Flexible Prices and CEO Relative Performance Evaluation*

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Abstract

Standard agency theory predicts that Relative Performance Evaluation (RPE) is most valuable when peer performance accurately captures common shocks, allowing boards to insulate CEOs from luck. However, when firms can actively respond to shocks, peer-group performance also reflects strategic managerial choices, so RPE may distort rather than simply filter managerial incentives. Consistent with this intuition, we show that boards of flexible-price firms rely less on RPE in CEO dismissal decisions than boards of sticky-price firms, leaving flexible-price CEOs more exposed to peer-group performance. These findings are not driven merely by CEO-selection motives or by a scarcity of suitable peers for RPE. We rationalize our results with a model in which RPE can induce managers either to mimic peers to avoid relative underperformance or to adopt contrarian strategies that gamble for retention. Product-price flexibility expands the managerial action space and amplifies this moral hazard, and hence, boards place greater weight on absolute performance to preserve optimal pricing incentives. Our findings suggest that the "performance-luck" puzzle — boards' failure to fully filter common shocks from CEO dismissal decisions (Jenter and Kanaan, 2015) — can reflect a rational response to the agency costs and strategic distortions created by RPE.

Keywords: Relative Performance Evaluation, Corporate Governance, Price Rigidities

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1 Introduction

Whether to retain or fire a CEO following poor stock-price or accounting performance is among the most consequential governance decisions made by corporate boards. Because executive leadership shapes a firm's strategic direction, culture, and capital allocation, deciding to dismiss an incumbent CEO carries substantial financial and organizational implications. Standard economic agency theory suggests that boards should evaluate executives using Relative Performance Evaluation (RPE) to isolate managerial skill from common shocks (e.g., Holmström, 1979, 1982; Gibbons and Murphy, 1990). In optimal contracting models, performance metrics ought to filter out broad market trends, aggregate industry downturns, and macroeconomic fluctuations—that is, shocks entirely outside the CEO's control. By benchmarking firm performance against peer-group performance, boards avoid punishing executives for industry-wide slumps ("bad luck") or rewarding them for industry-wide booms ("good luck"). Evaluating CEOs based on performance metrics that filter out common shocks enables boards to refine executive selection and construct precise incentive structures that reward productive managerial behavior.

Despite its theoretical appeal as a means of filtering external shocks from CEO performance, RPE remains far from universally used in practice (e.g., Edmans, Gabaix, and Jenter, 2017). Evidence from CEO dismissal decisions illustrates this gap: Jenter and Kanaan (2015) find that CEOs are significantly more likely to be forced out following negative shocks to peer-group performance, suggesting that boards do not fully insulate CEOs from bad luck when making retention decisions. Survey evidence reveals a similar pattern: Edmans, Gosling, and Jenter (2023) report that 63% of directors and 75% of institutional investors believe that firms fail to filter broader market and industry conditions out of CEO performance measures.

In this paper, we examine the economic mechanisms through which firms' operating environments may reduce boards' reliance on RPE in CEO turnover decisions. Our central intuition is that, although RPE can filter out exogenous industry-wide shocks — including those arising from broader macroeconomic conditions — that are beyond CEOs' control, it may be less informative when firms have greater scope to respond to such shocks. In these

settings, peer-group performance reflects not only luck but also strategic interactions and heterogeneous corporate responses shaped by managerial decisions. Moreover, RPE may itself distort managers' incentives to respond to these shocks, further reducing the value of peer-group performance as a benchmark.

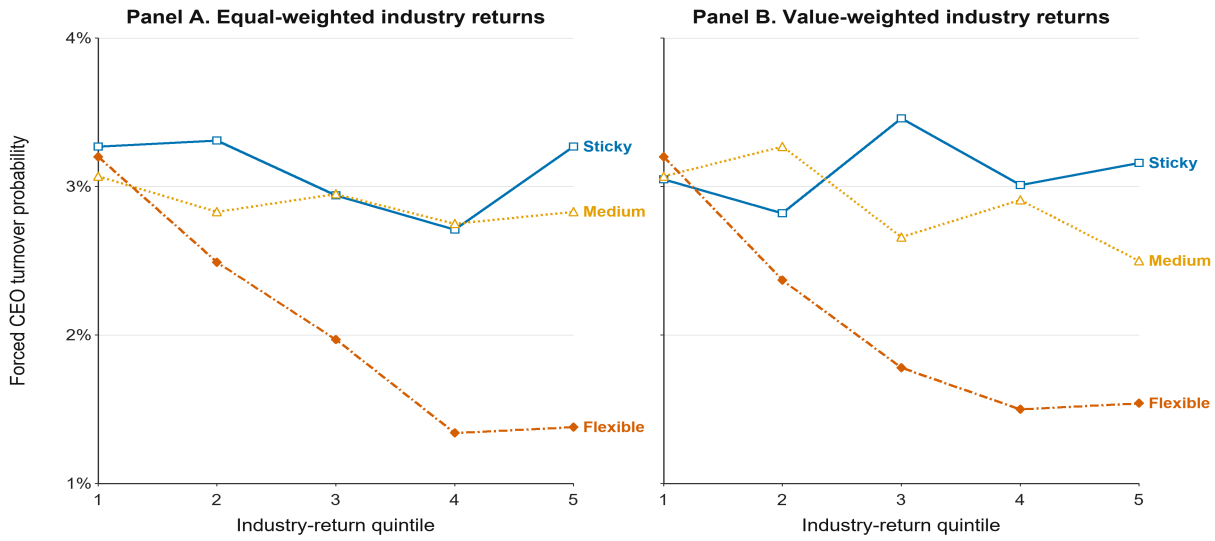
In practice, firms can use product-price adjustments as an operational buffer against adverse shocks — for example, by raising prices to pass input-cost increases on to customers or by lowering prices to support demand and limit inventory accumulation. Yet, firms differ substantially in their ability to adjust prices, which may shape how their boards use RPE in CEO turnover decisions. In sticky-price industries, nominal and real rigidities constrain the timing and magnitude of price changes across peer firms, causing industry-wide common shocks to pass through more directly and similarly into firm performance. Consequently, the informativeness of peer-group performance as a signal of the common shock is less contaminated by heterogeneous pricing responses, strategic interactions, or RPE-induced moral hazard. Peer-group performance therefore provides boards with a cleaner measure of common luck, making RPE especially valuable for distinguishing external shocks from managerial ability.

In contrast to the sticky-price scenario, managers of flexible-price firms can adjust product prices in response to shocks, thereby reducing the value of RPE in two ways. First, price adjustments partially insulate firm performance from industry-wide common shocks and make peer-group performance a noisier measure of luck. Second, RPE can distort executives' pricing decisions, as it makes executives care about the performance relative to peers. For example, to avoid relative underperformance, executives are encouraged to mimic their peers, even when doing so does not maximize firm value. This concern extends beyond theoretical conjecture. For example, Edmans et al. (2023) report that peer mimicry received the strongest support among investors from the surveyed explanations for the limited use of RPE. Boards in flexible-price industries may therefore rely less on RPE to preserve firm-specific pricing incentives.

We begin our analysis by examining whether firms' use of RPE varies with product-price flexibility. We measure product-price flexibility using the monthly frequency of price adjustment (FPA) for detailed North American Industry Classification System (NAICS)

Figure 1: **CEO Forced Turnover Probabilities by Industry Performance**

This figure plots CEO forced-turnover probabilities across quintiles of equal-weighted (Panel A) and value-weighted (Panel B) Fama–French 48 industry returns. Firms are classified as Sticky, Medium, or Flexible using the 33rd and 67th percentiles of monthly price-adjustment frequency. The sample comprises Compustat ExecuComp firm-year observations from 1993–2020.



sectors from Pasten, Schoenle, and Weber (2017). Although firms choose their product prices, their ability to adjust them in equilibrium is largely determined by product-market and technological conditions beyond the incumbent CEO's control. We therefore view FPA as primarily capturing a firm's underlying price flexibility rather than the CEO's strategic behavior.[1] Figure 1 provides a descriptive visualization of our main result. It plots forced CEO turnover probabilities across quintiles of Fama–French industry returns from 1993 to 2020. Under both equal- and value-weighted industry returns, forced turnover is sensitive to industry performance only among the most price-flexible firms and is largely insensitive to industry performance among firms with low or intermediate price flexibility.

For our formal tests, we follow the two-stage framework of Jenter and Kanaan (2015) to estimate the sensitivity of forced CEO turnover to the industry component of firm performance, which we refer to as "industry-induced returns," and examine how this sensitivity

[1]There is a broad consensus that price rigidity is a persistent characteristic at both the industry and firm levels. Consistent with this view, the frequency of non-sale price changes has not increased over the past 40 years (Nakamura, Steinsson, Sun, and Villar, 2018), and price stickiness after 1996 is strongly predicted by price stickiness before 1996 (slope coefficient = 0.93; D'Acunto, Liu, Pflueger, and Weber, 2018). These findings support our treatment of price stickiness as predetermined relative to CEO turnover decisions.

varies with firms' product-price flexibility. We first decompose firm stock returns into industry-induced and idiosyncratic components and then use Cox proportional hazards models to estimate the conditional hazard of forced CEO turnover over a CEO's tenure. To gauge economic magnitude, we move industry-induced returns from the 10th to the 90th percentile and evaluate CEO survival at the sample-median tenure of three years for the stickiest and most flexible firms. This change raises predicted three-year CEO survival by 2.81 (2.36) percentage points for the stickiest firms and 3.83 (4.37) percentage points for the most flexible firms, using equal-weighted (value-weighted) industry returns. The logit models yield a similar contrast: the implied probability of forced turnover falls by 1.18 (1.02) percentage points for the stickiest firms and by 2.36 (2.55) percentage points for the most flexible firms. Because product-price flexibility may capture other firm characteristics that affect how boards respond to performance, we also control for these characteristics and their interactions with both return components. These controls moderately attenuate the interaction estimates, but the magnitudes remain close to those in the baseline specifications.

We also normalize the decomposed returns so that differences in estimated dismissal sensitivity do not simply reflect variation across firms in their exposure to industry returns or in return volatility. Specifically, we estimate each firm's loading on industry returns separately and standardize its industry-induced and idiosyncratic components using their respective within-firm means and standard deviations. After normalization, dismissal sensitivity to idiosyncratic performance differs little between sticky- and flexible-price firms, whereas flexible-price firms remain substantially more sensitive to industry-induced returns. Under the same counterfactual and reporting convention, predicted three-year CEO survival rises by 1.09 (2.35) percentage points for the stickiest firms and 6.48 (7.02) percentage points for the most flexible firms. The normalized logit estimates imply reductions in forced-turnover probability of 0.42 (0.96) percentage points for the stickiest firms and 2.78 (2.95) percentage points for the most flexible firms. Adding firm controls again moderately attenuates the interaction estimates without changing the overall pattern.

As discussed in Jenter and Kanaan (2015), forced CEO turnover can serve two distinct functions: providing ex ante incentives that discipline managerial behavior and facilitating ex post screening to identify the "right" leader for the firm. To distinguish between these

mechanisms, we complement our turnover analysis by examining CEO compensation, which primarily operates as an ex ante incentive mechanism. Compensation is more sensitive to industry-induced performance among flexible-price firms, particularly to industry-induced returns at $t-2$. Moving $t-2$ equal-weighted (value-weighted) industry-induced returns from the 10th to the 90th percentile is associated with a 2.59 (1.51)% decline in compensation for the stickiest firms but a 5.91 (8.24)% increase for the most flexible firms. Using firm-normalized returns, the corresponding changes are a 3.96 (1.06)% decline and an 8.63 (8.99)% increase, respectively. Overall, the results are consistent with boards placing greater weight on absolute performance when product prices are more flexible, thereby strengthening CEOs' ex ante incentives.

Our empirical findings suggest that boards rely less on RPE when making CEO turnover decisions at flexible-price firms. Edmans et al. (2023) highlight two potential impediments to the use of RPE: difficulty identifying suitable peers and moral hazard arising from incentives to mimic peer firms. Our additional evidence, however, does not support peer scarcity as an explanation for the weaker use of RPE at flexible-price firms. Specifically, flexible-price firms are more likely to disclose specific peer groups in their RPE-based compensation plans and identify a larger number of close industry peers. This greater availability of potential peers is accompanied by a strong positive association between product-price flexibility and product similarity. This evidence suggests that the weaker reliance on RPE at flexible-price firms is unlikely to be driven by a lack of suitable peers.

We therefore conjecture that RPE-induced moral hazard may be more important. This conjecture is consistent with theories linking managerial evaluation to herding and conservatism (Scharfstein and Stein, 1990; Zwiebel, 1995) and showing that RPE can distort decisions affecting rivals and product-market competition (Gibbons and Murphy, 1990; Aggarwal and Samwick, 1999). When pricing is an active managerial choice, a CEO whose retention depends on relative performance may mimic peers' pricing decisions to reduce the risk of relative underperformance, even when a different response would maximize firm value. This mechanism captures the peer-mimicry concern documented by Edmans et al. (2023).

To formalize this mechanism and rationalize our empirical findings, we develop a two-period agency model in which shareholders design CEO retention policies to balance the

benefits of filtering common industry shocks against the need to preserve incentives for optimal product pricing. The model features a continuum of peer firms operating under uncertain industry conditions. Managers privately observe imperfect signals about industry conditions and possess private information about their own abilities, whereas shareholders observe neither managerial ability nor the precise signals. After observing realized firm performance, shareholders decide whether to retain or dismiss the incumbent CEO at the end of the first period.

The model's central mechanism is that product-price flexibility expands managers' pricing action space and thereby increases the agency costs of RPE. In sticky-price firms, prices are fixed ex ante based on prior expectations about industry conditions and cannot be revised after managers receive additional information. Because managers have no pricing discretion, RPE simply filters common industry shocks from performance measures. The optimal retention policy therefore relies exclusively on RPE and places no weight on absolute performance. In flexible-price firms, by contrast, managers can adjust prices after observing their private signals about industry conditions, making pricing decisions an important determinant of firm value. Although filtering common shocks through RPE improves boards' assessment of managerial ability, it also distorts incentives by rewarding or penalizing CEOs according to their performance relative to peers. High-ability managers may imitate peer pricing decisions to limit the downside risk of relative underperformance, whereas low-ability managers may adopt inefficient contrarian strategies—deliberately deviating from peer pricing decisions—to increase their chance of relative outperformance and gamble for retention. To mitigate these moral-hazard costs and preserve incentives for value-maximizing pricing decisions, boards of flexible-price firms optimally move away from full RPE: they filter common shocks less completely and place greater weight on absolute performance, which combines industry-induced and idiosyncratic performance. Consequently, CEO dismissal at more flexible-price firms is more sensitive to industry-induced performance.

2 Data, Sample, and Descriptive Statistics

This section describes our data, sample construction, and descriptive statistics based on the raw data. Subsection 2.1 introduces the sources of our empirical data and explains the sample construction. Subsection 2.2 presents descriptive statistics for the sample.

2.1 Data and Sample

Our sample universe includes firm-year observations from the Execucomp compensation database, from which we extract total compensation (adjusted to 2000 dollars using the Consumer Price Index from the Bureau of Labor Statistics (BLS)), executive age, percentage of total shares owned by executives, and the estimated value of in-the-money, unexercised exercisable options.

We use a dataset of forced CEO turnovers from Peters and Wagner (2014), covering 1,438 announcements of forced CEO exits recorded in the Execucomp database between 1993 and 2020. The authors expanded the data used in Peters and Wagner (2014) and Jenter and Kanaan (2015) to include up to 2020. They also slightly modified the original criteria from Parrino (1997) to define a forced turnover, allowing for cases where CEOs over 65 are forced to leave, not restrictively classifying departures of CEOs who remain on the board as voluntary, and expanding the sources searched for CEO departure information. The data can be perfectly matched with the Execucomp CEO database for the current vintage. All merged observations within the period from 1993 to 2020 are considered forced turnovers. The remaining observations are either voluntary turnovers or cases where no turnover occurred.[2]

We utilize the frequency of price adjustment (FPA) data from Pasten, Schoenle, and Weber (2017) to measure output-price flexibility. This data is derived from the confidential microdata underlying the Producer Price Index (PPI) for the years 2002 to 2012. The authors calculate the FPA at the goods level by taking the ratio of the number of price changes to the total number of sample months. For example, if a price remains at \$5 for three months and then changes to \$10 for another two months, this results in one price

[2]For details, see CEO Turnover Database on the website of Peter Florian.

change occurring over five months, yielding a frequency of 1/5. The authors subsequently aggregate these goods-based frequencies into 674 data points categorized by 6-digit NAICS sectors. The FPA reflects the average fraction of months with price changes throughout the sample period, following the spirit of Calvo (1983), and remains constant over time.

We measure FPA at the 6-digit NAICS sector level, assuming firms within the same 6-digit sector share similar price flexibility due to comparable productions, inputs, labor, technologies, and business conditions. We then match FPA to Compustat firms by 6-digit NAICS sector codes.[3] As shown in Figure 2 of the Online Appendix, the distribution of FPA is positively skewed, with a 28.6% monthly adjustment rate implying a duration (computed as $-1/\log(1\text{-adjustment frequency})$) of approximately 6.83 months. The data are consistent with the finding by Nakamura and Steinsson (2008) that a median duration of prices is between eight and 11 months.

All accounting data is sourced from the Compustat Industrial Annual files, while stock return information comes from the monthly CRSP tapes. Following the methodology of Jenter and Kanaan (2015), we calculate industry performance benchmark as the equal-weighted average stock returns of all firms listed on CRSP within the same industry, ensuring that each sample firm is excluded from its own industry benchmark. To account for the possibility that boards may use relative performance evaluation against the largest firms in their industry, we also decompose firm performance into a systematic component caused by the value-weighted returns of industry peers and a firm-specific component. Industries are categorized using the Fama and French (1997) classification system, which includes 48 industries; however, firms in the "Other" industry are not included in our analysis.

2.2 Descriptive Statistics

Table 2 presents descriptive statistics for the main Cox-regression sample. As described in Subsection 2.1, the sample includes firm-year observations from 1993 to 2020 with valid start–stop survival times and nonmissing turnover, return, price-adjustment-frequency (PAF), and control variables. The final sample contains 3,075 firms and 38,347 firm-year observations.

[3] If 6-digit codes are not matched, we use 5-digit codes, stopping at this level to ensure granularity and minimize errors.

Panel A reports the frequency of CEO turnovers. The full sample includes 5,818 CEO turnovers, corresponding to a turnover rate of 15.17%. Of these turnovers, 1,032 are forced (2.69% of firm-year observations) and 4,786 are voluntary (12.48%). We classify firm-year observations into three PAF groups using the 33rd and 67th percentiles of PAF within the estimation sample. The bottom, middle, and top PAF terciles are labeled Sticky, Medium, and Flexible, respectively, and contain 13,286, 12,386, and 12,675 firm-year observations. The forced-turnover rate declines across these groups, from 3.10% for Sticky firms to 2.88% for Medium firms and 2.07% for Flexible firms, whereas voluntary-turnover rates are similar across the three groups.

Panel B summarizes firm characteristics by turnover outcome. Relative to firm-years in which the CEO is retained or leaves voluntarily, firm-years ending in a forced turnover are associated with larger book assets, sales, and employment, but lower market values of equity. This pattern is particularly pronounced among Flexible firms, whose forced-turnover observations have average book assets of $82.6 billion, compared with $32.9 billion for retained-CEO observations and $24.4 billion for voluntary-turnover observations.

Panel C reports firm-level and industry-level stock returns during the 12 months preceding fiscal year t. Across all PAF groups, average firm-level returns are negative before forced CEO turnovers. The average firm-level return before a forced turnover is -6.42% for Sticky firms, -6.56% for Medium firms, and -14.58% for Flexible firms. Consistent with Jenter and Kanaan (2015), industry performance is also weaker before forced turnovers than before voluntary turnovers or CEO retentions. This pattern is most pronounced among Flexible firms: their average equal-weighted industry return is 3.65% before a forced turnover, compared with 11.67% before a voluntary turnover and 10.63% before CEO retention. In contrast, the corresponding equal-weighted industry returns before forced turnovers are 12.14% for Sticky firms and 12.04% for Medium firms.

Panel D reports forced- and voluntary-turnover frequencies across quintiles of equal- and value-weighted industry returns, constructed separately within each PAF group. The negative relation between forced turnover and industry performance is concentrated among Flexible firms. Using equal-weighted industry returns, the forced-turnover rate for Flexible firms declines from 3.20% in the lowest industry-performance quintile to 1.38% in the

highest quintile; the corresponding value-weighted rates decline from 3.20% to 1.54%. The analogous relation is considerably weaker and non-monotonic among Sticky and Medium firms. Voluntary-turnover rates do not exhibit a comparable monotonic pattern across industry-performance quintiles. Overall, the descriptive evidence indicates that the association between poor industry performance and forced CEO turnover is strongest among firms with more flexible prices.

3 Estimation Framework

In this section, we introduce our estimation approach, point out issues with inference, and propose our solutions to mitigate these issues. Subsection 3.1 describes the estimation approach.

3.1 Two-Stage Estimation Approach

Following Jenter and Kanaan (2015), we estimate the sensitivity of CEO turnover to peer performance using a two-stage regression approach. A firm's performance is measured by its stock return. The first stage decomposes firm performance into a systematic component caused by peer group performance and an idiosyncratic component that reflects, among other things, CEO ability. Specifically, for each lag $n \in \{1, 2\}$, we estimate

$$Return_{i,t-n} = \beta_{0,n} + \beta_{1,n} Return_{\text{peer}(i),t-n} + \nu_{i,t-n}, \tag{3.1}$$

where $Return_{i,t-n}$ is firm i's annualized stock return in year $t-n$. Peer-group performance $Return_{\text{peer}(i),t-n}$ is the equal- or value- weighted average stock returns of all firms listed on CRSP within the same Fama-French 48 industry as firm i. We exclude firm i's return when calculating $Return_{\text{peer},t-n}$.

Using the estimates from equation (3.1), we define the industry-induced component of firm i's return as

$$\widehat{Return}_{i,t-n} = \widehat{\beta}_{0,n} + \widehat{\beta}_{1,n} Return_{\text{peer}(i),t-n}, \tag{3.2}$$

and the idiosyncratic component as

$$\widehat{\nu}_{i,t-n} = Return_{i,t-n} - \widehat{Return}_{i,t-n}. \tag{3.3}$$

We refer to $\widehat{Return}_{i,t-n}$ as "industry-induced return $t-n$" and to $\widehat{\nu}_{i,t-n}$ as "idiosyncratic return $t-n$." The former captures the component of firm performance predicted by industry-wide conditions, whereas the latter captures firm-specific performance, including CEO ability and other idiosyncratic shocks.

In the second stage, we use the two estimated return components to explain the hazard of forced CEO dismissal. Taking the Cox proportional-hazards model as our main second-stage specification, we estimate

$$\begin{aligned} h_i(\tau \mid \mathcal{I}_{i,t}) = h_0(\tau) \exp\{&\widehat{\mathbf{R}}'_{i,t}\boldsymbol{\gamma}_1 + \widehat{\boldsymbol{\nu}}'_{i,t}\boldsymbol{\gamma}_2 \\ &+ PAFrnk_i\widehat{\mathbf{R}}'_{i,t}\boldsymbol{\gamma}_3 + PAFrnk_i\widehat{\boldsymbol{\nu}}'_{i,t}\boldsymbol{\gamma}_4 \\ &+ PAFrnk_i\gamma_5 + X'_{i,t}\boldsymbol{\gamma}_6 + \theta_t\}, \end{aligned} \tag{3.4}$$

where $h_i(\tau \mid \mathcal{I}_{i,t})$ is the conditional hazard of forced CEO dismissal for firm i at duration τ, and $h_0(\tau)$ is the unspecified baseline hazard. The two vectors of decomposed returns are

$$\widehat{\mathbf{R}}'_{i,t} = \left(\widehat{Return}_{i,t-1}, \widehat{Return}_{i,t-2}\right) \quad \text{and} \quad \widehat{\boldsymbol{\nu}}'_{i,t} = \left(\widehat{\nu}_{i,t-1}, \widehat{\nu}_{i,t-2}\right). \tag{3.5}$$

Thus, $\widehat{\mathbf{R}}'_{i,t}$ contains the two industry-induced return components estimated in the first stage: the component of firm performance predicted by peer-group performance at $t-1$ and the corresponding component at $t-2$. Similarly, $\widehat{\boldsymbol{\nu}}'_{i,t}$ contains the estimated idiosyncratic return components at $t-1$ and $t-2$.

The goal of our empirical analysis is to examine how the sensitivity of CEO turnover to peer performance depends on a firm's degree of product-price stickiness. To this end, we introduce $PAFrnk_i$ and its interaction with performance measures to the estimation. The variable $PAFrnk_i$ is the fractional rank of firm i's price-adjustment frequency (PAF), with higher values indicating greater price flexibility. The coefficients $\boldsymbol{\gamma}_3$ and $\boldsymbol{\gamma}_4$ capture whether the sensitivity of forced CEO dismissal to industry-induced and idiosyncratic performance,

respectively, varies with price flexibility. The vector $X_{i,t}$ contains the control variables, including an indicator for CEOs between 63 and 66 years old (*Retirement age*) and an indicator for CEOs who own more than 5% of their firms' outstanding equity (*High equity ownership*). Finally, θ_t denotes calendar-year fixed effects that absorb common time trends and economy-wide shocks.

Our estimation approach in equations (3.1) and (3.4) uses the industry-induced and idiosyncratic returns estimated from the first-stage regression to predict forced CEO turnover in the second-stage regression. This two-stage approach involves uncertainty both in the estimation of these return measures and in forced CEO turnover conditional on the predictors. Conventional standard errors may therefore be underestimated. To account for both sources of uncertainty, we bootstrap the sample and re-estimate both stages in each bootstrap iteration. The resulting variation in the bootstrap coefficient estimates naturally incorporates estimation uncertainty from both stages.

3.2 Measurement Errors

Because systematic data on boards' information sets and peer-selection criteria are unavailable, we proxy a firm's peer group with other firms in the same Fama–French 48 industry. This proxy introduces measurement error because boards may use more precise peer groups and performance measures.

Although Jenter and Kanaan (2015) note that "a less informative benchmark biases us in favor of accepting the relative performance evaluation hypothesis," measurement error requires particular caution in our setting. Our inference compares CEO-dismissal sensitivities across firms with different degrees of product-price rigidity, which varies systematically across industries. However, the informativeness of the Fama–French 48 industry benchmark may also vary across industries because of differences in industry composition and within-industry comparability. Measurement error may therefore be systematically related to price flexibility. Econometrically, this means that the estimated Cox coefficients on peer-group performance in equation (3.4), especially the interaction coefficient γ_3, may conflate genuine heterogeneity in CEO-dismissal sensitivity with heterogeneity in measurement precision. Thus, rather than capturing only how dismissal sensitivity varies with price flexibility, γ_3 may also reflect cross-

industry differences in benchmark informativeness.

Importantly, measurement error does not bias our estimates of interest. We show that the estimates of the CEO-dismissal sensitivity to peer-group performance remains unbiased even with the presence of measurement error. That means, although industry performance is just a noisy proxy for peer-group performance, the CEO-dismissal sensitivity estimated based on industry performance (industry-induced returns) does not deviate from the actual one systematically. By contrast, the estimated sensitivity to idiosyncratic returns is biased and should not be interpreted at face value. We derive these results below.

Our assessment proceeds in two steps. We first derive analytically the effect of measurement error on linear estimates and then use simulations to examine nonlinear estimates. Consider the following stylized framework. For each firm i, its value is given by

$$v_i = \overline{v} + \epsilon_i,$$

where $\overline{v}$ denotes the value of the actual peer group selected and used by the board in practice, and ϵ_i is the firm's idiosyncratic value. The board observes both firm value and true peer-group performance and combines these signals to form its performance assessment for the dismissal decision:

$$w_i = \gamma_1 \overline{v} + \gamma_2 \left(v_i - \overline{v}\right) + \omega. \tag{3.6}$$

As specified later, w_i positively determines the probability of dismissal and is referred to as dismissal metrics. Our coefficient of primary interest, γ_1, captures the sensitivity of CEO dismissal to peer-group performance, whereas γ_2 captures its sensitivity to idiosyncratic performance.

The econometrician does not observe the value of the board's true peer group, $\overline{v}$, and instead observes a peer-performance benchmark

$$m = \overline{v} + \eta,$$

This benchmark captures the value of the peer group with measurement error η. In our setting, this noisy proxy is the average performance of all firms in the firm's industry. We

maintain the following assumptions about the value of the peer group, $\overline{v}$, a firm's idiosyncratic value, ϵ_i, and the measurement error, η

- they are zero in expectation:

$$\mathbb{E}[\overline{v}] = \mathbb{E}[\epsilon_i] = \mathbb{E}[\eta] = 0;$$

- they are orthogonal to each other:

$$\text{Cov}(\overline{v}, \epsilon_i) = \text{Cov}(\overline{v}, \eta) = \text{Cov}(\epsilon_i, \eta) = 0;$$

- they have finite second moments.

We then implement the two-stage estimation approach described in Subsection 3.1. In the first stage, we regress the firm value, v_i, on the observed peer-performance benchmark, m:

$$v_i = \alpha + \beta_m m + u_i.$$

The population OLS estimator of β_m is

$$\hat{\beta}_m = \frac{\text{Cov}\left[v_i, m\right]}{\text{Var}\left[m\right]} = \frac{\text{Var}\left[\overline{v}\right]}{\text{Var}\left[m\right]}.$$

The predicted firm value is therefore

$$\hat{v}_i = \hat{\beta}_m m,$$

and the corresponding residual is

$$v_i - \hat{v}_i = v_i - \hat{\beta}_m m.$$

In the second stage, we estimate

$$w_i = \alpha + \gamma_1 \hat{v}_i + \gamma_2 \left(v_i - \hat{v}_i\right) + u_i.$$

Because $\hat{v}_i$ and $v_i - \hat{v}_i$ are orthogonal by construction, their population OLS estimators are

$$\hat{\gamma}_1 = \frac{\text{Cov}\left[w_i, \hat{v}_i\right]}{\text{Var}\left[\hat{v}_i\right]} = \frac{\text{Cov}\left[\gamma_1 \overline{v} + \gamma_2 \left(v_i - \overline{v}\right), \hat{\beta}_m m\right]}{\text{Var}\left[\hat{\beta}_m m\right]} = \gamma_1,$$

and

$$\begin{aligned}
\hat{\gamma}_2 &= \frac{\text{Cov}\left[w_i, v_i - \hat{v}_i\right]}{\text{Var}\left[v_i - \hat{v}_i\right]} \\
&= \frac{\text{Cov}\left[\gamma_1 \overline{v} + \gamma_2 \left(v_i - \overline{v}\right), v_i - \hat{\beta}_m m\right]}{\text{Var}\left[v_i - \hat{\beta}_m m\right]} \\
&= \frac{\gamma_1 \left(1 - \hat{\beta}_m\right) \text{Var}\left[\overline{v}\right] + \gamma_2 \text{Var}\left[\epsilon_i\right]}{\left(1 - \hat{\beta}_m\right)^2 \text{Var}\left[\overline{v}\right] + \hat{\beta}_m^2 \text{Var}\left[\eta\right] + \text{Var}\left[\epsilon_i\right]}.
\end{aligned}$$

Thus, $\hat{\gamma}_1 = \gamma_1$ regardless of the measurement error: our estimate of the CEO-dismissal sensitivity to peer-group performance remains unbiased. By contrast, $\hat{\gamma}_2 = \gamma_2$ does not generally hold when measurement error is present, that is, when $\text{Var}\left[\eta\right] > 0$ and $\hat{\beta}_m < 1$. The estimated sensitivity to idiosyncratic returns cannot therefore be interpreted at face value.

After analytically characterizing the effect of measurement error on estimates from the linear model, we next consider settings in which the dismissal outcome depends nonlinearly on the performance measures. Because the resulting estimates are not readily available in closed form, we evaluate the effect of measurement error through simulations. We consider two types of firms. In equation (3.6), both types have the same sensitivity to idiosyncratic performance, $\gamma_2 = -4$, and the same constant, $\omega = -2$. They differ only in their sensitivity to peer-group performance: $\gamma_1 = -1$ for the first type and $\gamma_1 = -3$ for the second type. Thus, the second type exhibits a stronger, more negative dismissal response to peer-group performance.

Our main analyses employ Cox proportional hazards and logit models, so we generate dismissal outcomes using data-generating processes consistent with these two specifications. Let w_i denote the linear dismissal index in equation (3.6). For the Cox simulation, we assume

a constant baseline hazard. Writing $w_i = \omega + \mathbf{x}_i'\boldsymbol{\gamma}$, the individual hazard rate is

$$h_i(t \mid \mathbf{x}_i) = h_0(t) \exp\left(\mathbf{x}_i'\boldsymbol{\gamma}\right) = \exp\left(w_i\right),$$

where $h_0(t) = \exp(\omega)$. The hazard rate is the instantaneous rate of dismissal at time t, conditional on the CEO having remained in office up to that time. Under the constant-hazard assumption, the corresponding survival probability through tenure t is

$$S_i(t \mid \mathbf{x}_i) = \exp\left[-t \exp\left(w_i\right)\right],$$

and the probability of dismissal by tenure t is $1 - S_i(t \mid \mathbf{x}_i)$. A change Δx in a performance measure with coefficient γ therefore multiplies the dismissal hazard by $\exp(\gamma \Delta x)$.[4]

For the logit simulation, we instead interpret w_i as the log odds of dismissal and generate the binary outcome using

$$\Pr\left(\text{Dismissal}_i = 1 \mid \mathbf{x}_i\right) = \frac{\exp(w_i)}{1 + \exp(w_i)}.$$

Unlike the Cox hazard rate, this expression is directly a probability and is therefore bounded between zero and one. We simulate 100,000 observations for each firm type and then estimate the corresponding Cox and logit models.

Panel A of Table 1 presents estimation results for the Cox proportional hazards model. Columns (1) and (2) show that the estimated sensitivity of CEO dismissal to peer-group performance is close to the true parameters, which is -1 for the low type and -3 for the high type. Column (3) shows that the estimated average sensitivity of CEO dismissal to peer-group performance is close to -2 when all firms are pooled together, confirming that the estimates of Jenter and Kanaan (2015) are unbiased. Column (4) shows that the estimated difference in the sensitivity of CEO dismissal to peer-group performance between the firm types is close to -2. It confirms that our estimation can properly uncover the difference

[4] We simulate the Cox outcome in three steps. First, we draw u_i from a uniform distribution on $(0, 1)$. Second, we generate the latent dismissal time as $T_i = -\ln(u_i)/\exp(w_i)$, which has survival function $S_i(t) = \exp[-t \exp(w_i)]$. Third, we set observed tenure equal to $\min\{T_i, 20\}$ and define dismissal as $\mathbf{1}\{T_i \leq 20\}$. Thus, a CEO with $T_i > 20$ is right-censored rather than dismissed. The common constant ω determines the time scale of the simulated hazard and is absorbed into the baseline hazard in Cox estimation.

between the true parameters. On the other hand, the two-stage estimation do not uncover the sensitivity of CEO dismissal to idiosyncratic performance, as the related estimates deviate substantially from the true parameters. Panel B of Table 1 presents estimation results for the logit model, which are similar to those in Panel A.

3.3 Robust Estimation Approach

The two-stage estimation approach outlined in Subsection 3.1 relies on two assumptions. First, equation (3.1) pools all firms and estimates a common β_1, imposing a homogeneous loading of firm returns on peer performance. If the true loadings differ across firms, the pooled specification will mismeasure both the systematic and idiosyncratic return components.

Second, interpreting differences in CEO-dismissal sensitivity as differences in the importance boards assign to performance requires comparable volatility across firms. This concern is important because sticky-price firms have substantially more volatile stock returns than flexible-price firms (e.g., Gorodnichenko and Weber, 2016; Xie, 2020). The same raw-return decline therefore represents a smaller standardized shock for a sticky-price firm, so a lower estimated sensitivity may reflect greater volatility rather than less weight placed on performance.

Our normalized-return specification addresses these two concerns in two steps. This normalization makes the dismissal sensitivities of sticky- and flexible-price firms comparable. First, we estimate the association between firm and peer performance separately for each firm i and lag $n \in \{1, 2\}$:

$$Return_{i,s-n} = \beta_{0,i,n} + \beta_{1,i,n} Return_{\text{peer}(i),s-n} + \nu_{i,s-n}, \qquad s \in \mathcal{T}_i, \tag{3.7}$$

where $\mathcal{T}_i$ contains firm i's usable observations over 1993–2020. Peer performance is the equal- or value-weighted average return of the other firms in the same Fama–French 48 industry, excluding firm i. The resulting firm-specific industry-induced and idiosyncratic components are

$$\widehat{Return}_{i,t-n} = \widehat{\beta}_{0,i,n} + \widehat{\beta}_{1,i,n} Return_{\text{peer}(i),t-n}, \qquad \widehat{\nu}_{i,t-n} = Return_{i,t-n} - \widehat{Return}_{i,t-n}. \tag{3.8}$$

Second, we scale each component by its firm-specific volatility. Let $T_i = |\mathcal{T}_i|$. The component means and standard deviations are

$$\begin{aligned} \mu^R_{i,n} &= \frac{1}{T_i}\sum_{s\in\mathcal{T}_i} \widehat{Return}_{i,s-n}, \quad \sigma^R_{i,n} = \left[\frac{1}{T_i-1}\sum_{s\in\mathcal{T}_i}\left(\widehat{Return}_{i,s-n} - \mu^R_{i,n}\right)^2\right]^{1/2}, \\ \mu^\nu_{i,n} &= \frac{1}{T_i}\sum_{s\in\mathcal{T}_i} \widehat{\nu}_{i,s-n}, \qquad\qquad \sigma^\nu_{i,n} = \left[\frac{1}{T_i-1}\sum_{s\in\mathcal{T}_i}\left(\widehat{\nu}_{i,s-n} - \mu^\nu_{i,n}\right)^2\right]^{1/2}. \end{aligned} \tag{3.9}$$

We then construct

$$\widetilde{Return}_{i,t-n} = \frac{\widehat{Return}_{i,t-n} - \mu^R_{i,n}}{\sigma^R_{i,n}}, \qquad \widetilde{\nu}_{i,t-n} = \frac{\widehat{\nu}_{i,t-n} - \mu^\nu_{i,n}}{\sigma^\nu_{i,n}}. \tag{3.10}$$

This scaling makes the dismissal sensitivities of sticky- and flexible-price firms comparable rather than allowing their different return volatilities to drive the comparison mechanically.

In the second stage, we use the normalized components in our main Cox proportional-hazards specification:

$$\begin{aligned} h_i(\tau \mid \mathcal{I}_{i,t}) = h_0(\tau)\exp\{&\widetilde{\mathbf{R}}'_{i,t}\boldsymbol{\gamma}_1 + \widetilde{\boldsymbol{\nu}}'_{i,t}\boldsymbol{\gamma}_2 \\ &+ PAFrnk_i\widetilde{\mathbf{R}}'_{i,t}\boldsymbol{\gamma}_3 + PAFrnk_i\widetilde{\boldsymbol{\nu}}'_{i,t}\boldsymbol{\gamma}_4 \\ &+ PAFrnk_i\gamma_5 + X'_{i,t}\boldsymbol{\gamma}_6 + \theta_t\}, \end{aligned} \tag{3.11}$$

where

$$\widetilde{\mathbf{R}}'_{i,t} = \left(\widetilde{Return}_{i,t-1}, \widetilde{Return}_{i,t-2}\right), \qquad \widetilde{\boldsymbol{\nu}}'_{i,t} = \left(\widetilde{\nu}_{i,t-1}, \widetilde{\nu}_{i,t-2}\right). \tag{3.12}$$

4 Empirical Results

This section presents the paper's empirical results. Subsection 4.2 compares the sensitivity of CEO dismissals to peer performance between sticky- and flexible-price firms. Subsection 4.4 presents implied probabilities of forced CEO turnover calculated from the logit models. Subsection 4.5 compares the sensitivity of CEO compensation to peer performance between sticky- and flexible-price firms.

4.1 Replication of Jenter and Kanaan (2015)

We use the two-stage approach of Jenter and Kanaan (2015) to examine whether the sensitivity of forced CEO turnover to peer-group performance remains evident after extending the sample through 2020. Following Jenter and Kanaan (2015), we estimate second-stage CEO turnover using the Cox (1972) proportional hazard model. The Cox model flexibly accommodates the fact that each CEO's hazard rate—the likelihood that a currently employed CEO is dismissed within the next month—depends on the CEO's tenure and other CEO characteristics. We treat voluntary turnovers as right-censored observations.

Table 3 presents our replication of Jenter and Kanaan (2015) over the 1993–2020 sample period. We regress forced CEO turnover on idiosyncratic firm performance and the component of firm performance predicted by industry performance (industry-induced return). We compute standard errors using a block bootstrap with 2,000 replications, clustered at the Fama–French 48-industry level, jointly resampling the first- and second-stage estimation procedures. Columns (1) and (2) use equal-weighted industry returns as instruments, whereas columns (3) and (4) use value-weighted industry returns. Columns (2) and (4) additionally include calendar-year fixed effects. In column (1), the industry-induced return at $t-1$ has a negative and highly significant coefficient of -0.905 (standard error 0.187), whereas the industry-induced return at $t-2$ is positive and marginally significant (0.267, standard error 0.155). With year fixed effects in column (2), the coefficient on the industry-induced return at $t-1$ increases in magnitude to -1.412 (standard error 0.320), while the coefficient at $t-2$ becomes economically small and statistically insignificant. The industry-induced return at $t-1$ is also negative and highly significant when we use value-weighted industry returns, with coefficients of -0.824 in column (3) and -1.502 in column (4). In contrast, the value-weighted industry-induced returns at $t-2$ are statistically insignificant.

Idiosyncratic returns at both $t-1$ and $t-2$ are negative and statistically significant across all columns. For example, in column (1), the coefficient on idiosyncratic return at $t-1$ is -2.038 (standard error 0.211), and the coefficient at $t-2$ is -0.444 (standard error 0.104). These estimates remain similar after adding year fixed effects and when using value-weighted industry returns. Overall, the results are broadly consistent with Jenter and Kanaan (2015):

recent industry-induced performance and idiosyncratic performance are important predictors of CEO dismissal. However, the positive and marginally significant coefficient on the equal-weighted industry-induced return at $t-2$ in column (1) differs from the pattern reported by Jenter and Kanaan (2015), which may reflect our extension of the sample period through 2020.

4.2 Flexible Prices, Peer Performance, and CEO Dismissals

We next test whether the sensitivity of forced CEO turnover to peer-group performance varies with firms' product-price flexibility. We estimate the following Cox hazard regression:

$$\begin{aligned} h_{i,t} = h_0(t) \exp\{&\widehat{\mathbf{R}}_{i,t}^{'}\gamma_1 + \hat{\boldsymbol{\nu}}_{i,t}^{'}\gamma_2 + PAFrnk_i \times \widehat{\mathbf{R}}_{i,t}^{'}\gamma_3 \\ &+ \times\hat{\boldsymbol{\nu}}_{i,t}^{'}\gamma_4 + PAFrnk_i\gamma_5 + X_{i,t}^{'}\gamma_6 + \theta_t\}, \end{aligned} \tag{4.1}$$

where $h_{i,t}$ is the hazard of forced CEO dismissal, $\widehat{\mathbf{R}}_{i,t}$ denotes industry-induced returns, and $\hat{\boldsymbol{\nu}}_{i,t}$ denotes idiosyncratic firm returns. Both return vectors include performance in years $t-1$ and $t-2$. $PAFrnk_i$ is the fractional rank of firm i's product-price adjustment frequency, with higher values indicating greater price flexibility. In even-numbered columns, we also include firm characteristics and their interactions with the return measures.

Table 4 reports the results. Columns (1)–(4) use raw decomposed returns. The interaction between *PAFrnk* and industry-induced return in year $t-1$ is negative and statistically significant across all four specifications. The coefficients are -1.575 in column (1), -1.198 in column (2), -2.055 in column (3), and -1.646 in column (4). These estimates indicate that forced CEO dismissals are more sensitive to recent peer performance among firms with more flexible product prices.

Because *PAFrnk* is continuous, we evaluate the economic magnitude by varying it from the lowest observed value, 0, to the highest observed value, 0.87. In the equal-weighted specification without controls, the estimated sensitivity of CEO dismissal to industry-induced return in year $t-1$ changes from -0.672 for the stickiest firms to -2.045 for the most flexible firms. With controls, the corresponding estimates are -0.513 and -1.557. Using value-weighted industry returns, the estimated sensitivities change from -0.611 to -2.402

without controls, and from -0.434 to -1.868 with controls. The interactions for industry-induced return in year $t-2$ are generally weaker and statistically insignificant, indicating that the differential sensitivity is concentrated in the most recent year of peer performance. Columns (3)–(4) repeat the same analysis using value-weighted industry returns. The interaction between *PAFrnk* and industry-induced return in year $t-1$ is about 30% larger in magnitude without controls and about 37% larger with controls than in the corresponding equal-weighted specifications. This pattern is consistent with Jenter and Kanaan's (2015) interpretation that boards may pay more attention to salient peer firms when evaluating CEO performance.

Columns (5)–(8) report the corresponding estimates using normalized decomposed returns. These specifications provide a useful comparison with the raw-return results. One possible interpretation is that raw decomposed returns may partly reflect differences in the means and volatilities of returns across sticky- and flexible-price firms, which could be correlated with industry or product characteristics rather than with product-price rigidity itself. After normalization, the standalone coefficients on industry-induced return in year $t-1$ are small and statistically insignificant: -0.051, -0.006, -0.109, and -0.226 across columns (5)–(8). Thus, among sticky-price firms, CEO dismissal is not detectably sensitive to normalized industry-induced performance.

At the same time, the interactions between *PAFrnk* and normalized industry-induced return in year $t-1$ remain negative and statistically significant. This indicates that firms with more flexible product prices continue to exhibit greater dismissal sensitivity to peer performance after normalization. In contrast, the interactions between *PAFrnk* and normalized idiosyncratic return in year $t-1$ are statistically indistinguishable from zero across columns (5)–(8). Thus, after normalization, CEO dismissals among firms with different degrees of product-price stickiness display similar sensitivity to idiosyncratic firm performance.

4.3 Predicted CEO Survival Probability

To assess the economic magnitude of these estimates, Figure 3 plots conditional CEO survival probabilities over CEO tenure as industry-induced return increases from the 10th to the 90th percentile of its estimation-sample distribution. The counterfactual calculations represent

the stickiest and most flexible firms using the lowest and highest observed values of *PAFrnk*, respectively, while holding the remaining covariates at their model-sample means. Panel A uses equal-weighted industry returns and corresponds to column (1) of Table 4, whereas Panel B uses value-weighted industry returns and corresponds to column (3).

In Panel A, the 10th and 90th percentiles of equal-weighted industry-induced return are −10.6% and 38.6%, respectively. At the median CEO tenure of three years, increasing industry-induced return across these percentiles raises the predicted survival probability from 0.896 to 0.924 for sticky-price firms, a difference of 2.81 percentage points. For flexible-price firms, the corresponding probability rises from 0.939 to 0.977, a difference of 3.83 percentage points. Panel B produces a similar pattern when value-weighted industry-induced return increases from its 10th percentile of −9.8% to its 90th percentile of 36.0%. The predicted survival probability rises from 0.899 to 0.923 for sticky-price firms and from 0.934 to 0.977 for flexible-price firms, corresponding to increases of 2.36 and 4.37 percentage points, respectively. Thus, moving from low to high industry-induced performance increases predicted CEO survival by 2.81 (2.36) percentage points among sticky-price firms and by 3.83 (4.37) percentage points among flexible-price firms, with value-weighted estimates reported in parentheses.

Figure 4 reports the corresponding conditional survival probabilities using normalized decomposed returns. Panel A uses equal-weighted industry returns and corresponds to column (5) of Table 4, whereas Panel B uses value-weighted industry returns and corresponds to column (7). In Panel A, the 10th and 90th percentiles of normalized equal-weighted industry-induced return are −1.22 and 1.22, respectively. At three years of CEO tenure, moving between these percentiles raises the predicted survival probability from 0.902 to 0.913 for sticky-price firms, a difference of 1.09 percentage points, and from 0.911 to 0.976 for flexible-price firms, a difference of 6.48 percentage points. In Panel B, the corresponding percentiles of normalized value-weighted industry-induced return are −1.27 and 1.19. The predicted survival probability rises from 0.895 to 0.919 for sticky-price firms and from 0.905 to 0.975 for flexible-price firms, corresponding to increases of 2.35 and 7.02 percentage points, respectively. The normalized-return results therefore sharpen the contrast between the two groups: the increase in predicted survival is 1.09 (2.35) percentage points for sticky-price

firms, compared with 6.48 (7.02) percentage points for flexible-price firms.[5]

4.4 Logit Regressions

Prior studies of CEO turnover commonly estimate logit regressions rather than Cox hazard models. To show that our results are not driven by the choice of duration model, we follow Jenter and Kanaan (2015) and reestimate the second-stage turnover regressions using logit models in Table 5. Because the logit model does not directly account for the relation between CEO tenure and dismissal risk, we include CEO tenure as an explicit control in all specifications. The logit results are closely aligned with the Cox hazard estimates in Table 4. The interaction between *PAFrnk* and industry-induced return in year $t-1$ is negative and statistically significant across all specifications, while the corresponding interaction for year $t-2$ is generally insignificant.

We estimate the following logit regression:

$$\Pr(\textit{Forced Turnover}_{i,t} = 1 \mid \mathcal{X}_{i,t}) = \Lambda\Big(\widehat{\mathbf{R}}_{i,t}'\gamma_1 + \hat{\boldsymbol{\nu}}_{i,t}'\gamma_2 + \textit{PAFrnk}_i \times \widehat{\mathbf{R}}_{i,t}'\gamma_3 + \textit{PAFrnk}_i \times \hat{\boldsymbol{\nu}}_{i,t}'\gamma_4 + \textit{PAFrnk}_i\gamma_5 + X_{i,t}'\gamma_6 + \theta_t\Big), \tag{4.2}$$

Table 6 reports the implied probabilities of forced CEO turnover from these logit regressions. For each specification, we set *PAFrnk* to its lowest observed value to construct the sticky-price scenario and to its highest observed value to construct the flexible-price scenario. We then set industry-induced return in year $t-1$ to its 10th or 90th percentile, while leaving all other variables at their observed values and recomputing the relevant interaction terms. The realized base rate of forced CEO turnover is 2.691% in specifications without firm-characteristic controls and 2.706% in specifications with these controls.

Panel A reports implied probabilities based on raw decomposed returns. Without firm-characteristic controls, moving industry-induced return from the 90th to the 10th percentile

[5] Figure A.1 and Figure A.2 in the Online Appendix report the corresponding predicted survival probabilities based on the specifications in columns (2), (4), (6), and (8), which add the full set of controls and control-by-return interactions. The results are qualitatively similar.

raises the implied dismissal probability from 2.995% to 4.174% for the sticky-price scenario in the equal-weighted specification, a difference of 1.179 percentage points. For the flexible-price scenario, the corresponding probability rises from 1.326% to 3.689%, a difference of 2.363 percentage points. The value-weighted specification shows a similar pattern. The implied probability increases by 1.019 percentage points for the sticky-price scenario and by 2.547 percentage points for the flexible-price scenario.

The results are similar after controlling for firm characteristics. In the equal-weighted specification, the implied dismissal probability increases by 1.174 percentage points for the sticky-price scenario and by 1.847 percentage points for the flexible-price scenario. In the value-weighted specification, the corresponding increases are 1.091 and 2.064 percentage points. These magnitudes indicate that poor industry-induced performance has a sizable effect on CEO dismissal probabilities, and that the effect is larger when product prices are more flexible.

Panel B reports implied probabilities using normalized decomposed returns. The flexible-price scenario continues to show substantially larger sensitivity to industry-induced performance. With firm-characteristic controls, moving normalized industry-induced return from the 90th to the 10th percentile raises the implied dismissal probability by 0.841 percentage points for the sticky-price scenario and by 1.941 percentage points for the flexible-price scenario in the equal-weighted specification. In the value-weighted specification, the corresponding increases are 1.118 and 2.284 percentage points. These implied probabilities reinforce the main finding from the logit regressions: CEO dismissal probabilities respond more strongly to peer-performance shocks among firms with more flexible product prices.

4.5 CEO Compensation

CEO compensation provides a complementary test of the mechanism underlying the dismissal results we previously documented. The key distinction is between an ex ante incentive role for dismissal and an ex post retention decision. Under the incentive-based interpretation, boards use both the prospect of dismissal and performance-sensitive compensation to influence the incumbent CEO's effort and decisions before performance is realized. Accordingly, if boards at firms with more flexible prices place greater weight on industry-induced performance

when evaluating CEOs, compensation at those firms should also be less insulated from that performance component.

Alternatively, dismissal may primarily reflect an ex post screening, retention, or matching decision. After observing performance, boards may update their assessment of CEO ability and decide whether retaining the incumbent remains optimal, rather than use dismissal principally to shape the CEO's future behavior. A board may also replace a capable CEO because another manager is a better match for the firm's circumstances or strategic needs. In these cases, turnover reallocates the CEO–firm match, whereas performance-sensitive compensation is not necessary to achieve the board's objective.[6] Thus, if dismissal primarily reflects screening or rematching, compensation need not respond in parallel to industry-induced performance, because boards can address an unfavorable assessment by replacing the incumbent rather than revising the CEO's pay package.

To estimate the sensitivity of CEO compensation to firm and industry performance, we jointly resample the first-stage return decomposition in equation (3.1) and the subsequent OLS regressions. Consistent with our Cox specification, the second-stage model is

$$\begin{aligned} Ln(Compensation)_{i,t} = \gamma_0 + \widehat{\mathbf{R}}_{i,t}^{'}\gamma_1 + \hat{\boldsymbol{\nu}}_{i,t}^{'}\gamma_2 + PAFrnk_i \times \widehat{\mathbf{R}}_{i,t}^{'}\gamma_3 \\ + PAFrnk_i \times \hat{\boldsymbol{\nu}}_{i,t}^{'}\gamma_4 + PAFrnk_i\gamma_5 + X_{i,t}^{'}\gamma_6 + \theta_i + \theta_t + \varepsilon_{i,t}, \end{aligned} \tag{4.3}$$

where the dependent variable is the logarithm of total CEO compensation. Our primary dependent variable is the logarithm of total CEO compensation, expressed in year-2000 dollars using the Consumer Price Index. This broad measure combines cash pay (salary, bonus, and other annual compensation), equity-based pay (restricted-stock grants), long-term incentive plan (LTIP) payouts, and option-related compensation. The latter includes (i) the realized gain from options exercised during the fiscal year and (ii) the estimated value of options that remain unexercised.[7] Unlike the Cox model, equation (4.3) is estimated by

[6] Taylor (2010) models CEO turnover as a dynamic decision involving board learning about CEO ability and costly replacement. Eisfeldt and Kuhnen (2013) characterize turnover as a CEO–firm assignment decision, in which replacement can improve the match between the firm's needs and available managerial talent.

[7] We use realized-value compensation as our primary outcome because it captures the total economic value received by the CEO, including cash pay and the payoff from options granted in earlier years. It therefore measures whether prior performance translates into compensation ultimately received by the CEO. In contrast, grant-date option values capture the estimated value of newly awarded options when boards set

OLS and includes firm fixed effects in addition to year fixed effects.

Table 7 reports the results. CEO compensation is positively associated with recent industry-induced performance: the coefficients on industry-induced return at $t-1$ range from 0.204 to 0.434 and are statistically significant across all four raw-return specifications. However, the incremental sensitivity associated with price flexibility is less consistent at $t-1$. The interaction between *PAFrnk* and industry-induced return at $t-1$ is positive and statistically significant in the equal-weighted specifications, with coefficients of 0.291 and 0.284, but is smaller and statistically insignificant in the value-weighted specifications.

The evidence of differential sensitivity is more consistent at $t-2$. Across the four raw-return specifications, the interaction between *PAFrnk* and industry-induced return at $t-2$ is positive and statistically significant, with coefficients ranging from 0.140 to 0.233. To assess the economic magnitude, we compare the firm with the lowest observed value of *PAFrnk* with the firm at its highest observed value and increase industry-induced return at $t-2$ from the 10th to the 90th percentile of its sample distribution. Based on the specifications without controls, this increase reduces predicted compensation by 2.59% (1.51%) for the extremely sticky-price firm but raises it by 5.91% (8.24%) for the extremely flexible-price firm, where value-weighted estimates are reported in parentheses. The positive $t-2$ interaction remains statistically significant after adding the full set of controls.

The normalized-return results in columns (5)–(8) reinforce this conclusion. Normalized industry-induced return at $t-1$ is positively and significantly associated with compensation, but its interaction with *PAFrnk* is small and generally statistically insignificant. In contrast, the interaction between *PAFrnk* and normalized industry-induced return at $t-2$ is positive and precisely estimated in every specification, with coefficients ranging from 0.032 to 0.058. Using the same counterfactual comparison, we set *PAFrnk* to its observed minimum or maximum and increase normalized industry-induced return at $t-2$ from its 10th to its 90th percentile. Based on the specifications without controls, predicted compensation decreases by 3.96% (1.06%) for the extremely sticky-price firm but increases by 8.63% (8.99%) for the extremely flexible-price firm. Thus, although compensation generally responds to recent

compensation, rather than the subsequent value realized from earlier awards. We use grant-date values as an alternative measure to assess whether the results also hold at the time of award.

industry performance, the differential exposure of extremely flexible-price firms is most consistent for industry-induced performance at $t-2$.

The concentration of this result at the second lag is consistent with the multi-period nature of CEO compensation contracts. Dynamic compensation theory predicts that the compensation consequences of performance can extend beyond the current period (e.g., Edmans, Gabaix, Sadzik, and Sannikov, 2012; Gopalan, Milbourn, Song, and Thakor, 2014; Edmans, Gosling, and Jenter, 2023). We therefore interpret the robust response to industry-induced return at $t-2$ as consistent with boards incorporating earlier industry performance into CEO compensation decisions, particularly at firms with more flexible prices. However, the timing result does not by itself establish that boards universally revise compensation with a two-year delay.

4.6 Flexible Prices and Availability of Peer-group benchmark

One potential explanation for boards' weaker use of RPE at flexible-price firms is peer scarcity: boards may perceive that these firms lack a sufficiently large set of comparable peers from which to construct a valid performance benchmark, an important impediment to RPE identified by Edmans et al. (2023).

To examine this possibility, we study the peer firms disclosed in Incentive Lab's RPE-based CEO compensation grant plans.[8] Over 1998–2023, flexible-price firms are more likely than sticky-price firms to disclose a specific peer list (54.3% versus 36.0%). Although their disclosed peer lists are not larger overall, they contain substantially more close industry peers: an average of 12.0 versus 7.1 peers from the same Fama–French 48 industry and 7.2 versus 2.9 peers with an exact NAICS match. Thus, compensation-plan disclosures suggest that boards of flexible-price firms can identify more economically comparable peers, providing little support for perceived peer scarcity as the explanation for their weaker use of RPE in forced-turnover decisions. Because compensation-plan peers need not coincide with the benchmarks used in dismissal decisions, however, this evidence is indirect and does

[8]These data identify peers named in CEO compensation grant plans rather than peers actually considered in CEO dismissal decisions. We therefore interpret them as indirect evidence about the peer-group information available to boards.

not establish whether peer performance measures common shocks equally precisely across sticky- and flexible-price firms.

5 Model

The empirical analysis documents that firms with greater product-price flexibility display a higher sensitivity of CEO dismissal to peer-group performance—a clear deviation from relative performance evaluation (RPE). In this section, we develop a theoretical framework to explain this pattern. The theory relies on two widely accepted mechanisms. First, RPE can create distortionary incentives, encouraging CEOs to either mimic or contrarianly diverge from their peers. Indeed, survey evidence from Edmans, Gosling, and Jenter (2023) shows that 41% of institutional investors worry that benchmarking all performance measures leads CEOs to simply copy peer decisions—the top reason cited for avoiding RPE. Second, for firms with flexible pricing, dynamically adjusting prices in response to shifting economic fundamentals is critical to value creation. Because peer-mimicking distortions are particularly costly when agility matters, these firms rely more heavily on absolute performance evaluation, leaving CEO dismissal exposed to overall peer-group performance.

5.1 Setup

5.1.1 Economic Environment

Consider an industry consisting of a continuum of firms indexed by $i \in [0, 1]$. The model features two dates, date 0 and date 1. At each date, the industry experiences a state $\theta \in \{0, 1\}$, where $\theta = 0$ occurs with probability ϕ and $\theta = 1$ occurs with probability $1 - \phi$. We refer to $\theta = 0$ as the normal and more likely state. That means, $\phi > \frac{1}{2}$. The state is independently drawn across the two dates.

At each date, the value of firm i is given by

$$v_i = a_i + b_i.$$

Here, a_i represents the ability of the manager, and a_i is drawn from a prior distribution

with support $\in [\underline{a}, \overline{a}]$, p.d.f. $f(\cdot)$, and expectation μ. Managers know their own ability, but shareholders only know the prior distribution. b_i represents the firm's pricing efficiency, which depends on the firm's pricing strategy. Firms can implement one of two pricing strategies: $p_i = 0$ or $p_i = 1$. If the pricing strategy matches the realized state ($p_i = \theta$), the pricing efficiency is positive and equals γ; otherwise, the pricing efficiency is 0:

$$b_i = \begin{cases} \gamma > 0, & \text{if } p_i = \theta \\ 0, & \text{if } p_i \neq \theta \end{cases}.$$

At each date, a manager receives a signal about the state of the industry at the current date. When $\theta = 0$, a manager receives signal $s_i = 1$ with probability κ and $s_i = 0$ with probability $1 - \kappa$. When $\theta = 1$, a manager receives signal $s_i = 1$ with probability 1. That means, $s_i = 0$ implies $\theta = 1$ with probability 0, and $s_i = 1$ implies $\theta = 1$ with probability

$$q_{11} = \frac{1 - \phi}{1 - \phi + \phi\kappa}.$$

We assume $\phi\kappa < 1 - \phi$, so $q_{11} > \frac{1}{2}$. Signals are independent across managers conditional the state, and are privately observed by managers.

We consider and compare sticky-price and flexible-price firms. In practice, flexible-price firms can continuously adjust prices to reflect current economic conditions, whereas sticky-price firms must set prices in advance and adjust them infrequently. Accordingly, in the model, for sticky-price firms, the pricing strategy is set ex ante before signal realization and maximizes the expected firm value based on prior information. Since $\theta = 0$ is more likely than $\theta = 1$, sticky-price firms always implement $p_i = 0$. For flexible-price firms, the pricing strategy can be set after signal realization. Managers decide the pricing strategy based on the signal realization.

5.1.2 Agents and Preferences

Shareholders and managers are all risk-neutral. Shareholders receive the firm value at each date and pay a fixed salary to the manager. Their objective is to maximize the sum of firm

value across both dates. Managers have lexicographic preferences: they first maximize their total salary and then the firm value. At the end of date 0, shareholders decide whether to retain or dismiss the current manager. If the current manager is dismissed, another person is selected as the new manager. In general, the abilities of the current manager and the new manager can be dependent. We use α to capture the dependence and assume that the expected ability of the new manager is $\alpha x + (1-\alpha)\mu$ if the ability of the current manager is x.

Shareholders design a performance metrics w_i and base the dismissal decision on the metrics. Since our interest is in the firm's use of relative performance evaluation and absolute performance evaluation, we focus on the case that w_i is linear in the two performance measures as follows:

$$w_i \equiv \beta_a v_i + (1-\beta_a)(v_i - \overline{v}) - \omega. \tag{5.1}$$

Here, $\overline{v} \triangleq \int_0^1 v_i di$ is the average firm value in the industry. β_a and $\beta - \beta_a$ jointly reflect the sensitivity of the manager's expected compensation to the absolute and relative performance; they are nonnegative. ω adjusts the level of the performance measure. The probability that the current manager is retained depends on the performance metrics w_i as follows:

$$\Pi(w_i) = \max\{0, \min\{w_i, 1\}\}.$$

This probability has two key features: it is increasing in w_i, but insensitive to w_i when w_i is close to 1 or 0.

This probability form can be microfounded with shareholders observing the firm value v_i with noises. Specifically, shareholders observe $\tilde{v}_i = v_i + \epsilon_i$, where $\epsilon_i \sim U[0,1]$, so the performance metrics they observe is $\tilde{w}_i = w_i + \epsilon_i$. Since $\tilde{w}_i$ depends on the firm value positively, the dismissal decision must follow a cutoff rule: shareholders decide to dismiss the current manager if and only if $\tilde{w}_i$ is lower than a cutoff. Since shareholders can decide the overall level of $\tilde{w}_i$ by choosing ω, it is without loss of generality to assume that the cutoff is 1. Taken together, the probability that the current manager is retained is

$$\Pr[\tilde{w}_i \geq 1] = \Pr[\epsilon_i \geq 1 - w_i] = \max\{0, \min\{w_i, 1\}\}.$$

5.2 Model Solution

Before separately analyzing sticky-price and flexible-price firms, we first formulate the key terms that apply to both of them. Denote the probability that a manager with ability x is retained by

$$\lambda(x;\beta_a,w) \triangleq \mathbb{E}\left[\Pi(w_i)\,|x\right].$$

The expected ability of the manager at date 1 is then

$$\begin{aligned} A(\beta_a,\omega) &\triangleq \int_{\underline{a}}^{\bar{a}} x\lambda(x;\beta_a,w)\,f(x)\,dx + \int_{\underline{a}}^{\bar{a}} [\alpha x + (1-\alpha)\,\mu]\,[1-\lambda(x;\beta_a,w)]\,f(x)\,dx \\ &= \int_{\underline{a}}^{\bar{a}} x\,[\alpha + (1-\alpha)\,\lambda(x;\beta_a,w)]\,f(x)\,dx + (1-\alpha)\,\mu\left(1-\int_{\underline{a}}^{\bar{a}} \lambda(x;\beta_a,w)\,f(x)\,dx\right). \end{aligned}$$

The average pricing efficiency of the industry depends on the state. Denote it by γ_i as follows:

$$\int_0^1 b_i di = \begin{cases} \gamma_0, & \text{if } \theta = 0 \\ \gamma_1, & \text{if } \theta = 1 \end{cases}$$

where $\gamma_0, \gamma_1 \in [0,\gamma]$. (γ_0,γ_1) are determined endogenously in equilibrium but shareholders and managers all take them as given when making decisions. Note that due to law of large numbers, (γ_0,γ_1) are expected by agents without uncertainty.

5.2.1 Sticky-price Firms

For sticky-price firms, managers take no action. The sum of the firm value at the two dates depends only on the sum of the manager's ability. Since the ability of the manager at date 0 is exogenous with an expectation of μ, the performance metrics is designed to maximize the expected ability of the manager at date 1, $A(\beta_a,\omega)$.

Since all sticky-price firms set $p_i = 0$, they have the same pricing efficiency γ when $\theta = 0$ and 0 when $\theta = 1$. The average firm value in the industry, which equals the average ability plus the average pricing efficiency, is then $\gamma_0 = \mu + \gamma$ when $\theta = 0$ and $\gamma_1 = \mu$ when $\theta = 1$. For a manager with ability x, the probability of being retained is

$$\Pi(x - \mu - \omega + \beta_a(\mu + \gamma))$$

when $\theta = 0$, and

$$\Pi\left(x - \mu - \omega + \beta_a \mu\right)$$

when $\theta = 1$. Taken together, the expected probability of being retained is

$$\lambda\left(x; \beta_a, w\right) = \phi\Pi\left(x - \mu - \omega + \beta_a\left(\mu + \gamma\right)\right) + \left(1 - \phi\right)\Pi\left(x - \mu - \omega + \beta_a \mu\right).$$

For sticky-price firms, the dismissal decision is used to maximize the expectation of the manger's ability at date 1. Ideally, the dismissal decision should depends only on the current manager's ability. When $\beta_a > 0$, the probability of being retained depends on the industry state, as absolute performance evaluation does not control for it. This introduces noise into the dismissal decision, as the manager's ability is independent of the industry state. In contrast, when $\beta_a = 0$, pure relative performance evaluation effectively controls for the variation of the performance metrics due to industry shocks.

Specifically, when $\beta_a = 0$, the probability of retaining a manager with ability x is

$$\lambda\left(x; 0, \omega\right) = \Pi\left(x - \mu - \omega\right).$$

Since

$$\Pi\left(x - \mu - \omega + \beta_a\left(\mu + \gamma\right)\right) \geq \lambda\left(x; \beta_a, w\right) \geq \Pi\left(x - \mu - \omega + \beta_a \mu\right),$$

there exists ω' between $\omega - \beta_a\left(\mu + \gamma\right)$ and $\omega + \beta_a \mu$ such that

$$\int_{\underline{a}}^{\overline{a}} \lambda\left(x; 0, \omega'\right) f\left(x\right) dx = \int_{\underline{a}}^{\overline{a}} \lambda\left(x; \beta_a, w\right) f\left(x\right) dx.$$

We can show that for any (β_a, ω) with $\beta_a > 0$, the expected ability of the manager at date 1 is higher under the alternative performance metrics $(0, \omega')$,

$$A\left(\beta_a, \omega\right) < A\left(0, \omega'\right).$$

This observation gets us to the following proposition regarding optimal performance metrics for sticky-price firms.

Proposition 1. *Optimal performance metrics for sticky-price firms involve only relative performance evaluation, i.e.,* $\beta_a = 0$.

5.2.2 Flexible-price Firms

Unlike sticky-price firms, managers of flexible-price firms can choose the pricing strategy. At date 1, since the salary of the manager is fixed, according to the lexicographic preference, he will choose the pricing strategy to maximize the expected firm value at date 1. Note that $s_i = 0$ implies $\theta = 0$ with probability 1, and $s_i = 1$ implies $\theta = 1$ with probability $\frac{1-\phi}{1-\phi+\phi\kappa}$. Both probabilities are greater than 0.5, so the manager always picks $p_i = s_i$ at date 1. Under this strategy, the expected pricing efficiency is γ upon receiving $s_i = 0$ and $\frac{1-\phi}{1-\phi+\phi\kappa}\gamma$ upon receiving $s_i = 1$. Taken together, the expected pricing efficiency is

$$\phi\left(1-\kappa\right)\gamma + \left(1-\phi+\phi\kappa\right)\frac{1-\phi}{1-\phi+\phi\kappa}\gamma = \left[\left(1-\kappa\right)\phi + 1 - \phi\right]\gamma.$$

We then obtain Lemma 1 about the expected firm value at date 1.

Lemma 1. *The manager at date 1 always follows his signal and chooses* $p_i = s_i$. *Under the performance metrics* (β_a, w), *the expected firm value at date 1 is*

$$A\left(\beta_a, \omega\right) + \left[\left(1-\kappa\right)\phi + 1 - \phi\right]\gamma.$$

Next, we turn to date 0. The ability of the manager at date 0 is exogenous with an expectation of μ and not affected by the performance metrics. According to the lexicographic preference, the manager at date 0 will choose the pricing strategy to maximize the probability of being retained. Upon receiving $s_i = 0$, the manager knows $\theta = 0$. The probability that he is retained is

$$\Pi\left(v_i - \left(1-\beta_a\right)\gamma_0 - \omega\right),$$

which is at least weakly increasing the firm value. Therefore, according to the lexicographic preference, the manager will choose $p_i = 0$ to maximize the firm value upon receiving $s_i = 0$.

Consider the manager who has ability x and receives $s_i = 1$ at date 0. If he chooses

$p_i = k$, the probability of being retained is

$$\begin{aligned}\lambda_k(x) =& \frac{\phi\kappa}{1-\phi+\phi\kappa}\Pi\left(x-(1-\beta_a)\mu-\omega+\gamma\cdot\mathbf{1}_{\{k=0\}}-(1-\beta_a)\gamma_0\right)\\ &+\frac{1-\phi}{1-\phi+\phi\kappa}\Pi\left(x-(1-\beta_a)\mu-\omega+\gamma\cdot\mathbf{1}_{\{k=1\}}-(1-\beta_a)\gamma_1\right).\end{aligned}$$

Taken together, a manager with ability x chooses $p_i = s_i$ iff $\lambda_1(x) \geq \lambda_0(x)$.

Lemma 2. *If $\beta_a = 1$, all managers choose $p_i = s_i$ at date 0. If $\beta_a < 1$, there always exists an interval such that managers with ability in this interval choose $p_i = 0$ at date 0.*

If $\gamma_0 = \gamma_1$ (pricing efficiency is equal in both states), $\lambda_1(x) \geq \lambda_0(x)$, and managers would always choose $p_i = s_i$. However, this would imply $\gamma_0 < \gamma_1 = \gamma$. When $\gamma_0 > \gamma_1$ (pricing efficiency is higher in the normal state) and $\beta_a < 1$, choosing $p_i = 1$ is a riskier strategy upon receiving $s_i = 1$, as

$$\gamma-(1-\beta_a)\gamma_1 > \gamma-(1-\beta_a)\gamma_0 > -(1-\beta_a)\gamma_1 > -(1-\beta_a)\gamma_0.$$

On the other hand, the probability of being retained, $\Pi(x)$, is concave around $x = 1$, so high-ability managers prefer to choose $p_i = 0$. When $\gamma_0 > \gamma_1$ (pricing efficiency is higher in the unusual state) and $\beta_a < 1$, choosing $p_i = 1$ is a safer strategy upon receiving $s_i = 1$, as

$$\gamma-(1-\beta_a)\gamma_0 > \gamma-(1-\beta_a)\gamma_1 > -(1-\beta_a)\gamma_0 > -(1-\beta_a)\gamma_1.$$

The probability of being retained, $\Pi(x)$, is convex around $x = 0$, so low-ability managers prefer to choose $p_i = 0$, following the same intuition as above.

Lemma 2 derives from a key insight. Due to relative performance evaluation, managers care about the difference between their pricing efficiency and the industry average. High-ability managers are basically concerned about being dismissed when his pricing efficiency is low while the industry average is high. This creates incentives for them to conform to the behavior of others to reduce the risk of low relative performance. On the contrary, low-ability managers are likely to be dismissed except when his pricing efficiency is high while the industry average is low. This creates incentives for them to act opposite to others to increase

the chance of high relative performance. If relative performance evaluation is not employed, i.e., $\beta_a = 1$, the incentive to manipulate relative performance vanishes. All managers will choose $p_i = s_i$ at date 0, as this pricing strategy maximizes the expected firm value.

Proposition 2. *If $\alpha = 1$, optimal performance metrics for flexible-price firms involve pure absolute performance evaluation, i.e., $\beta_a = 1$.*

Lemmas 1 and 2 implies a tension regarding relative performance evaluation for flexible-price firms. On the one hand, relative performance evaluation distorts managers' pricing strategies at date 0 and reduces firms' pricing efficiency, as shown in Lemma 2. On the other hand, it controls for the variation of the performance metrics due to industry shocks and enables more efficient dismissal decisions, as shown in Lemma 1 and Proposition 1. Optimal performance metrics achieves balance between the two effects. In the extreme case where $\alpha = 1$, dismissal does not change the manager's ability at date 1, so the second effect vanishes. The first effect implies pure absolute performance evaluation. This observation is confirmed by Proposition 2.

5.3 Implications and relation to empirics

The above theoretical analysis implies a difference in the tendency to use relative performance evaluation between sticky-price and flexible-price firms. Compared with sticky-price firms, flexible-price firms rely more on managers' pricing strategies, so the distortion created by relative performance evaluation has greater negative impacts. Therefore, flexible-price firms would tend to place less emphasis on relative performance evaluation, which means choosing a higher β_a.

In the empirical part, we decompose firms' stock return into an industry-induced part, which is linear in the industry return, and an idiosyncratic part, which is orthogonal to the industry return. Following the decomposition, we can rewrite Equation (5.1) as follows:

$$w_i \equiv \beta_a \overline{v} + (v_i - \overline{v}) - \omega.$$

Choosing a higher β_a, flexible-price firms would have a higher sensitivity of the performance

metrics and the dismissal decision to the industry return. This prediction is consistent with our empirical findings.

6 Conclusion

Classical agency theory predicts that RPE is most valuable when peer-group performance precisely measures common shocks, allowing boards to insulate CEOs from luck. We show that this value depends critically on firms' ability to respond to those shocks. Consistent with this argument, we find that, when evaluating CEOs of flexible-price firms—which can adjust product prices in response to shocks—boards place less weight on performance relative to peers and greater weight on absolute performance. For these firms, realized performance reflects both the common shock (luck) and managerial ability to respond to it. We find a similar pattern in executive compensation. Finally, our evidence suggests that these results are unlikely to be driven by flexible-price firms lacking suitable peers against which to benchmark performance.

We develop a two-period agency model to explain these findings. Boards choose retention policies by balancing the informational benefit of filtering common shocks against the incentive costs created by peer benchmarking. In sticky-price firms, managers cannot adjust prices after observing economic conditions, so RPE primarily removes common industry noise from performance. In flexible-price firms, managers reset product prices after receiving private signals, and RPE distorts these choices: high-ability managers may mimick their peers to reduce the risk of relative underperformance, while low-ability managers may pursue inefficient contrarian strategies to gamble for retention. Because flexible pricing broadens managers' action space, these moral-hazard costs are more consequential, leading boards optimally to place greater weight on absolute performance.

Viewed as a whole, our theory and evidence offer a rationalization for the broader "performance-luck" puzzle in CEO dismissal decisions (Jenter and Kanaan, 2015) and the related "pay-for-luck" pattern in compensation. Exposure to industry performance need not invariably indicate weak governance: when responding to an external shock is itself a value-relevant managerial decision, fully filtering industry performance can discard information

about managerial ability and distort managers' incentives. The optimal use of RPE therefore depends not only on whether a shock lies outside the CEO's control, but also on the firm's capacity to respond and on the behavior induced by peer-based evaluation.

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Appendix: Proofs

Proof of Proposition 1

We show that, for any (β_a, ω) with $\beta_a > 0$, there exists an ω' such that

$$A(\beta_a, \omega) < A(0, \omega').$$

Note that

$$\Pi(x - \mu - \omega + \beta_a(\mu + \gamma)) \geq \lambda(x; \beta_a, w) \geq \Pi(x - \mu - \omega + \beta_a \mu),$$

whereas the probability of retaining a manager with ability x under $(0, \omega')$ is

$$\lambda(x; 0, \omega') = \Pi(x - \mu - \omega').$$

There exists an ω' between $\omega - \beta_a(\mu + \gamma)$ and $\omega + \beta_a \mu$ such that

$$\int_{\underline{a}}^{\overline{a}} \lambda(x; 0, \omega') f(x)\, dx = \int_{\underline{a}}^{\overline{a}} \lambda(x; \beta_a, w) f(x)\, dx.$$

Given this equality, $\lambda(x; 0, \omega')$ must cross $\lambda(x; \beta_a, w)$ from below, say at $\tilde{a}$. Thus, for $x < \tilde{a}$ and $x > \tilde{a}$, respectively,

$$\lambda(x; 0, \omega') < \lambda(x; \beta_a, w) \quad \text{and} \quad \lambda(x; 0, \omega') > \lambda(x; \beta_a, w).$$

Therefore,

$$\begin{aligned}
& A(0, \omega') - A(\beta_a, \omega) \\
= & \int_{\underline{a}}^{\overline{a}} x\left[\alpha + (1-\alpha)\lambda(x; 0, \omega')\right] f(x)\, dx \\
& \quad + (1-\alpha)\mu\left[1 - \int_{\underline{a}}^{\overline{a}} \lambda(x; 0, \omega') f(x)\, dx\right] \\
& \quad - \int_{\underline{a}}^{\overline{a}} x\left[\alpha + (1-\alpha)\lambda(x; \beta_a, w)\right] f(x)\, dx \\
& \quad - (1-\alpha)\mu\left[1 - \int_{\underline{a}}^{\overline{a}} \lambda(x; \beta_a, w) f(x)\, dx\right] \\
= & (1-\alpha)\int_{\underline{a}}^{\overline{a}} x\left[\lambda(x; 0, \omega') - \lambda(x; \beta_a, w)\right] f(x)\, dx \\
= & -(1-\alpha)\int_{\underline{a}}^{\tilde{a}} x\left[\lambda(x; \beta_a, w) - \lambda(x; 0, \omega')\right] f(x)\, dx \\
& \quad + (1-\alpha)\int_{\tilde{a}}^{\overline{a}} x\left[\lambda(x; 0, \omega') - \lambda(x; \beta_a, w)\right] f(x)\, dx
\end{aligned}$$

$$
\begin{aligned}
&> -(1-\alpha)\tilde{a}\int_{\underline{a}}^{\tilde{a}}\left[\lambda\left(x;\beta_a,w\right)-\lambda\left(x;0,\omega'\right)\right]f(x)\,dx \\
&\quad +(1-\alpha)\tilde{a}\int_{\tilde{a}}^{\overline{a}}\left[\lambda\left(x;0,\omega'\right)-\lambda\left(x;\beta_a,w\right)\right]f(x)\,dx \\
&=(1-\alpha)\tilde{a}\int_{\underline{a}}^{\overline{a}}\left[\lambda\left(x;0,\omega'\right)-\lambda\left(x;\beta_a,w\right)\right]f(x)\,dx \\
&=0.
\end{aligned}
$$

Proof of Lemma 2

First, we show that $\gamma_0 \neq \gamma_1$. Suppose $\gamma_0 = \gamma_1$. Then

$$
\begin{aligned}
\lambda_k(x) =& \frac{\phi\kappa}{1-\phi+\phi\kappa}\Pi\left(x-(1-\beta_a)\mu-\omega+\gamma\cdot\mathbf{1}_{\{k=0\}}-(1-\beta_a)\gamma_0\right) \\
&+\frac{1-\phi}{1-\phi+\phi\kappa}\Pi\left(x-(1-\beta_a)\mu-\omega+\gamma\cdot\mathbf{1}_{\{k=1\}}-(1-\beta_a)\gamma_0\right).
\end{aligned}
$$

Since $\frac{1-\phi}{1-\phi+\phi\kappa} > \frac{\phi\kappa}{1-\phi+\phi\kappa}$, $\lambda_1(x) \geq \lambda_0(x)$. Hence, all managers choose $p_i = s_i$ at date 0, and

$$
\begin{aligned}
\gamma_0 &= (1-\kappa)\gamma, \\
\gamma_1 &= \gamma.
\end{aligned}
$$

Contradiction!

Consider $\gamma_0 > \gamma_1$. Note that

$$
\gamma-(1-\beta_a)\gamma_1 > \gamma-(1-\beta_a)\gamma_0 > -(1-\beta_a)\gamma_1 > -(1-\beta_a)\gamma_0.
$$

So, $\lambda_0(x)-\lambda_1(x)=0$ when

$$
x < (1-\beta_a)\mu+\omega-\gamma+(1-\beta_a)\gamma_1
$$

or

$$
x > (1-\beta_a)\mu+\omega+(1-\beta_a)\gamma_0+1
$$

Between $[(1-\beta_a)\mu+\omega-\gamma+(1-\beta_a)\gamma_1,(1-\beta_a)\mu+\omega+(1-\beta_a)\gamma_0+1]$, as x increases, $\lambda_0(x)-\lambda_1(x)$ first decreases from 0, then increases, and finally decreases back to 0. $\lambda_0(x)-\lambda_1(x)$ attains its maximum at $x-(1-\beta_a)\mu-\omega-(1-\beta_a)\gamma_1=1$. It equals

$$
\frac{\phi\kappa}{1-\phi+\phi\kappa}\left[1-\Pi\left(1-(1-\beta_a)(\gamma_0-\gamma_1)\right)\right]
$$

and is positive when $\beta_a < 1$. Therefore, there exists $\underline{x}$ such that $\lambda_0(x) > \lambda_1(x)$ if and only if

$$
\underline{x} < x < (1-\beta_a)\mu+\omega+(1-\beta_a)\gamma_0+1.
$$

These managers will choose $p_i = 0$ at date 0.

Consider $\gamma_0 < \gamma_1$. Note that

$$\gamma - (1-\beta_a)\gamma_0 > \gamma - (1-\beta_a)\gamma_1 > -(1-\beta_a)\gamma_0 > -(1-\beta_a)\gamma_1.$$

So, $\lambda_0(x) - \lambda_1(x) = 0$ when

$$x < (1-\beta_a)\mu + \omega - \gamma + (1-\beta_a)\gamma_0$$

or

$$x > (1-\beta_a)\mu + \omega + (1-\beta_a)\gamma_1 + 1$$

Between $[(1-\beta_a)\mu + \omega - \gamma + (1-\beta_a)\gamma_0, (1-\beta_a)\mu + \omega + (1-\beta_a)\gamma_1 + 1]$, as x increases, $\lambda_0(x) - \lambda_1(x)$ first increases from 0, then decreases, and finally increases back to 0. $\lambda_0(x) - \lambda_1(x)$ attains its maximum at $x - (1-\beta_a)\mu - \omega + \gamma - (1-\beta_a)\gamma_1 = 0$. It equals

$$\frac{\phi\kappa}{1-\phi+\phi\kappa}\Pi\left((1-\beta_a)(\gamma_1-\gamma_0)\right),$$

and is positive when $\beta_a < 1$. Therefore, there exists $\overline{x}$ such that $\lambda_0(x) > \lambda_1(x)$ if and only if

$$(1-\beta_a)\mu + \omega - \gamma + (1-\beta_a)\gamma_0 < x < \overline{x}.$$

These managers will choose $p_i = 0$ at date 0.

Taken together, we have shown that when $\beta_a < 1$, managers will choose $p_i = 0$ at date 0 if

- $\gamma_0 > \gamma_1$ and $\underline{x} < x < (1-\beta_a)\mu + \omega + (1-\beta_a)\gamma_0 + 1$, or
- $\gamma_0 < \gamma_1$ and $(1-\beta_a)\mu + \omega - \gamma + (1-\beta_a)\gamma_0 < x < \overline{x}$;

when $\beta_a = 1$, managers will choose $p_i = s_i$ at date 0.

Figure 2: **Distribution of Monthly Frequency of Price Adjustment**

The figure plots the distribution of the monthly frequency of price adjustment (FPA). The samples are restricted to S&P 1500 constituent firms headquartered in the U.S. The sample period is 1997Q1-2012Q4. Utilities and Financial sectors are excluded. In the sample period of 2002-2012, the FPA at NAICS sectors of different granularities is calculated by Pasten et al. (2017). Equal-weighted probabilities of price adjustments at the goods level are calculated using the micro-data underlying the Producer Price Index constructed by the BLS. The granularity for FPA is at the 6-digit level.

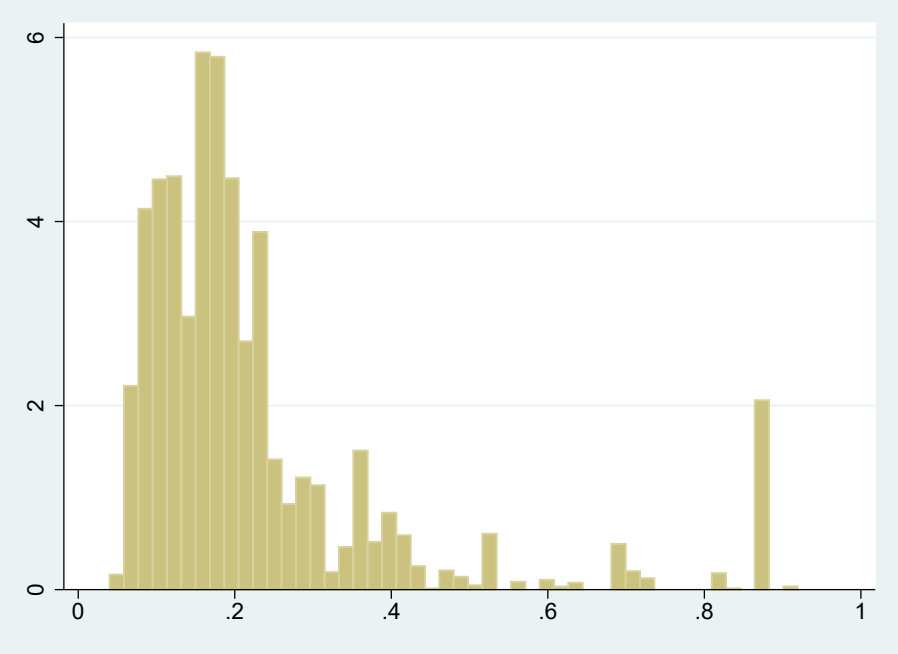
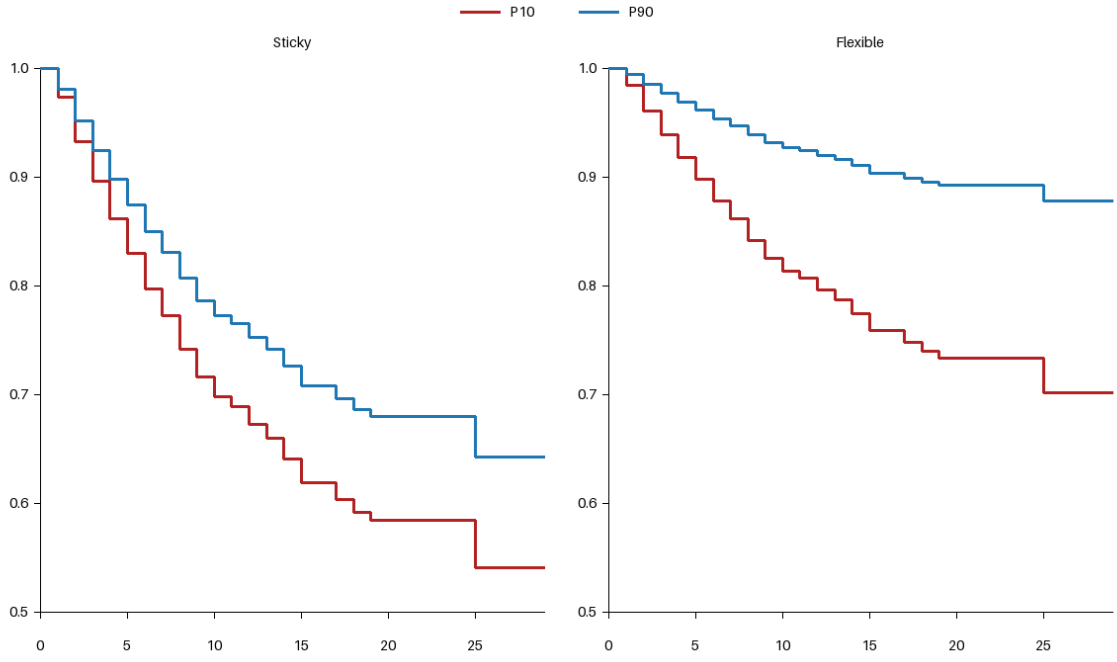


Figure 3: **Predicted CEO Survival over CEO Tenure: Raw Industry-Induced Returns**

This figure compares the implied CEO survival probabilities between sticky- and flexible-price firms at different levels of industry-induced performance over CEO tenure. In the counterfactual calculations, sticky-price firms are represented by the lowest PAF rank in the estimation sample, whereas flexible-price firms are represented by the highest PAF rank. PAFrnk is the fractional rank of a firm's price-adjustment frequency (PAF), with higher values indicating greater price flexibility. The implied survival probabilities are calculated from Cox regressions of forced CEO dismissal on idiosyncratic firm performance and the component of firm performance predicted by industry performance. The first-stage regressions use industry stock returns to predict contemporaneous company stock returns. The industry definitions follow the Fama and French (1997) classification into 48 industries, with all firms in the "Other" industry dropped from the regression analysis. The Cox regressions model the hazard of forced CEO dismissal as a function of CEO tenure, using the predicted values and the residuals from the first-stage regression as estimates of the peer-group component and the idiosyncratic component of company stock returns, respectively. The Cox regression specifications correspond to Columns (1) and (3) of Table 4, with Panel A based on the specification in Column (1) and Panel B based on the specification in Column (3). We calculate the implied survival probabilities by holding all covariates other than the counterfactual variables at their model-sample means. We then vary the implied survival probabilities by setting the industry-induced component of firm performance at $t-1$ equal to either its 10th or 90th percentile value and evaluate the corresponding survival probabilities over CEO tenure. We compute the implied survival probabilities separately for sticky-price firms and flexible-price firms. The figure reports results using both equal-weighted and value-weighted Fama–French 48 industry returns.

Panel A: EW Industry



Panel B: VW Industry

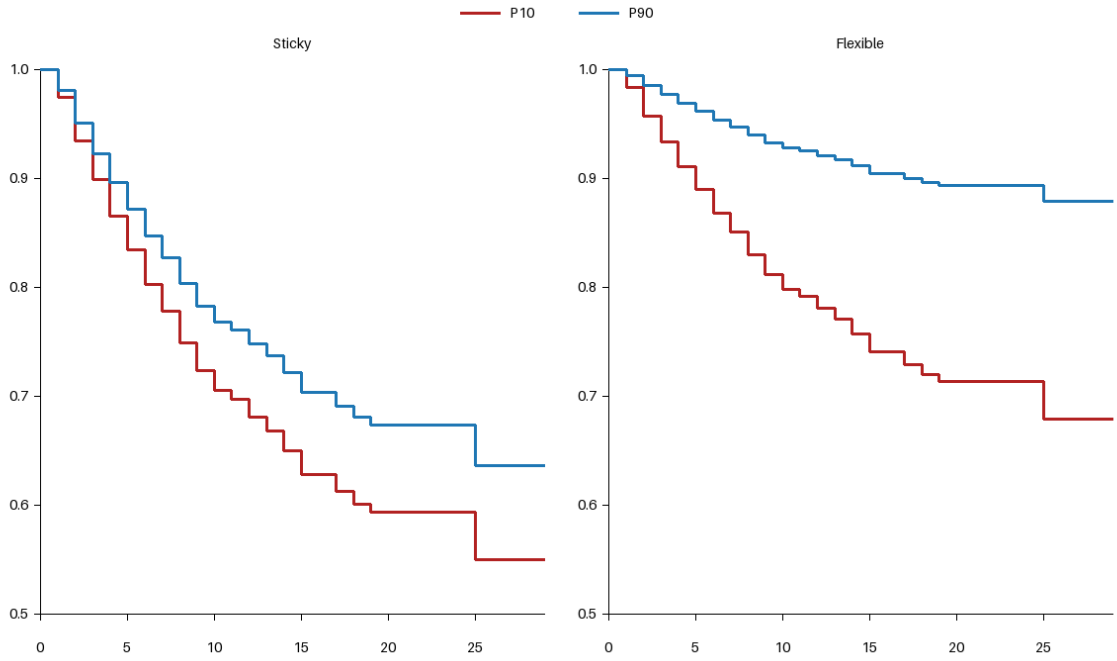
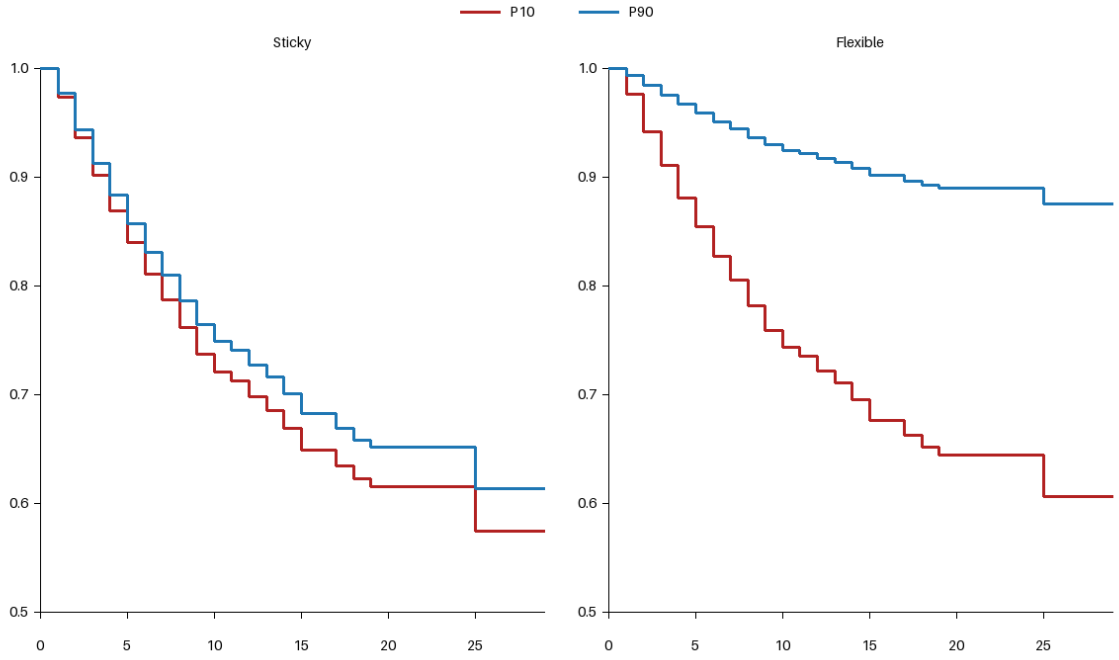


Figure 4: **Predicted CEO Survival over CEO Tenure: Normalized Industry-Induced Returns**

This figure compares the implied CEO survival probabilities between sticky- and flexible-price firms at different levels of industry-induced performance over CEO tenure. In the counterfactual calculations, sticky-price firms are represented by the lowest PAF rank in the estimation sample, whereas flexible-price firms are represented by the highest PAF rank. PAFrnk is the fractional rank of a firm's price-adjustment frequency (PAF), with higher values indicating greater price flexibility. The implied survival probabilities are calculated from Cox regressions of forced CEO dismissal on normalized idiosyncratic firm performance and normalized industry-induced firm performance. The first-stage regressions use industry stock returns to predict contemporaneous company stock returns separately for each firm. The industry definitions follow the Fama and French (1997) classification into 48 industries, with all firms in the "Other" industry dropped from the regression analysis. We standardize each firm's industry-induced returns using the mean and standard deviation of that firm's industry-induced returns over the 1993–2020 sample period. Likewise, we standardize each firm's idiosyncratic returns using the mean and standard deviation of that firm's idiosyncratic returns over the same period. Firms with fewer than five usable return observations—defined as observations with nonmissing firm and corresponding industry returns—are excluded from the regression analysis. The Cox regressions model the hazard of forced CEO dismissal as a function of CEO tenure, using the normalized predicted values and normalized residuals from the first-stage regression as estimates of the peer-group component and the idiosyncratic component of company stock returns, respectively. The Cox regression specifications correspond to Columns (5) and (7) of Table 4, with Panel A based on the specification in Column (5) and Panel B based on the specification in Column (7). We calculate the implied survival probabilities by holding all covariates other than the counterfactual variables at their model-sample means. We then vary the implied survival probabilities by setting the normalized industry-induced component of firm performance at $t-1$ equal to either its 10th or 90th percentile value and evaluate the corresponding survival probabilities over CEO tenure. We compute the implied survival probabilities separately for sticky-price firms and flexible-price firms. The figure reports results using both equal-weighted and value-weighted Fama–French 48 industry returns.

Panel A: EW Industry



Panel B: VW Industry

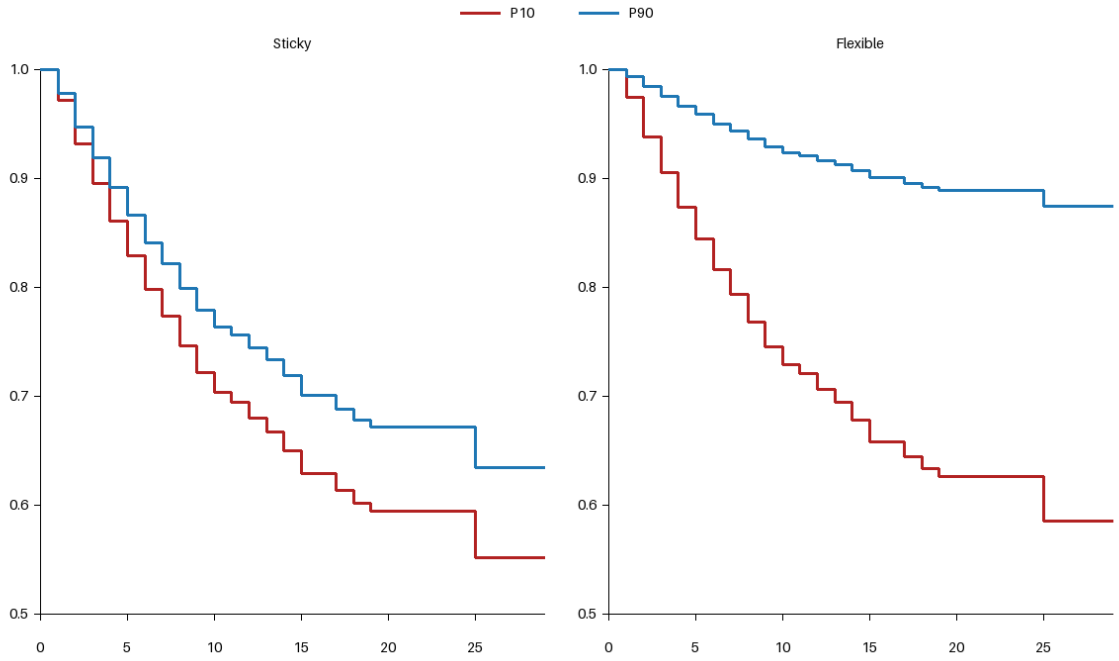


Table 1: **Estimates of Simulated Data**

This table reports estimates from a simulation of 200,000 firms, divided equally between low- and high-sensitivity groups. Actual peer-group performance is drawn from $N(0.05, 0.10^2)$, idiosyncratic firm value from $N(0, 0.05^2)$, and firm returns equal the sum of the two components. The observed industry benchmark capture actual peer-group performance with additive measurement error following $N(0, 0.05^2)$. Within each group, firm returns are regressed on the observed industry benchmark; industry-induced return is the fitted component and idiosyncratic return is the residual. In firms' dismissal metrics, the sensitivity of CEO dismissal to peer-group performance is -1 for low-sensitivity firms and -3 for high-sensitivity firms, while the sensitivity of CEO dismissal to idiosyncratic-performance coefficient is -4 for both types. Panel A presents the estimates of a Cox proportional hazard model, which generates survival times from an exponential proportional-hazards process and right-censors tenure at 20; Panel B presents the estimates of a logit model, which generates binary dismissals using a logistic probability. Columns (1) and (2) estimate the groups separately. Column (3) pools both groups without interactions, while column (4) includes a dummy variable for high-sensitivity firms, High, and its interactions with both predicted return components. Standard errors are reported in parentheses.

Panel A: Cox Proportional Hazards Model

	Low	High	All	
	(1)	**(2)**	**(3)**	**(4)**
Peer_predicted	-0.997^{***}	-3.032^{***}	-2.007^{***}	-0.997^{***}
	(0.037)	(0.039)	(0.027)	(0.037)
Idiosyncratic_predicted	-2.677^{***}	-3.545^{***}	-3.089^{***}	-2.678^{***}
	(0.050)	(0.051)	(0.036)	(0.050)
High				0.013^{**}
				(0.005)
High # Peer_predicted				-2.035^{***}
				(0.053)
High # Idiosyncratic_predicted				-0.867^{***}
				(0.071)
Constant				
Observations	100,000	100,000	200,000	200,000

Panel B: Logit Model

	Low	High	All	
	(1)	**(2)**	**(3)**	**(4)**
Peer_predicted	-1.153^{***}	-2.942^{***}	-2.019^{***}	-1.153^{***}
	(0.111)	(0.115)	(0.080)	(0.111)
Idiosyncratic_predicted	-2.868^{***}	-3.659^{***}	-3.247^{***}	-2.868^{***}
	(0.149)	(0.153)	(0.107)	(0.149)
High				-0.015
				(0.016)
High # Peer_predicted				-1.789^{***}
				(0.160)
High # Idiosyncratic_predicted				-0.791^{***}
				(0.214)
Constant	-1.995^{***}	-2.011^{***}	-2.001^{***}	-1.995^{***}
	(0.011)	(0.011)	(0.008)	(0.011)
Observations	100,000	100,000	200,000	200,000

Standard errors in parentheses.
$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 2: **Summary Statistics**

This table presents an overview of the CEO turnover dataset for the overall sample and two subsamples stratified by whether a firm's monthly price adjustment frequency is above the sample mean. Panel A shows the number of observations and the frequency of forced and voluntary CEO turnover. Panel B presents firm characteristics by CEO retention outcome and firms' price adjustment frequency. Panel C presents firm and industry performance by CEO retention outcome and firms' price adjustment frequency. Panel D reports the frequency of forced CEO turnover by industry performance quintile and firms' price adjustment frequency. Panel E reports the level of CEO compensation by industry performance quintile and firms' price adjustment frequency.

Panel A: Frequency of Voluntary and Forced CEO Turnovers

		Number of CEO Turnovers			Frequency of CEO Turnovers		
	N	Total	Forced	Voluntary	Total	Forced	Voluntary
All	38,347	5,818	1,032	4,786	15.17%	2.69%	12.48%
Sticky	13,286	2,106	412	1,694	15.85%	3.10%	12.75%
Medium	12,386	1,862	357	1,505	15.03%	2.88%	12.15%
Flexible	12,675	1,850	263	1,587	14.60%	2.07%	12.52%

Panel B: Firm Characteristics by CEO Turnover Outcome

		CEO is Retained	Voluntary Turnover	Forced Turnover
All	Book assets ($m)	16,855	13,220	31,248
	Market value of equity ($m)	8,199	7,347	6,500
	Sales ($m)	5,496	5,137	6,020
	Number of employees	16,236	15,194	19,806
Sticky	Book assets ($m)	9,220	7,280	12,522
	Market value of equity ($m)	7,932	6,395	5,843
	Sales ($m)	4,054	3,577	4,308
	Number of employees	15,309	13,620	16,974
Medium	Book assets ($m)	8,512	8,158	15,040
	Market value of equity ($m)	7,442	7,692	7,131
	Sales ($m)	4,416	4,725	5,445
	Number of employees	15,978	15,534	15,645
Flexible	Book assets ($m)	32,851	24,360	82,584
	Market value of equity ($m)	9,342	8,149	6,747
	Sales ($m)	8,398	7,509	10,090
	Number of employees	17,459	16,576	29,987

Panel C: Firm and Industry Performance by CEO Turnover Outcome

		CEO is Retained	Voluntary Turnover	Forced Turnover
All	Firm-level return	15.98%	10.69%	-8.55%
	EW industry return	12.10%	13.47%	9.94%
	VW industry return	10.90%	12.68%	9.54%
Sticky	Firm-level return	18.14%	11.22%	-6.42%
	EW industry return	12.85%	14.70%	12.14%
	VW industry return	11.67%	13.81%	12.30%
Medium	Firm-level return	16.56%	11.77%	-6.56%
	EW industry return	12.83%	13.99%	12.04%
	VW industry return	11.51%	13.57%	10.75%
Flexible	Firm-level return	13.17%	9.11%	-14.58%
	EW industry return	10.63%	11.67%	3.65%
	VW industry return	9.51%	10.64%	3.55%

Panel D: CEO Forced Turnover Probabilities by Industry Performance

		Quintile				
		1	2	3	4	5
		Forced Turnover				
All	EW industry return	3.12%	2.97%	2.58%	2.22%	2.57%
	VW industry return	3.16%	2.76%	2.44%	2.53%	2.57%
Sticky	EW industry return	3.27%	3.31%	2.94%	2.71%	3.27%
	VW industry return	3.05%	2.82%	3.46%	3.01%	3.16%
Medium	EW industry return	3.07%	2.83%	2.95%	2.75%	2.83%
	VW industry return	3.07%	3.27%	2.66%	2.91%	2.50%
Flexible	EW industry return	3.20%	2.49%	1.97%	1.34%	1.38%
	VW industry return	3.20%	2.37%	1.78%	1.50%	1.54%

Table 3: **Two-Stage Hazard Regressions of CEO Dismissal on Firm and Industry Performance**

This table presents the two-stage hazard regressions of CEO dismissal on idiosyncratic firm performance and the component of firm performance predicted by industry performance. The first-stage regressions use industry stock returns to predict contemporaneous company stock returns. The industry definitions follow the Fama and French (1997) classification into 48 industries, with all firms in the "Other" industry dropped from the regression analysis. The second-stage Cox hazard regressions predict CEO dismissal using the predicted values and the residuals from the first-stage regression as estimates of the peer group component and the idiosyncratic component of company stock returns, respectively. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of all outstanding shares. Standard errors are based on a block bootstrap (2000 replications) clustered at the Fama-French 48 industry level, jointly resampling both the first and second stages of the estimation procedure.

	EW Industry		VW Industry	
	(1)	**(2)**	**(3)**	**(4)**
Industry-induced return t-1	-0.905^{***}	-1.412^{***}	-0.824^{***}	-1.502^{***}
	(0.187)	(0.320)	(0.169)	(0.249)
Industry-induced return t-2	0.267^{*}	-0.002	-0.018	-0.162
	(0.155)	(0.251)	(0.170)	(0.236)
Idiosyncratic return t-1	-2.038^{***}	-2.176^{***}	-2.001^{***}	-2.160^{***}
	(0.211)	(0.218)	(0.202)	(0.215)
Idiosyncratic return t-2	-0.444^{***}	-0.464^{***}	-0.386^{***}	-0.434^{***}
	(0.104)	(0.110)	(0.112)	(0.118)
Retirement age	-0.922^{***}	-0.917^{***}	-0.937^{***}	-0.920^{***}
	(0.175)	(0.176)	(0.176)	(0.176)
High equity ownership	-1.120^{***}	-1.167^{***}	-1.163^{***}	-1.175^{***}
	(0.212)	(0.211)	(0.212)	(0.211)
N	38,954	38,954	38,954	38,954
Year FE		✓		✓

Standard errors in parentheses
$*p < 0.10, **p < 0.05, ***p < 0.01$

Table 4: **Two-Stage Hazard Regressions of CEO Dismissal on Firm and Industry Performance: Raw and Normalized Returns**

This table presents two-stage Cox hazard regressions of CEO dismissal on idiosyncratic firm performance and the component of firm performance predicted by industry performance. Industries follow the Fama and French (1997) 48-industry classification, and firms in the "Other" industry are excluded. PAFrnk is the fractional rank of a firm's price-adjustment frequency (PAF), with higher values indicating greater price flexibility. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of outstanding shares. Columns (1)–(4) use raw decomposed returns. In the first stage, we pool all firm-year observations and regress firm stock returns on the corresponding industry stock returns. The fitted values are industry-induced returns, and the residuals are idiosyncratic firm returns. Columns (5)–(8) use normalized decomposed returns. For these specifications, the first-stage decomposition is performed separately for each firm. We then standardize each firm's industry-induced returns using the mean and standard deviation of that firm's industry-induced returns over the 1993–2020 sample period. Likewise, we standardize each firm's idiosyncratic returns using the mean and standard deviation of that firm's idiosyncratic returns over the same period. Firms with fewer than five usable return observations—defined as observations with nonmissing firm and corresponding industry returns—are excluded from columns (5)–(8). Even-numbered columns include size dummies based on Fama and French (1992), market-to-book ratio, profitability, long-term debt, profit margin, and product-market concentration based on Hoberg and Phillips (2010), along with their interactions with the return measures. Standard errors are based on a block bootstrap with 2,000 replications clustered at the Fama–French 48 industry level; each replication jointly resamples the first- and second-stage estimation procedures.

	Raw Returns				Normalized Returns			
	EW Industry		VW Industry		EW Industry		VW Industry	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Industry-induced return t-1 × PAFrnk	−1.575**	−1.198**	−2.055***	−1.646**	−0.564***	−0.356**	−0.522***	−0.403***
	(0.685)	(0.595)	(0.773)	(0.649)	(0.179)	(0.146)	(0.160)	(0.150)
Industry-induced return t-2 × PAFrnk	−0.435	−0.236	−1.199	−0.443	−0.152	0.108	−0.130	0.053
	(0.767)	(0.668)	(0.752)	(0.722)	(0.206)	(0.121)	(0.173)	(0.175)
Idiosyncratic return t-1 × PAFrnk	−1.893***	−1.465**	−1.694***	−1.274**	−0.146	−0.279	−0.111	−0.185
	(0.538)	(0.606)	(0.496)	(0.579)	(0.171)	(0.176)	(0.138)	(0.176)
Idiosyncratic return t-2 × PAFrnk	−0.477	−0.138	−0.263	−0.020	−0.016	−0.057	0.095	0.049
	(0.403)	(0.331)	(0.453)	(0.387)	(0.106)	(0.139)	(0.114)	(0.149)
Industry-induced return t-1	−0.672*	−0.513	−0.611*	−0.434	−0.051	−0.006	−0.109	−0.226
	(0.345)	(0.723)	(0.328)	(0.739)	(0.079)	(0.165)	(0.077)	(0.150)
Industry-induced return t-2	0.061	−0.317	0.257	0.009	−0.081	−0.075	−0.094	−0.049
	(0.332)	(0.582)	(0.328)	(0.665)	(0.078)	(0.143)	(0.068)	(0.147)
Idiosyncratic return t-1	−1.145***	−0.952	−1.193***	−0.984	−0.428***	−0.204*	−0.428***	−0.166
	(0.293)	(0.624)	(0.277)	(0.628)	(0.068)	(0.118)	(0.065)	(0.103)
Idiosyncratic return t-2	−0.133	−0.068	−0.189	−0.087	−0.157***	−0.162	−0.195***	−0.169
	(0.207)	(0.309)	(0.227)	(0.333)	(0.054)	(0.169)	(0.058)	(0.145)
PAFrnk	−0.728***	−0.730***	−0.502***	−0.603***	−0.806***	−0.942***	−0.784***	−0.908***
	(0.216)	(0.232)	(0.191)	(0.191)	(0.217)	(0.257)	(0.219)	(0.254)
Retirement age	−0.851***	−0.825***	−0.849***	−0.819***	−0.856***	−0.839***	−0.855***	−0.842***
	(0.136)	(0.147)	(0.137)	(0.150)	(0.139)	(0.154)	(0.139)	(0.163)
High equity ownership	−0.990***	−1.046***	−0.992***	−1.056***	−1.078***	−1.280***	−1.079***	−1.272***
	(0.246)	(0.254)	(0.246)	(0.254)	(0.252)	(0.258)	(0.251)	(0.259)
Observations	38,347	33,107	38,347	33,107	36,532	30,848	36,532	30,848
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Controls		✓		✓		✓		✓
Controls × Returns		✓		✓		✓		✓

Standard errors in parentheses.
*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table 5: **Two-Stage Logit Regressions of CEO Dismissal on Firm and Industry Performance: Raw and Normalized Returns**

This table presents two-stage logit regressions of CEO dismissal on idiosyncratic firm performance and the component of firm performance predicted by industry performance. Industries follow the Fama and French (1997) 48-industry classification, and firms in the "Other" industry are excluded. PAFrnk is the fractional rank of a firm's price-adjustment frequency (PAF), with higher values indicating greater price flexibility. A CEO is of retirement age if she is between 63 and 66 years old, CEO equity ownership is high if she owns more than 5% of outstanding shares, and tenure is the number of years that the CEO has been in office. Columns (1)–(4) use raw decomposed returns. In the first stage, we pool all firm-year observations and regress firm stock returns on the corresponding industry stock returns. The fitted values are industry-induced returns, and the residuals are idiosyncratic firm returns. Columns (5)–(8) use normalized decomposed returns. For these specifications, the first-stage decomposition is performed separately for each firm. We then standardize each firm's industry-induced returns using the mean and standard deviation of that firm's industry-induced returns over the 1993–2020 sample period. Likewise, we standardize each firm's idiosyncratic returns using the mean and standard deviation of that firm's idiosyncratic returns over the same period. Firms with fewer than five usable return observations—defined as observations with nonmissing firm and corresponding industry returns—are excluded from columns (5)–(8). The second-stage logit regressions estimate the probability of a forced CEO turnover. Even-numbered columns include size dummies based on Fama and French (1992), market-to-book ratio, profitability, long-term debt, profit margin, and product-market concentration based on Hoberg and Phillips (2010), along with their interactions with the return measures. Standard errors are based on a block bootstrap with 2,000 replications clustered at the Fama–French 48 industry level; each replication jointly resamples the first- and second-stage estimation procedures.

	Raw Returns				Normalized Returns			
	EW Industry		VW Industry		EW Industry		VW Industry	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Industry-induced return t-1 × PAFrnk	−1.755**	−1.307**	−2.209***	−1.736**	−0.607***	−0.394***	−0.553***	−0.427***
	(0.707)	(0.620)	(0.799)	(0.683)	(0.181)	(0.146)	(0.162)	(0.151)
Industry-induced return t-2 × PAFrnk	−0.461	−0.250	−1.254	−0.480	−0.157	0.117	−0.138	0.050
	(0.785)	(0.697)	(0.773)	(0.746)	(0.209)	(0.123)	(0.176)	(0.183)
Idiosyncratic return t-1 × PAFrnk	−1.982***	−1.468**	−1.796***	−1.296**	−0.148	−0.285	−0.123	−0.200
	(0.562)	(0.644)	(0.518)	(0.615)	(0.179)	(0.181)	(0.142)	(0.182)
Idiosyncratic return t-2 × PAFrnk	−0.469	−0.099	−0.257	0.014	−0.002	−0.047	0.116	0.072
	(0.421)	(0.335)	(0.471)	(0.394)	(0.109)	(0.144)	(0.117)	(0.154)
Industry-induced return t-1	−0.708**	−0.573	−0.651*	−0.502	−0.051	−0.001	−0.114	−0.226
	(0.360)	(0.764)	(0.341)	(0.776)	(0.079)	(0.173)	(0.077)	(0.154)
Industry-induced return t-2	0.035	−0.302	0.249	−0.003	−0.088	−0.071	−0.100	−0.034
	(0.345)	(0.600)	(0.340)	(0.691)	(0.082)	(0.146)	(0.071)	(0.152)
Idiosyncratic return t-1	−1.198***	−0.983	−1.244***	−1.025*	−0.450***	−0.195*	−0.446***	−0.155
	(0.300)	(0.610)	(0.286)	(0.603)	(0.071)	(0.117)	(0.068)	(0.101)
Idiosyncratic return t-2	−0.149	−0.076	−0.206	−0.101	−0.167***	−0.177	−0.208***	−0.192
	(0.221)	(0.358)	(0.242)	(0.379)	(0.056)	(0.179)	(0.061)	(0.154)
PAFrnk	−0.733***	−0.746***	−0.508***	−0.622***	−0.830***	−0.977***	−0.809***	−0.948***
	(0.217)	(0.238)	(0.194)	(0.200)	(0.223)	(0.266)	(0.225)	(0.264)
Retirement age	−0.875***	−0.860***	−0.874***	−0.857***	−0.880***	−0.874***	−0.877***	−0.877***
	(0.144)	(0.159)	(0.144)	(0.162)	(0.145)	(0.166)	(0.146)	(0.173)
High equity ownership	−1.071***	−1.121***	−1.074***	−1.128***	−1.165***	−1.372***	−1.164***	−1.364***
	(0.266)	(0.284)	(0.266)	(0.283)	(0.273)	(0.292)	(0.273)	(0.296)
Tenure	−0.030***	−0.035***	−0.030***	−0.035***	−0.040***	−0.040***	−0.040***	−0.040***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Constant	−3.555***	−3.725***	−3.558***	−3.741***	−3.667***	−3.629***	−3.704***	−3.640***
	(0.242)	(0.375)	(0.236)	(0.367)	(0.313)	(0.354)	(0.312)	(0.349)
Observations	38,347	33,107	38,347	33,107	36,532	30,848	36,532	30,848
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Controls		✓		✓		✓		✓
Controls × Returns		✓		✓		✓		✓

Standard errors in parentheses.
*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table 6: **Implied Probabilities of Forced CEO Turnover: Industry Performance Effects across Price Stickiness**

This table reports average implied probabilities of forced CEO turnover, in percentage points, from eight two-stage logit specifications in Table 5. The table compares the implied probabilities of forced CEO dismissal between sticky- and flexible-price firms at different levels of industry-induced performance. Panel A uses raw stock returns, and Panel B uses firm-normalized stock returns. The first-stage regressions use equal-weighted or value-weighted Fama–French 48 industry stock returns to decompose firm performance into an industry-induced component and an idiosyncratic component. The "Other" industry is excluded. The second-stage logit regressions use these components to predict forced CEO turnover. For each specification, we set *PAFrnk* to its minimum value in the estimation sample to obtain the sticky-price scenario and to its maximum value to obtain the flexible-price scenario. We then set the industry-induced return at $t-1$ to its 10th or 90th percentile in the corresponding estimation sample, while retaining all other covariates at their observed values and recomputing the relevant interaction terms. The realized base rate of forced CEO turnover is 2.691% for specifications without firm-characteristic controls and 2.706% for specifications with firm-characteristic controls. These base rates are the same for the corresponding raw-return and normalized-return specifications.

	EW Industry		VW Industry	
	Sticky	Flexible	Sticky	Flexible
	Panel A. Raw Returns			
Firm characteristics not controlled				
Industry-induced return at $t-1$: 10th pctl.	4.174	3.689	4.126	3.819
Industry-induced return at $t-1$: 90th pctl.	2.995	1.326	3.107	1.272
Firm characteristics controlled				
Industry-induced return at $t-1$: 10th pctl.	4.153	3.190	4.177	3.382
Industry-induced return at $t-1$: 90th pctl.	2.979	1.343	3.086	1.318
	Panel B. Normalized Returns			
Firm characteristics not controlled				
Industry-induced return at $t-1$: 10th pctl.	3.787	3.715	4.112	3.894
Industry-induced return at $t-1$: 90th pctl.	3.363	0.937	3.150	0.942
Firm characteristics controlled				
Industry-induced return at $t-1$: 10th pctl.	4.118	2.995	4.329	3.284
Industry-induced return at $t-1$: 90th pctl.	3.277	1.054	3.211	1.000

Table 7: **Two-Stage Ordinary Least Squares Regressions of CEO Compensation on Firm and Industry Performance: Raw and Normalized Returns**

This table presents two-stage ordinary least squares (OLS) regressions of CEO compensation on idiosyncratic firm performance and the component of firm performance predicted by industry performance. The dependent variable is the natural logarithm of the sum of salary, bonus, other annual compensation, restricted stock grants, long-term incentive plan (LTIP) payouts, the value of options exercised, and the estimated value of options not exercised. Industries follow the Fama and French (1997) 48-industry classification, and firms in the "Other" industry are excluded. PAFrnk is the fractional rank of a firm's price-adjustment frequency (PAF), with higher values indicating greater price flexibility. A CEO is of retirement age if she is between 63 and 66 years old, and CEO equity ownership is high if she owns more than 5% of outstanding shares. Columns (1)–(4) use raw decomposed returns. In the first stage, we pool all firm-year observations and regress firm stock returns on the corresponding industry stock returns. The fitted values are industry-induced returns, and the residuals are idiosyncratic firm returns. Columns (5)–(8) use normalized decomposed returns. For these specifications, the first-stage decomposition is performed separately for each firm. We then standardize each firm's industry-induced returns using the mean and standard deviation of that firm's industry-induced returns over the 1993–2020 sample period. Likewise, we standardize each firm's idiosyncratic returns using the mean and standard deviation of that firm's idiosyncratic returns over the same period. Firms with fewer than five usable return observations—defined as observations with nonmissing firm and corresponding industry returns—are excluded from columns (5)–(8). In the second stage, we regress log CEO compensation on the industry-induced and idiosyncratic return components, their interactions with PAFrnk, PAFrnk, retirement age, high equity ownership, and lagged log CEO compensation. Even-numbered columns additionally include size dummies based on Fama and French (1992), market-to-book ratio, profitability, long-term debt, profit margin, and product-market concentration based on Hoberg and Phillips (2010), along with their interactions with the return measures. Standard errors are based on a block bootstrap with 2,000 replications clustered at the Fama–French 48 industry level; each replication jointly resamples the first- and second-stage estimation procedures.

	Raw Returns				Normalized Returns			
	EW Industry		VW Industry		EW Industry		VW Industry	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Industry-induced return t-1 × PAFrnk	0.291**	0.284**	0.066	0.071	0.046	0.054*	−0.004	0.013
	(0.122)	(0.132)	(0.092)	(0.107)	(0.030)	(0.032)	(0.023)	(0.025)
Industry-induced return t-2 × PAFrnk	0.193**	0.140*	0.233**	0.142**	0.058***	0.044***	0.045**	0.032***
	(0.077)	(0.074)	(0.109)	(0.063)	(0.016)	(0.014)	(0.019)	(0.012)
Idiosyncratic return t-1 × PAFrnk	−0.001	−0.029	0.053	0.022	−0.081***	−0.050**	−0.049**	−0.024
	(0.047)	(0.039)	(0.045)	(0.040)	(0.024)	(0.024)	(0.022)	(0.024)
Idiosyncratic return t-2 × PAFrnk	0.091**	0.078	0.077*	0.072	0.013	0.019	0.021	0.025
	(0.046)	(0.055)	(0.045)	(0.058)	(0.016)	(0.018)	(0.018)	(0.019)
Industry-induced return t-1	0.204***	0.256***	0.366***	0.434***	0.050***	0.065***	0.084***	0.100***
	(0.062)	(0.077)	(0.042)	(0.054)	(0.013)	(0.017)	(0.010)	(0.018)
Industry-induced return t-2	−0.053	0.001	−0.033	−0.034	−0.016*	−0.007	−0.004	−0.004
	(0.047)	(0.090)	(0.040)	(0.052)	(0.009)	(0.016)	(0.008)	(0.013)
Idiosyncratic return t-1	0.297***	0.313***	0.272***	0.272***	0.163***	0.141***	0.149***	0.128***
	(0.026)	(0.075)	(0.026)	(0.082)	(0.014)	(0.022)	(0.013)	(0.022)
Idiosyncratic return t-2	0.021	0.038	0.022	0.048	0.017	0.015	0.010	0.008
	(0.025)	(0.056)	(0.027)	(0.067)	(0.011)	(0.016)	(0.012)	(0.021)
Retirement age	−0.002	−0.001	−0.002	−0.000	−0.003	−0.001	−0.004	−0.003
	(0.013)	(0.016)	(0.013)	(0.017)	(0.013)	(0.016)	(0.014)	(0.016)
High equity ownership	−0.170**	−0.187**	−0.170**	−0.188**	−0.162**	−0.169**	−0.161**	−0.169**
	(0.067)	(0.082)	(0.067)	(0.083)	(0.066)	(0.080)	(0.067)	(0.082)
Ln(Compensation t-1)	0.444***	0.431***	0.443***	0.432***	0.456***	0.445***	0.455***	0.445***
	(0.029)	(0.038)	(0.029)	(0.038)	(0.030)	(0.037)	(0.029)	(0.037)
Constant	4.494***	4.683***	4.481***	4.674***	4.454***	4.647***	4.456***	4.646***
	(0.235)	(0.332)	(0.234)	(0.338)	(0.242)	(0.332)	(0.241)	(0.331)
Observations	36,132	31,231	36,132	31,231	34,293	28,956	34,293	28,956
Adjusted R^2	0.697	0.696	0.697	0.696	0.700	0.697	0.700	0.697
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Controls		✓		✓		✓		✓
Controls × Returns		✓		✓		✓		✓

Standard errors in parentheses.
*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

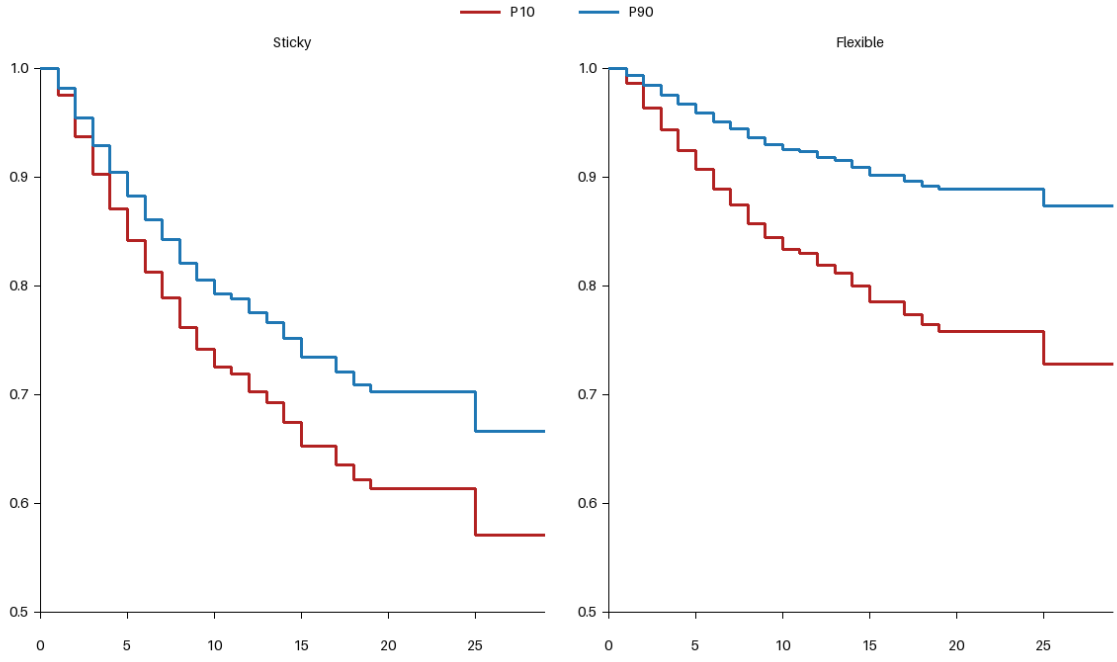
Online Appendix: Flexible Prices and CEO Relative Performance Evaluation

Dan Luo and Jin Xie

Figure A.1: **Predicted CEO Survival over CEO Tenure: Raw Industry-Induced Returns**

This figure compares the implied CEO survival probabilities between sticky- and flexible-price firms at different levels of industry-induced performance over CEO tenure. In the counterfactual calculations, sticky-price firms are represented by the lowest PAF rank in the estimation sample, whereas flexible-price firms are represented by the highest PAF rank. PAFrnk is the fractional rank of a firm's price-adjustment frequency (PAF), with higher values indicating greater price flexibility. The implied survival probabilities are calculated from Cox regressions of forced CEO dismissal on idiosyncratic firm performance and the component of firm performance predicted by industry performance. The first-stage regressions use industry stock returns to predict contemporaneous company stock returns. The industry definitions follow the Fama and French (1997) classification into 48 industries, with all firms in the "Other" industry dropped from the regression analysis. The Cox regressions model the hazard of forced CEO dismissal as a function of CEO tenure, using the predicted values and the residuals from the first-stage regression as estimates of the peer-group component and the idiosyncratic component of company stock returns, respectively. The Cox regression specifications correspond to Columns (2) and (4) of Table 4, with Panel A based on the specification in Column (2) and Panel B based on the specification in Column (4). We calculate the implied survival probabilities by holding all covariates other than the counterfactual variables at their model-sample means. We then vary the implied survival probabilities by setting the industry-induced component of firm performance at $t-1$ equal to either its 10th or 90th percentile value and evaluate the corresponding survival probabilities over CEO tenure. We compute the implied survival probabilities separately for sticky-price firms and flexible-price firms. The figure reports results using both equal-weighted and value-weighted Fama–French 48 industry returns.

Panel A: EW Industry



Panel B: VW Industry

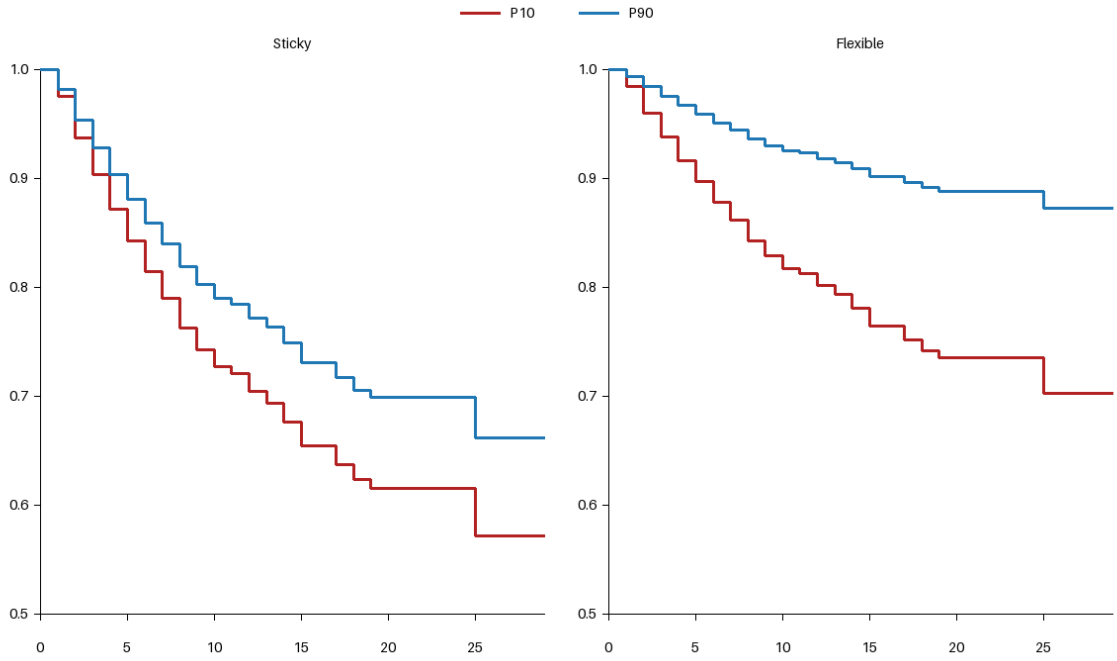
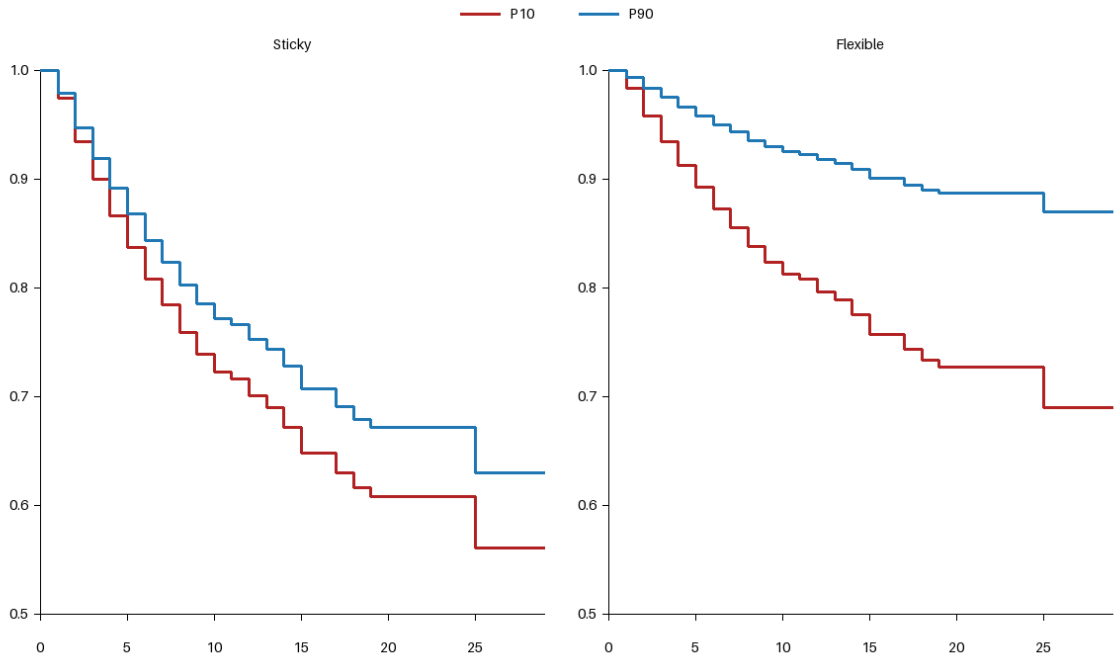


Figure A.2: **Predicted CEO Survival over CEO Tenure: Normalized Industry-Induced Returns**

This figure compares the implied CEO survival probabilities between sticky- and flexible-price firms at different levels of industry-induced performance over CEO tenure. In the counterfactual calculations, sticky-price firms are represented by the lowest PAF rank in the estimation sample, whereas flexible-price firms are represented by the highest PAF rank. PAFrnk is the fractional rank of a firm's price-adjustment frequency (PAF), with higher values indicating greater price flexibility. The implied survival probabilities are calculated from Cox regressions of forced CEO dismissal on normalized idiosyncratic firm performance and normalized industry-induced firm performance. The first-stage regressions use industry stock returns to predict contemporaneous company stock returns separately for each firm. The industry definitions follow the Fama and French (1997) classification into 48 industries, with all firms in the "Other" industry dropped from the regression analysis. We standardize each firm's industry-induced returns using the mean and standard deviation of that firm's industry-induced returns over the 1993–2020 sample period. Likewise, we standardize each firm's idiosyncratic returns using the mean and standard deviation of that firm's idiosyncratic returns over the same period. Firms with fewer than five usable return observations—defined as observations with nonmissing firm and corresponding industry returns—are excluded from the regression analysis. The Cox regressions model the hazard of forced CEO dismissal as a function of CEO tenure, using the normalized predicted values and normalized residuals from the first-stage regression as estimates of the peer-group component and the idiosyncratic component of company stock returns, respectively. The Cox regression specifications correspond to Columns (6) and (8) of Table 4, with Panel A based on the specification in Column (6) and Panel B based on the specification in Column (8). We calculate the implied survival probabilities by holding all covariates other than the counterfactual variables at their model-sample means. We then vary the implied survival probabilities by setting the normalized industry-induced component of firm performance at $t-1$ equal to either its 10th or 90th percentile value and evaluate the corresponding survival probabilities over CEO tenure. We compute the implied survival probabilities separately for sticky-price firms and flexible-price firms. The figure reports results using both equal-weighted and value-weighted Fama–French 48 industry returns.

Panel A: EW Industry



Panel B: VW Industry

