Why are CEOs rarely succeeded by external candidates?*

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Abstract

Outsider CEOs lead large U.S. public firms only 8.4% of the time. To understand this low frequency, we estimate a dynamic model of board hiring decisions that disentangles the board's subjective preference from three economic frictions: search costs, transition costs, and lower outsider productivity. While these three frictions contribute to the rarity of external appointments, their combined effect is smaller than that of the board's preference in favor of insider CEOs. Absent this preference, the model predicts a 49% rate of outsider leadership. Younger boards exhibit the strongest bias toward internal promotions, suggesting that career concerns influence directors' hiring behavior.

Keywords: CEO successions, board career concerns, internal, external candidates, structural estimation.

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1 Introduction

U.S. public firms overwhelmingly favor internal candidates when appointing CEOs, typically selecting individuals who are current or former executives or directors of the same company. Cziraki and Jenter (2022) report that, across multiple studies, only 15–30% of CEO hires since the 1970s have been external. Since the early 1990s, approximately 20% of CEO appointments in large public firms have involved outsiders. These figures, conditional on turnover, suggest that internal promotions are three to five times more common than external hires. Unconditional on turnover, our dataset of 4,782 CEOs from 2001 to 2019 shows that outsider CEOs account for just 8.4% of firm-year observations, highlighting the persistent scarcity of outsiders in the CEO role over time. Why, then, are CEOs so rarely succeeded by external candidates?

Boards may rationally favor insider CEO appointments due to several economic frictions. First, internally promoted CEOs often possess firm-specific knowledge and experience that outsiders lack, making them more effective from the outset. This difference in expected ability can translate into higher productivity. Second, external hiring involves a costly search process to identify and evaluate suitable candidates, whereas internal promotions draw from a known pool of executives with well-understood qualifications. Third, the appointment of an outsider as CEO imposes transition costs as the newcomer adapts to established routines or implements changes, potentially disrupting operations. These costs are often weighed against the potential benefits of change: as Parrino (1997) notes, insiders tend to preserve continuity, while outsiders are often hired to drive change.

In addition to these considerations, boards may also exhibit a preference for insiders, potentially driven by a mix of rational and behavioral factors. This tendency is independent of firm-specific conditions and reflects a persistent inclination to favor internal promotions beyond what cost and productivity factors alone would justify. Such favoritism may stem from familiarity with internal candidates, weakened corporate governance, a desire to incentivize junior executives, or directors' risk aversion, driven by their own career concerns.

Despite outlining several plausible explanations, surprisingly little is known about the relative importance of these forces in shaping the actual choice between insider and outsider CEOs, which

limits the potential for effective organizational reform. This paper aims to quantify the economic magnitude of these forces and establish a benchmark for the expected rate of external hiring based on observed board practices.

Measuring the economic forces behind CEO succession is inherently challenging. Managerial ability and directors' subjective preferences are unobservable by nature, and field experiments often used to uncover these latent factors are rarely feasible at the highest levels of corporate decision-making (Graham, Harvey, and Puri 2013). Common empirical proxies also raise endogeneity concerns. For example, firm performance, frequently used to approximate CEO productivity, is influenced by corporate governance, organizational culture, industry dynamics, as well as external shocks that also shape CEO turnover and appointments. (Bennedsen, Nielsen, Perez-Gonzalez, and Wolfenzon 2007; Taylor 2010). In addition, observable search expenses, such as headhunter fees, provide only a partial measure of search costs, as external CEO searches tend to follow periods of poor firm performance. These expenses omit managerial time and attention, which cannot be easily measured. More generally, exogenous shifts in the relative attractiveness of insider versus outsider CEOs are rare, limiting opportunities to exploit quasi-natural experiments that isolate the underlying drivers of succession decisions.

To address these challenges, we take a different approach by estimating a dynamic model of CEO succession decisions. In our framework, the board chooses between insider and outsider CEOs, taking into account recurring profits influenced by the CEO's ability and a one-time switching cost associated with external appointments. This switching cost includes search frictions that reflect match inefficiencies, transition disruptions due to leadership changes, and a disutility from hiring outsiders, all of which create an option value to waiting. Once an outsider CEO is appointed, the board retains the flexibility to revert to an insider without incurring additional costs. These features allow the model to generate path-dependent succession patterns and substantial inertia in transitions between insider and outsider CEOs.

Through the lens of the model, we interpret observed hiring patterns using structural estimation. This approach allows us to account for the endogenous relationships among CEO succession decisions, firm performance, and the broader CEO labor market. It also enables us to infer the

otherwise hard-to-measure underlying forces through revealed preference, as firms' succession decisions derive directly from the relative utilities they assign to internal versus external candidates. The estimated model further allows us to quantify the contribution of each mechanism to the observed scarcity of outsider CEO appointments.

We estimate a small productivity difference between insider and outsider CEOs. Search and transition costs are statistically significant, but together they explain less than 9% of the utility loss associated with external appointments. The most influential economic force in our analysis is the board's subjective preference for insiders. Absent this preference, our estimates suggest that outsider CEOs would lead firms in nearly 49% of observations. This strong preference for insiders raises the threshold for appointing an outsider, resulting in infrequent and delayed transitions. It also dampens the responsiveness of outsider CEO appointments to other firm and market conditions in the model.

To arrive at these estimates, our empirical identification strategy exploits how the observed frequency of outsider CEO appointments varies with each component of the board's latent utility. These slope relationships ensure a unique mapping between observed choices and model parameters. For example, search cost is inferred from the muted responsiveness of outsider CEO appointments despite large shifts in CEO market tightness, whereas board preference is identified from pronounced inertia, evidenced by only a 1.51% transition rate from insider to outsider CEOs even when conditions favor external hiring.

Building on the finding that board preference is the most influential force discouraging external CEO appointments, we examine four potential sources of this favoritism toward insiders. We reestimate the structural model across subsamples to assess how this bias varies with observable firm and board characteristics. First, board familiarity with internal candidates may lead directors to favor individuals they know and trust. However, our analysis suggests this is not the primary driver: firms with more independent directors continue to favor insiders. Second, weak governance may play a role, as outsider appointments become more frequent and the measured bias declines for firms following an activist campaign. These estimates, however, rely on relatively small samples, as not many firms in ExecuComp have been targeted by activist shareholders.

Third, tournament incentives may influence succession, as a policy of promoting insiders could motivate internal executives (Lazear and Rosen 1981). However, we do not observe stronger insider preferences in more homogeneous industries, where external employment opportunities are greater and internal promotion may be less effective as a motivational device.

The most compelling explanation lies in career concerns among board members. We find that firms with younger directors exhibit substantially stronger preferences for insiders than those with older directors. This pattern suggests that insider favoritism may reflect career concerns (Chevalier and Ellison 1999). Younger directors may be more risk-averse in succession decisions, seeking to protect their reputations by adhering to established succession plans and avoiding the potential fallout of failed external appointments.

Economists have closely tracked the evolution of CEO succession over the past two decades. Parrino (1997) documents the dominance of insider appointments and shows that the probability of outside succession is negatively related to firm performance. Huson, Parrino, and Starks (2001) and Murphy and Zábojník (2007) report an upward trend in external hiring from the 1970s through the 2000s. Murphy and Zábojník (2004) and Frydman (2019) argue that this increase reflects a growing demand for CEOs with generalist skills, which pushed boards to look beyond internal pools. More recently, Cziraki and Jenter (2022) document a reversal in the trend toward external CEO hiring, showing that insider dominance has remained prevalent since the early 2000s. Their analysis reveals that internal promotions are especially common in larger firms and tend to follow periods of strong industry-adjusted stock performance. Building on this evidence, our study informs the discussion by quantifying the relative influence of key economic forces in shaping CEO succession decisions. We find that subjective board bias in favor of insiders is the most significant factor driving succession outcomes.

Our paper contributes to the structural estimation literature on CEO succession and turnover. An influential early work in this domain is Taylor (2010), who estimates a dynamic model of CEO turnover and recovers substantial personal costs incurred by boards when dismissing underperforming CEOs, interpreted as evidence of CEO entrenchment. Building on Taylor's framework, Capron, Hamilton, Hincapié, and Lyman (2025) examine performance differentials between in-

sider and outsider CEOs, attributing insiders' superior performance to the board's informational advantage in selecting internal candidates. Our paper differs from these studies in two key respects. First, we develop a deliberately parsimonious model that abstracts from CEO turnover events. This simplification allows us to focus directly on insider–outsider CEO differences while avoiding overfitting and over-interpreting limited firm performance data. Second, we employ maximum likelihood estimation, which complements existing moments-based approaches by directly leveraging the model's policy function. This method allows us to target the full joint distribution of hiring choices conditional on all state variables, thereby fully utilizing the informational content of the data.

Our model uses a partial equilibrium framework to study firm-level CEO succession decisions, incorporating search frictions through a cost function inspired by the Mortensen-Pissarides matching model (Mortensen and Pissarides 1994; Pissarides 2000). This setup captures market tightness and matching inefficiencies without modeling full general equilibrium dynamics. While related to Murphy and Zábojník (2004, 2007), who link general managerial skills to external hiring and wage trends, our model emphasizes search frictions, transition costs, and board preferences—features that better reflect the realities of CEO labor markets. In contrast to Gabaix and Landier (2008), who analyze CEO pay in a frictionless, competitive general equilibrium setting, our framework complements their approach by modeling how boards make hiring decisions under uncertainty and market frictions.

Finally, we contribute to the small literature on CEO selection (Guenzel and Malmendier 2020). Kaplan and Sorensen (2021) show that boards tend to overweight interpersonal skills when hiring CEOs. Cvijanović, Gantchev, and Li (2023) find that firms with pre-established succession plans tend to perform better. Our paper features a substantial board disutility for appointing outsider CEOs and suggests that career concerns largely drive this preference.

2 Model

In this section, we present a dynamic model of CEO succession in discrete time. Each period t, a risk-neutral board decides whether to appoint an external CEO. The succession decision affects

the board's utility via the channels described next.

2.1 Profitability

Let d_t be a binary variable indicating whether the firm is led by an internally promoted ($d_t = 0$) or externally recruited ($d_t = 1$) CEO in period t. The variable switches to 1 when an outsider is appointed and remains 1 for as long as that externally hired CEO remains in office; it switches back to 0 when the outsider is replaced by a newly appointed insider. The firm's total profit y_t is

$$y_t = (a - \lambda d_t)k_t + z_t, \tag{1}$$

where $a > 0$ is the productivity of an internally promoted CEO and λ is the productivity gap between internal and external hires. Both a and λ are constants. The productivity gap remains as long as an outsider CEO leads the firm. We follow He and Whited (2023) in interpreting a and λ as reduced-form parameters capturing how CEO attributes (e.g., experience, personality, intelligence) together with compensation and contract design affect productivity.[1]

Firm size k_t evolves exogenously according to a Markov process, independent of board decisions. We adopt a multiplicative specification between CEO ability and firm size, which implies that marginal CEO productivity increases with firm size, consistent with the framework of Edmans, Gabaix, and Landier (2009). Profit uncertainty is captured by an additive shock z_t, also governed by an exogenous Markov process and independent of both the hiring decision d_t and CEO actions.

2.2 External hiring costs

In our model, the board pays a one-time switching cost c_t when it brings in an outsider to replace an insider CEO (that is, when $d_t = 1$ and $d_{t-1} = 0$). In principle, hiring a new outsider to replace an incumbent outsider could involve similar costs. However, such transitions are extremely rare:

[1] While our model does not derive optimal compensation contracts, it incorporates observable CEO ability, the same primitive that drives contract design in models such as Murphy and Zábojník (2004, 2007).

they occur in only about 6% of the periods in which an outsider is in office. For parsimony, we therefore assume that these cases generate no switching cost.

This cost has three components and is given by

$$c_t = (\phi_t + \eta z_{t-1} + \kappa)(1 - d_{t-1})d_t. \tag{2}$$

The first component, ϕ_t, captures the expected costs arising from labor market frictions that prevent the firm from immediately finding a suitable external CEO. These costs include both explicit expenses, such as recruiter fees, and implicit ones, such as the time and effort required to secure a successful match. Rather than itemizing each element, we adopt a reduced-form approach grounded in matching theory. Following Mortensen and Pissarides (1994) and Pissarides (2000), we model total search costs as increasing with the expected time needed to fill the vacancy. Specifically, we let

$$\phi_t \equiv \phi q(s_t),$$

where the parameter ϕ and the increasing function $q(\cdot)$ are constants capturing permanent features of the CEO market. The state variable s_t captures CEO market tightness and is defined as the logarithm of the ratio of eligible internal to qualified external candidates available to replace the incumbent CEO at time t.

We employ the ratio of internal to external CEO candidates as an empirical counterpart to labor market tightness in the matching framework of Mortensen and Pissarides (1994) and Pissarides (2000). While their definition centers on the ratio of vacancies to unemployed workers, our adaptation reflects the relative availability of viable candidates for CEO succession, capturing the board's hiring constraints in a specialized executive labor market. Following Pissarides (2000), a Cobb-Douglas matching function of the number of internal candidates and the total eligible external candidates implies that the expected searching time, and, therefore, the cost, equals an exponential function $\phi \exp(\alpha s_t)$, in which the parameter, α, is the elasticity of the number of matches to the number of available external candidates. We include a derivation of this formula

in the Appendix A.

The second component of c_t in equation (2) captures the disruptions associated with CEO transitions. Appointing an external candidate can create uncertainty that unsettles established routines, employee expectations, and organizational norms, and may trigger the departure of key personnel, especially when the outsider is expected to implement major changes. Parrino (1997) provides evidence that insiders are more likely to preserve the status quo, while outsiders are typically chosen to drive change. Past firm performance can further amplify these temporary disruptions. Bennedsen et al. (2007), for example, find that more profitable firms are more likely to select successors from within the CEO's family, while outsiders are often appointed after poor performance—possibly because transition costs rise with stronger prior profitability. To capture these effects, we define the transition cost as a linear function of the lagged profitability shock z_{t-1}, with η governing the sensitivity. A positive η indicates that appointing an outsider CEO temporarily reduces profits more after unusually strong performance, but may yield short-term gains following sharp downturns.

Finally, the parameter κ represents the fixed component of the board's utility cost from appointing an external CEO—one that is independent of executive labor market tightness or firm performance. This fixed cost introduces inertia into succession decisions by capturing an inherent reluctance to hire outsiders.[2] We interpret this reluctance as reflecting an underlying board preference consistent with taste-based discrimination models, in which agents are willing to incur a cost to favor a preferred choice (Becker 1971).

Our approach follows Taylor (2010) in representing the board's personal cost as a preference parameter, but it differs in interpretation.[3] Whereas Taylor interprets this parameter as reflecting CEO entrenchment, we do not. Because our framework does not explicitly model the board's choice to retain or replace each CEO, κ should not be viewed as capturing entrenchment. Instead,

[2] In comparison, Capron et al. (2025) model board preference for insiders as comprising both a fixed and a performance-dependent cost. In our framework, we classify the latter as a transition cost and treat it separately from the fixed board preference.

[3] Our modeling choice of board preference is consistent with Taylor (2010). In his model, the entire utility flow, including board non-pecuniary costs, is scaled by a constant firm size. Because discrete choices depend on relative utilities, scaling by a constant does not affect the outcome. This makes their approach and ours effectively equivalent.

it represents a general preference for insiders, which may arise from factors outside the model's scope. We discuss these possible sources in Section 6.

2.3 The board's problem

The board decides whether to appoint an outsider CEO to maximize its inter-temporal utility. The board's per-period utility is

$$u_t(x_t, d_t) + \epsilon_t(d_t) = \begin{cases} ak_t + z_t + \epsilon_t(0) & \text{if} \quad d_t = 0, \\ (a-\lambda)k_t + z_t - (\phi(s_t) + \eta z_{t-1} + \kappa)(1 - d_{t-1}) + \epsilon_t(1) & \text{if} \quad d_t = 1, \end{cases}$$

where $x_t = \{k_t, s_t, z_{t-1}, d_{t-1}\}$ denotes the vector of state variables impacting the succession decision d_t. Each period's utility includes the firm's profit net of external hiring costs, $u_t(k_t, d_t) \equiv y_t(k_t, d_t) - c_t(s_t, z_{t-1}, d_{t-1}, d_t)$, and a choice-specific random component, $\epsilon(d_t)$.

The random shock $\epsilon(d_t)$ captures factors unobserved by the econometrician. These shocks, standard in discrete choice models, are known to the board prior to making the CEO appointment decision. We interpret this private information as reflecting match quality between the CEO candidate and the firm including cultural fit or alignment in managerial style. For example, $\epsilon_t(1) > 0$ may reflect the board's perception of unusually high-quality external candidates, while $\epsilon_t(0) < 0$ may indicate temporary dissatisfaction with the incumbent CEO or the internal successors (Geelen and Hajda 2024). As is customary in computation and estimation of dynamic discrete choice models, and for the sake of tractability, we assume that ϵ_t has an independent type-I extreme value distribution with volatility σ_ϵ (see, for example, Arcidiacono and Ellickson 2011).

The board's optimization problem can be expressed recursively using the Bellman equation:

$$V(x_t, \epsilon_t) = \max_{d_t} \left\{ u_t(x_t, d_t) + \epsilon_t(d_t) + \beta \mathbb{E}[V(x_{t+1}, \epsilon_{t+1} | x_t, \epsilon_t, d_t)] \right\}, \tag{3}$$

where $\beta < 1$ is the discount factor, and $V(x_t, \epsilon_t)$ is the board's value function given the state (x_t, ϵ_t). This problem makes explicit the notion that hiring from the CEO market may not perfectly substitute for internal succession. If it goes for an outsider, the board expects to face costly switches

in the short-term or earning losses in the long-term. Rather than imposing restrictions on the corresponding parameters, we estimate their magnitude from the data, allowing for the possibility that they may even represent benefits. For example, firms may hire externally if outsider CEOs are expected to outperform ($\lambda < 0$), if transitions are beneficial, or if external hires offer flexibility to return to internal succession. Additionally, the model allows for board-specific benefits to external hiring, captured by preference shocks $\epsilon(1)$, which are unobserved by the econometrician.

2.4 Hiring policy

Our strategy to solve equation (3) consists of recasting the value function fixed-point problem as a fixed-point problem in probability space. We follow the procedure in Aguirregabiria and Mira (2002) and obtain the probability distribution p over the board's binary choice, d_t, given the state vector x_t by iterating on the model's policy function. We provide a formal derivation of the optimal succession policy in Appendix B. We use Figure 1 to illustrate the firm's hiring policy.

Figure 1 illustrates the model-implied conditional probability of hiring an outsider, $p(d_t = 1|x_t)$, as a function of the state variables $x_t = \{k_t, s_t, z_{t-1}, d_{t-1}\}$. The figure is organized into two columns: the left panels depict results without board bias toward insiders ($\kappa = 0$), while the right panels incorporate such bias ($\kappa = 3$). Each row corresponds to a different state variable: profitability shock z_{t-1}, firm size k_t, and CEO market tightness s_t. Within each panel, solid blue lines represent insider-led firms ($d_{t-1} = 0$), while dashed red lines represent outsider-led firms ($d_{t-1} = 1$). All parameters are set to their estimated values from Table 3, except for κ.

In the top-left panel, which varies the profitability shock z_{t-1}, the board of an insider-led firm finds it optimal to delay appointing an outsider until profitability declines sufficiently. Accordingly, the blue line is monotonically decreasing in z_{t-1}. Once an outsider has been appointed, however, that regime tends to persist. This persistence arises because the board retains the option to revert to an insider at no additional search or transition cost. As long as profitability remains high, the board prefers to keep the outsider in place, exercising the option to switch back only after very negative shocks. Consequently, the red line slopes upward.

Turning to the middle-left panel of Figure 1, we analyze how the probability of external hiring

varies with firm size, k_t. When $\lambda > 0$, an outsider CEO imposes annual utility losses of λk_t, making larger firms more costly to operate under outsider leadership. However, with the estimated productivity gap being small ($\lambda = 0.004$), the probability curves for both insider-led firms (blue) and outsider-led firms (red) remain nearly flat. This indicates that, at this level of λ, firm size exerts little influence on the hiring decision.

The bottom-left panel examines the role of CEO market tightness, s_t. For insider-led firms, the probability of appointing an outsider decreases with s_t, reflecting rising search costs when external candidates are scarce. For outsider-led firms, the relationship is reversed: tighter markets increase the probability of retaining the incumbent outsider, since the option value of reverting to an internally promoted CEO rises with expected search costs.

A strong disutility for external promotions ($\kappa > 0$) carries important quantitative implications. As shown in the right column of Figure 1, the gap between the blue and red lines widens relative to the left column. With state variables held constant, stronger board preferences against outsiders lower the probability of appointing an external CEO, shifting the solid blue curves downward. At the same time, outsider regimes become more persistent, reflected in the upward shift of the dashed red curves.

3 Data

We identify all CEO turnover events between 2000 and 2020 using the 2021 annual ExecuComp file and manually verify consistency with SEC filings in EDGAR and the dataset of Jenter and Kanaan (2015). Following ExecuComp's convention, a succession is recorded in the first fiscal year in which the incoming CEO has served more than six months. We exclude firm-year observations involving interim CEOs, Co-CEOs, or turnovers linked to acquisitions, mergers, or spin-offs, as our model does not address these motives for CEO change. Consistent with Cremers and Grinstein (2014), an interim CEO is defined as one serving fewer than twelve months.

To determine CEO origins and construct candidate pools, we collect director information from BoardEx and link it to ExecuComp using the WRDS match table, supplemented with manual

matching of individual CEOs and directors. Firm-level accounting data are drawn from Compustat, with financial firms (SIC 6000–6999) and observations with zero or negative total assets (AT) or sales (SALE) excluded. Because the model is dynamic, we also require each firm to have at least two consecutive years of data. The final sample covers 4,786 CEOs at 2,245 firms, yielding 26,635 firm-year observations from 2001 to 2019. The sample does not extend earlier due to BoardEx's limited coverage (Engelberg, Gao, and Parsons 2012) and the need for lagged state variables in estimation.

3.1 Variables construction

We trace each CEO's career history to determine whether they are classified as insiders or outsiders at the time of appointment. A CEO is considered an outsider if they have never served as an employee, executive, or board member of the firm prior to the year before their appointment. This means individuals formally affiliated with the firm for less than one year before becoming CEO are still treated as outsiders. Following Parrino (1997), this definition helps avoid misclassifying external hires as internal promotions in cases where firms require appointees to hold nominal roles before assuming the CEO position. Without this distinction, firms that formalize all successions internally would appear to have no external hires. Our definition refines Parrino's, who treated only long-tenured executives as insiders. In contrast, Cziraki and Jenter (2022) argue that current or former board members should also be treated as insiders, since their appointments typically involve no search costs or transition disruptions. Consistent with this view, we classify a CEO as an insider if they were already serving on the board and had not been appointed within one year of assuming the CEO role.

For each firm-year in our sample, we construct two CEO candidate pools. The internal candidate pool consists of individuals who currently hold or have previously held executive positions or board memberships within the firm. The external candidate pool consists of all the current executives of peer firms in the same industry defined using 3-digit SIC codes. Our definition of the CEO candidate pool is motivated by U.S. public firms' expectations that CEOs must possess specific industry expertise and skills in dealing with a diverse set of shareholders. Not surprisingly,

Cziraki and Jenter (2022) show that the pool of qualified candidates from which S&P 500 firms recruit is small. He and Whited (2023) verify that 90% of all the appointments in their sample of 2,621 S&P1500 CEO appointments from 2000 to 2019 belong to the candidate pools defined above.

Our construction of the external candidate pool follows the methodology of He and Whited (2023). We decompose each firm into its business segments and retrieve the corresponding industry codes from Compustat Segment data. For each firm-year, we retain the top three segments ranked by sales; for conglomerates classified under SIC 9997, which typically span more than three activities, we include all segments for that year. The external candidate pool is defined as the set of executives employed in peer firms operating within these segments. This approach captures the full range of activities in which a firm is engaged—upstream, downstream, and unrelated—thereby reflecting the broad set of executives who plausibly constitute the universe of external CEO candidates.

Because firms rarely disclose their short lists, the CEO candidate pool is not directly observable. The literature has therefore relied on proxies. Taylor (2010), for instance, implicitly treats all CEOs reported in the annual *Forbes* surveys as potential candidates for any CEO post in that year. Our measure remains a proxy, but incorporates two refinements that more closely approximate the economic search constraints underlying CEO succession. First, we distinguish between internal and external pools and allow both to evolve separately over time. Second, the external pool consists of executives—CEOs and non-CEO top managers—employed in firms operating within the same 3-digit SIC segments as the focal firm's primary activities. This restriction captures the technological and competitive relatedness that determines which executives are realistically substitutable across firms. By conditioning the external pool on the firm's segment composition, the measure captures variation in the set of plausibly substitutable executives that arises from changes in industry structure and firm scope. While useful for identification of the search frictions parameter, the resulting time-series variation is therefore an outcome of economically meaningful shifts in the underlying search environment. For these reasons, we regard the proxy as a more informative representation of CEO search frictions and competitive dynamics than existing measures.

Following Parrino (1997) and Taylor (2010), we measure firm performance using operating income before depreciation (OIBDP). For each observation, we estimate the idiosyncratic prof-

itability shock as the residual z_{it} from the regression:

$$y_{it} = a_0 + a_1 k_{it} + z_{it}, \tag{4}$$

where y_{it} and k_{it} are the logarithms of OIBDP and total assets (AT), respectively. In rare cases of negative OIBDP, we impute interpolated values to compute logarithms. We include industry-year fixed effects in the regression to account for the mean reversion in profitability (Parrino 1997) and any non-idiosyncratic shocks (Guiso, Pistaferri, and Schivardi 2005).

3.2 Descriptive statistics

Figure 2 plots the annual share of CEO transitions involving an outsider between 2001 and 2019. The blue bars reflect a broad definition of outsiders—those who had not held an executive role at the firm for more than one year before their appointment. The red bars apply a stricter definition of 'true outsiders,' excluding not only former executives but also board members with more than one year of service prior to becoming CEO. The figure shows that the upward trend in external hiring observed from the 1970s to 2000 (Parrino 1997; Huson et al. 2001; Murphy and Zábojník 2007) did not continue into the 2000s or 2010s. Instead, regardless of definition, the share of external appointments fluctuates from year to year without a clear trend, consistent with the findings of Cziraki and Jenter (2022).

Table 1 summarizes our dataset. Panel A reports the share of firm-years in which the CEO was an outsider at the time of appointment. On average, outsiders lead U.S. public firms in 8.4% of firm-year observations, with this share rising over time—from 5.3% during 2001–2005 to 10.7% in 2016–2019. Unlike Figure 2, which shows a stable rate of external hiring *conditional* on CEO turnover, the overall presence of outsider CEOs has grown steadily. There is also variation across industries: Manufacturing (9.8%) and Health (11.1%) exceed the average, while Energy (4.9%) and Utilities (3.1%) fall well below. Panel B reports summary statistics for the remaining state variables. Using our definitions of the CEO candidate pool, insiders represent on average 15.9% of all qualified candidates between 2000 and 2019. This corresponds to roughly 5.3 external candidates for every insider ($= (1 - 0.159)/0.159$). Importantly, this ratio varies substantially over

the sample. At the third quartile of the insider-share distribution (0.215), where CEO markets tend to be tighter, firms face about 3.7 eligible external candidates per insider. At the first quartile (0.04), where markets are relatively loose, this number rises to roughly 24 external candidates per insider. The wide dispersion suggests that our candidate pool measure effectively captures variation in CEO-market tightness. Such variation is central to identifying the role of search frictions in CEO succession decisions.

4 Estimation

We estimate the four model parameters, λ, ϕ, η and κ by maximum likelihood (ML), targeting the joint likelihood of the observed firm policies, $d_t \in \{0, 1\}$, across all firms and years, conditional on the state variables, $x_t = \{k_t, s_t, z_{t-1}, d_{t-1}\}$. Solving the Bellman equation in (3) produces the optimal CEO hiring policy as a function of model parameters. We discuss below all the steps involved. Details are included in Appendix B.

4.1 Preset and targeted parameters

We set the discount factor at $\beta = 0.99$, consistent with He and Whited (2023), who determine this value through an external grid search following Rust and Phelan (1997) and demonstrate that it yields the highest likelihood fit. We set the matching function elasticity α to 0.24, a figure lying at the lower bound of the existing estimates in the matching function estimation literature. This conservative choice reflects the well-known difficulty during the matching process of the CEO labor market.

We estimate four key parameters: the expected productivity gap between insider and outsider CEOs, λ; the search cost multiplier, ϕ; the transition cost sensitivity, η; and the board's disutility from appointing an outsider, κ. Note that these structural parameters are identified only up to scale, which is a common feature of discrete choice models. This restriction arises because the CEO succession decision depends on the relative utilities of the two alternatives. The ranking of choice-specific utilities remains unchanged if we add or multiply all utilities by a constant. To

address this scale-indeterminacy, we normalize the utility function before estimation. Following standard practice, we set the insider CEO's productivity parameter a to zero, which effectively normalizes the utility of promoting an internal candidate to zero. We then divide all four structural parameters by the dispersion of the error term σ_ϵ, which accounts for the influence of unobserved factors (Train 2009).

We then estimate the standardized parameter vector $\boldsymbol{\theta} = \frac{1}{\sigma_\epsilon}\{\lambda, \phi, \eta, \kappa\}$, which captures the relative strength of observable economic forces compared to unobserved factors. For simplicity, we continue to refer to these normalized parameters using their original notation throughout the paper, as this does not affect the interpretation of their relative magnitudes, which is the primary focus of our analysis.

4.2 Estimation algorithm

We use the Nested Pseudo Likelihood algorithm (NPL) proposed by Aguirregabiria and Mira (2002) due to its computational efficiency and tractability. As we show in Appendix B, the value function iteration to solve equation (3) can be recast as a conditional probability iteration problem, over the decision to appoint an outsider CEO. The ML estimator can be obtained through iteration of a two-step algorithm that reverses the order of the Nested Fixed Point algorithm (NFXP) by Rust (1987, 1994). Namely, at the K-th iteration, we take the hiring conditional probability $p^{K-1}(\boldsymbol{\theta})$ as given and select parameter estimates $\boldsymbol{\theta}^K$ that maximize the likelihood of obtaining the observed joint distribution of hiring choices. In the second step, we update the choice probability $p^K(\boldsymbol{\theta})$ by solving a fixed point problem. We continue until we reach convergence in p and $\boldsymbol{\theta}$.

4.3 State transitions

A key component in solving equation (3) is the Markov transition matrix $f(x_{t+1}|x_t, d_t)$, which describes the distribution of next-period states given current conditions. This matrix is essential for the board to compute the expected continuation value of utility. To reduce computational burden, we follow Rust and Phelan (1997) by imposing rational expectations and decomposing

the transition matrix into a product of conditional densities as follows:

$$f(x_{t+1}|x_t, d_t) = f_k(k_{t+1}|k_t) f_s(s_{t+1}|k_t, s_t, d_t) f_z(z_t|z_{t-1}), \tag{5}$$

where f_k, f_s, and f_z correspond to each state variable's transition matrix. This decomposition preserves our assumption that firm size k and profitability shock z evolve independently and exogenously. At the same time, it allows CEO market tightness s_{t+1} to endogenously depend on k_t, s_t, and d_t.

Table 2 supports our decomposition of the transition matrix by estimating regressions that describe the evolution of each state variable, k_{t+1}, s_{t+1} and z_t, as functions of relevant period-t variables. These regressions capture the statistical evolution of the state variables without implying causal relationships. We estimate them using the dynamic panel methods of Arellano and Bover (1995) and Blundell and Bond (1998), which account for unobserved firm heterogeneity. Column (2) shows that larger firms tend to face tighter CEO markets, where qualified external candidates are relatively scarce. This result is intuitive: large firms typically have broader boards and management teams due to greater complexity and diversification. Column (2) further indicates that external hiring increases future internal representation in the candidate pool, likely because new CEOs restructure inherited teams and appoint their own executives. Taken together, the evidence supports our assumption that CEO market tightness evolves systematically with firm size and past succession decisions.

Following this decomposition, we discretize the three continuous state variables and estimate their transition probabilities,f_k, f_s, and f_z, separately. We assume that firm size k and profitability shocks z follow independent AR(1) processes. Using the method of Rouwenhorst (1995), we construct grids with seven and nine support points for k and z, respectively, and derive the corresponding transition matrices f_k and f_z. We estimate f_s using a semi-parametric approach. We first let s have 25 evenly-spaced points of support. We then approximate the conditional transition probabilities using Gaussian kernel density estimation. To account for the influence of firm size k and the endogenous CEO succession choice d, we estimate separate kernel densities for each firm size grid point and CEO origin, effectively constructing sub-transition matrices that capture these

dependencies.

5 Results

5.1 Model fit

Before presenting parameter estimates, we first assess the model's goodness of fit. Panel A of Table 3 compares model-predicted conditional choice probabilities to their empirical counterparts. Recall that the model is estimated via maximum likelihood, targeting the full distribution of these probabilities rather than matching a specific set of moments. As such, this comparison serves as an external validity check of the model. To generate the model-predicted statistics, we simulate synthetic data that closely match the actual sample size. Each firm in the sample is replicated over the observed time period, starting from the same initial state variables and evolving according to the model solution. We then compile all simulated firm data into a panel that mirrors the actual dataset in size and coverage. Following Michaelides and Ng (2000), the procedure is repeated ten times and computes average frequencies across all the panels.

The statistics in Panel A of Table 3 demonstrate that the model closely reproduces observed CEO succession patterns. In the data, outsider CEOs represent 8.36% of all firm-year observations, while the model, based on maximum likelihood parameter estimates, predicts a nearly identical rate of 8.24%. Splitting the sample by the origin of the incumbent CEO reveals strong persistence, both in the data and predicted by the model. Insider-led firms switch to outsider CEOs in only 1.51% of cases in the following year, compared with the model's prediction of 1.45%. Likewise, outsider-led firms retain an external CEO 93.17% of the time, closely matched by the model's estimate of 93.08%.

5.2 Parameter estimates

Next, we discuss the parameter estimates presented in Panel B of Table 3. All four parameters are estimated with high precision. The estimates of λ, η, and κ are statistically significantly different

from zero at the 99% confidence level, while the estimate of ϕ is statistically significantly different from zero at the 95% confidence level.

The positive estimate of λ indicates that outsider CEOs tend to underperform relative to their insider counterparts. This finding differs from Huson, Malatesta, and Parrino (2004) who show that outside appointments are associated with improved firm performance. One possible reason for this difference is the methodological approach: In Huson et al. (2004), performance changes are measured ex post and are conditional on CEO turnover, which is itself endogenously determined. For instance, improved performance may reflect a recovery following turnover triggered by prior declines. In contrast, our analysis is based on the full time series of each firm and estimates expected performance differences unconditionally on turnover. Our results support the view that, at any given time, insider CEOs may benefit from firm-specific knowledge that outsiders lack. In the next section, we quantify the extent to which this measured difference in expected productivity contributes to the paucity of external CEO hiring.

As expected, the estimate of ϕ is positive, indicating that replacing an incumbent CEO with an outsider involves a search cost that rises with CEO market tightness. Since our definition of the CEO candidate pool is limited to the same industry, this finding underscores the value of industry-specific expertise in CEO selection. Our results suggest that firms are more likely to hire *firm* outsiders when there is a greater availability of *industry* insiders.

The estimate of η is also positive, which is consistent with the result in Bennedsen et al. (2007) that, on average, deteriorating firm performance triggers outsider CEO successions. This pattern can be explained by the fact that transition costs tend to rise with profitability, making outside appointments more likely when profitability is low. In times of negative profitability shocks, our estimate suggests that the disruptions to business routines caused by CEO turnover (see, for example, Taylor 2010) may actually be beneficial in the short term when the succession involves an outsider. This interpretation is consistent with Parrino (1997), who argues that outsider CEOs are frequently brought in to lead major transformations.

Finally, the estimate of κ is positive and highly statistically significant, indicating a general board preference for insider CEO candidates. We further investigate the sources of this insider

preference in Section 6.

5.3 Economic significance

The parameter estimates in Table 3 indicate the directional effects of each economic channel in the model. However, as in all discrete-choice settings, these parameters are identified only up to scale and are therefore not directly expressed in economic units. This is an inherent feature of the model. To translate these estimates into economically meaningful magnitudes, we apply two complementary transformations.

First, we quantify the contribution of each economic force to changes in the board's expected utility from a succession decision. Specifically, let $v(d_t, x_t)$ denote the value function given hiring decision $d_t \in \{0, 1\}$ and state x_t. Thus, $v(.)$ is defined as the current period utility from the choice d_t plus the present discounted value from behaving optimally from $t+1$ onwards:

$$v(d_t, x_t) \equiv u(d_t, x_t) + \beta \mathbb{E}[V(x_{t+1}, \epsilon_{t+1} | x_t, \epsilon_t, d_t)]. \tag{6}$$

It is straightforward to show that the expected utility loss from hiring an outsider while an insider CEO is in office, i.e., $v(d_t = 1, x_t | d_{t-1} = 0) - v(d_t = 0, x_t | d_{t-1} = 0)$ equals

$$-\underbrace{(\lambda k_t + \phi \exp(\alpha s_t) + \eta z_{t-1} + \kappa)}_{u(1,x_t|d_{t-1}=0) - u(0,x_t|d_{t-1}=0)} + \underbrace{\Delta CV}_{\beta \mathbb{E}[V(x_{t+1},\epsilon_{t+1}|x_t,\epsilon_t,1) - V(x_{t+1},\epsilon_{t+1}|x_t,\epsilon_t,0)]}. \tag{7}$$

The first four terms capture the expected flow costs during the transition, while the final term, ΔCV, reflects the impact of the hiring decision on the board's continuation value.

Panel A of Table 4 presents the decomposition of utility flow costs. On average, productivity losses explain only 0.45% of utility flow costs, whereas search costs are more substantial at 8.84%. Transition costs, by contrast, generate a net utility gain, reflecting the effect of large negative earnings shocks. The estimate of $\kappa = 6.56$ indicates that the dominant source of utility loss—91% on average—derives from the board's strong preference for insider CEOs.

In the model, one benefit of replacing an insider CEO with an outsider is that the board gains

the option to later promote an insider without incurring switch costs. Panel B compares the value of this option (ΔCV) to the immediate utility loss, both expressed as a share of the total change in utility (Δv). On average, the option value is sizable, amounting to 37% of the initial utility loss in absolute terms.

In summary, our estimates suggest that the primary cost of hiring an outsider CEO stems from the board's preference for insiders. However, search and transition costs also play a role, especially under tight CEO labor markets or extreme profitability conditions. Importantly, the option to revert to internal promotion helps offset the utility cost of external appointments.

We next conduct counterfactuals to gauge the relative importance of each channel in explaining the propensity of outside CEO appointment. We use the baseline model as a laboratory to implement four experiments. In each experiment, one parameter is set to zero while the others remain fixed at their maximum likelihood estimates. We then compute the implied frequency of external hiring using the same procedure as in Panel B of Table 3. The results are reported in Table 5.

Removing the productivity gap between insider and outsider CEOs increases the predicted external hiring from 8.24% to 11.85%. Search costs have a similarly strong effect: eliminating them raises external hiring to 10.09%. In contrast, transition costs have little net impact. Because their effects are symmetric across positive and negative profitability shocks, setting $\eta = 0$ changes the predicted frequency only marginally, by -0.49%. We examine the robustness of this result under alternative transition-cost specifications in Section 7.

The board's preference for insiders is the dominant factor in CEO hiring decisions. Removing this preference raises the predicted share of outsider CEOs to 48.9%. Strikingly, without such favoritism, outsiders would be nearly as prevalent as insiders in CEO roles, despite insiders' modest productivity advantage and the presence of search frictions. In short, our estimates suggest that insider CEOs are not significantly better, and the external CEO market is not sufficiently constrained to account for the rarity of external appointments.

5.4 Parameter sensitivity and identification

In this section, we examine why the model assigns a dominant role to insider favoritism and how the choice probabilities reveal such preference. Intuitively, our estimation strategy relies on the principle of revealed preferences: since the parameters represent the board's utility, observed hiring decisions must reflect their values. Empirical evidence from Panel B of Table 3 show that transitions from insider-led firms to outsider CEOs are rare, at only 1.45%, indicating substantial switch costs. This inertia persists across firm size, CEO market conditions, and profitability shocks, indicating that the switching cost reflects a subjective disutility borne by the board rather than objective economic constraints.

We begin by calculating the sensitivity measure proposed by Andrews, Gentzkow, and Shapiro (2017), which evaluates how changes in data moments affect parameter estimates. This analysis helps clarify how each targeted parameter is identified. For each parameter, the sensitivity is derived from the Jacobian of selected moments and a weighting matrix, with higher values indicating which moments are most informative about the underlying parameters. Although we use a maximum likelihood approach, Pesendorfer and Schmidt-Dengler (2008) show that it is asymptotically equivalent to a moment-based estimator, where the relevant moments are the conditional choice probabilities of external hiring given four state variables. These conditional probabilities capture the full distribution of CEO succession decisions.

Formally, we calculate the sensitivity

$$\frac{\partial \boldsymbol{\theta}}{\partial p(d_t = 1|x_t)} \text{ for } x_t = \{k_t, s_t, z_{t-1}, d_{t-1}\}. \tag{8}$$

for each point in a grid of 3,150 combinations of values of all four state variables. We then regress these sensitivities on the grid values of each state variable and their interactions. Table 6 presents the regression results. Since the choice probabilities vary across four state dimensions, this exercise highlights which states are most influential for identifying each parameter. To ensure comparability within columns, the continuous variables k_t, s_t, and z_{t-1} are standardized. The largest coefficient in each column is highlighted in bold.

Columns (1)–(3) of Table 6 show that parameter sensitivities closely align with their associated state variables:λ with firm size k_t, ϕ with CEO market tightness s_t, and η with profitability shocks z_{t-1}. Specifically, the productivity difference λ is primarily identified from variation in firm size, especially among outsider-led firms. Intuitively, a higher λ implies that large firms incur greater costs when appointing outsider CEOs compared to smaller firms. For the cost-related parameters ϕ and η, identification is most sensitive in insider-led firms. In these cases, switching to an outsider CEO involves costs that vary with CEO market tightness and profitability shocks. As a result, even small changes in the probability of switching in response to these variables are highly informative for estimating ϕ and η.

Column (4) of Table 6 shows that the sensitivity of κ, which captures the board's fixed preference against outsider CEOs, is highest for the interaction between prior CEO status and CEO market tightness. When the market is tight and the firm is already led by an outsider, the board's decision to retain or replace the CEO is less likely driven by search costs and more indicative of an intrinsic preference.

Next, we assess whether the three economic forces, productivity differences, transition costs, and search costs, can explain the data in a model *without* a preference for insiders, i.e., when $\kappa = 0$. Figure 3 plots the resulting policy functions when either the search cost parameter ϕ (left panel) or the transition cost parameter η (right panel) is set to ten times their full-sample estimates. Inflating ϕ generates policy functions qualitatively similar to those produced by a strong insider preference (right panel of Figure 1), but quantitatively the conditional probabilities of hiring an outsider become far more sensitive to CEO market tightness than is observed in the data. Likewise, arbitrarily increasing η (right panel of Figure 3) produces counterfactual outsider hiring policies across all state variables.

To formally test whether boards indeed exhibit a preference for insiders, we re-estimate the model under the restriction $\kappa = 0$, the *Constrained Model*, and conduct a likelihood ratio test against the *Unconstrained Model* discussed in Section 5.2. The test statistic, reported in Table 7, rejects the null hypothesis that the constrained model is true (p-value = 0). Panel A of Table 7 indicates that the constrained model fits the data primarily by attributing reluctance to hire outsiders

to extremely high search costs. Yet the comparison of predicted and actual moments (Panel B) confirms the insight from Figure 3: the search cost channel alone cannot account for the observed data. Specifically, the constrained model predicts an external hiring rate of 15.52%, nearly double the observed 8.36%. It also exaggerates the conditional probability of switching from an insider to an outsider across nearly all states, while underestimating the persistence of outsider CEOs by predicting less inertia in reverting back to insiders.

6 Understanding board preferences

Why do boards experience strong disutility from appointing outsider CEOs? To investigate this question, we conduct a series of subsample analyses.

Since direct comparison of parameter estimates across subsamples may be invalid due to potential differences in scale, we apply the equality test proposed by Swait and Louviere (1993) in each subsample analysis. The null hypothesis attributes variation to scale (the volatility of the unobserved utility term σ_ϵ) while the alternative suggests differences in the underlying structural parameters.

6.1 Board independence

Boards may prefer internal CEO candidates because they are more comfortable working with familiar executives. Independent directors, who do not hold executive roles in the firm, lack this familiarity. As a result, they may be more open to outsider appointments, leading the model to infer a lower estimate of κ. To test this conjecture, we divide the sample based on board independence, measured by the number of non-employee directors.

We use the absolute count rather than the percentage of independent directors, based on the premise that a larger number of independent directors implies broader external connections and a more extensive professional network. This may increase the board's confidence in evaluating outsider candidates and reduce reliance on internal familiarity, thereby lowering the preference for internal appointments. A board may appear highly independent in percentage terms but still consist of few individuals, limiting its exposure to external candidates. Controlling for the board's

network reach is important, especially given that Cziraki and Jenter (2022) show that 54% of newly appointed outsider CEOs have prior board connections with the hiring firm.

The Low and High subsamples correspond to the bottom and top quartiles of firm-year observations ranked by this measure. Panel A of Table 8 compares firm characteristics across these groups. Firms with more independent directors tend to be significantly larger and have CEO candidate pools with a higher share of insiders.

Panel B of Table 8 presents the estimation results for the high and low board independence groups. As expected, the rate of outsider CEO appointments is slightly higher in the subsample with more independent directors. This increase reflects the interplay of two forces: reduced board favoritism toward internal candidates and heightened sensitivity to CEO market tightness, as shown in Panel C. However, after accounting for differences in the scale factor, the two sets of parameter estimates are statistically indistinguishable.

6.2 Shareholder activism

Favoritism toward insider CEOs may reflect entrenchment and weakened corporate governance. While the presence of independent directors, as discussed earlier, signals governance quality, it also proxies for the breadth of professional networks. To isolate the role of governance, we examine firms in our sample that experienced shareholder activism. Activists often target firms that are poorly governed and increase their value by improving or replacing management and board members (Brav, Jiang, Partnoy, and Thomas 2008). The obligatory filing of a Schedule 13D with the SEC after acquiring more than 5% of voting shares marks the beginning of an activist engagement with intention to influence the target firm. We use the Schedule 13D filing data of Albuquerque, Fos, and Schroth (2022) to identify all targeted firms in our data set. To better capture governance interventions by shareholder activists, we impose two sample restrictions. First, we focus on the initial Schedule 13D filing for each firm and exclude subsequent amendments, allowing for a clean comparison before and after the intervention without concerns about intermediary ownership changes. Second, we consider a three-year window around the initial filing, motivated by the observation that CEO turnovers typically occur within this period. This selection yields a sample of 782 firms and 3,147 firm-year observations spanning the three years before and after the

initial Schedule 13D filing.

Panel B of Table 9 shows that the frequency of external CEO successions increases following an activist campaign. Accordingly, the estimate of κ decreases, indicating that the board preferences for insiders may be partially reflecting weak governance. But this result should be considered preliminary: due to the small sample size, we cannot reject that the significant difference between the κ estimates in the before and after subsamples may be due to differences in σ_ϵ.

6.3 Tournament incentives

We next examine how tournament incentives influence the board's preference for insider CEOs. Part of the estimated magnitude of κ may reflect a commitment to rewarding high-performing junior executives, thereby sustaining effort incentives early in their careers.(Lazear and Rosen 1981). To test this hypothesis, we follow the reasoning of Kale, Reis, and Venkateswaran (2009), who argue that promotion-based tournament incentives should be weaker in more homogeneous industries. In such industries, larger pools of potential outsiders exist and inside executives competing for the CEO role face greater external employment opportunities, reducing the power of internal promotion as an incentive device.

Although our model incorporates the availability of external candidates within the industry, we further introduce a complementary measure to account for broader industry-level heterogeneity. Following Parrino (1997), we define industry homogeneity as the average partial correlation between each firm's market-adjusted monthly return and that of an equally weighted industry index. Returns are computed using CRSP monthly data over five-year rolling windows, requiring at least two firms and three years of data per industry. For multi-segment firms, we take the average homogeneity across segments.

We sort firm-year observations into quartiles based on firm-specific industry homogeneity and compare the top and bottom groups. Panel A of Table 10 shows that firms in highly homogeneous industries tend to be larger, have more internal CEO candidates, and experience smaller, idiosyncratic negative profitability shocks.

At first glance, this seems counterintuitive. Parrino (1997) associates homogeneous industries with firm similarity and managerial mobility, traits conceptually aligned with perfect competition, which typically features many small firms and abundant external candidates. However, Parrino's industry homogeneity measure is negatively correlated with the number of firms in the industry. This result holds under both 2-digit and segment-level 3-digit SIC classifications. Technically, as the number of firms increases, the industry index becomes more diversified, reducing the influence of individual firm performance and lowering firm-index correlations. Consequently, sorting by industry homogeneity also sorts firms by CEO market tightness, revealing a substantial gap in insider CEO share between the two subsamples.

Panel B of Table 10 presents estimation results for firms in high and low industry homogeneity groups. Firms in highly homogeneous industries face tighter CEO markets, resulting in a lower probability of appointing outsider CEOs.[4] The sensitivity to CEO market tightness, ϕ, behaves irregularly due to the subsamples representing the extremes of the tightness distribution. Despite these differences, the Swait and Louviere (1993) test indicates that, after adjusting for scale, the two sets of estimates are statistically indistinguishable.

6.4 Board age

Lastly, we consider whether boards' favoritism for insider CEOs reflects directors' own career concerns. Appointing an outsider may be interpreted as evidence that the board failed to establish or manage an effective succession plan, while the premature failure of an externally appointed CEO could further signal board incompetence. Consistent with this view, our data show that directors are significantly more likely to lose board seats following the resignation of an outsider

[4] Parrino (1997) reports that the top three homogeneous industries—metal mining, oil and gas extraction, and air transportation—have the highest frequencies of outside successions at 50%, 36.36%, and 42.86%, respectively. In our sample, these industries remain homogeneous based on mean partial correlation but show frequencies of outside successions in the bottom quartile among all industries. Conversely, Parrino (1997) identifies the top three heterogeneous industries—fabricated metal products, wholesale trade (nondurable goods), and transportation equipment—with low frequencies of outside successions at 0%, 13.33%, and 14.89%, respectively. In our sample, these industries remain heterogeneous based on mean partial correlation but exhibit frequencies of outside successions above the median among all industries. We propose that the difference may be due to industry mergers and acquisitions waves and the rise of non-compete agreements.

CEO within three years of appointment.[5]

If younger directors have more at stake in terms of future career prospects and reputation, they may exhibit a higher κ. To explore this possibility, we divide the sample based on the median age of directors. The Young and Old board-age subsamples correspond to the bottom and top quartiles of firm-year observations ranked by this measure. Panel A of Table 11 shows that younger boards are typically associated with smaller firms and CEO candidate pools with fewer internal candidates. Panel B of Table 11 shows significant differences in parameter estimates across the two subsamples. The Swait and Louviere (1993) test rejects the null hypothesis, at the 99% confidence level, that these differences are due solely to scale. Consistent with the career concern explanation, younger boards exhibit a stronger preference for insiders, reflected in a higher estimate of κ. The difference is economically meaningful: for younger boards, outsider disutility accounts for 95.53% of total flow cost, compared to 65.37% for older boards (Panel C). Overall, the evidence strongly suggests that insider favoritism in CEO succession reflects directors' career concerns.

To summarize, the board's preference for internal CEO appointments appears to be driven primarily by directors' career concerns. While alternative explanations such as familiarity with internal candidates, weak corporate governance, and the use of promotion as an incentive mechanism are theoretically plausible, our subsample analyses suggest that none of these factors significantly account for the observed preference for internal appointments.

7 Robustness

7.1 Asymmetric transitions costs

The benchmark specification for transition costs under outsider CEO appointments relies on a single parameter, η. Under this restriction, $\eta > 0$ implies that transitions are beneficial following negative profitability shocks but costly after positive ones. To test robustness, we allow for

[5] A logit regression with year-fixed effects reveals that the odds ratio of director turnover increases by 0.58 after the departure of a failed outsider CEO.

asymmetric transition costs using the specification

$$(\eta_+ \times \mathbb{1}\{z_{t-1} \geq 0\} + \eta_- \times \mathbb{1}\{z_{t-1} < 0\}) \times z_{t-1}, \tag{9}$$

where the indicator functions $\mathbb{1}\{\cdot\}$ identify whether the firm over- or under-performed relative to expectations in the prior year, and η_+ and η_- are the new parameters to be estimated. This formulation allows transitions to be either costly or beneficial, depending on whether profitability shocks are positive or negative. The results are reported in Panel A of Table 12.

The estimate of η_- is statistically significant, positive, and comparable in magnitude to the benchmark estimate of η in Table 3. This confirms that appointing an external CEO after poor performance generates temporary *benefits*, thereby reducing the net costs of switching to an outsider. By contrast, the estimated η_+ is close to zero, suggesting that external appointments following positive profitability shocks do not produce meaningful temporary disruptions. All other parameter estimates remain very close to their benchmark values in Table 3.

7.2 Earnings persistence by CEO type

The previous result—that transitions are beneficial when profitability shocks are negative—combined with the tendency for outsider CEOs to be appointed during periods of abnormally low profitability, suggests that outsiders may be hired precisely to end a firm's underperformance spell. To capture this mechanism, we extend the model to allow external CEOs to accelerate the mean reversion of earnings. This extension introduces an additional dimension of heterogeneity between insiders and outsiders beyond differences in expected productivity. Formally, we allow the coefficient of the AR(1) process for idiosyncratic shocks to differ by CEO type and estimate the parameters of the following equation using dynamic panel methods:

$$z_{i,t+1} = \mu + \rho_1 z_{it} + \rho_2 z_{it} \times d_{it} + u_{it}. \tag{10}$$

We then re-estimate the model using the profitability dynamics implied by equation (10). Panel B of Table 12 shows that the estimate of ρ_2 is negative, large, and statistically significant (-0.60).

This implies that performance is far less persistent under outsider CEOs ($\hat{\rho}_1 + \hat{\rho}_2 = 0.07$) than under insiders ($\hat{\rho}_1 = 0.67$), consistent with the view that outsiders accelerate the mean reversion of earnings shocks. Nevertheless, despite this important difference between internal and external CEOs, all baseline model parameter estimates remain robust to this extension.

8 Conclusion

The major factor explaining why the majority of CEOs of large US companies were promoted from within the firm, as opposed to hired externally, is the board of directors' subjective preference for home-grown leaders. A dynamic model of CEO succession conditional on states of profitability and friction in the external job market infers that external hiring is too infrequent, both unconditionally or conditional on any state, to be explained only with CEO search or transition costs or the potential superior performance of insiders. The preference for promoting internally must be therefore important. The most likely explanation for this preference is that directors care about their reputation, and conforming to internal succession planning avoids potential mistakes hiring outsiders.

Our findings suggest that other reasons besides directors' career concerns and the tightness of the CEO labor market may also distort succession decisions in important ways. Future research could improve our understanding of CEO hiring policy by incorporating measures of the quality of succession planning or of the information boards have about the external CEO market.

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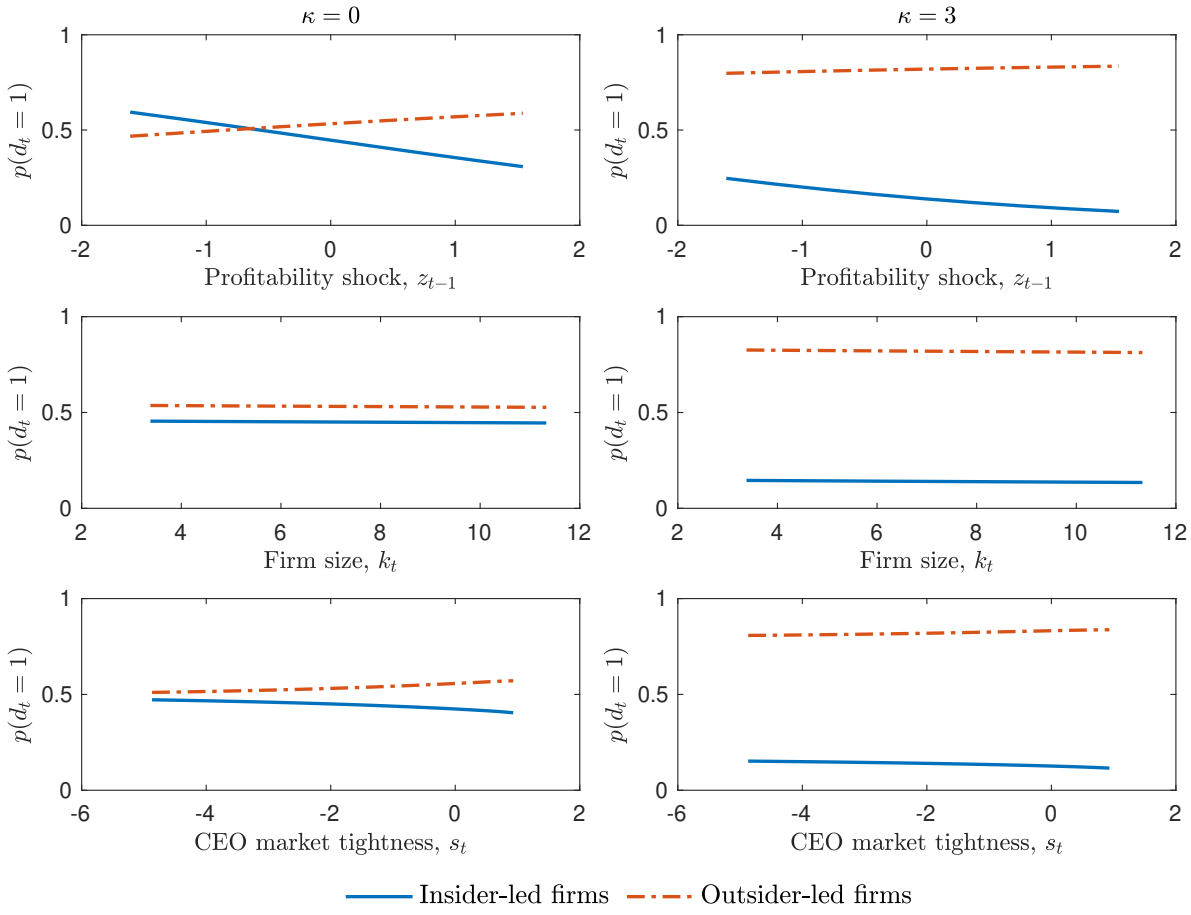
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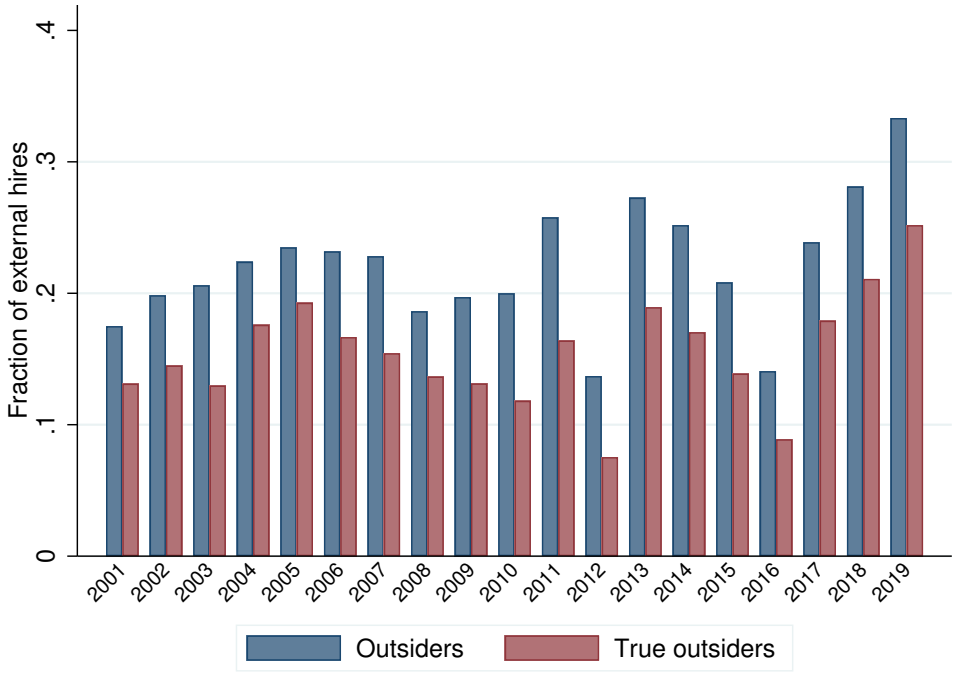
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Figure 1: Policy Functions



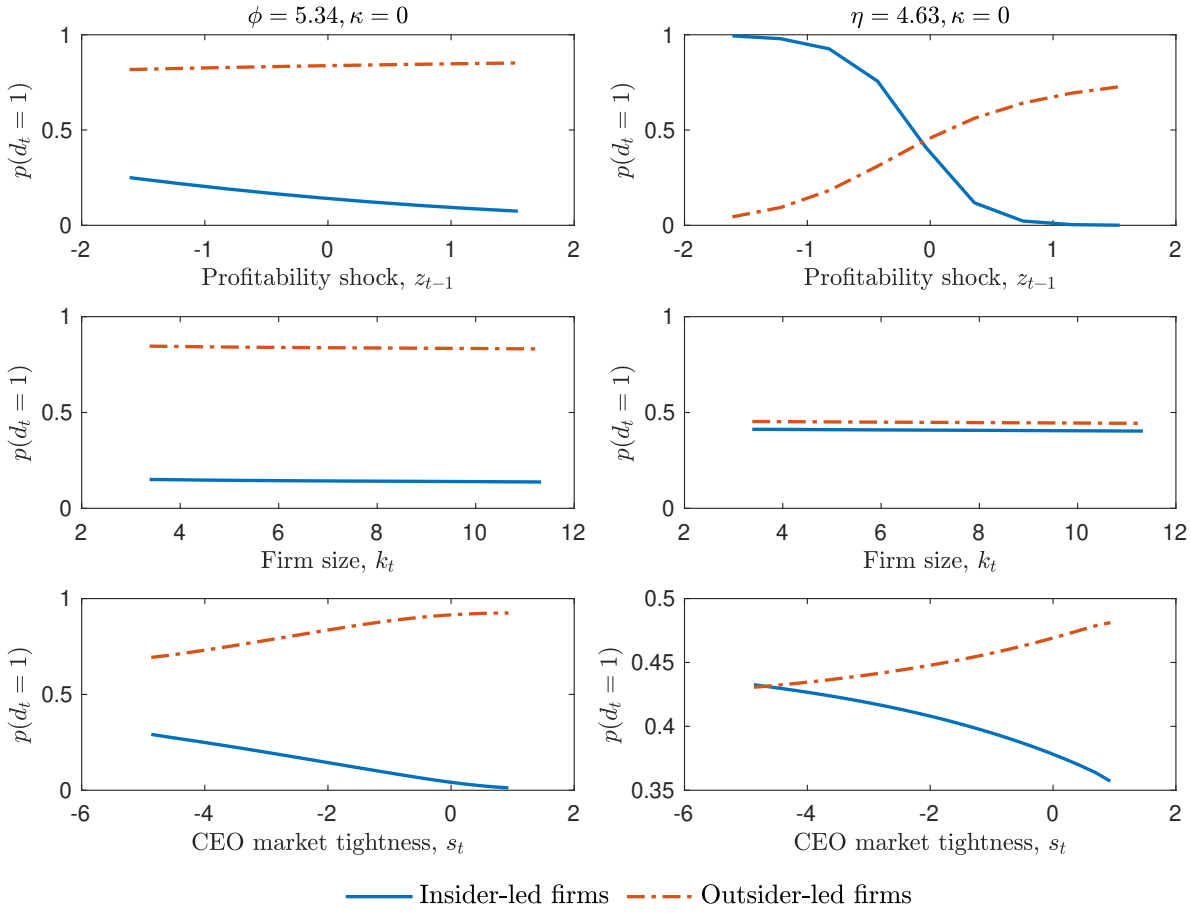
The figure shows the model-implied conditional probability of external CEO hiring, $p(d_t = 1 \mid x_t)$, as a function of the state variables $x_t = \{z_{t-1}, k_t, s_t, d_{t-1}\}$. Each row, from top to bottom, corresponds to a state variable: profitability shock z_{t-1}, firm size k_t, and CEO market tightness s_t. Each panel contains two lines: solid blue for insider-led firms ($d_{t-1} = 0$) and dashed red for outsider-led firms ($d_{t-1} = 1$). All parameters follow Table 3 estimates, except board preference κ, set to 0 in the left column and 3 in the right.

Figure 2: Outside CEO Successions Over Time



The figure plots the fraction of all CEO successions in which the newly appointed CEO is an outsider to the firm for each year between 2001 and 2019 Blue bars use the definition from Parrino (1997), classifying a CEO as an "outsider" if appointed within one year of becoming an executive. Red bars apply a stricter criterion: "true outsiders" had no prior executive or board experience at the firm before the year preceding their appointment.

Figure 3: Policy Functions Without a Board Preference for Insider CEOs



The figure shows the model-implied conditional probability of external CEO hiring, $p(d_t = 1 \mid x_t)$, as a function of the state variables $x_t = \{z_{t-1}, k_t, s_t, d_{t-1}\}$. Each row, from top to bottom, corresponds to a state variable: profitability shock z_{t-1}, firm size k_t, and CEO market tightness s_t. Each panel contains two lines: solid blue for insider-led firms ($d_{t-1} = 0$) and dashed red for outsider-led firms ($d_{t-1} = 1$). The board preference is fixed at $\kappa = 0$. Left panels use an external search cost of $\phi = 5.68$; right panels set the transition cost at $\eta = 4.79$. All other parameters are set to their estimated values in Table 3.

Table 1: Summary Statistics

The table reports descriptive statistics for the variables used in this study. The sample covers 4,782 CEOs from 2,245 firms, yielding 26,624 firm-year observations between 2001 and 2019. CEO and CEO turnover data are from ExecuComp, while candidate pools for each CEO position are constructed using BoardEx and Compustat. Additional firm-level accounting data are also from Compustat. Firms are classified according to Fama and French's 12-industry scheme (Fama and French 1997). Insider CEOs are defined as individuals who had held an executive position or board membership for more than one year prior to appointment. Outsider CEOs are those who had never been affiliated with the firm, or who assumed an executive or board role less than one year before becoming CEO. *Size* is measured as the natural logarithm of total assets (AT). The *Insiders' share* is the proportion of insiders in the total candidate pool. *Profitability shock* is the residual from a regression of the log of operating income before depreciation (OIBDP) scaled by total assets (AT) on *Size* and industry-year fixed effects.

Panel A: Conditional distributions of Insider v. Outsider CEOs

	Firm-Year Obs.	Insider CEOs	Outsider CEOs	% of Outsider
Full sample	26,624	24,399	2,225	8.4%
2001-2005	6,873	6,509	364	5.3%
2006-2010	7,384	6,761	623	8.4%
2011-2015	7,210	6,526	684	9.5%
2016-2019	5,157	4,603	554	10.7%
Utilities	1,391	1,348	43	3.1%
Energy	1,357	1,290	67	4.9%
Telecom	728	692	36	4.9%
Other	3,848	3,592	256	6.7%
Chemicals	1,018	946	72	7.1%
Business equipment	5,699	5,193	506	8.9%
Whole sale and retail	3,543	3,210	333	9.4%
Consumer nondurables	1,766	1,599	167	9.5%
Consumer durables	876	792	84	9.6%
Manufacturing	3,636	3,281	355	9.8%
Health	2,762	2,456	306	11.1%

Panel B: Summary statistics of state variables

	Mean	SD	25%	50%	75%
Size	7.353	1.622	6.196	7.244	8.415
Insiders' share	0.156	0.159	0.040	0.101	0.215
Profitability shock	-0.037	0.556	-0.258	0.006	0.283

Table 2: Regression Estimates of the Transition Matrices of Firm Size and the CEO Candidates Pool

The sample consists of 4,782 CEOs from 2,245 firms, yielding 26,624 firm-year observations between 2001 and 2019. The table presents coefficient estimates from three separate regressions, each with a different dependent variable: firm size k_{t+1} in column (1), CEO market tightness s_{t+1} in column (2), and profitability shock z_t in column (3). d_t is the indicator of external hiring, equal to 1 if the CEO was externally appointed in year t, and 0 otherwise. Standard errors appear in parentheses below each estimate. All regressions are estimated using the dynamic panel methods of Arellano and Bover (1995) and Blundell and Bond (1998), which account for unobserved heterogeneity across firms.

	(1) Firm size, k_{t+1}	(2) CEO market tightness, s_{t+1}	(3) Profitability shock, z_t
k_t	0.894	0.079	—
	(0.012)	(0.015)	
s_t	—	0.807	—
		(0.019)	
CEO succession decision, d_t	—	0.055	—
		(0.023)	
z_{t-1}	—	—	0.620
			(0.021)

Table 3: Estimation Results: Full Sample

The table reports the estimation results for the full sample. Panel A compares the conditional probabilities of having an outsider CEO in the actual data with those predicted by the model using the current parameter estimates. The results are reported separately for insider-led and outsider-led firms, based on CEO origin in the previous year. Within each group, observations are further split by firm size ("Small" and "Large"), CEO market tightness ("Low" and "High"), and profitability shock ("Positive" and "Negative"). "Small" and "Low" refer to values below the first tercile of the respective conditional distribution, while "Large" and "High" refer to values above the third tercile. Panel B reports the structural parameter estimates from the dynamic choice model in Section 2 with their corresponding standard errors in parentheses. λ is the productivity gap between insider and outsider CEOs. ϕ is the search cost multiplier. η is the transition cost sensitivity. κ is the board's disutility from appointing an outsider.

Panel A: Data and model predicted choice probabilities	Data	Model
All firms	8.36%	8.24%
Insider-led firms	1.51%	1.45%
Small firms	1.85%	1.62%
Large firms	0.68%	1.26%
Low CEO market tightness	1.62%	1.68%
High CEO market tightness	1.02%	1.26%
Negative profitability shocks	2.47%	2.14%
Positive profitability shocks	1.46%	0.88%
Outsider-led firms	93.17%	93.08%
Small firms	94.22%	92.62%
Large firms	93.55%	92.33%
Low CEO market tightness	92.66%	92.99%
High CEO market tightness	91.07%	93.08%
Negative profitability shocks	92.37%	93.58%
Positive profitability shocks	89.55%	93.81%

Panel B: Parameter estimates for the full sample	λ	ϕ	η	κ
ML estimate	0.004	0.554	0.531	6.555
Standard error	(0.001)	(0.300)	(0.095)	(0.210)

Table 4: Economic Significance of Parameter Estimates

The table reports the breakdown of utility losses to the board from appointing an outsider as CEO, based on the structural parameter estimates from the dynamic choice model in Section 2. The change in utility is calculated for each possible state of firm size k_t, the CEO market tightness s_t, and the profitability shock z_{t-1}. Reported values reflect the average across all states, with standard deviations shown in parentheses. Panel A summarizes the components of utility flow cost–productivity loss λk_t, search cost $\phi \exp(\alpha s_t)$, transition cost ηz_{t-1}, and subjective utility loss (κ)–in the year following an outsider appointment. Panel B presents the decomposition of total utility change into the immediate loss incurred in the transition year and the utility gain associated with the option value of reverting to internal successions.

Panel A: Shares of immediate utility losses after the appointment of an outsider CEO

	Productivity loss λk_t	Search cost $\phi \exp(\alpha s_t)$	Transition cost ηz_{t-1}	Board preference κ
Mean	0.45%	8.84%	-0.40%	91.11%
Standard deviation	(0.10%)	(0.88%)	(4.15%)	(3.85%)

Panel B: Decomposition of total change in the board's utility

	Immediate utility loss	Option value
Mean	-1.585	0.585
Standard deviation	(0.040)	(0.040)

Table 5: Counterfactual Analysis

This table presents results from four counterfactual experiments using the baseline model. Each column sets one structural parameter to zero while holding others at their estimated values from Table 3. The model predicts the probability of appointing an outsider as CEO using a simulated sample that mirrors the firms and time period in the dataset. λ is the productivity gap between insider and outsider CEOs. ϕ is the search cost multiplier. η is the transition cost sensitivity. κ is the board's disutility from appointing an outsider.

Model-predicted frequency; benchmark = 8.24%				
	$\lambda = 0$	$\phi = 0$	$\eta = 0$	$\kappa = 0$
Frequency of Outsider CEOs	11.85%	10.09%	7.76%	48.96%
Δ from benchmark	3.61%	1.85%	-0.49%	40.72%

Table 6: Regression Estimates of Parameter Sensitivities on State Variables

The table reports regression results of the sensitivity measure proposed by Andrews et al. (2017), estimated for each model parameter with respect to the state variables. In each column, the dependent variable is the sensitivity of a given parameter to changes in the conditional probability of appointing an outsider as CEO, $p(d_t = 1|x_t)$, which varies with the state vector $x_t = \{k_t, s_t, z_{t-1}, d_{t-1}\}$. λ is the productivity gap between insider and outsider CEOs. ϕ is the search cost multiplier. η is the transition cost sensitivity. κ is the board's disutility from appointing an outsider. The state variables include firm size k_t, the CEO market tightness s_t, the profitability shock z_{t-1}, and the prior hiring decision d_{t-1}. Sensitivities are computed across 3,150 grid points spanning all the combinations of these four state variables, with continuous variables standardized for comparability. The largest coefficient in each column is highlighted in bold, and standard errors are reported in parentheses.

	(1) $\frac{\partial \lambda}{\partial p(d_t\|x_t)}$	(2) $\frac{\partial \phi}{\partial p(d_t\|x_t)}$	(3) $\frac{\partial \eta}{\partial p(d_t\|x_t)}$	(4) $\frac{\partial \kappa}{\partial p(d_t\|x_t)}$
k_t	0.011	0.042	-0.022	-0.106
	(0.007)	(0.194)	(0.057)	(0.056)
s_t	0.177	**14.969**	-0.138	-4.620
	(0.008)	(0.257)	(0.057)	(0.072)
z_{t-1}	0.171	-0.752	**4.052**	1.363
	(0.009)	(0.256)	(0.070)	(0.073)
d_{t-1}	0.145	-2.511	-2.193	-3.208
	(0.007)	(0.195)	(0.056)	(0.057)
$k_t \times d_{t-1}$	**0.344**	0.799	0.510	0.283
	(0.007)	(0.197)	(0.057)	(0.057)
$s_t \times d_{t-1}$	-0.274	-24.750	0.386	**7.738**
	(0.008)	(0.260)	(0.057)	(0.073)
$z_{t-1} \times d_{t-1}$	-0.190	0.861	-4.386	-1.473
	(0.009)	(0.258)	(0.070)	(0.073)
Adjusted R^2	0.747	0.844	0.793	0.883
Observations	3,150	3,150	3,150	3,150

Table 7: Estimation: Constrained and Unconstrained Model

The table reports estimation results for the full sample under two specifications: the model with board preferences for insiders (Unconstrained Model) and the model without such preferences (Constrained Model). Panel A compares the conditional choice probabilities of appointing an outsider as CEO from the data with those predicted by each model. The results are reported separately for insider-led and outsider-led firms, based on CEO origin in the previous year. Within each group, observations are further split by firm size ("Small" and "Large"), CEO market tightness ("Low" and "High"), and profitability shock ("Positive" and "Negative"). "Small" and "Low" refer to values below the first tercile of the respective conditional distribution, while "Large" and "High" refer to values above the third tercile. Panel B presents the structural parameter estimates from the dynamic choice model in Section 2, with standard errors reported in parentheses. λ is the productivity gap between insider and outsider CEOs. ϕ is the search cost multiplier. η is the transition cost sensitivity. κ is the board's disutility from appointing an outsider. In the constrained model, κ is set to zero. The likelihood ratio test evaluates the null hypothesis that $\kappa = 0$.

Panel A: Data and model predicted choice probabilities

	Data	Model	
		Unconstrained	Constrained
All firms	8.36%	8.24%	15.52%
Insider-led firms	1.51%	1.45%	3.31%
Small firms	1.85%	1.62%	4.70%
Large firms	0.68%	1.26%	2.02%
Low CEO market tightness	1.62%	1.68%	9.28%
High CEO market tightness	1.02%	1.26%	0.05%
Negative profitability shocks	2.47%	2.14%	4.17%
Positive profitability shocks	1.46%	0.88%	2.75%
Outsider-led firms	93.17%	93.08%	90.02%
Small firms	94.22%	92.62%	89.80%
Large firms	93.55%	92.33%	90.09%
Low CEO market tightness	92.66%	92.99%	88.45%
High CEO market tightness	91.07%	93.08%	93.31%
Negative profitability shocks	92.37%	93.58%	89.59%
Positive profitability shocks	89.55%	93.81%	90.13%

Table 7 *(Continued)* Estimation: Constrained and Unconstrained Model

Panel B: Parameter estimates	λ	ϕ	η	κ
Unconstrained model	0.004 (0.001)	0.554 (0.300)	0.531 (0.095)	6.555 (0.210)
Constrained model	0.005 (0.007)	11.024 (0.174)	0.202 (0.094)	—
Likelihood ratio = 613.428			$p-$value = 0.000	

Table 8: Model Estimates by Board Independence Subsamples

The table reports the model's parameter estimates for different subsamples based on the firm's board independence. We measure board independence by the number of non-employee directors. The *Low* and *High* subsamples correspond to the top and bottom quarters of firm-year observations ranked by board independence. Panel A presents summary statistics for both subsamples. Panel B reports the structural parameter estimates of the dynamic choice model in Section 2 for each subsample. Standard errors are shown in parentheses below each estimate. λ is the productivity gap between insider and outsider CEOs. ϕ is the search cost multiplier. η is the transition cost sensitivity. κ is the board's disutility from appointing an outsider. The last two columns show the probability of appointing an outsider as CEO, based on actual data and model predictions. The null hypothesis of the Swait and Louviere (1993) test is that the parameters estimated for two different data sets are equal while controlling for scale differences between these data sets. Panel C presents the decomposition of the board's utility losses from appointing an outsider CEO, by subsample, based on the parameter estimates in Panel A.

Panel A: Subsample statistics

	Low	High	Difference	t-Stat.
Size	6.362	8.664	-2.303	-95.031
Insider's share	0.109	0.204	-0.095	-35.703
Profitability shock	-0.034	0.009	-0.043	-4.538

Panel B: Parameter estimates and predictions

	λ	ϕ	η	κ	% Outsider CEO model	% Outsider CEO data
Low	0.005	0.271	0.460	6.921	5.8%	6.0%
	(0.003)	(0.694)	(0.189)	(0.442)		
High	0.002	1.200	0.844	6.134	10.0%	7.6%
	(0.016)	(0.918)	(0.339)	(0.668)		
Swait and Louviere (1993) Equality test					p-value	0.853

Panel C: Decomposition of utility loss

	λk_t	$\phi \exp(\alpha s_t)$	ηz_{t-1}	κ	Immediate loss	Option value
Low	0.45%	4.21%	-0.35%	95.68%	-1.581	0.581
	(0.09%)	(0.38%)	(3.91%)	(3.75%)	(0.036)	(0.036)
High	0.17%	18.20%	-0.12%	81.75%	-1.638	0.638
	(0.03%)	(1.79%)	(4.94%)	(4.33%)	(0.054)	(0.054)

Table 9: Model Estimates Before and After Activist Campaigns

The table reports the model's parameter estimates for firms targeted by activist investors, before and after the 13D filings announcing activist intent. The sample consists of 782 firms subjected to an activist campaign, with 3,147 observations in a three-year window *Before* and *After* the Schedule 13D filing with the SEC. Panel A presents summary statistics for both subsamples. Panel B reports the structural parameter estimates of the dynamic choice model in Section 2 for each subsample. Standard errors are shown in parentheses below each estimate. λ is the productivity gap between insider and outsider CEOs. ϕ is the search cost multiplier. η is the transition cost sensitivity. κ is the board's disutility from appointing an outsider. The last two columns show the probability of appointing an outsider as CEO, based on actual data and model predictions. The null hypothesis of the Swait and Louviere (1993) test is that the parameters estimated for two different data sets are equal while controlling for scale differences between these data sets. Panel C presents the decomposition of the board's utility losses from appointing an outsider CEO, by subsample, based on the parameter estimates in Panel A.

Panel A: Subsample statistics

	Before	After	Difference	t-Stat.
Size	6.946	7.019	-0.073	-1.335
Insider's share	0.133	0.140	-0.007	-1.390
Profitability shock	-0.125	-0.200	0.075	3.453

Panel B: Parameter estimates and predictions

	λ	ϕ	η	κ	% Outsider CEO Model	% Outsider CEO Data
Before	0.005	0.353	0.526	6.440	7.2%	7.6%
	(0.006)	(1.198)	(0.353)	(0.833)		
After	0.002	0.366	0.089	5.813	11.1%	10.2%
	(0.006)	(1.007)	(0.267)	(0.719)		
Swait and Louviere (1993) Equality test					p-value	0.848

Panel C: Decomposition of utility loss

	λk_t	$\phi \exp(\alpha s_t)$	ηz_{t-1}	κ	Immediate loss	Option value
Before	0.54%	5.81%	-1.14%	94.79%	-1.606	0.606
	(0.12%)	(0.64%)	(4.68%)	(4.43%)	(0.042)	(0.042)
After	0.20%	6.52%	-0.29%	93.57%	-1.752	0.752
	(0.05%)	(0.64%)	(0.89%)	(1.06%)	(0.013)	(0.013)

Table 10: Model Estimates by Industry Homogeneity Subsamples

The table reports the model's parameter estimates for two subsamples based on the industry homogeneity measure proposed by Parrino (1997). The *Low* and *High* homegeneity subsamples correspond to the top and bottom quarters of firm-year observations ranked by industry homogeneity. Panel A presents some summary statistics for both subsamples. Panel B reports the structural parameter estimates of the dynamic choice model in Section 2 for each subsample. Standard errors are shown in parentheses below each estimate. λ is the productivity gap between insider and outsider CEOs. ϕ is the search cost multiplier. η is the transition cost sensitivity. κ is the board's disutility from appointing an outsider. The last two columns show the probability of appointing an outsider as CEO, based on actual data and model predictions. The null hypothesis of the Swait and Louviere (1993) test is that the parameters estimated for two different data sets are equal while controlling for scale differences between these data sets. Panel C presents the decomposition of the board's utility losses from appointing an outsider CEO, by subsample, based on the parameter estimates in Panel A.

Panel A: Subsample statistics

	Low	High	Diff.	t-Stat.
Size	6.829	7.910	-1.081	-38.421
Insider's share	0.044	0.270	-0.227	-90.498
Idiosyncratic shock	-0.084	-0.009	-0.076	-7.139

Panel B: Parameter estimates and predictions

	λ	ϕ	η	κ	% Outsider CEO model	% Outsider CEO data
Low	0.004	-2.643	0.359	7.801	10.4%	10.5%
	(0.002)	(1.104)	(0.139)	(0.562)		
High	0.008	-0.567	1.233	8.315	4.1%	5.2%
	(0.023)	(1.013)	(0.394)	(0.880)		
Swait and Louviere (1993) Equality test					p-Val.	0.314

Panel C: Decomposition of utility loss

	λk_t	$\phi \exp(\alpha s_t)$	ηz_{t-1}	κ	Immediate loss	Option value
Low	0.50%	-33.29%	-0.66%	133.44%	-1.712	0.712
	(0.13%)	(2.68%)	(4.36%)	(6.20%)	(0.050)	(0.050)
High	0.81%	-8.73%	-0.67%	108.58%	-1.458	0.458
	(0.16%)	(0.92%)	(7.53%)	(8.14%)	(0.050)	(0.050)

Table 11: Model Estimates by Board Age Subsamples

The table reports the model's parameter estimates for different subsamples based on the firm's median director age. The *Young* and *Old* subsamples correspond to the top and bottom quarters of firm-year observations ranked by the median age of the firm's board members. Panel A presents summary statistics for both subsamples. Panel B reports the structural parameter estimates of the dynamic choice model in Section 2 for each subsample. Standard errors are shown in parentheses below each estimate. λ is the productivity gap between insider and outsider CEOs. ϕ is the search cost multiplier. η is the transition cost sensitivity. κ is the board's disutility from appointing an outsider. The last two columns show the probability of appointing an outsider as CEO, based on actual data and model predictions. The null hypothesis of the Swait and Louviere (1993) test is that the parameters estimated for two different data sets are equal while controlling for scale differences between these data sets. Panel C presents the decomposition of the board's utility losses from appointing an outsider CEO, by subsample, based on the parameter estimates in Panel A.

Panel A: Subsample statistics

	Young	Old	Difference	t-Stat.
Size	6.868	7.509	-0.640	-23.538
Insider's share	0.122	0.172	-0.051	-19.414
Profitability shock	-0.068	-0.016	-0.052	-5.162

Panel B: Parameter estimates and predictions

	λ	ϕ	η	κ	% Outsider CEO model	% Outsider CEO data
Young	0.005	0.386	0.116	6.362	7.8%	8.6%
	(0.002)	(0.605)	(0.165)	(0.387)		
Old	0.004	2.580	1.081	5.540	8.7%	7.5%
	(0.002)	(0.730)	(0.216)	(0.470)		
Swait and Louviere (1993) Equality test					p-value	<0.01

Panel C: Decomposition of utility loss

	λk_t	$\phi \exp(\alpha s_t)$	ηz_{t-1}	κ	Immediate loss	Option value
Young	0.52%	6.08%	-0.13%	93.53%	-1.610	0.610
	(0.11%)	(0.49%)	(1.10%)	(1.15%)	(0.016)	(0.016)
Old	0.36%	34.89%	-0.61%	65.37%	-1.488	0.488
	(0.08%)	(3.26%)	(6.57%)	(4.90%)	(0.055)	(0.055)

Table 12: Robustness Analysis: Asymmetric Transition Costs and Earnings Persistence

The table reports the estimation results under two extensions to the main model in Section 2. Panel A reports structural estimates where transition cost sensitivity differs for the positive and negative profitability shocks. The standard errors are shown in parentheses underneath each estimate. λ is the productivity gap between insider and outsider CEOs. ϕ is the search cost multiplier. η_+ and η_- are the transition cost sensitivity to positive and negative profitability shocks, respectively. κ is the board's disutility from appointing an outsider. Panel B reports the parameter estimates for an extension of the model in which the profitability shock has different persistence under insider or outsider CEOs, as per equation (10). ρ_1 is the AR(1) coefficient of the profitability shock when the CEO is an insider and $\rho_1 + \rho_2$ when the CEO is an outsider.

Panel A: Model with Asymmetric Transition Costs

	λ	ϕ	$\eta+$	$\eta-$	κ
ML estimate	0.004	0.497	0.197	0.613	6.651
Std. error	(0.001)	(0.304)	(0.294)	(0.117)	(0.225)

Panel B: Model with CEO-specific Earnings' Persistence

		Insider CEOs		Outsider CEOs
AR(1) coeff.	ρ_1	0.669	$\rho_1 + \rho_2$	0.065
Std. error		(0.022)		(0.048)

	λ	ϕ	η	κ
MLE Estimate	0.004	0.548	0.532	6.558
Std. error	(0.001)	(0.301)	(0.096)	(0.211)

Appendix

A Derivation of the expected search costs function

To derive the expected vacancy duration in the search and matching framework of Mortensen and Pissarides (1994) and Pissarides (2000), start with the matching function $m(v,u)$, which determines the number of matches made per period as a function of the number of vacancies, v and the total number of available unmatched candidates u.

Consider the Cobb-Douglas matching function with constant returns to scale of Petrongolo and Pissarides (2001):

$$m(u,v) = \mu u^{\alpha} v^{1-\alpha} \tag{A.1}$$

where $\alpha \in (0,1)$ is the matching elasticity of labor supply and the constant $\mu > 0$ is the Hicks-neutral level of contact efficiency, i.e., the number of matches is increasing in μ for a given v and u.

We set the matching function elasticity α to be 0.24, a figure lying at the lower bound of the existing estimates in the matching function estimation literature. We choose this conservative number to reflect the well-known difficulty during the matching process of the CEO labor market.

The expected vacancy duration, $q(v,u)$, is the ratio of vacancies to matched candidates. Therefore,

$$q(v,u) \equiv \frac{v}{m(u,v)} = \frac{v}{\mu u^{\alpha} v^{1-\alpha}} = \frac{1}{\mu}\left(\frac{v}{u}\right)^{\alpha} \tag{A.2}$$

We define $s = \ln(v/u)$ and normalize $\mu = 1$ following Cooper, Haltiwanger, and Willis (2007), yielding

$$q(s) = \exp(\alpha s) \tag{A.3}$$

With this formulation, s serves as a sufficient statistic for CEO market tightness. As a result, job filling rates decline in tighter labor markets.

B Model solution

We briefly outline the steps to recast the fixed-point problem that is in the value function space with the one in the probability space as in Aguirregabiria and Mira (2002). As the first step, we integrate the unobservable state variable ϵ out and rewrite the Bellman equation.

The conditional continuation value of choosing d_t can be :

$$\mathbb{E}[V_{t+1}(x_{t+1}, \epsilon_{t+1}|x_t, d_t)] = \int \int \Big[V_{t+1}(x_t, \epsilon_t) g(\epsilon_{t+1}) d\epsilon_{t+1}\Big] f(x_{t+1}|x_t, d_t) dx_{t+1},$$

where $g(\epsilon)$ is the probability density function of the unobserved shock, and $f(x_{t+1}|x_t, d_t)$ is the transition probability density representing the board's subjective beliefs about uncertain future events. This decomposition of the transition probability density of observable and unobservable state variables is based on the conditional independence assumption that is widely used in the literature. The best response probability that the individual chooses d given x is found by integrating the decision rule over the private information shock ϵ.

We briefly outline the steps to recast the fixed-point problem that is in the value function space with the one in the probability space as in Aguirregabiria and Mira (2002). As the first step, we integrate the unobservable state variable ϵ out and rewrite the Bellman equation (3) as:

$$\begin{aligned} V_t(x_t) &= \int V_t(x_t, \epsilon_t) g(\epsilon_t) d\epsilon_t \\ &= \int \max_{d_t} \Big[u_t(x_t, d_t) + \epsilon_t(d_t) + \beta \mathbb{E}[V_{t+1}(x_{t+1}|x_t, d_t)]\Big] g(\epsilon_t) d\epsilon_t. \end{aligned}$$

The optimal decision δ at time t solves

$$\delta_t(x_t, \epsilon_t) = \arg\max_{d_t} \Big[u_t(x_t, d_t) + \epsilon_t(d_t) + \beta \mathbb{E}[V_{t+1}(x_{t+1}|x_t, d_t)]\Big],$$

and the conditional choice probability $p(d_t|x_t)$ can be obtained by integrating out ϵ_t

$$p(d_t|x_t) = \int \mathbb{1}\left\{\delta_t(x_t, \epsilon_t) = d_t\right\} g(\epsilon_t) d\epsilon_t.$$

We denote the number of iterations by K and cap it at 20 following Pesendorfer and Schmidt-Dengler (2008). We select the set of estimates with the highest value of the pseudo likelihood if there exists more than one NPL fixed point (Aguirregabiria and Mira 2007).

C Estimation

We employ the Nested Pseudo Likelihood algorithm (NPL), as introduced by Aguirregabiria and Mira (2002), to estimate $\boldsymbol{\theta}$. This algorithm is constructed based on Rust (1987, 1994)'s well-established Nested Fixed Point algorithm (NFXP), with a notable modification involving the interchange of the order in the two-step procedure. We outline the procedure below:

In the first step, with arbitrary conditional choice probabilities, we derive parameter estimates $(\boldsymbol{\theta})^K$ by maximizing the following likelihood:

$$\boldsymbol{\theta}^K = \arg\max \sum \ln(\boldsymbol{\Psi}(p^{K-1}(\boldsymbol{\theta}))).$$

In the second step, with the obtained estimates, we derive the conditional choice probabilities p by solving a fixed point problem:

$$p^K(\boldsymbol{\theta}) = \boldsymbol{\Psi}(p^{K-1}(\boldsymbol{\theta})),$$

where $\boldsymbol{\Psi}$ represents the operator for policy iteration. We then iterate these two steps until we reach convergence of p and $\boldsymbol{\theta}$.