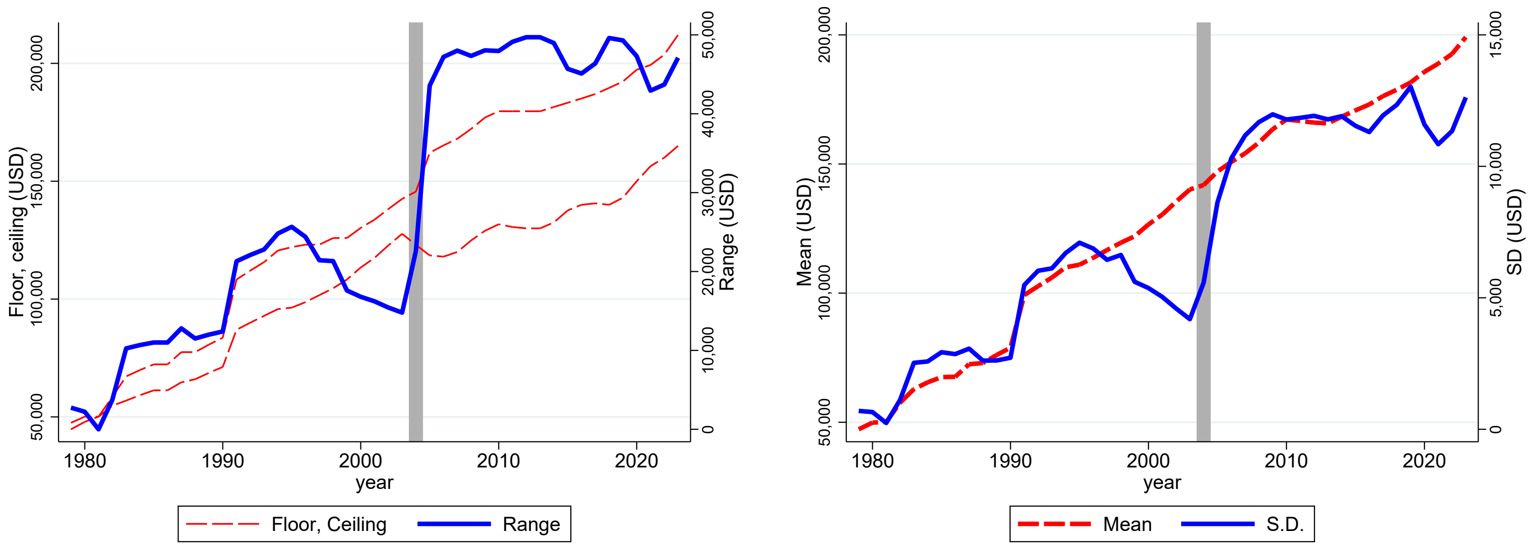


Figure 2: **Turnover dynamics**

The figure reports the coefficients (η_k) from Equation 2. Panel A and B reports the dynamic effects of the SES performance pay reform and financial agencies, respectively. The vertical bars display 90% confidence intervals. See Section 2.1 and Section 2.2.

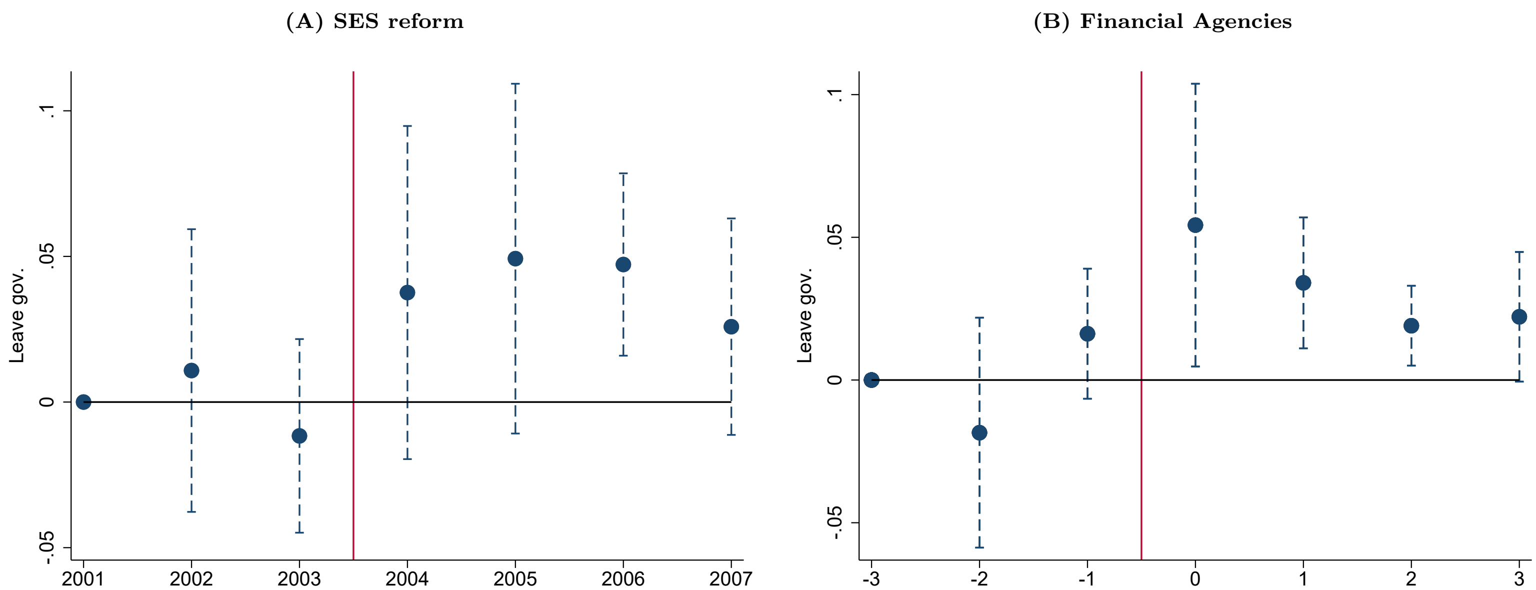


Figure 3: **Optimal exit and effort policy**

In Panel A, we plot the optimal effort policy, given baseline levels of pay differentials. Darker areas correspond to lower choice of effort, as % change from the lowest value of effort. In Panel B, we plot the optimal exit policy for two levels of effort, high (lighter shade) and low (darker shade), given a baseline level of pay differentials. The policies are calculated using the parameters in Table 4 and Table 5. See Section 3.3.

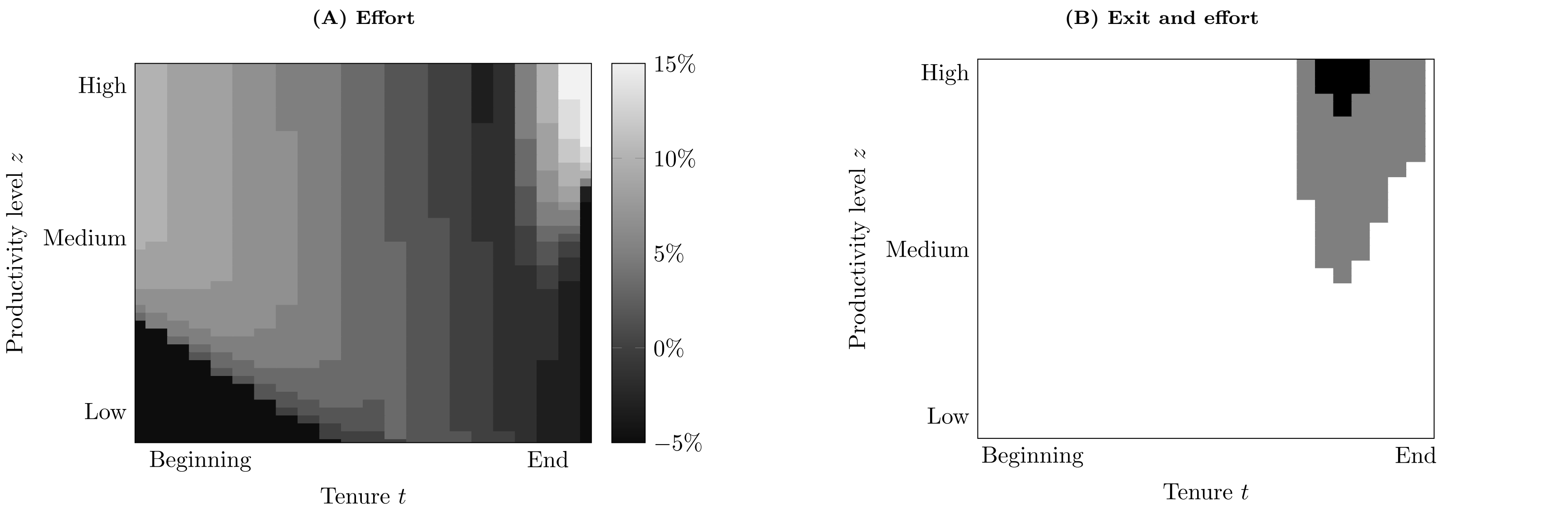
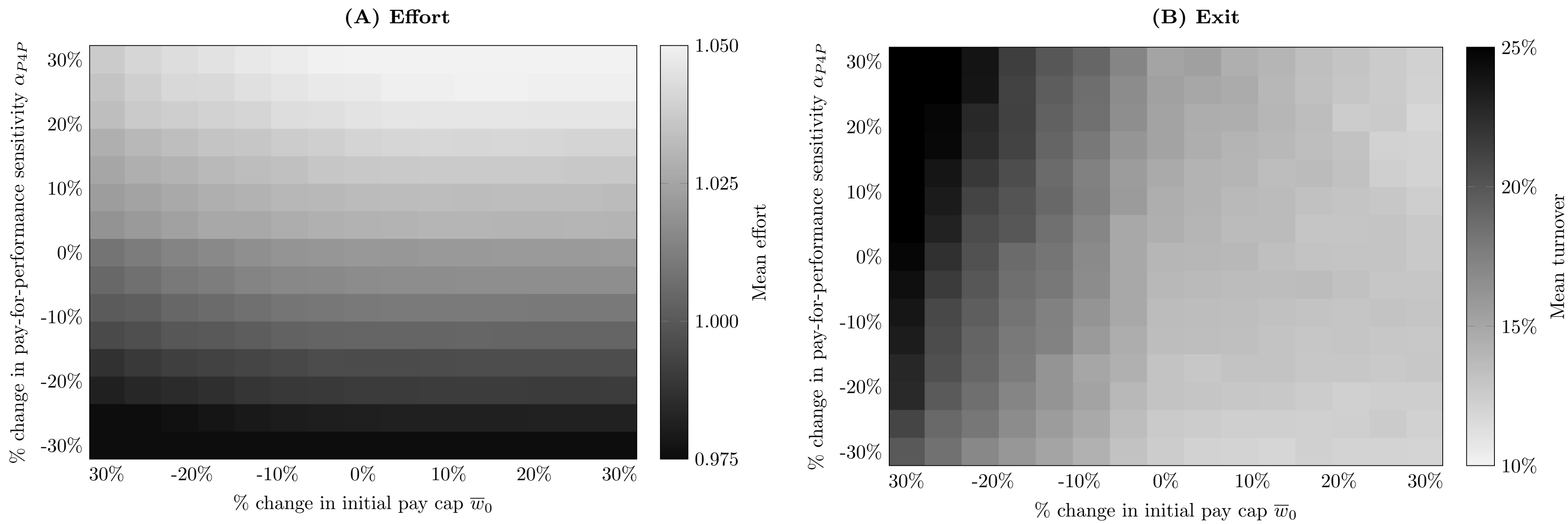


Figure 4: **Restructuring executive pay**

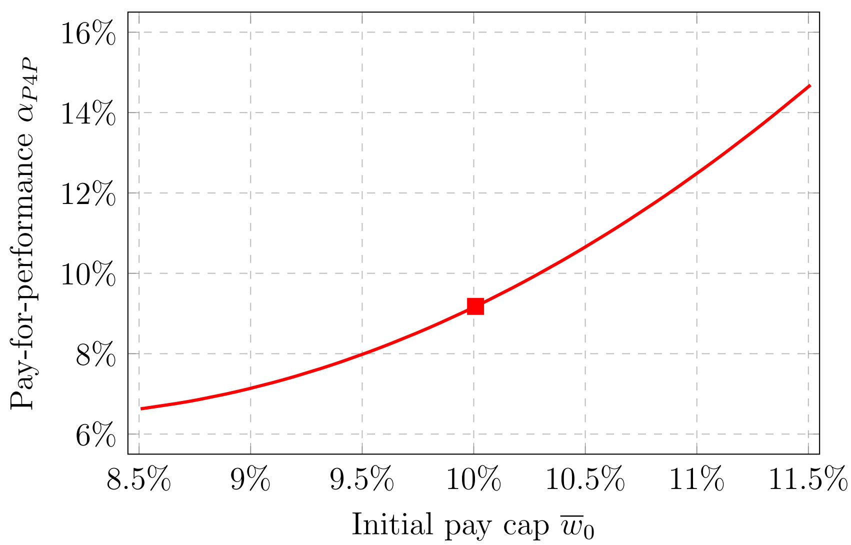
The figure shows how effort (Panel A) and exit (Panel B) respond to the two parameters of executive pay packages: pay-for-performance α_{P4P} and pay cap $\overline{w}_0$. The values of the two parameters are expressed as % of the baseline estimated values from Table 5, Panel A. The remaining parameters are kept unchanged. The table below the figure presents the midpoint elasticities of turnover and effort to pay-for-performance α_{P4P} and pay cap $\overline{w}_0$. See Section 5.1.



Midpoint elasticity:	Effort	Exit
1% increase in α_{P4P}	0.11%	0.80%
1% increase in $\overline{w}_0$	0.02%	-0.98%

Figure 5: **Evaluating alternative executive pay policies**

Panel A. Net zero change in turnover. The figure presents different combinations pay-for-performance α_{P4P} and initial pay cap $\overline{w}_0$, which result in the lowest possible change in turnover rate relative to the baseline value, while holding all other parameters fixed. The curve is a second-order polynomial interpolation of moments from a discrete set of counterfactual experiments. The square indicates the baseline parameter values from Table 5. See Section 5.2.2.



Panel B. Effects of parameter changes on exit and effort. The graphs show the effects of changing the cost of effort (left), public sector preference (middle), and pay differential (right), on turnover and mean effort. Each curve is a second-order polynomial interpolation of moments from a discrete set of counterfactual experiments, starting from the baseline values of structural parameters and varying only the respective parameter, while keeping all other parameters constant. The corresponding elasticities are in Table 8, Panel B. See Section 5.2.3, Section 5.2.4, and Section 5.2.5.

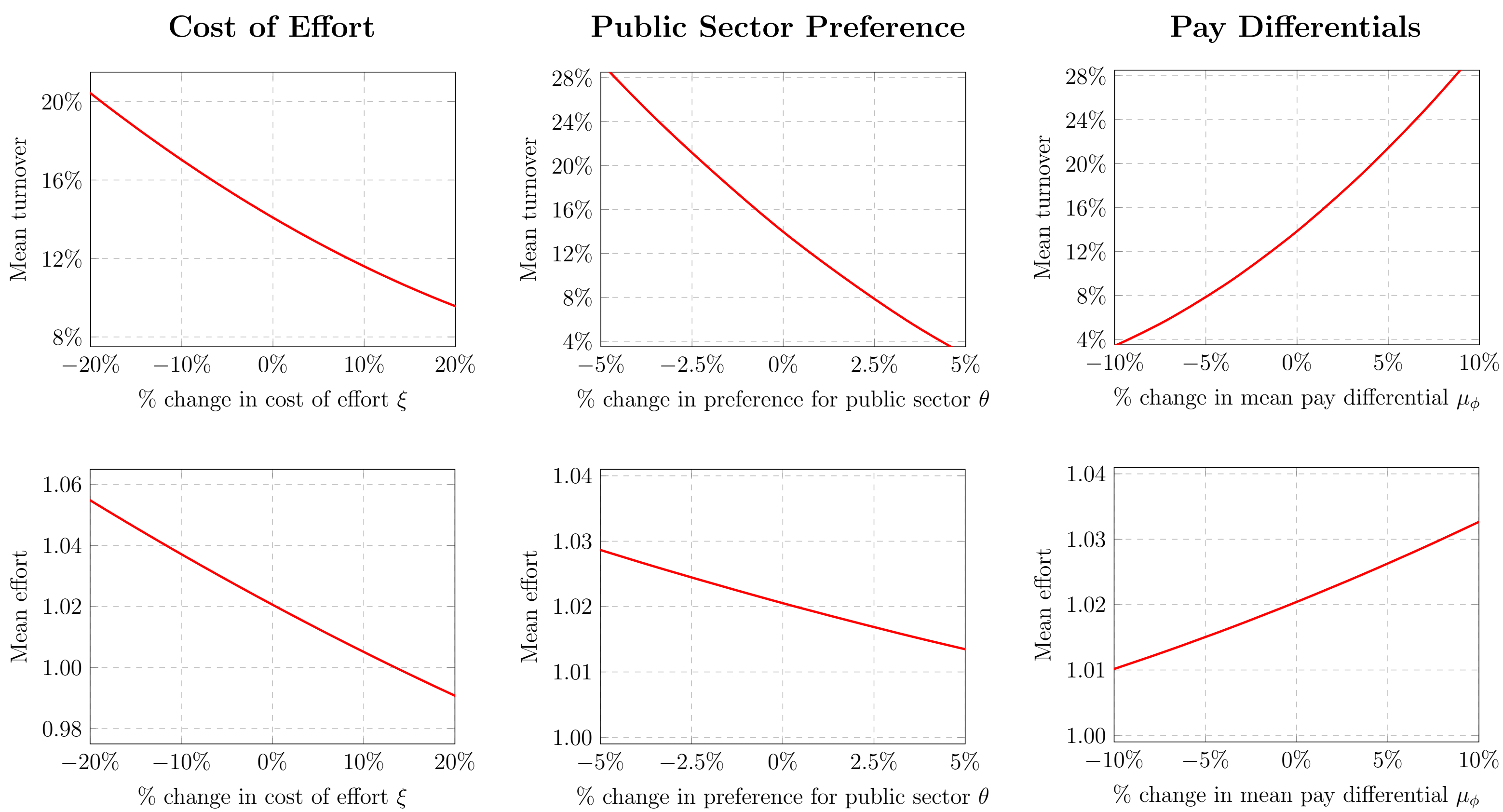


Table 1: **Descriptive statistics**

The sample includes all federal executives who held an executive position at any point between 1973-2013. In Panel A, we focus on years in which the executive held an executive position. In Panel B, we include the years before being elevated to the executive rank. *Salary* is the executive's pay in constant 2023 USD. $\Delta Salary$ is the year-on-year change in salary. *Salary* and $\Delta Salary$ are winsorized at the 1 and 99 percent level. *Tenure* is the number of years since joining the public sector. *Age* is the age of the executive. $Exit = 1$ when the regulator ultimately left the government, regardless of their rank at the time of exit. *College* and *Postgrad* indicates whether has a college degree and postgraduate education, respectively. *Manager* indicates whether the executive is in a managerial position in a given year. See Section 1.2.

Statistic:	Avg.	Median	S.D.	Min	Max	Obs.
Panel A: Executive period						
Salary($)	212,929.5	217,500.0	21,909.4	167,916.0	251,080.7	156,634
$\Delta Salary$	1.3	0.2	5.2	-9.4	23.3	130,816
Tenure	16.5	16.0	9.2	0.0	40.0	156,623
Age	51.5	52.0	8.3	22.0	75.0	156,633
Exit	10.8	0.0	31.0	0.0	100.0	151,892
College	94.0	100.0	23.8	0.0	100.0	156,634
Postgrad	75.4	100.0	43.1	0.0	100.0	156,634
Panel B: Full career						
Salary($)	179,367.3	185,913.1	45,541.5	58,195.9	251,080.7	381,686
$\Delta Salary$	2.8	1.4	6.2	-9.9	24.2	347,648
Tenure	12.2	11.0	9.1	0.0	40.0	381,646
Age	45.3	47.0	10.5	17.0	75.0	381,683
Exit	5.7	0.0	23.1	0.0	100.0	376,235
College	91.8	100.0	27.4	0.0	100.0	381,686
Postgrad	69.0	100.0	46.3	0.0	100.0	381,686
Manager	76.0	100.0	42.7	0.0	100.0	381,686

Table 2: **Pay-for-performance and exits: Federal executives**

Panel A. Average effect. Results from estimating Equation 1. $\mathbb{1}(Exit) = 1$ if the executive exits the government in year $t+1$, $Post = 1$ from 2004 onwards, and $Treated = 1$ for agencies participating in the SES pay system. $Log(Pay_{pre})$ and $Log(Tenure_{pre})$ are log of average pay and tenure before the SES reform, respectively. Standard errors clustered by agency are in parentheses. See Section 2.1.1.

	$\mathbb{1}(Exit)$			
	(1)	(2)	(3)	(4)
Treated×Post	0.045***	0.041**	0.038**	0.040**
	(0.012)	(0.017)	(0.016)	(0.016)
Log(Pay$_{pre}$)	-0.075*	-0.223***	-0.244***	-0.233***
	(0.042)	(0.085)	(0.077)	(0.075)
Log(Tenure$_{pre}$)	-0.020***	-0.017***	-0.037***	-0.038***
	(0.006)	(0.005)	(0.004)	(0.005)
Year FE	Yes	-	-	-
Agency FE	Yes	Yes	Yes	Yes
Occupation×Year FE	-	Yes	Yes	Yes
AgeBin×Year FE	-	-	Yes	Yes
City×Year FE	-	-	-	Yes
R^2	0.018	0.027	0.058	0.057
N	35,201	34,925	34,923	33,973
Effect (%Mean)	44.28	39.65	36.69	38.98

Panel B. Heterogeneous effect. Results from estimating Equation 1 on subsamples with high, medium, and low ability employees. Classification is based on estimates of individual fixed effects from Equation 3, where high, medium, and low ability are defined as the top, middle, and bottom terciles of the yearly ability distribution, respectively. $\mathbb{1}(Exit) = 1$ if the executive exits the government in year $t+1$. $Post = 1$ from 2004 onwards, and $Treated = 1$ for agencies participating in the SES pay system. Controls include $Log(Pay_{pre})$ and $Log(Tenure_{pre})$. P-value (vs. column(1)) and P-value (vs. column(2)) report the p-values from tests of whether the estimate in column (3) differs significantly from those in columns (1) and (2), respectively. Standard errors clustered by agency are in parentheses. See Section 2.1.2.

Outcome:	$\mathbb{1}(Exit)$		
Ability:	Low	Medium	High
	(1)	(2)	(3)
Treated×Post	0.037	0.033	0.083***
	(0.026)	(0.025)	(0.022)
Controls	Yes	Yes	Yes
Agency FE	Yes	Yes	Yes
Occupation×Year FE	Yes	Yes	Yes
R^2	0.056	0.095	0.116
N	10,744	10,805	10,798
P-value (vs. column(1))			0.11
P-value (vs. column(2))			0.04

Table 3: **Pay-for-performance and exits: Independent reforms**

Panel A. Financial regulators. Results from estimating Equation 4. The sample includes ten financial agencies adopting performance pay at different periods. $Treated = 1$ for agencies that switched to a performance pay reform for each cohort. $Post = 1$ indicates after adopting pay-for-per performance. $Log(Pay_{pre})$ and $Log(Tenure_{pre})$ are log of average pay and tenure before P4P, respectively. Standard errors clustered by agency are in parentheses. See Section 2.2.

	$\mathbb{1}(Exit) = 1$				
	(1)	(2)	(3)	(4)	(5)
Treated×Post	0.021*	0.034***	0.037***	0.043***	0.045***
	(0.010)	(0.008)	(0.010)	(0.011)	(0.010)
Log(Pay$_{pre}$)	-0.053***	-0.126***	-0.159***	-0.172***	-0.190***
	(0.010)	(0.029)	(0.038)	(0.040)	(0.041)
Log(Tenure$_{pre}$)	-0.062***	-0.043***	-0.044***	-0.065***	-0.065***
	(0.013)	(0.010)	(0.011)	(0.014)	(0.014)
Cohort×Year FE	Yes	-	-	-	-
Cohort×Agency FE	Yes	Yes	Yes	Yes	Yes
Cohort×Occupation×Year FE	-	Yes	Yes	Yes	Yes
Cohort×Manager×Year	-	-	Yes	Yes	Yes
Cohort×AgeBin×Year FE	-	-	-	Yes	Yes
Cohort×City×Year FE	-	-	-	-	Yes
R^2	0.042	0.062	0.066	0.097	0.106
N	247,308	246,311	246,311	246,287	244,294
Effect (%Mean)	25.14	42.16	44.90	52.23	54.73

Panel B. Federal Aviation Administration. Results from estimating Equation 5. The sample includes employees who work for the Federal Aviation Agency. $Treated = 1$ for air traffic controllers. $Post = 1$ indicates years after the agency expanded performance pay for air traffic controllers (2004). $Log(Pay_{pre})$ and $Log(Tenure_{pre})$ are log of average pay and tenure before 2004, respectively. Standard errors clustered by occupation are in parentheses. See Section 2.3.

	$\mathbb{1}(Exit) = 1$			
	(1)	(2)	(3)	(4)
Treated×Post	0.033***	0.033***	0.056***	0.048***
	(0.002)	(0.003)	(0.006)	(0.004)
Log(Pay_{pre})	-0.142***	-0.155***	-0.128***	-0.172***
	(0.015)	(0.012)	(0.009)	(0.013)
Log($Tenure_{pre}$)	0.084***	0.082***	0.034***	0.038***
	(0.013)	(0.013)	(0.006)	(0.006)
Year FE	Yes	-	-	-
Occupation FE	Yes	Yes	Yes	Yes
Manager×Year	-	Yes	Yes	Yes
AgeBin×Year FE	-	-	Yes	Yes
City×Year FE	-	-	-	Yes
R^2	0.043	0.045	0.093	0.132
N	215,945	215,945	215,944	215,209
Effect (%Mean)	59.47	59.66	102.23	86.56

Table 4: **Structural model: Parameters and moments**

The table summarizes the values of parameters estimated outside of the model (Panel A) and the definitions of variables used to create the model-implied moments (Panel B). See Section 3.4.

Panel A: Parameters estimated outside of the model

Parameter	Symbol	Full sample	After reform
Risk aversion	γ	3	3
Risk-free interest rate	r	0.0275	0.0175
Maximum tenure	T	25	25
Years in retirement	N	15	15
Retirement replacement factor	λ	0.6	0.6
Wage trend intercept	l_0	0	0
Wage trend coefficient	l_t	0.0320	0.0266
Private sector premium mean	μ_ϕ	0.2197	0.2363
Private sector premium standard deviation	σ_ϕ	0.0591	0.0654
Incremental growth rate of private sector pay	p_t	0.0230	0.0186
Initial pay cap	$\bar{w}_0$	0.1001	0.1334
Pay cap coefficient	$\bar{w}_t$	0.0286	0.0161

Panel B: Definitions of variables

Moment	Model	Data
Log relative wage	$\alpha_{Base} Tenure_t + \alpha_{P4P} \max\{0, \ \log(z_t)\}$	$\log(\text{relative wage}_{it})$
Pay gap	$(\overline{w}_t - \widetilde{w}_t^g)/\widetilde{w}_t^g$	$(\text{pay cap}_{it} - \text{wage}_{it})/\text{wage}_{it}$
Turnover rate	$\sum$ quits / $\sum$ executives	$\sum_{it} \text{quits}_{it}$ / $\sum_{it} \text{executives}_{it}$

Table 5: **Characterizing federal executives**

In Panel A, we report the estimates of the structural parameters: α_{P4P} is the sensitivity to pay-for-performance; θ is the public sector preference; ρ is the persistence of productivity; σ is the volatility of productivity; ξ is the cost of effort. In Panel B, we report the data-implied and the model-implied moments. We use the full sample of federal executives between 1996-2012 and the Simulated Method of Moments, which chooses model parameters by minimizing the distance between the moments from a simulated panel of firms and their data counterparts. We report the estimated parameters and their standard errors, clustered at the executive level. See Section 4.1.

Panel A. Parameter estimates:

Parameter	**Symbol**	**Estimate**	**Std. error**
Pay-for-performance	α_{P4P}	0.0918	0.0151
Preference for public sector	θ	2.1126	0.1057
Productivity persistence	ρ	0.7245	0.1011
Productivity volatility	σ	0.1613	0.0091
Effort aversion	ξ	0.0029	0.0003

Panel B. Model-implied and data-implied moments:

Moment	**Simulated**	**Actual**
Variance of residual log wage	0.0004	0.0009
Serial correlation of residual log wage	0.1445	0.1989
Mean pay gap	0.0585	0.0553
Variance of pay gap	0.0010	0.0013
Serial correlation of pay gap	0.1450	0.1229
Mean turnover	0.1399	0.1218
Covariance of wages and pay gaps	-0.0004	-0.0006

Table 6: **Federal executives after the reform**

In Panel A, we report the estimates of the structural parameters: α_{P4P} is the sensitivity to pay-for-performance; θ is the public sector preference; ρ is the persistence of productivity; σ is the volatility of productivity; ξ is the cost of effort. In Panel B, we report the data-implied and the model-implied moments. We use the sample of federal executives after the reform, 2005-2012, and the Simulated Method of Moments, which chooses model parameters by minimizing the distance between the moments from a simulated panel of firms and their data counterparts. We report the estimated parameters and their standard errors, clustered at the executive level. See Section 4.2.

Panel A. Parameter estimates:

Parameter	**Symbol**	**Estimate**	**Std. error**
Pay-for-performance	α_{P4P}	0.2355	0.0036
Preference for public sector	θ	2.3982	0.0125
Productivity persistence	ρ	0.7102	0.0161
Productivity volatility	σ	0.2051	0.0041
Effort aversion	ξ	0.0015	0.0002

Panel B. Model-implied and data-implied moments:

Moment	**Simulated**	**Actual**
Variance of residual log wage	0.0010	0.0006
Serial correlation of residual log wage	0.1640	0.2143
Mean pay gap	0.0295	0.0803
Variance of pay gap	0.0020	0.0009
Serial correlation of pay gap	0.1662	0.1164
Mean turnover	0.1222	0.1229
Covariance of wages and pay gaps	-0.0010	-0.0004

Table 7: **Heterogeneous impact of pay-for-performance**

The table reports the structural estimates and the model-implied moments for four subsamples: executives with high and low pre-reform salary (Panel A), and with high and low education level (Panel B). The model is estimated using the Simulated Method of Moments, which chooses model parameters by minimizing the distance between the moments from a simulated panel of firms and their data counterparts. We recalculate the parameters estimated outside of the model in each subsample, and report the estimated parameters and their standard errors, clustered at the executive level. α_{P4P} is the sensitivity to pay-for-performance; θ is the public sector preference; ρ is the persistence of productivity; σ is the volatility of productivity; ξ is the cost of effort. See Section 4.3.

Panel A. Split by salary:

Lower salary					
Parameter	α_{P4P}	θ	ρ	σ	ξ
Estimate	0.0634	2.0734	0.7109	0.3970	0.0027
Std. error	(0.1482)	(0.0900)	(0.2565)	(0.0112)	(0.0005)

Higher salary					
Parameter	α_{P4P}	θ	ρ	σ	ξ
Estimate	0.0048	2.2110	0.6818	0.3022	0.0059
Std. error	(0.0066)	(0.4955)	(0.9504)	(0.2892)	(0.0055)

Panel B. Split by education level:

College degree or less					
Parameter	α_{P4P}	θ	ρ	σ	ξ
Estimate	0.1870	2.4241	0.9899	0.1241	0.0628
Std. error	(0.0040)	(0.0265)	(0.2988)	(0.0009)	(0.0013)

Postgraduate degree					
Parameter	α_{P4P}	θ	ρ	σ	ξ
Estimate	0.0848	3.8215	0.8649	0.8416	0.0015
Std. error	(0.0332)	(5.2222)	(0.2810)	(0.1956)	(0.0024)

Table 8: **Counterfactual policies**

Panel A. Inducing greater effort. In this table, we propose two combinations of the structural parameters to match the implied change in turnover and effort after the executive pay reform. The change in pay cap ($\overline{w}_0$) is calculated from the data as the % difference between initial pay cap in the post-reform subsample and the full sample, and the change in turnover rate ($\%\Delta Turnover$) equals the treatment effect from Table 2, Panel A. We then compute the implied change in pay-for-performance (α_{P4P}), based on our structural model. Finally, we compute the resultant change in effort. See Section 5.2.1.

Panel A. Lower bound: 3.8 p.p. increase in turnover		
	%Δ Mean turnover	%Δ Mean effort
0.85% decrease in θ	65.77%	0.70%
33.3% increase in $\overline{w}_0$	-16.70%	0.12%
11.4% increase in α_{P4P}	8.24%	1.33%
Combined effect	37.97%%	2.02%

Panel B. Upper bound: 4.5 p.p. increase in turnover		
	%Δ Mean turnover	%Δ Mean effort
0.95% decrease in θ	75.91%	0.77%
33.3% increase in $\overline{w}_0$	-16.70%	0.12%
27.1% increase in α_{P4P}	12.05%	2.67%
Combined effect	42.88%	3.54%

Panel B. Targeting structural parameters. We consider three counterfactual policies that change the cost of effort (left), private sector discount (middle), and pay differential (right). In each case, we consider a 1% deviation from the baseline parameter estimate in Table 4 and Table 5, while holding all other parameters constant. Note that 0.1% change in private sector discount ($\frac{1}{\theta}$) corresponds to 0.1% change in public sector preference (θ). For each policy, we report the resultant impact on turnover, effort, and wages. The corresponding figures are in Figure 5, Panel B. See Section 5.2.3, Section 5.2.4, and Section 5.2.5.

Parameter:	Cost of effort	Public sector preference	Pay differential
	ξ	θ	μ_ϕ
Magnitude:	-1%	-0.1%	$+1\%$
%Δ Mean turnover	2.42%	6.32%	14.84%
%Δ Mean effort	0.13%	0.08%	0.22%
%Δ Mean productivity	0.18%	0.09%	0.27%
%Δ Mean log wages	-0.01%	-0.09%	-0.15%
%Δ Mean log wages (non-quitters)	0.03%	0.01%	0.02%

Appendix

A.1 Executives résumés

This section describes how we obtain the full CVs for a sample of federal executives (discussed in Section 2.1.2). We begin with 2,689 treated executives who left the government during our sample period (2001–2007). To match these executives with individuals in the Revelio Labs dataset, we implement the following steps: (1) we extract all Revelio Labs "companies" whose ultimate parent is listed as "Government of the United States of America" or whose website ends in ".gov"; (2) we fuzzy match these entities to the agencies where our executives were employed, followed by manual inspection of each match to ensure accuracy; (3) we extract all individuals in the dataset who worked at these matched agencies; and (4) we identify potential matches by requiring an exact match on last name and agency, along with a fuzzy match on first name. This procedure yields 394 matched individuals, which we further restrict to those with résumés that allow us to observe their post-government positions, resulting in a final sample of 201 executives. The relatively low match rate stems from (1) our effort to limit false positive matches, (2) the older age of treated executives, which makes them less likely to have LinkedIn profiles, (3) the relatively early sample period, during which Revelio Labs' coverage is more limited, and (4) mislabeling of employers in the Revelio dataset—for example, users may list their affiliation as the Department of Transportation of the United Kingdom rather than the United States. To classify the executive's first post-government job, we rely on the URL of the organization's website: an entity is classified as a nonprofit if its URL ends in ".org," a government organization if it ends in ".gov," and a university if it ends in ".edu." Finally, to classify the seniority of the executive's post-government position, we use the seven levels of seniority as reported by Revelio Labs.

A.2 Structural estimation: additional

We follow Lee and Ingram (1991) when estimating the model using Simulated Method of Moments. One important issue to address when using SMM is related to the unobserved heterogeneity in the data. In the model, the only source of heterogeneity is the draws of productivity shock (ε). In reality, productivity shocks could be correlated with unobserved factors such as talent or ability, or with factors not explicitly captured by the model such as geographical location or agency. To address this challenge, we follow Hennessy and Whited (2007) and extract as much of observed heterogeneity from data as possible to make the model- and data-implied moments comparable. In particular, when calculating the variance (and covariance) of wages using residual wage after controlling for the deterministic growth rate and executive-, agency-, city- and occupation fixed effects. Similarly, when calculating the variance and covariance of pay gaps we also control for executive-, agency-, city- and occupation fixed effects. We use the Han and Phillips (2010) estimator to calculate the serial correlation of wages and pay gaps given the panel structure of the data.

Let the pooled time series of all firms be $x_i = x_1, \ldots, x_N$, where $N = n \times T$ is the total number of firm-year observations. Using the transformed data, we compute a set of moments $h(x_i)$. We create the simulated moments by first solving the model given a vector of parameters $\Theta = (\alpha_{P4P}, \theta, \rho, \sigma, \xi)$ and then generating simulated data y from the model. We simulate $S = 10$ datasets of $N = 10,000$ executives over $T = 25$ years, following Michaelides and Ng (2000), who find that a simulation estimator behaves well in finite samples if the simulated sample is approximately ten times as large as the actual data sample. The resulting moments in a given simulated sample are given by the vector $h(y_s, \Theta)$.

The simulated methods of moments estimator $\widehat{\beta}$ is then the solution to

$$\widehat{\Theta} = \arg\min_{\Theta} \left[g(x) - g(y, \Theta)\right]' W \left[g(x) - g(y, \Theta)\right], \tag{A.1}$$

where $g(x) = \frac{1}{N}\sum_{i=1}^{N} h(x_i)$ and $g(y, \Theta) = \frac{1}{S}\sum_{s=1}^{S} h(y_s, \Theta)$ are the sample means of the actual and model-implied data, and W a positive definite weight matrix, which we calculate following Bazdresch, Kahn, and Whited (2017) as the optimal clustered weight matrix. We use simulated annealing to find the optimum to the minimization problem.

Under mild regularity conditions, the SMM estimator is asymptotically normal

$$\sqrt{N}(\widehat{\Theta} - \Theta) \xrightarrow{d} \mathcal{N}\left(0, V\right), \tag{A.2}$$

where V is the covariance matrix as in Newey and McFadden (1994). Note that we use more grid points for state variables when calculating standard errors and conducting counterfactual experiments for increased precision.

Finally, we compute the diagnostic measure of Andrews, Gentzkow, and Shapiro (2017) to investigate whether the model parameters are locally identified by the underlying moments. The benefit of the measure is that a reported high sensitivity means not only that the moment is sensitive to the underlying parameter, but also that the parameter is precisely estimated. The results are presented in Table A.9.

Each column in Table A.9 corresponds to a structural parameter, and each row corresponds to a moment used in the estimation procedure. The sensitivities are scaled by the standard deviations of moments. The results confirm the intuition behind the identification of the structural parameters. For instance, higher turnover rate results in higher pay-for-performance α_{P4P} while larger persistence and volatility of productivity translate to higher to variance and serial correlation of residual log wages and pay gaps, respectively. It should be noted, however, that the elasticities are only local and, moreover, highly sensitive to the numerical properties of the gradient. Because of that it might appear that some moments are not informative about the underlying parameter while in reality they do provide substantial identifying information. It should also be noted that the sign and magnitudes of the elasticities for α_{P4P} and σ are different, in line with the intuition outlined in Section 3.4.

Figure A.1: **Trends in executive pay**

The figure replicates Figure 1 using executives who were in the government before the reform. It plots the upper and lower bounds of the pay distribution (1^{st} and 99^{th} percentiles) as well as the gap between them. The grey bar represents the executive pay reform, which was implemented in 2004. See Section 1.3.

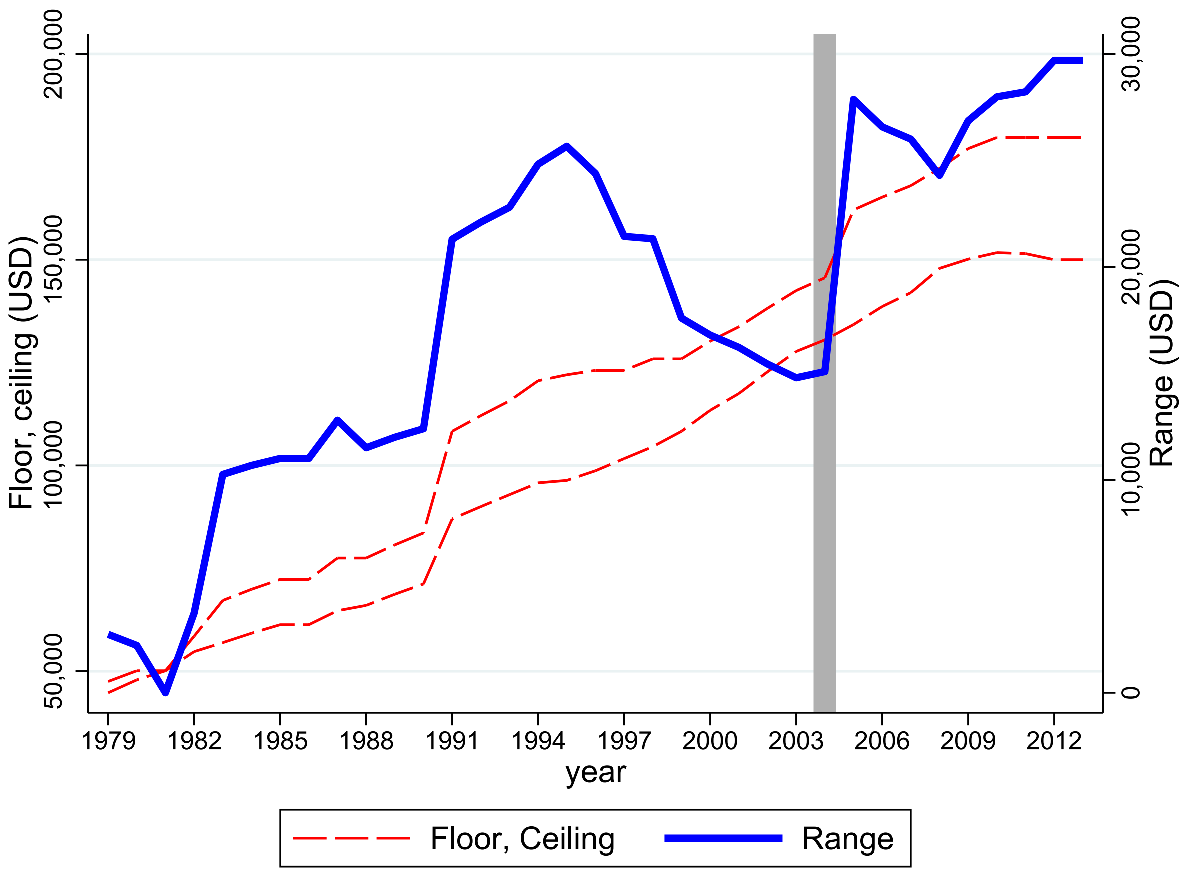


Figure A.2: **Optimal exit and effort policy: additional**

In Panel A, we plot the optimal exit policy for two levels of pay differentials, high (lighter shade) and low (darker shade), given the baseline level of effort and pay-for-performance. In Panel B, we plot the optimal exit policy for two levels of pay-for-performance: higher (lighter shade) and lower (darker shade), given the baseline level of the pay differential and level of effort implied by the level of pay-for-performance. The policies are calculated using the parameters in Table 4 and Table 5. See Section 3.3.

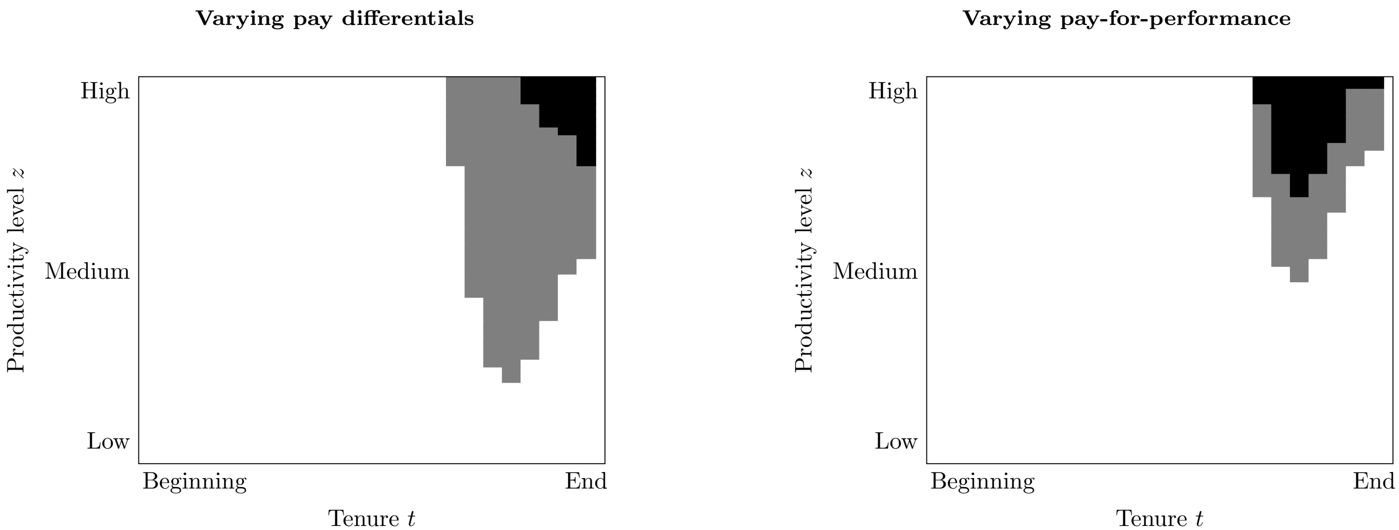


Figure A.3: **The role of risk aversion**

The graphs show the effects of changing the risk aversion on the turnover and mean effort. Each curve is a second-order polynomial interpolation of moments from a discrete set of counterfactual experiments, starting from the baseline values of structural parameters and varying only the respective parameter, while keeping all other parameters constant. See Section 3.4.

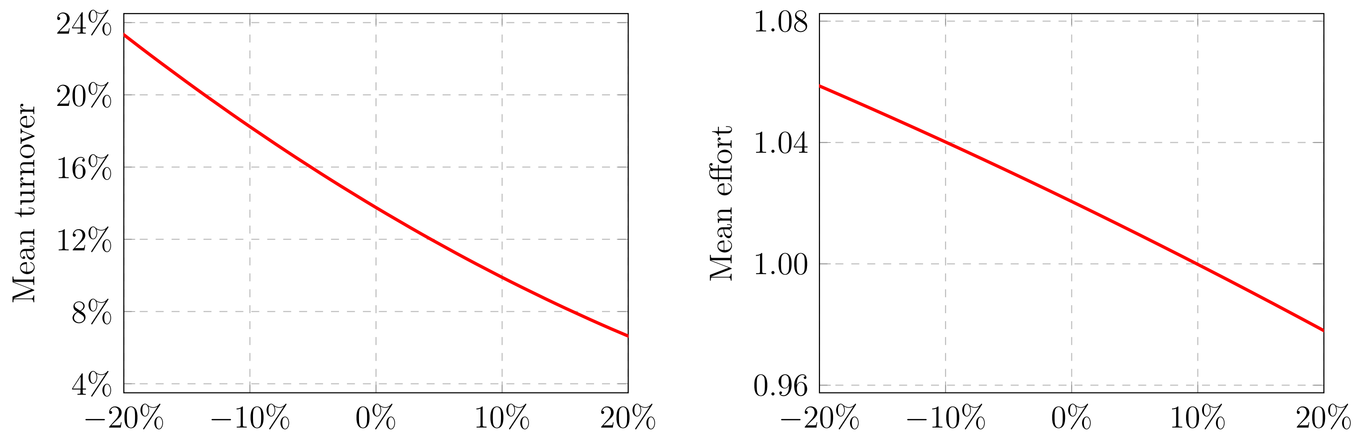


Table A.1: **Control Agencies for SES Reform**

Below is the list of control agencies for our main analysis. See Section 2.1.

Control Agencies
African Development Foundation
Christopher Columbus Fellowship Foundation
Courts, U.S. Tax Court
Department of Agriculture, National Appeals Board
Department of Education, Advisory Councils and Committees
Department of Education, National Assessment Governing Board
Department of Treasury, Office of Thrift Supervision
Export-Import Bank of the United States
Federal Election Commission
Federal Financial Institutions Examination Council
Government Publishing Office
International Boundary Commission: U.S. and Canada
International Joint Commission: U.S. and Canada
James Madison Memorial Fellowship Foundation
Medicare Payment Advisory Commission
Morris K. Udall Scholarship Foundation
National Security Council
Pension Benefit Guaranty Corporation
President, Office of Administration
Presidio Trust
Smithsonian Institution
Smithsonian Institution, John F. Kennedy Center for the Performing Arts
Smithsonian Institution, National Gallery of Art
Smithsonian Institution, Woodrow Wilson International Center for Scholars
U.S. Holocaust Memorial Council
Utah Reclamation Mitigation and Conservation Commission

Table A.2: **Pay-for-performance and exits: Federal executives - robustness**

Panel A. This table is similar to Table 2, Panel A, except that the control group includes all employees from control agencies (those not participating in the SES system), even those who are not managers. See Section 2.1.2.

Outcome:	$\mathbb{1}(Exit)$			
	(1)	(2)	(3)	(4)
Treated×Post	0.062***	0.063***	0.061***	0.063***
	(0.011)	(0.012)	(0.014)	(0.014)
Log(Pay$_{pre}$)	-0.053***	-0.116***	-0.133***	-0.129***
	(0.010)	(0.016)	(0.014)	(0.013)
Log(Tenure$_{pre}$)	-0.013	-0.008	-0.029***	-0.029***
	(0.011)	(0.010)	(0.006)	(0.007)
Year FE	Yes	-	-	-
Agency FE	Yes	Yes	Yes	Yes
Occupation×Year FE	-	Yes	Yes	Yes
AgeBin×Year FE	-	-	Yes	Yes
City×Year FE	-	-	-	Yes
R^2	0.033	0.043	0.077	0.081
N	80,035	79,685	79,684	78,671
Effect (%Mean)	70.94	71.23	68.57	72.51

Panel B. Results from estimating Equation 1. $\mathbb{1}(Exit_{age\leq 60}) = 1$ if the executive exits the government in year $t+1$ and is age 60 or younger. $\mathbb{1}(Reire_{age>60}) = 1$ if the executive exits the government in year $t+1$ and is older than 60. $Post = 1$ from 2004 onwards, and $Treated = 1$ for agencies participating in the SES pay system. $Log(Pay_{pre})$ and $Log(Tenure_{pre})$ are the logarithms of average pay and tenure prior to the SES reform, respectively. Standard errors clustered by agency are reported in parentheses. See Section 2.1.2.

Outcome:	$\mathbb{1}(Exit_{age\leq 60})$			$\mathbb{1}(Reitre_{age>60})$		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated×Post	0.041***	0.038**	0.042***	0.005*	0.003	0.002
	(0.010)	(0.015)	(0.015)	(0.003)	(0.005)	(0.005)
Log(Pay_{pre})	-0.077**	-0.208***	-0.196**	0.002	-0.014*	-0.014*
	(0.037)	(0.078)	(0.076)	(0.006)	(0.008)	(0.009)
Log(Tenure_{pre})	-0.024***	-0.022***	-0.022***	0.004***	0.004***	0.004***
	(0.005)	(0.005)	(0.005)	(0.001)	(0.001)	(0.001)
Year FE	Yes	-	-	Yes	-	-
Agency FE	Yes	Yes	Yes	Yes	Yes	Yes
Occupation×Year FE	-	Yes	Yes	-	Yes	Yes
City×Year FE	-	-	Yes	-	-	Yes
R^2	0.020	0.027	0.024	0.006	0.014	0.019
N	35,201	34,925	33,975	35,201	34,925	33,975

Table A.3: **Estimating ability**

Results from estimating Equation 3. The outcome variable, $Log(Pay)$, is log of pay. $Log(Tenure)$ is log of tenure. Column (1) includes office-by-year and individual fixed effects. Column (2) includes agency-by-year, city-by-year, and individual fixed effects. Column (3) includes office-by-year, occupation-by-year, and individual fixed effects. Robust standard errors are reported in parentheses. See Section 2.1.2.

Outcome:	*Log(Pay)*		
	(1)	(2)	(3)
Log(Tenure)	0.128***	0.127***	0.120***
	(0.002)	(0.002)	(0.002)
Office×Year FE	Yes	No	Yes
Individual FE	Yes	Yes	Yes
Agency×Year FE	No	Yes	No
City×Year FE	No	Yes	No
Occupation×Year FE	No	No	Yes
R^2	0.982	0.982	0.985
N	128,266	132,358	127,490

Table A.4: **Robustness: Heterogeneity by ability**

Results from estimating Equation 1 on sub-samples with high, medium, and low ability. In Panel A, ability is proxied using estimates of individual fixed effects from Equation 3, replacing office-by-year fixed effects with agency-by-year and city-by-year fixed effects. In Panel B, ability is proxied using estimates from the 3, adding occupation-by-year fixed effects to the specification. High, medium, and low ability are defined as the top, middle, and bottom terciles of the yearly ability distribution, respectively. $\mathbb{1}(Exit) = 1$ if the executive exits the government in year $t + 1$. if the executive exits the government in year $t + 1$ and is older than 60. $Post = 1$ from 2004 onwards, and $Treated = 1$ for agencies participating in the SES pay system. Controls include $Log(Pay_{pre})$ and $Log(Tenure_{pre})$. P-value (vs. column(1)) and P-value (vs. column(2)) are the p-values from testing whether difference between estimates in column (3) and those of the first two columns are statistically significant. Standard errors clustered by agency are in parentheses.

Outcome:	$\mathbb{1}(Exit)$		
Ability:	Low	Medium	High
	(1)	(2)	(3)
Panel A: Agency×year & City×year FE			
Treated×Post	0.032	0.057*	0.111***
	(0.021)	(0.033)	(0.019)
R^2	0.052	0.116	0.124
N	10,739	10,774	10,801
P-value (vs. column(1))			0.00
P-value (vs. column(2))			0.10
Panel B: Office×year & Occupation×year FE			
Treated×Post	0.033	0.016	0.058*
	(0.025)	(0.037)	(0.032)
R^2	0.057	0.097	0.112
N	10,741	10,825	10,775
P-value (vs. column(1))			0.46
P-value (vs. column(2))			0.15
Controls	Yes	Yes	Yes
Agency FE	Yes	Yes	Yes
Occupation×Year FE	Yes	Yes	Yes

Table A.5: **Outside options of federal executives**

Panel A: Destination before and after: This table reports the post-government destinations of treated executives who exited the government. The data are from Revelio Labs and include 201 unique executives. *For-profit* Firm refers to private-sector, for-profit companies. *Non-Profit* includes nonprofit organizations, excluding universities. *University* refers to academic institutions. *Government* indicates employment in non-federal government. *Publicly Listed Firm* refers to publicly traded companies. *Gov. Pay* denotes the executive's final annual government salary (in 2023 dollars) prior to departure. *Private Pay* is the executive's first total annual compensation (in 2023 dollars) after leaving government.

	Mean	**SD**	**Min**	**Max**
For-profit Firm	0.60	0.49	0.00	1.00
Non-Profit	0.17	0.38	0.00	1.00
University	0.12	0.33	0.00	1.00
Government	0.11	0.31	0.00	1.00
Publicly Listed Firm	0.25	0.44	0.00	1.00
Gov. Pay	232,219.09	8,753.51	206,977.35	252,946.36
Private Pay	386,311.34	302,321.59	42,780.48	1,639,746.63

Panel B: Seniority: This table reports the seniority level of treated executives' first job after leaving the government. Seniority is categorized into seven levels, as defined by Revelio Labs.

Seniority	**Number**	**Fraction** (%)
Senior Executive Level (e.g., CFO; COO; CEO)	6	2.99
Executive Level (e.g., Partner, Managing Director)	44	21.89
Director Level (e.g., Head of Legal)	83	41.29
Manager Level (e.g., Lead Lawyer)	23	11.44
Associate/Analyst Level (e.g., Attorney)	10	4.98
Junior Level (e.g., Legal Adviser)	24	11.94
Entry level (e.g., Paralegal)	11	5.47

Panel C: Industries: This table reports the top 15 industries in which treated executives held their first job after leaving the federal government. Industry is classified using the *Revelio Industry Classification K=50* clusters.

Industry:	**Number**	**Fraction** (%)
Public Sector Management	29	14.43
Aerospace and Defense	28	13.93
Education Services	25	12.44
Consulting and Advisory Services	20	9.95
Legal Services	19	9.45
Information Technology Services	13	6.47
Healthcare and Wellness Services	8	3.98
Professional and Trade Associations	8	3.98
Engineering and Construction Services	7	3.48
Research and Development	7	3.48
Financial Services	5	2.49
Real Estate and Development	4	1.99
Human Resources Services	3	1.49
Logistics and Transportation	3	1.49
Marketing and Advertising Services	3	1.49

Table A.6: **Adoption of pay-for-performance in federal agencies**

Below is the list of agencies adopting pay-for-performance. See Section 2.2.

Agency	**Year**	**Notes**
Commodity Futures Trading Commission	2006	Switched from the GS/ES system to CT in 2003
Farm Credit Administration	1993	Switched from GG/GH payplan to VG/VH payplan in 1990; introduced the VE payplan in 1991
Federal Aviation Administration	2004	Affected air controllers, increasing the number of employees subject to pay-for-performance from 37% to 75%. (Source).
Federal Deposit Insurance Corporation	2003	Introduced the CM/EM pay plan for managers; Switched from GG to CG in 1989 (Pay structure reform to track other agencies)
Financial Crimes Enforcement Network	-	Never adopted.
Internal Revenue Service (IRS)	2000	Creating the IR pay plan based on pay-for-performance. Use occupations that are likely to be converted "IR" to identify treated
National Credit Union Administration	1991	Switch from the GS/ES pay plan to CU/SS payplan in 1991
Office of the Comptroller of the Currency	1981	Switched from GG to the CP payplan in 1981
Office of Thrift Supervision	1991	Always adopter
Office of Federal Housing Enterprise Oversight	1992	Always adopter
Securities and Exchange Commission	2002	Switched from GS/ES to SK/SO pay plan

Table A.7: **Balancing Test**

This table tests whether the treated and control groups are different among pre-reform characteristics. See Section 2.2.

	Control	Treated	Dif	P-value
Pay	110,112.249	127,639.220	-17,526.971	0.239
$\Delta Pay(\%)$	0.087	0.104	-0.017	0.368
Senior	0.027	0.036	-0.008	0.525
Manager	0.213	0.248	-0.034	0.431
Leave Gov.	0.085	0.079	0.006	0.675
Retire	0.004	0.002	0.002	0.212
Exit	0.081	0.076	0.004	0.782
Age	41.826	40.962	0.864	0.796
Tenure	11.874	12.538	-0.665	0.845

Table A.8: **Estimates of relative wage and pay cap trends**

The table presents the estimates of the deterministic trend of wages l_t from Equation 15 (column 1) and of the deterministic trend of wage growth potential $\overline{w}_t$ from Equation 16 (column 2). Log*(Rel. Salary)* is the executive's salary scaled by their initial salary. Log*(Rel. Max Salary)* is the executive's maximum salary over their entire career, scaled by their initial salary. Both outcomes are expressed in logs. *Tenure* is years of experience in the public sector since the beginning of the sample period. The symbols $*$, $**$, and $***$ indicate significance at the 10 percent, 5 percent, and 1 percent level, respectively. See Section 3.4.

	log*(Rel. Salary)*	log*(Rel. Max Salary)*
	(1)	(2)
Tenure	0.320***	0.0286***
	(0.0000)	(0.0000)
Executive FE	Yes	Yes
Agency FE	Yes	Yes
Occupation FE	Yes	Yes
City FE	Yes	Yes
Within R^2	0.899	0.886
N	62,620	62,620

Table A.9: **Characterizing federal executives: diagnostics**

We present the sensitivities of the structural parameters to moments using the full-sample estimates and the diagnostic tool of Andrews, Gentzkow, and Shapiro (2017), which measures the local sensitivity of parameters to moments (scaled by the standard deviation of moments). α is the sensitivity to pay-for-performance; θ is the preference for public sector; ρ is the persistence of productivity; σ is the volatility of productivity; ξ is the cost of effort. See Section 4.1 and Appendix A.2.

	α_{P4P}	θ	ρ	σ	ξ
Variance of residual log wage	-0.0086	-0.0582	0.0533	0.0058	-0.0002
Serial correlation of residual log wage	-0.0045	-0.0311	0.0278	0.0024	-0.0001
Mean pay gap	0.0056	0.0473	-0.0519	-0.0027	0.0001
Variance of pay gap	-0.0200	-0.1391	0.1310	0.0151	-0.0004
Serial correlation of pay gap	0.0040	0.0232	-0.0196	-0.0033	0.0001
Mean turnover	0.0005	0.0039	-0.0031	-0.0004	0.0000
Covariance of wages and pay gaps	-0.0129	-0.0896	0.0831	0.0115	-0.0003