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Vladimir Vladimirov

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Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

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## Abstract

Renewable fixed-term contracts are widespread in executive compensation. This paper studies why these contracts are optimal, what determines their length, and how that length affects managerial behavior. The model relates a contract's length to the period during which dismissing a manager triggers severance pay. Though longer contracts are more costly to terminate, their severance protection can discourage managers from trying to avoid replacement through window dressing or concealing soft information. Thus, the board's choice of contract length balances higher replacement costs with a higher likelihood of window dressing. The predicted determinants of contract length and severance pay are supported empirically.



JEL Classification: G30, G34, D82

Keywords: contract length, contract horizon, Severance pay, renewable fixed-term contracts, voluntary and forced turnover, turnover-performance sensitivity, Asymmetric information



Vladimir Vladimirov - vladimirov@uva.nl
*University of Amsterdam and CEPR*

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*University of Amsterdam and CEPR, Plantage Muidergracht 12, 1018TV, Amsterdam, The Netherlands. E-mail: vladimirov@uva.nl. T: +31205257371. F: +3120525 5285. I thank Patrick Bolton, Arnoud Boot, Murillo Campello, Tolga Caskurlu, Jason Donaldson, Ruediger Fahlenbrach, Daniel Garrett, Stuart Gillan, Juan Pedro Gomez, Moqi Groen-Xu, Sebastian Gryglewicz, Michel Habib, Marina Halac, Florian Hoffmann, Roman Inderst, Dirk Jenter, Torsten Jochem, Boyan Jovanovic, Oguzhan Karakas, Nicolas Klein, Tomislav Ladika, Chen Lin, Alexander Ljungqvist, Richard Lowery, Andrey Malenko, Frédéric Malherbe, David Martinez-Miera, Konstantin Milbradt, Martin Oehmke, Per Östberg, Daniel Paravisini, Enrico Perotti, Florian Peters, Sebastian Pfeil, Giorgia Piacentino, Joshua Pierce, Uday Rajan, Adriano Rampini, Merih Sevilir, Fenghua Song, Jan Starmans, Spyros Terovitis, Ed Van Wesep, David Yermack, John Zhu, as well as conference and seminar participants at the American Finance Association annual meeting (Philadelphia), European Economic Association annual meeting (Geneva), European Winter Finance Summit, Executive Compensation Conference (Rotterdam), University of Amsterdam, and University of Zurich for constructive feedback.

# 1 Introduction

Renewable fixed-term contracts play an important role in executive compensation: more than 45% of S&P 500 and S&P 1500 firms hire managers with explicit contracts that typically cover a fixed period, can be renewed, and offer severance pay upon premature termination (Gillan et al., 2009; Rau and Xu, 2013). Yet, despite the ubiquity of such contracts, it is not well-understood what determines their length and why that length is important. For example, when Barnes & Noble hired Ronald Boire as CEO in 2015, it offered him a three-year contract, renewable for two years at terms specified at the hiring date. Existing work typically defines a contract's end as the date beyond which employment terms are not specified (Laffont and Tirole, 1988). However, this definition makes it hard to explain the difference between Ronald Boire's contract and a five-year contract.

Yet this difference matters in practice. The common view among practitioners and empirical, and legal scholars is that longer contracts provide managers with greater protection against termination (Gillan et al., 2009; Schwab and Thomas, 2006). Such protection impacts managerial behavior and firm value, as it affects how managers are assessed. In particular, the sensitivity of CEO replacement to underperformance peaks near to contract end and renewal dates (Cziraki and Groen-Xu, 2020), making managers more likely to engage in window dressing and less likely to reveal negative news close to such dates (Liu and Xuan, 2020). Rationalizing such effects of contract length would be hard if the cost of replacing a manager during a contract's term were the same as at its end and renewal dates. In particular, a contract's length is *not* a commitment to employ a manager for the duration of the contract, as the contracts can be terminated at any time — Ronald Boire was forced out after a year.

Taking this perspective, this paper models the length of renewable fixed-term contracts by the period during which replacing a manager triggers severance pay. Though clearly a simplification, the idea that the protection provided by a longer contract is only as good as the severance pay protection it offers is close to the view of contract length in practice. Indeed, Ronald Boire's contract specified a severance payment if he was terminated prior to the contract's renewal date(s), but not if the contract was not renewed. It is for this reason that a three-year contract, renewable for two years at the terms specified at the hiring date, is different from a five-year contract. Based on this idea, the paper analyzes when firms offer shorter contracts. This makes it possible to explain why the performance sensitivity of managerial turnover and window dressing incentives changes not only as a function of a contract's length (which is an endogenous object), but also as a function of the firm's and its environment's fundamentals.

To this end, the paper develops a parsimonious model in which a board needs to hire a manager for two periods. In every period, the manager can increase the likelihood of being of good match quality (henceforth, "fit") for the organization by investing in firm-specific human capital. A manager who is a good fit in the first period is more likely to pursue a successful strategy and achieve high cash flows. Moreover, such a manager is more likely to also be a good fit and to succeed in the second period. The opposite holds for a manager who turns out not to be a good fit in the first period. However, only the manager observes her firm-specific human capital investments and her fit in every period. This is her soft information, which she may prevent the board from learning — for example, by misinforming the board about the success outlook of her strategy or by manipulating and withholding important information that reveals her managerial quality.

The paper's main results arise from investigating whether the manager's contract should offer severance pay if the manager is replaced at the end of the first period. A two-period contract offers such severance protection. By contrast, a contract that can be terminated without severance pay at the end of the first period is implemented with a one-period contract that renews automatically for one more period unless terminated by the board. It is assumed that the board replaces the manager at the end of the first period if its posterior beliefs indicate that a new manager is more likely to be a good fit in the second period (the manager need not share these beliefs).

The rationale for offering severance pay ($10.5 million in Ronald Boire's case) in this model is that it protects both managers and the firm by making managers less desperate to hang on to their job.[1] The incentives to do so can be strong, as managers' labor incomes drop steeply following termination (Fee and Hadlock, 2004; Nielsen, 2017). This leads to a trade-off: a one-period contract can help lower the cost of replacing a manager by not rewarding her for failure, but it creates incentives for the manager to hide or manipulate soft information that could lead to her dismissal. That forces the board to rely on hard cash-flow performance to infer the manager's fit.

The main result is that this cost-benefit trade-off makes it sometimes suboptimal to offer severance pay, resulting in shorter contracts, more manipulation of soft information, and a stronger reliance on hard performance measures.[2] The analysis points to several main determinants of contract length.

First, boards will not offer severance pay (i.e., contracts are short) if the manager's fit is

[1] This rationale is standard (Levitt and Snyder, 1997; Inderst and Mueller, 2010). Ex ante severance agreements are, indeed, associated with more-truthful managers (Rau and Xu, 2013; Brown, 2015).

[2] The result that it is sometimes suboptimal to incentivize an agent to reveal her private information is common to settings with limited commitment (Hart and Tirole, 1988; Laffont and Tirole, 1990). Here, this occurs because the board cannot commit not to replace a manager it believes to be a bad fit.

not persistent. By contrast, higher persistence means that eliciting the manager's fit in the first period is useful, as it is informative about the manager's fit and, thus, the likelihood of generating high cash flows in the following period. Reinforcing this effect, higher persistence reduces the cost of incentivizing managers not to conceal information that they are a bad fit, as such managers know that they are less likely to be successful in the second period. That is, higher persistence leads to offering severance pay and longer contracts.

Second, a central determinant of contract length is the manager's outside option, conditional on being replaced. If dismissal leads to a large drop in managers' labor income, severance pay must be *higher* to incentivize managers not to conceal or manipulate soft information that could lead to their dismissal. The higher cost of offering severance pay will make boards less likely to do so, resulting in shorter contracts and forcing boards to rely more on hard performance measures. A notable implication is that worse outside options (as in industry downturns) make severance pay less effective and managerial turnover more closely tied to underperformance. There is evidence for this prediction (Jenter and Kanaan, 2015), but it has been interpreted as a lack of relative performance evaluation. This paper's model shows that the reason could be unrelated to such an explanation.

Perhaps surprisingly, another implication is that firms offering severance pay will prefer to hire managers with *better* outside options, as such managers are less desperate to hang on to their job if they are no longer a good fit. This result is in stark contrast to the standard case in the literature, in which the board does not offer severance pay and evaluates managers based only on performance. In this case, the board always prefers to hire a manager with a *lower* outside option. Thus, the model explains why boards may appear to favor managers from a "select club" with good outside options, even if these managers are not necessarily a better fit. For the same reason, the board may tolerate investment in general human capital, improving managers' outside options, even if such activities do not directly benefit the firm.

Notably, the effect of managers' *ex post* outside options, conditional on being replaced, is the polar opposite of that of the managers' *ex ante* outside options at the hiring stage. In particular, a higher outside option, conditional on being replaced, leads to less severance pay but longer contracts. By contrast, a better outside option at the hiring stage, resulting in a strong bargaining position, will result in both higher severance pay and longer contracts. These contrasting predictions offer a way to distinguish the rationale for offering severance pay, as described above, from the rationale for offering severance pay to managers because of their strong bargaining positions at the hiring stage.

A third set of determinants of contract length consists of the firm's upside potential and cash-flow volatility. A firm with a high upside (which can be unrelated to the firm's size) and high cash-flow volatility has more at stake from having the right manager in charge.

Thus, such a firm is more likely to offer severance pay and longer contracts.

Finally, the firm's competitive environment also plays a role. When the firm is more similar to other firms and faces similar market conditions and uncertainties, the board effectively has access to more information that can help it disentangle the manager's fit from the firm's performance. This reduces the benefit of offering severance pay to keep the manager honest, leading to shorter contracts.

The paper provides support for the model's predictions, based on a hand-collected dataset of the contract length and severance pay of S&P1500 CEOs. In line with the model, the majority of contractual severance pay agreements specify that managers receive severance pay if their contracts are terminated before expiration, with much less or no severance pay owed if a manager's contract is not renewed.

Severance pay is *lower* while contracts are longer when managers' outside options are higher — a finding that supports the paper's theoretical channel. As noted above, this finding provides a way to distinguish the model's rationale from alternative explanations related to rent extraction by managers. As a proxy for changes in managers' outside options, conditional on being replaced, the paper exploits staggered changes in the state-level enforcement of non-compete agreements. Such agreements limit managers' ability to find a comparable job within a specific period and geographical area after leaving a firm.

Further in line with the model, contracts are longer and severance pay higher when the firm's cash-flow volatility and upside potential are high. The evidence also supports the prediction that contracts are shorter and severance pay lower when a firm's similarity to other firms increases.

Overall, the model explains what factors determine the length of contracts, and the empirical evidence provides support for the model's predictions. The resulting insights may guide work studying the performance sensitivity of turnover and window dressing by managers. The twice-repeated agency setting analyzed in the paper is the minimum repetition needed to analyze contract length and its determinants. These results add to one-shot models that also consider severance pay as an incentive for managers not to conceal unfavorable information (Levitt and Snyder, 1997; Inderst and Mueller, 2010). In particular, the analysis contributes by studying the impact of contract length on the sensitivity of turnover to first-period performance and relating it to firms' and their environments' fundamentals. Among the factors that play a role are the managers' ex post and ex ante outside options (which have opposite effects), the manager's fit persistence, and the similarity to other firms. The analysis of these factors also differentiates this paper from Van Wesep and Wang (2013). In their model, the board always learns the managers' match-quality and does not choose whether to rely, instead, on noisy firm performance when deciding whether the manager is

good enough or needs to be replaced. By contrast, this decision underpins the main trade-offs and results in the present paper. In He (2012), severance pay compensates risk-averse managers for not undoing incentive contracts through private savings, but that paper does not study the relation to contract length or the effect on the sensitivity of managerial turnover to performance. Interestingly, Almazan and Suarez (2003) argue that severance pay can motivate managers to invest in firm-specific human capital by making it costly for firms to replace managers with slightly better ones. By contrast, severance pay in the present setting compensates managers for not hiding or manipulating information that could lead the board to search for a better manager. This effect on the managers' *ex post* incentives not to manipulate information is also the main difference between the current paper and Manso (2011), who shows that a commitment to greater job protection could have *ex ante* benefits by motivating managers to explore riskier innovation.

Also closely related is the work of Laffont and Tirole (1988, 1990) who study whether a sequence of short-term contracts, negotiated each time from scratch, dominates a long-term contract. Similar to their work, this paper analyzes a (twice-)repeated agency problem in which agents are privately informed about their persistent types, and principals cannot commit not to use the information reported by an agent in the first period to her disadvantage in the second period. The main difference is that a contract's length is not defined by the date beyond which the manager's compensation is not specified but by the period during which replacing a manager triggers severance pay. Thus, the main novelty is the analysis of whether the firm should offer managers severance pay for early termination or evaluate managers based on hard performance. The insights are then applied to study the determinants and implications of the length of renewable fixed-term contracts. These insights also add to Inderst (2017) who argues that at-will contracts (which offer little protection against replacement) provide cheaper incentives for agents not to shirk but could induce the opportunistic actions of agents to make themselves less dispensable.

The paper's novel implications for contract length and severance pay also distinguish it from models in which the board learns the managers' quality from firm performance over time (Hermalin and Weisbach, 1998; Taylor, 2010). The main similarity to these papers is that the board's primary reason for replacing a manager is to appoint a better manager. For comparison, in repeated moral hazard models, the threat of termination is used as a tool to extract effort from managers more efficiently (Sannikov, 2008). Also related are Jenter and Lewellen (2017) and Garrett and Pavan (2012). Both papers consider dynamically changing types, but they take polar opposite approaches. In Jenter and Lewellen (2017), the board does not screen managers and, thus, must rely on the firm's most recent performance to infer their productivity. By contrast, Garrett and Pavan (2012) consider contracts that always

incentivize managers to report their private information. In the present paper, the decision of how to evaluate the manager can be seen as combining both approaches. The resulting suboptimality of full revelation has also been analyzed in the literature on relational contracts (Halac, 2012; Malcomson, 2016). However, this literature assumes an extreme inability to write contracts, while the central question in the current paper is why renewable fixed-term contracts are used and what determines their length.[3]

# 2 Model

Consider a firm at which a board is in charge of hiring and replacing the firm's managers and designing their employment contracts. The firm operates in a two-period economy, in which every period $t$ consists of two dates.

At the initial date of each period, $\tau_t = 0$, the manager ("she") hired by the firm can invest in firm-specific human capital. Such an investment carries a non-monetary cost $c$, but it entails a probability, $e_t$, that the manager is a good fit, $\theta_G$. With probability $1 - e_t$ or, respectively, if the manager does not invest in firm-specific human capital, her fit is $\theta_N$, with $\Delta\theta \equiv \theta_G - \theta_N > 0$. The strategy developed by a manager who is a good fit is more likely to be successful. Specifically, the firm's cash flows $x_t \in \{x_L, x_H\}$ at the end of the period are stochastic, with the manager's fit $\theta_t$ corresponding to the probability of achieving the higher cash flow $x_H$. For ease of notation, define $\Delta x \equiv x_H - x_L$ with $x_L, \Delta x \geq 0$.

The probability that a manager is a good fit in the second period is higher if she was a good fit in the first period. The opposite holds if the manager was not a good fit. That is, $e_2(\theta_G) > e_1 > e_2(\theta_N)$, where $e_2(\theta_1)$ is the probability that investing in firm-specific human capital in the second period results in a good fit as a function of the manager's fit in the first period. The difference $|e_2(\theta_1) - e_1|$ defines the persistence of the manager's fit. If the board replaces the incumbent at the end of the first period, the probability that a new manager's investment in firm-specific human capital results in a good fit is $e_1$. It is inconsequential for the analysis whether the incumbent manager agrees with this probability. In particular, the incumbent may believe that she would always be more likely to be a better fit also in the second period.[4]

[3] The paper also contributes to prior work on human capital investments (Jovanovic, 1979 a,b; and Felli and Harris, 1996) by analyzing a setting in which a worker's fit changes over time and is her private information. Tenure limits also reduce agents' ability to extract rents in Lazear (1979), Prescott and Townsend (2006), and Hertzberg et al. (2010). Wang (2011, 2015) studies settings in which managers leave because they have better outside options.

[4] There is no truly voluntary turnover in this model. However, in practice, a smooth transition, eased by a severance package, might appear voluntary to outsiders, even if the board and the manager disagree behind the scenes whether a replacement could do a better job. Such disagreement has been motivated by

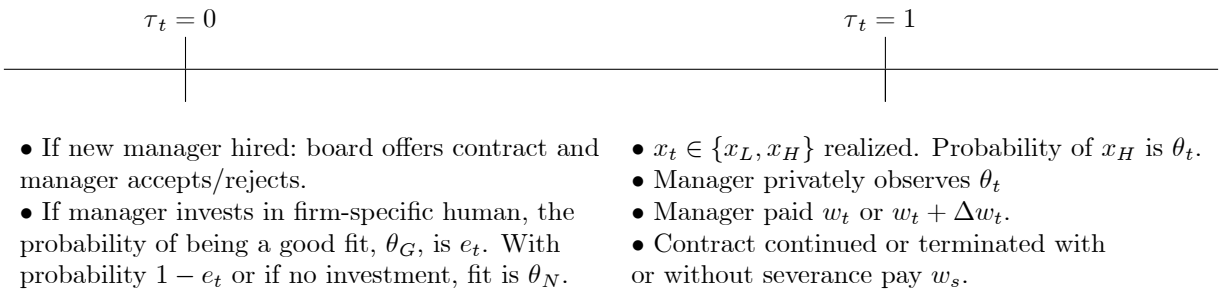


**Figure 1: Timing of events in period $t$.**

Neither the board nor potential managers have private information when a new manager is hired, and a manager cannot manipulate the firm's cash flows, $x_t$. However, the key information frictions are that only the manager knows her investment in firm-specific human capital and her fit realizations $\theta_t$. This is her "soft" information that she can prevent the board from learning by misreporting her fit. The notion that the manager "reports" her fit is naturally a (standard) simplification. In practice, misreporting a bad fit could mean manipulating information about the success likelihood of the manager's strategy by hiding negative news, shifting responsibility for low cash flows to other employees, or misrepresenting facts as a short-term setback needed for long-term success. Based on the manager's reports and the realized cash flows, the board can then decide whether to replace the manager at the end of the first period. Figure 1 summarizes the timing of events in each period. All parties are risk-neutral, and the common discount factor between the two periods is $\delta \in (0, 1)$. The managers from which the board can choose have zero wealth.

**Contracting.** Existing theoretical work defines a contract's length by the date beyond which the manager's compensation is not specified (Laffont and Tirole, 1988). However, as noted in the Introduction, this definition cannot explain why, for example, a three-year contract, renewable for two years at the terms specified at the hiring date, is different from a five-year contract. A natural way to tackle this question is to interpret a renewable fixed-term contract as the implementation of a long-term contract, notionally split into fixed periods.

To understand what determines the length of these periods, this paper follows the arguments of practitioners and empirical and legal scholars (Gillan et al., 2009; Schwab and Thomas, 2006) that the purpose of longer fixed-term contracts is to provide managers with better protection against termination. That is, a three-year contract renewable for two years is not the same as a five-year contract because it is less costly for the board to replace the manager at the end of the third year. Notably, as in practice, this notion of contract length

heterogeneous priors and overconfidence (Goel and Thakor, 2008; Gervais et al., 2011; Huang et al., 2016). Interestingly, it has also been applied to explain short-term debt contracts (Zhu, 2018).

is unrelated to a commitment to employ the manager for the duration of her contract, as contracts can be terminated at any time. To make this precise, this paper defines:

**Definition 1** *A renewal date of a renewable fixed-term contract is defined by the date on which the board can replace the manager in at least some cash-flow states without triggering a severance payment for premature termination. The length of a renewable fixed-term contract is defined as the time between a contract's start and its renewal dates.*

The requirement that a renewal date is defined by termination without severance pay is naturally a normalization — in practice, it would translate into replacing the manager with little severance pay compared to that when replacing a manager during her contract's term.

Definition 1 implies that the board can offer two types of contracts when hiring a manager with a contract covering the whole potential employment relationship. The first type is a renewable fixed-term contract for one period that can be renewed for one more period at the terms specified on the hiring date. The second is a contract that always offers severance pay protection if terminated at the end of the first period — i.e., a two-period contract. To streamline the analysis, it is assumed:

**Assumption 1**: *The board either offers or does not offer severance pay for termination in the first period.*

Assumption 1 simplifies contracting by excluding (renewable one-period) contracts that allow for replacement without severance pay in some, but not in other, cash-flow states.

**Assumption 2**: *The board replaces the manager if and only if its posterior beliefs indicate that the manager is a bad fit.*

Assumption 2 further simplifies the analysis by abstracting from contracts committing the board to replace a manager that it comes to see as a good fit or to keep a manager that it comes to see as a bad fit after the first period.[5] Assuming that

$$\sum_{\theta_1 \in \{\theta_N, \theta_G\}} \Pr\left(\theta_1 | x_L\right) e_2\left(\theta_1\right) < e_1 < \sum_{\theta_t \in \{\theta_N, \theta_G\}} \Pr\left(\theta_1 | x_H\right) e_2\left(\theta_1\right), \tag{1}$$

Assumption 2 implies that if the board relies only on the firm's cash-flow performance to learn about the manager's fit, it replaces the manager at the end of the first period if and only if the firm's cash flows are low. Instead, if the manager has no incentives to misreport her soft information (i.e., her fit), the board replaces the manager if and only if she is a bad fit.

[5] Assumption 2 arises naturally if boards are career-concerned and want to avoid the risk of offering contracts forcing them to make replacement or retention decisions that appear ex post wrong to outsiders.

Observe that, although a contract's length is set when a manager is hired, the manager's replacement is not tied to the contract's length but is endogenously determined by the evolution of the board's beliefs about the manager's fit. Section 3.5 discusses relaxing Assumptions 1 and 2. This allows for richer replacement policies, which may help lower hiring costs, but it adds few additional qualitative insights about the determinants of severance pay and contract length.[6]

Let $\mathbf{w}$ denote the manager's contract, with $\omega_t(h^t) \in \mathbf{w}$ denoting the manager's compensation after history $h^t \in H^t$ of reports and cash-flow realizations in period $t$ (where $H^0 = \varnothing$). It is convenient to denote the manager's "base wage" after a low cash-flow realization in period $t$ with $w_t(x_{t-1}) \equiv \omega_t(x_{t-1}, x_t = x_l)$ and the manager's "bonus" in addition to that base wage after a high cash-flow realization with $\Delta w_t(x_{t-1}) \equiv \omega_t(x_{t-1}, x_t = x_H) - \omega_t(x_{t-1}, x_t = x_L)$. Note that, to simplify notation, the dependence on the manager's reports will be made explicit only when needed to avoid confusion.

Furthermore, let $w_s(x_1)$ denote the severance pay for terminating the manager's contract in the first period.[7] Depending on whether such a payment is offered, a manager may or may not have incentives to conceal information revealing her as a bad fit. Since the game ends at the end of the second period, it is without loss of generality to assume that the manager's severance pay in the second period is effectively contained in her final base wage $w_2$ and bonus $\Delta w_2$.

The manager is penniless and protected by limited liability, which requires that $w_t, w_s \geq 0$. Furthermore, the manager should have no incentives to destroy cash flows, i.e., $\Delta w_t \geq 0$ (Innes, 1990). Contracts that satisfy these requirements are labeled as "feasible." It is assumed that, after getting hired, the manager cannot be prevented from leaving the firm at any time during the employment relationship for alternative employment that pays $\overline{U}$ per period. This *ex post* outside option conditional on leaving the firm (for short, "outside option") will play a central role.

[6] A previous working paper version considers alternative policies, such as offering severance pay only in some cash-flow states; committing not to replace managers following low cash flows; or committing to replace managers following high cash flows.

[7] Also in practice, severance pay can depend on the cash-flow history, as it is typically co-determined by the manager's average historical bonus (see Section 4 and Goldman and Huang, 2015).

# 3 Severance Pay, Contract Length, and Turnover

## 3.1 A Simple Example Illustrating the Main Insights

Suppose that $\theta_N = 0$ and $\theta_G \to 1$. Thus, the cash-flow realizations almost perfectly reveal the manager's fit. However, while a perfectly informed board will not replace a manager who is a good fit even if the firm's cash flows are low, the board will replace the manager if it relies on the firm's cash flows her fit. The reason is that low cash flows at the end of the first period imply with near certainty that the manager is a bad fit. Avoiding this mistake, which occurs with a minuscule probability, requires offering severance pay that compensates the manager for forgoing future wages in excess of her outside option. Thus, the offered severance pay must satisfy

$$w_s(x_1) + \delta\overline{U} \geq \delta U_2(\theta_N, x_1), \tag{2}$$

where $U_2(\theta_N, x_1)$ is the manager's expected payoff in the second period if she is a bad fit but stays with the firm (i.e., after history $h^1 = \{\theta_N, x_1\}$).

The trade-off for the board is now immediately apparent. Incentivizing the manager not to manipulate or conceal information that would reveal her as a bad fit means that she is rewarded with probability $1 - e_1$ for being a bad fit in the first period. Yet the expected second-period benefit compared to making a dismissal decision, based on the firm's cash flows, is almost zero, as the cash flows are almost perfectly informative about the manager's fit. Even without solving for the optimal contract, it is apparent that almost any positive severance pay needed to satisfy (2) will not be worth it. That is, the board will offer a fixed-term contract for one period, renewable for one more period, and will rely on the firm's cash-flow performance to evaluate the manager.

As the simple example in this Section illustrates, one of the main differences between a two-period contract and a renewable fixed-term contract is that managerial turnover is more performance-sensitive on a contract's renewal date. The reason is that managers are then more likely to conceal or manipulate soft information that could lead to their dismissal. Boards will expect that and, thus, will base their replacement decisions on hard performance measures. The example also suggests a simple comparative static with wide-ranging implications. Severance pay needs to be higher when $\overline{U}$, i.e., the manager's outside option conditional on leaving the firm, is lower (see condition (2)). This makes offering severance pay less attractive, implying that contracts will be shorter and, thus, more performance-sensitive. Therefore, managers are more likely to be replaced for underperformance when their outside options are worse, such as in industry-wide bad times. This could appear as a lack of relative performance evaluation, even though it is entirely unrelated to such an

explanation.

Conversely, a higher outside option $\overline{U}$, conditional on being replaced, will make it easier to keep the manager honest. That will allow boards to offer longer contracts with *less* severance pay. These comparative statics will be the polar opposite to what can be expected from alternative explanations of severance pay based on rent extraction by managers. Such explanations would predict that managers with a stronger bargaining position (and higher ex ante outside options) negotiate for longer contracts with *higher* severance pay. The rest of the paper makes these insights more precise and derives further comparative statics and implications. Readers interested mainly in the empirical implications and evidence can jump to Section 4.

## 3.2 The Board's Problem

Let $q\left(h^t, \mathbf{w}\right)$ denote the endogenous probability of history $h^t$ for a contract $\mathbf{w}$. Furthermore, let $H_r^1\left(\mathbf{w}\right)$ denote the set of histories for which the manager is replaced after the first period, and let $V_{new}$ denote the board's equilibrium expected payoff from hiring a new manager in the second period. The firm's expected payoff in the first period is

$$V_1 = \sum_{t=1}^{2} \sum_{h^t \in H^t \setminus H_r^1(\mathbf{w})} \delta^{t-1} q(h^t, \mathbf{w}) \left(x_t - \omega_t(h^t)\right) + \sum_{h^1 \in H_r^1(\mathbf{w})} q(h^1, \mathbf{w}) \delta V_{new}. \tag{3}$$

Consider, next, the manager's expected payoff. Let $\mathbf{c}_t\left(h^{t-1}\right) = c$ if the manager has incentives to invest in firm-specific human capital at the beginning of period $t$, and $\mathbf{c}_t\left(h^{t-1}\right) = 0$ otherwise. Clearly, these incentives also depend on the manager's contract. The manager's expected payoff at the beginning of the first period is

$$U_1 = \sum_{t=1}^{2} \delta^{t-1} \left( \overline{U} + \sum_{h^t \in H^t \setminus H_r^1(\mathbf{w})} q(h^t, \mathbf{w}) \left(\omega_t(h^t) - \mathbf{c}_t\left(h^{t-1}\right) - \overline{U}\right) \right). \tag{4}$$

Expression (4) states that, in expectation, the manager must obtain at least her outside option $\overline{U}$ in every period, but she might receive something different from $\overline{U}$ while she is employed by the firm.

Using (4) to plug into (3), the board's objective when hiring a manager is to choose $\mathbf{w}$

to maximize

$$\max_{\mathbf{w}} \sum_{t=1}^{2} \sum_{h^t \in H^t \setminus H_r^1(\mathbf{w})} \delta^{t-1} q(h^t, \mathbf{w}) \left( x_t - \mathbf{c}_t \left( h^{t-1} \right) - \overline{U} \right) + \sum_{h^1 \in H_r^1(\mathbf{w})} q(h^1, \mathbf{w}) \delta V_{new} - U_1 + (1+\delta)\, \overline{U}, \tag{5}$$

subject to the constraints that the contract $\mathbf{w}$ is feasible, incentive-compatible, and individually rational for the manager in every period. Hence, the board trades off maximizing the surplus generated from employing a manager (the first two terms in expression (5)) with minimizing the manager's rent, $U_1 - (1+\delta)\, \overline{U}$. The manager's expected payoff and incentive constraints are as follows:

**Manager's payoff and incentive constraints at $t = 2$.** Starting with the second period, the manager's expected payoff in that period when her fit in the first period is $\theta_1$ and the cash-flow realization is $x_1$ (i.e., the history is $h^1 = \{\theta_1, x_1\}$) is

$$\begin{aligned} U_2(\theta_1, x_1) &= \mathbf{e}_2\left(h^1\right)\left(w_2(x_1) + \theta_G \Delta w_2(x_1)\right) \\ &\quad + \left(1 - \mathbf{e}_2\left(h^1\right)\right)\left(w_2(x_1) + \theta_N \Delta w_2(x_1)\right) - \mathbf{c}_2\left(h^1\right), \end{aligned}$$

where, by analogy to $\mathbf{c}_t\left(h^{t-1}\right)$, the analysis defines $\mathbf{e}_2\left(h^1\right) = e_2(\theta_1)$ if the manager invests in firm-specific human capital at the beginning of the second period and $\mathbf{e}_2\left(h^1\right) = 0$ otherwise. Hence, the incentive constraint that the manager invests in firm-specific human capital in the second period is

$$e_2(\theta_1)\, \Delta\theta \Delta w_2(x_1) \geq c. \tag{6}$$

**Manager's payoff and incentive constraints at $t = 1$.** The manager's expected payoff in the first period is

$$U_1 = e_1\left(w_1 + \theta_G \Delta w_1 + \delta U_2^e(\theta_G)\right) + (1 - e_1)\left(w_1 + \theta_N \Delta w_1 + \delta U_2^e(\theta_N)\right) - c.$$

In this expression, the manager's expected continuation payoff $U_2^e(\theta_1)$ depends on the board's replacement policy. As discussed, there are two alternatives. In the first, the board learns about the manager's fit only from the firm's cash-flow performance and, thus, replaces the manager with probability $\theta_1$, i.e., if and only if the cash flows are low. That is, the manager's discounted expected continuation payoff from the second period is

$$\delta U_2^e(\theta_1) = \delta\left(\theta_1 U_2(\theta_1, x_H) + (1 - \theta_1)\, \overline{U}\right). \tag{7}$$

In the second alternative, the board offers severance pay in all cash-flow states at the end of the first period, with the aim of incentivizing the manager not to conceal her fit. In this

case, the board terminates the manager's contract if and only if $\theta_1 = \theta_N$, giving

$$\begin{aligned} \delta U_2^e(\theta_G) &= \delta\left(\theta_G U_2(\theta_G, x_H) + (1-\theta_G) U_2(\theta_G, x_L)\right) \\ \delta U_2^e(\theta_N) &= \theta_N w_s(x_H) + (1-\theta_N) w_s(x_L) + \delta\overline{U}. \end{aligned} \tag{8}$$

The severance pay paid for replacing the manager in the first period is chosen such that the manager has no incentives to misrepresent her fit:

$$\delta U_2(\theta_G, x_1) \geq w_s(x_1) + \delta\overline{U} \tag{9}$$

$$w_s(x_1) + \delta\overline{U} \geq \delta U_2(\theta_N, x_1). \tag{10}$$

Finally, incentivizing effort in the first period requires that

$$e_1\left(\Delta\theta\Delta w_1 + \delta U_2^e(\theta_G) - \delta U_2^e(\theta_N)\right) \geq c. \tag{11}$$

The reason that a manager may obtain an "efficiency wage" above her outside option (i.e., a positive rent) in this model is that the board wants to incentivize her to invest in firm-specific human capital. To see this, observe that if the board did not offer incentives for firm-specific human capital investments, it could satisfy (9) and (10), without leaving any rent to the manager by offering $w_t = \overline{U}$, $w_s = \Delta w_t = 0$.

## 3.3 Optimal Compensation and Severance Pay

We can now use conditions (6)-(11) to derive the optimal compensation contract for the two replacement policies. The non-severance pay elements of the manager's compensation contract follow standard considerations. To stimulate investment in firm-specific human capital, the board needs to punish the manager for signals indicating no such investment (i.e., $x_t = x_L$) and to reward her for signals indicating the opposite ($x_t = x_H$). Thus, the base pay is optimally set as low as possible, while high cash-flow realizations are rewarded with the promise of higher pay. However, bonuses are not paid out immediately since, reminiscent of Lazear's (1979) classical result, once a bonus is paid out, it ceases to have an incentive effect. Instead, bonuses are paid also conditional on future success, and we have $\Delta w_1 = 0$. Since the board must keep its promises of such deferred compensation (following $x_1 = x_H$), the bonus in the second period may be higher than the minimum needed to stimulate effort in that period. Otherwise, if $x_1 = x_L$, and the manager is retained because she is revealed as a good fit in the first period, the bonus is just high enough to stimulate investment in firm-specific capital in the second period. Finally, if the board does not offer severance pay

in the first period, it faces the risk that it may retain a manager who is not a good fit. The problem is that stimulating such a manager to invest in firm-specific human capital in the second period is harder and may require offering a higher bonus. Thus, in this case, the board must decide whether it is worth offering such a bonus that guarantees that the manager will invest in firm-specific human capital regardless of her fit.

**Severance pay.** The first novel insight from the paper concerns the board's severance pay policy. Before discussing the determinants of severance pay in detail, Proposition 1 formally states all elements of the manager's compensation, depending on whether the board offers severance pay in the first period (all proofs are in the Appendix). To avoid trivial case distinctions, it is assumed in what follows that the manager's outside option, conditional on being replaced, is below the threshold: $\overline{U} \leq \frac{\theta_N c}{e_2(\theta_G)\Delta\theta}$. This condition ensures that the manager's on-the-job pay is always higher than her outside option, conditional on being replaced. That is, without a severance payment to compensate the manager for termination, she will conceal or manipulate information that would reveal her as a bad fit.

**Proposition 1** *(i) Suppose that the board offers the manager severance pay for termination at the end of the first period, in which case the board replaces the manager if and only if the manager is a bad fit. The optimal compensation contract associated with this replacement policy is*

$$\begin{aligned}
\Delta w_1 &= w_1 = w_2(x_1) = 0 \text{ for } x_1 \in \{x_L, x_H\} && (12)\\
\Delta w_2(x_L) &= \frac{c}{e_2(\theta_G)\Delta\theta} && (13)\\
\Delta w_2(x_H) &= \frac{\frac{c}{\delta e_1} + \theta_G c - \theta_N \mathbf{c}_2(\theta_N, x_H) + \frac{\theta_N c}{e_2(\theta_G)}}{(\theta_N + \theta_G e_2(\theta_G) - \theta_N \mathbf{e}_2(\theta_N, x_H))\Delta\theta} && (14)\\
w_s(x_L) &= \delta\left(\theta_N \Delta w_2(x_L) - \overline{U}\right) && (15)\\
w_s(x_H) &= \delta\left((\theta_N + \mathbf{e}_2(\theta_N, x_H)\Delta\theta)\Delta w_2(x_H) - \overline{U}\right) && (16)
\end{aligned}$$

*where* $\mathbf{e}_2(\theta_N, x_H) = e_2(\theta_N)$ *and* $\mathbf{c}_2(\theta_N, x_H) = c$ *if* $e_2(\theta_N) \geq c\frac{\theta_N + \theta_G e_2(\theta_G)}{\frac{c}{\delta e_1} + \theta_G c + \frac{\theta_N c}{e_2(\theta_G)}}$ *and* $\mathbf{e}_2(\theta_N, x_H) = \mathbf{c}_2(\theta_N, x_H) = 0$ *otherwise.*

*(ii) Suppose that the board does not offer severance pay for termination in the first period and replaces the manager if and only if the cash flows are low. The board optimally offers*

$$w_1 = \Delta w_1 = w_2(x_H) = 0. \quad (17)$$

*If the board wants to incentivize the manager to invest in firm-specific human capital regard-*

*less of her fit in the first period, the second-period bonus is*

$$\Delta w_2(x_H) = \max\left\{ \frac{\frac{c}{\delta e_1} + \theta_G c - \theta_N c + \Delta\theta\overline{U}}{(\theta_N + \theta_G e_2(\theta_G) - \theta_N e_2(\theta_N))\Delta\theta}, \frac{c}{e_2(\theta_N)\Delta\theta} \right\}. \tag{18}$$

*Otherwise, the board sets the second-period bonus to*

$$\Delta w_2(x_H) = \frac{\frac{c}{\delta e_1} + \theta_G c - \theta_N \mathbf{c}_2(\theta_N, x_H) + \Delta\theta\overline{U}}{(\theta_N + \theta_G e_2(\theta_G) - \theta_N \mathbf{e}_2(\theta_N, x_H))\Delta\theta}, \tag{19}$$

*where* $\mathbf{e}_2(\theta_N, x_H) = e_2(\theta_N)$ *and* $\mathbf{c}_2(\theta_N, x_H) = c$ *if* $e_2(\theta_N) \geq c\frac{\theta_N + \theta_G e_2(\theta_G)}{\frac{c}{\delta e_1} + \theta_G c + \Delta\theta\overline{U}}$ *and* $\mathbf{e}_2(\theta_N, x_H) = \mathbf{c}_2(\theta_N, x_H) = 0$ *otherwise.*

The severance payment that the board must offer to prevent the manager from concealing that she is not a good fit must compensate the manager for the expected on-the-job continuation pay that she would have to forgo if she leaves the firm. One particular factor that lowers the manager's on-the-job pay is a higher fit persistence. Intuitively, higher persistence (defined as a larger difference $|e_2(\theta_1) - e_1|$) makes it more likely that a repeated investment in firm-specific human capital will pay off for the manager. This reduces the need to offer high incentive pay, $\Delta w_H(x_1)$, to stimulate such an investment. Conversely, lower persistence requires higher second-period incentive pay, which makes it more attractive for the manager to conceal information to keep her job. Thus, lower fit persistence drives severance pay higher.

Another factor affecting the manager's severance pay is her outside option, conditional on being replaced. A higher outside option reduces the benefit of lying and trying to stay with the firm. Thus, a higher outside option $\overline{U}$ makes it easier to incentivize the manager to be truthful about her fit and leads to lower severance pay. This simple comparative static has wide-ranging implications that have not been explored before.

**Lemma 1** *Severance pay decreases in the persistence of the manager's fit and the manager's outside option* $\overline{U}$*.*

Perhaps surprisingly, as long as the board must offer positive severance pay to incentivize truthful reporting (i.e., $\overline{U} \leq \frac{\theta_N c}{e_2(\theta_G)\Delta\theta}$), the firm's expected payoff *increases* in the manager's outside option. This result is driven by two complementary effects. On the one hand, a higher outside option means that the manager is effectively compensated by the outside labor market for leaving, which helps the firm save on severance pay. On the other hand, a higher outside option does not increase the manager's rent. This rent results from the need

to incentivize the manager to invest in firm-specific human capital. The manager's outside option does not affect this incentive problem since, conditional on leaving, the manager receives a severance payment higher than that outside option.

In stark contrast, the firm's expected payoff *decreases* in the manager's outside option $\overline{U}$ if the board does not offer severance pay to elicit truthful revelation. In this case, a higher outside option requires offering the manager a higher bonus, $\Delta w_2(x_H)$, to stimulate investment in firm-specific human capital. The reason is that a higher outside option provides a better cushion in case of termination if the manager does not receive severance pay for termination in the first period. Such a cushion makes incentivizing the manager more difficult, explaining the need for a higher bonus. As a result, hiring a manager with a higher outside option *decreases* the firm's expected payoff.

**Proposition 2** *If the board offers severance pay, it prefers hiring a manager with a higher outside option, conditional on being replaced. The board prefers hiring a manager with a lower outside option if it does not offer severance pay.*

Proposition 2 shows that taking into account severance pay is crucial for understanding why firms may prefer hiring a manager with a higher outside option – something that cannot be reconciled with the "standard" model in which managers are evaluated only on performance (e.g., Hermalin and Weisbach, 1998). This result has several implications. First, it helps explain why firms may hire managers from a "select club" with better outside options even if these managers do not necessarily appear to be a better fit. While the crucial condition behind Proposition 2 is that CEOs are paid above their outside option, conditional on being replaced, this condition is typically satisfied in practice. CEOs rarely leave the firm to become CEOs elsewhere (Fee and Hadlock, 2004), and their labor income declines, on average, by 40% following termination (Nielsen, 2017).

A second corollary of Proposition 2 is that boards may tolerate activities, such as managers taking positions at other firms, that not only improve their outside options but also distract them from their job. The explanation is that the distraction may be worth it if better outside options make managers who are not a good fit less desperate to hang on to their job. Third, boards will avoid damaging departing CEOs' outside options, as this would necessitate higher severance pay. Thus, even involuntary managerial turnover may be reported as voluntary to the general public. Indeed, there is evidence that severance pay is higher when firms replace CEOs who have a reputation for firm mismanagement (Goldman and Huang, 2015).

## 3.4 The Choice Between Shorter and Longer Renewable Fixed-Term Contracts and Turnover-Performance Sensitivity

Selecting the optimal replacement policy requires comparing the firm's expected payoff with each policy. In what follows, a larger parameter range for which one policy is preferred is interpreted as a higher likelihood of selecting that policy.

The board's choice to offer longer contracts depends on (i) factors that affect severance pay but not the manager's importance for the firm's cash flows; (ii) factors that affect the importance of having the right manager in charge but do not affect severance pay; and (iii) factors that affect both severance pay and the firm's cash flows. An example of case (i) is the manager's outside option, conditional on being replaced. This outside option has no effect on the firm's cash flows but affects the manager's severance pay. A straightforward implication of Lemma 1 and Proposition 2 is that a better outside option, conditional on being replaced, will lead to longer contracts offering less severance pay.

The firm's cash-flow upside potential, $\Delta x$, has no direct effect on the manager's severance pay (case (ii)). However, a higher upside potential means that there is more at stake from having the right manager in charge, making it more important to offer severance pay. Thus, indirectly, a higher $\Delta x$ will correlate with offering severance pay and longer contracts. Since a higher cash-flow upside, $\Delta x$, also means a higher volatility of the firm's cash flows, firms with a higher cash-flow volatility will also offer longer contracts. Note that a higher upside potential is not the same as a larger firm size, which is captured by the level of $x$. A larger size has no effect on the board's choice to offer severance pay.

The persistence of the manager's fit affects both the firm's cash flows and the manager's severance pay (case (iii)). A higher persistence makes it more important for the board to replace a manager who is a bad fit. In the extreme, in which the manager's fit is not persistent, the board obtains no benefit from offering severance pay and eliciting the manager's fit in the first period. Reinforcing this effect, Lemma 1 shows that an increase in persistence reduces the cost of offering severance pay. Intuitively, high persistence increases the return on investing in a good fit, while making it less likely that a manager who is a bad fit in the first period will earn a bonus in the second period. That makes staying at the firm at all costs less attractive.

**Proposition 3** *The board is more likely to offer a longer contract if:*
*(i) the manager's outside option, conditional on being replaced, is higher;*
*(ii) the firm's cash-flow upside potential is higher;*
*(iii) the firm's cash-flow volatility is higher; or*
*(iv) the manager's fit is more persistent.*

What gives the concept of contract length meaning in this paper is whether the manager receives severance pay when replaced before the end of the second period. Since the board must expect that the manager has incentives to conceal or manipulate soft information that could reveal her as a bad fit, it must rely more on hard performance measures to infer that fit. As a result, the board's decision to replace the manager will be more sensitive to the firm's cash-flow performance when the board offers shorter contracts.

**Corollary 1** *(i) Shorter contracts will have a higher turnover-performance sensitivity. (ii) Turnover-performance sensitivity will be higher if the managers' outside options, conditional on being replaced, are low; if the manager's fit persistence is low; if the firm's upside potential is low; or if the firm's cash-flow volatility is low.*

To the extent that managers' outside options are lower in industry downturns — e.g., because more firms are going bankrupt; fewer firms are being started; and more competition for available positions exists within the labor force — an immediate corollary is that dismissal decisions rely more strongly on performance measures in downturns. Thus, Corollary 1 offers an alternative explanation (compared to a lack of relative performance evaluation) for why managers are more likely to be replaced following underperformance in industry downturns (Jenter and Kanaan, 2015).[8]

## 3.5 The Firm's Competitive Environment, Renegotiations, and More Than Two Periods

The following section discusses several extensions of the baseline model.

### 3.5.1 Better Negotiating Position of Managers

To contrast the model's predictions with those from alternative explanations of severance pay related to rent extraction by managers, denote the manager's ex ante reservation value at the hiring stage with $\overline{U}_0$. A higher reservation value $\overline{U}_0$ could proxy for a better negotiating position of the manager at the beginning of the first period. If the additional constraint, $U_1 \geq \overline{U}_0$, binds, it undermines the rationale for not offering severance pay as a way of lowering the manager's incentive compensation. Trivially, this rationale becomes irrelevant if the manager's expected payoff from the severance pay contract described by part (i) of Proposition 1 is lower than $\overline{U}_0$.

[8] In Anderson et al. (2018) and Eisfeldt and Kuhnen (2013), a shock that decreases industry returns prompts the firm to look for a manager who is better suited to the new environment. This offers an alternative explanation to Jenter and Kanaan's (2010) findings.

If the manager's participation constraint, $U_1 \geq \overline{U}_0$ binds, her severance pay will increase in $\overline{U}_0$. This happens because the manager's bonus will no longer be determined by expression (14) but will be higher to satisfy the condition that, $U_1 \geq \overline{U}_0$. The higher bonus means that the manager has stronger incentives to hide information that could lead to her dismissal. In turn, the higher bonus requires that the contract offer higher severance pay.

**Proposition 4** *(i) A higher ex ante reservation value, $\overline{U}_0$, at the time of hiring makes it more likely that the board offers severance pay in the first period — i.e., that the board offers a longer contract. (ii) The manager's severance pay increases in $\overline{U}_0$.*

Proposition 4 captures the gist of explanations of severance pay related to rent extraction by managers, which predict that managers with stronger bargaining positions will negotiate for longer contracts and more severance pay. The crucial difference from the main predictions in the baseline model is that the implications for the level of severance pay are polar opposites. In particular, while rent extraction (higher $\overline{U}_0$), will predict higher severance pay, a higher outside option conditional on getting replaced (higher $\overline{U}$) will predict that the manager is offered *lower* severance pay. This crucial difference in predictions between Lemma 1 and Proposition 4 will be exploited in Section 4 to show empirical support for the model's main theoretical channel.

### 3.5.2 Competition From Similar Firms

The firm's competitive environment affects not only the managers' outside options, but also other factors that can affect the board's choice of contract length. One factor that plays a role is the similarity between the firm and its peers. The presence of more similar firms, exposed to similar market conditions and uncertainties, could offer an additional signal that the board could use to improve its inference about the manager's fit.

An additional signal about the manager's fit, based on the information from similar firms, reduces the relative benefit from offering longer contracts and severance pay to infer that fit. To see this, suppose that at the end of the first period, there is a commonly observable and verifiable signal that, with probability $\sigma$, helps the board infer that the manager is not a good fit despite her having generated high cash flows. Since this signal reduces the likelihood that the board makes a wrong replacement decision even without offering severance pay, it holds:

**Proposition 5** *The presence of more similar firms reduces the likelihood that the board offers severance pay and leads to shorter contracts.*

Other effects of competition are less clear-cut. For example, if competition leads to a decrease in the firm's cash-flow upside, $\Delta x$, it will make firms less likely to offer severance pay and more likely to offer shorter contracts. However, the effect will be the opposite if competition increases cash-flow volatility, as when $x$ decreases but $\Delta x$ increases (Proposition 3).

### 3.5.3 Renegotiations

The baseline model assumes that the board can commit to the contract it offers at the beginning of the first period. However, it is well known that, in some cases, the board and the manager could benefit from renegotiating the manager's contract to prevent inefficient replacement (DeMarzo and Fishman, 2007). The new element when the manager's fit is persistent is that the board and the manager could also renegotiate the manager's severance pay. This discussion focuses on that renegotiation possibility, as it is the main source of new insights.

The main such insight is that renegotiation-proof contracts will offer more severance pay. On the one hand, renegotiations in which the manager is replaced and obtains lower severance pay will not take place, as renegotiating must make both parties ex post better off. On the other hand, renegotiations that lead to an increase in severance pay can occur. If the initial contract does not offer severance pay in the first period, the board could renegotiate and offer the manager severance pay to ensure that she is not a bad fit in the second period.

**Proposition 6** *Renegotiation-proof contracts are longer and offer more severance pay.*

In practice, contract renegotiations are often by design. About 40% of the fixed-term contracts of the sample in Section 4 do not explicitly specify the continuation terms after the contracts' end. Together with Proposition 6, this stylized fact helps explain why firms offer discretionary severance pay above that required by managers' contracts.[9] In this model, that occurs if (by renegotiating) the board wants to ensure that it does not retain a manager who is a bad fit.

### 3.5.4 Multiple Periods and Richer Replacement Strategies

The model can be extended to an infinite-horizon formulation. In particular, analyzing an infinitely-lived board that repeatedly hires managers for, at most, two periods requires only a minor modification of the board's objective function, and Propositions 1–6 are nearly

[9] While Yermack (2006) documents that discretionary severance pay is typically modest, Goldman and Huang (2015) find that the opposite is often true.

identical.[10] The main additional insight if managers are hired for more than two periods is that offering severance pay over multiple periods increases the severance pay that needs to be offered in each period, as the manager has more to gain from trying to keep her job. In particular, if the board hires the manager for three periods and offers severance pay for termination in periods one and two, the severance pay in the first period must compensate the manager not only for the forgone wage, but also for severance pay in the second period.

Another insight from the infinite-horizon extension of the model is that the board could achieve commitment not to renegotiate the manager's contract if $\delta$ is sufficiently high. In particular, if the board engages in renegotiations once, all future managers will expect the same and demand only renegotiation-proof contracts from then on. This "trigger strategy" would prevent the board from deviating from its commitment to avoid renegotiations.

It is further worth remarking that allowing for richer replacement strategies by relaxing Assumptions 1 and 2 does not alter the predictions of when boards are more likely to offer severance pay and, thus, longer contracts. In particular, the comparative statics of the manager's severance pay (Lemma 1) are unchanged: A higher outside option conditional on getting replaced and a higher persistence of the manager's fit reduce the cost of offering severance pay. Furthermore, a higher cash-flow upside and volatility make it more important to have the right manager in charge (Proposition 3). Also, the benefit of offering severance pay and longer contracts declines if there are more similar firms (Proposition 5).

Finally, it should be noted that if managers are risk-averse, boards will typically offer them at least some positive payment after all cash-flow histories and reports. This standard result can trivially be seen if the manager's utility function is such that $u'(0) \to \infty$. Hence, with risk-averse managers, a more general formulation of the model will define a contract's end or renewal date by a date on which the board can replace the manager with little severance pay, compared to prior dates.

# 4 Implications and Evidence

## 4.1 Why Do Contract Length and Severance Pay Matter?

This paper argues that the length of a contract is effectively determined by the protection it offers to managers against termination. Indeed, if such protection were not an issue, it would not be clear why the length of contracts should matter for either party, given that boards can fire managers at any time. Thus, longer contracts are better for managers because they offer better protection. The model further shows that longer contracts can also be beneficial

[10] A previous working paper version solves the infinite-horizon version of the model.

to firms because the better protection they offer makes managers less desperate to hang on to their job and, thus, less likely to manipulate soft information that could lead to their dismissal.

As a result, longer contracts have a lower turnover-performance sensitivity, as boards do not rely exclusively on hard performance measures when evaluating managers with a long time to contract expiration.[11] This turnover performance sensitivity will increase close to renewal and end dates, as boards expect managers to be more likely to manipulate soft information, forcing boards to rely more on hard performance measures to evaluate managers.

In line with these predictions, turnover-performance sensitivity peaks close to end and renewal dates (Cziraki and Groen-Xu, 2020), making managers more likely to engage in window-dressing and to hide negative news (Liu and Xuan, 2020). The key point that this paper makes is that the length of a contract is an endogenous choice for the firm. Thus, a better understanding of turnover-performance sensitivity and window dressing requires a better understanding of the firm- and industry-specific factors that affect the choice of contract length.

## 4.2 Hypotheses and Evidence

A full-scale empirical analysis testing all of the model's predictions would be beyond the scope of this paper. In what follows, the paper presents empirical evidence supporting the channel described by the model and the main implications for contract length and severance pay. The main focus is on the effect of the managers' outside option, conditional on being replaced, as this outside option helps differentiate the model's predictions from theories of contract length and severance pay, based on rent extraction (Lemma 1 and Proposition 4).

In particular, a higher outside option conditional on getting replaced does not affect the importance of having the right manager in charge but lowers the necessary severance pay. Thus, when these ex post outside options are better, longer contracts need to offer less severance pay for premature dismissal, making offering longer contracts more attractive. This prediction contrasts with the effect of a higher ex ante reservation value (or bargaining power) at the time of getting hired, which leads to higher severance pay and longer contracts.

**Hypothesis 1** *Better outside options, conditional on being replaced, lead to (i) longer contracts but (ii) lower severance pay provisions.*

[11] Note that, in practice, an executive cannot claim severance pay if she is dismissed "without cause" or leaves without "good reason," such as a change in duties, diminution of pay, or relocation (Rau and Xu, 2013). However, if the board learns that the manager's fit has deteriorated, it will terminate the manager's contract, triggering such a payment.

The model further highlights several factors that do not directly affect severance pay but affect the importance of having the right manager in charge, leading to more severance pay and longer contracts.

**Hypothesis 2** *Firms will offer longer contracts stipulating higher severance pay if*
*(i) competition from similar firms is low;*
*(ii) cash-flow volatility is high; or*
*(iii) the firm's upside potential is high.*

**Data and Descriptive Statistics.** The sample is comprised of S&P1500 CEOs from 1994–2018, for whom ExecuComp provides the names and the dates at which they took the position of CEO. Details regarding the contracts of these CEOs are extracted from SEC Edgar's database. Specifically, Regulation S-K of the Securities and Exchange Act of 1934 mandates the disclosure of the terms of employment between publicly listed firms and their named executives. For 3267 CEOs, it was possible to find the full employment agreements as a separate exhibit from the companies' 10-K, 10-Q and 8-K filings. All relevant information was extracted manually from these contracts. For another 1456 CEOs, it was possible to find the relevant information from the companies' proxy filings. The overall sample has information on the employment terms of 4723 CEOs.[12] Following the model, the main focus is on contracts with explicit contract end or renewal dates, which represent 45% of the sample. The rest are at will or indefinite, and a small fraction (4%) are evergreen — i.e., contracts that renew automatically every day or month to retain the same time to expiration. For 73% of the contracts with explicit end or renewal dates, it was possible to find the severance pay agreements. Stock price and balance sheet data about these firms come from CRSP and Compustat.

In line with the model's predictions, replacing a manager at the end of the contract's term is typically much cheaper. Though the contractual formulations vary, contracts typically specify that severance pay is owed if the manager's contract is terminated before its expiration; that severance pay depends on the time remaining until the contract's end; or that severance pay is a function of the manager's target compensation for the next year on her contract. Furthermore, there is a very strong positive association between a contract's length and the severance pay specified by the contract. Severance pay is typically given as a multiple of the manager's base wage and bonus. A one-year increase in a contract's length is associated with a 10% increase in these multiples. Thus, even though managers can be

[12]Note that theory is not restricted to CEOs. For a random sample of 633 of the CEOs, the search was extended to include contracts from the time before they became the firm's CEO. These contracts are closely comparable in terms of contract length and severance pay provisions to the subsequent CEO contracts.

replaced at any time, firing a manager with a longer fixed-term contract is more expensive.

INSERT TABLE 1

**Evidence From the Enforcement of Non-Compete Agreements.** The challenge in testing Hypothesis 1 is to find a measure for arguably exogenous changes in the managers' outside options, conditional on being replaced. The proxy proposed here is based on differences in the state-level enforcement of non-compete agreements. Such agreements prohibit working for a rival firm within a certain period and a certain geographical area upon leaving the current employer. Garmaise (2011) finds that more than 70% of senior executives sign such agreements. There is wide variation in the extent to which these agreements are enforced across states, with California famously considering such agreements void. The empirical strategy is to exploit staggered changes in the enforcement of such noncompete agreements over time and across states. The underlying assumption is that stricter enforcement of noncompete agreements limits executives' outside options after leaving a firm. This assumption is supported by prior findings that stricter enforcement restricts the mobility of workers and executives (Marx, Strumsky, and Fleming 2009; Garmaise 2011) while leading to lower wages (Garmaise 2011; Balasubramanian et al., 2018). In terms of Hypothesis 1, *weaker* enforcement of noncompete agreements (i.e., better outside options, conditional on being replaced) will lead to longer contracts but less severance pay.

Following Garmaise (2011), the enforcement of non-compete agreements is proxied by an index ranging from 0 to 12, with higher values indicating stricter enforcement. Over the period in question, several states changed the level of enforcement in a staggered fashion, with some states strengthening the enforcement and others weakening it (Table 1). Most of these changes resulted from court rulings (and were not handed down by state Supreme Courts) and are plausibly exogenous to the length of contracts offered to executives (for details, see Ewens and Marx, 2018; Marx, 2018; Kini et al., 2020). In cases in which enforcement is weakened, Garmaise's (2011) index is decreased; otherwise, it is increased, depending on whether the answers to the 12 questions (on which the index is based) change (Appendix C). All index values are then multiplied by minus one to obtain an index of weaker enforcement, $Weak\ Enforcement$. The changes to enforcement affect approximately 36% of the firms in the sample.

The staggered nature of the state-level changes in the enforceability of non-compete agreements allows for the following difference-in-differences estimation:

$$Y_{i,s,t} = \alpha + \beta_1 Weak\ Enforcement_{s,t} + \beta X_{i,s,t} + \mu_i + \delta_t + \varepsilon_{i,s,t}. \tag{20}$$

There are two dependent variables of interest. The first is $Contract\ years_{i,s,t}$, which is defined as the years until the contract's first renewal date offered by firm $i$ headquartered in state $s$ in year $t$.[13] The second is $\frac{Severance\ pay}{bonus+salary}_{i,s,t}$, which is defined as the contractually promised severance pay divided by the manager's average bonus and salary over the last three years. In the vast majority of cases, the manager's severance pay is specified as a multiple of the manager's salary and average bonus. To calculate the dollar value of the manager's severance pay, these multiples are, thus, multiplied by the manager's salary and average bonus.

The key coefficient of interest is $\beta_1$, which captures the effect of $Weak\ Enforcement_{s,t}$ on contract length and severance pay, respectively. The vector $X_{i,s,t}$ is a set of firm- and industry-level control variables whose descriptive statistics can be found in Table 1. The first set of variables test for Hypothesis 2. They include $Tobin's\ Q$, which controls for the firm's cash-flow upside; $Lagged\ cash\text{-}flow\ volatility$, which controls for the volatility of net operating cash flows in the previous year; $Total\ similarity$, which is Hoberg and Phillips' (2016) firm-level index of similarity to competing firms. The regressions further include $Log(sales)$, which is the log of sales, represented in 2004 U.S. dollars; and industry, state, year, and firm fixed effects. Industries are defined at the three-digit SIC level.

INSERT TABLES 2 and 3

**Results.** Tables 2 and 3 contain the main results. Table 2 shows that, when a state relaxes the enforceability of noncompete agreements, firms offer their CEOs significantly longer contracts. A back-of-the-envelope calculation shows that a one unit increase in the index (i.e., weaker enforcement) extends contract length by approximately two months. These results are consistent with Hypothesis 1. Consistent with Hypothesis 2, contracts are also longer when the firm's cash-flow volatility and upside are higher and when the firms are less similar to competing firms.

To show support for the theoretical channel presented in the paper (Hypothesis 1), Table 3 further shows that severance pay decreases when the manager's outside option, conditional on being replaced, improves. Weak enforcement has a negative sign in all specifications. In economic terms, a one-unit increase in the index leads to a decrease in severance pay equal to 17% of that variable's standard deviation. Further in line with Hypothesis 2, severance pay increases in the firm's cash-flow volatility and decreases when the firm becomes more similar to competing firms. The results in Tables 2 and 3 are robust to using the log of contract length and the log of severance pay as dependent variables. As shown by model (4),

[13] As noted in Section 3.5, about 40% of the fixed-term contracts in the sample do not specify the terms in case of continuation. Then, *Contract years* is defined by the contract's end date.

the results in Table 2 are also robust to restricting attention to the contracts for which it was possible to extract all severance pay information. Overall, the empirical evidence supports the relevance of the proposed channel and the predicted determinants of contract length.[14]

# 5 Conclusion

What is the difference between a three-year contract, renewable for two years, and a five-year contract and why does this difference matter? Such fixed-term contracts, which offer little or no severance pay to managers if they are not renewed, are widely used in practice (Gillan et al., 2009; Rau and Xu, 2013) but have not been addressed by prior theory.

This paper argues that the decision about the length of a manager's contract is closely related to the decision about the length of the severance pay protection a board wants to offer the manager against termination. By protecting managers against a steep drop in their labor income following termination, severance pay can also protect firms, as it makes managers less desperate to conceal or manipulate soft information that could lead to their dismissal. Absent severance pay, boards must anticipate such manipulation and, thus, rely mainly on hard information to evaluate the manager's fit, making managerial turnover noisier and more performance-sensitive. Therefore, the choice to offer a shorter or a longer contract optimally balances the cost of a higher likelihood of window dressing and less-accurate replacement decisions with the cost of rewarding managers for failure.

The model shows that it is often optimal to offer shorter renewable contracts that do not provide severance pay on expiration and renewal dates. A key determinant of a contract's length is the managers' ex post outside option conditional on leaving the firm. Lower ex post outside options make managers more desperate to hang on to their job to avoid a steep drop in their labor income. Thus, firms must offer higher severance pay to those managers to prevent them from concealing unfavorable information, which makes offering such contracts less attractive. That is, contracts will be shorter. Since that will force boards to rely more on hard performance measures when managers' outside options are low (such as in industry downturns), there will be a tighter link between CEO turnover and firm underperformance. There is, indeed, evidence for this prediction, but it has hitherto been interpreted as a lack of relative performance evaluation (Jenter and Kanaan, 2015). Furthermore, stronger reliance on noisy performance in downturns is more likely to leave firms with managers who are not a good fit, which might exacerbate downturns.

[14] Unreported regressions replicate the results of Cziraki and Groen-Xu (2020) that the sensitivity of forced turnover to underperformance is stronger when managers have shorter contracts, which is also consistent with the model's predictions.

Factors such as the persistence of the manager's fit also matter for contract length. In particular, if a manager's fit were not persistent, offering severance pay to learn that fit would make little sense. Thus, higher persistence will lead to longer contracts and higher severance pay. Furthermore, firms with a higher cash-flow volatility and a higher upside will also be more likely to offer longer contracts and higher severance pay, as such firms have more to gain from having the right manager in charge. Competition from similar firms matters too. In particular, when there are more similar firms, boards have more signals from which to infer the manager's fit, thus reducing the need to offer severance pay and leading to shorter contracts.

Evidence from the length of S&P 1500 CEOs' contracts supports the predictions concerning the determinants of contract length. In particular, exploiting state-level changes in the enforceability of non-competition agreements, the paper shows that better *ex post* outside options lead to longer contracts but lower contractual severance pay. The finding that severance pay is lower is crucial, as it helps to distinguish the theoretical channel predicted by the model from alternative explanations regarding the use of severance pay and contract length related to rent extractions by managers. In particular, such an alternative explanation would predict that managers with better *ex ante* outside options at the time of hiring will negotiate for higher severance pay. Furthermore, as the model predicts, contracts are longer and severance pay is higher when the firm's cash-flow volatility and upside potential are high. Also in line with the model's predictions, contracts are shorter and severance pay is lower when there are more similar competing firms. These firm- and industry-specific factors affecting contract length highlighted by the model and the evidence can guide work analyzing window dressing by managers and the performance sensitivity of managerial turnover. Research in this area has documented the importance of contract length but has lacked a theory to explain the endogenous choice of contract length.

The insight that higher outside options makes a manager potentially cheaper to replace and, thus, potentially cheaper to employ has several broader implications for employment relationships. One is that a board might appear to hire from a "select club," i.e., a manager with high outside options, even if it is unlikely that she is a better fit. This is particularly true when managers are paid above their outside options (as is common in practice). For the same reason, boards might tolerate investments in general human capital even if they come at the expense of firm-specific human capital investments.

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# Appendix A Omitted Proofs

**Proof of Proposition 1.** In all that follows, observe that the second-period payment to the manager, $\omega_2$, cannot depend on the manager's report about $\theta_2$. Since no future cash-flow realizations depend on $\theta_2$ (as the game ends), the only contract that can incentivize the manager to report truthfully her second-period fit realization must be independent of that report. In what follows, the proof derives the optimal contract depending on whether the board tries to elicit the first-period fit realization $\theta_1$ by offering severance pay at the end of that period. Recall that the contracts' dependence on the managers' report is omitted, whenever it does not cause confusion.

**Case (i):** *The board offers severance pay at the end of the first period and replaces the manager if and only if she is a bad fit.* To minimize the manager's expected rent for this policy, define

$$\begin{aligned}
L_1 \;=\; & -e_1\Big(w_1+\theta_G\Delta w_1+\delta\theta_G\left(w_2\left(x_H\right)+\left(\theta_N+e_2\left(\theta_G\right)\Delta\theta\right)\Delta w_2\left(x_H\right)-c\right) \\
& \quad +\delta\left(1-\theta_G\right)\left(w_2\left(x_L\right)+\left(\theta_N+e_2\left(\theta_G\right)\Delta\theta\right)\Delta w_2\left(x_L\right)-c\right)\Big) \\
& -\left(1-e_1\right)\left(w_1+w_s\left(x_L\right)+\theta_N\left(\Delta w_1+w_s\left(x_H\right)-w_s\left(x_L\right)\right)+\delta\overline{U}\right)+c \\
& +\lambda_1\Big(e_1\Big(\Delta\theta\Delta w_1+\delta\theta_G\left(w_2\left(x_H\right)+\left(\theta_N+e_2\left(\theta_G\right)\Delta\theta\right)\Delta w_2\left(x_H\right)-c\right) \\
& \qquad +\delta\left(1-\theta_G\right)\left(w_2\left(x_L\right)+\left(\theta_N+e_2\left(\theta_G\right)\Delta\theta\right)\Delta w_2\left(x_L\right)-c\right) \\
& \qquad -\theta_N w_s\left(x_H\right)-\left(1-\theta_N\right)w_s\left(x_L\right)-\delta\overline{U}\Big)-c\Big) \\
& +\sum_{i=\{L,H\}}\lambda_i\left(e_2\left(\theta_G\right)\Delta\theta\Delta w_2\left(x_i\right)-c\right) \\
& +\sum_{i=\{L,H\}}\nu_i\left(w_s\left(x_i\right)+\delta\overline{U}-\delta\left(w_2\left(x_i\right)+\left(\theta_N+e_2\left(\theta_N,x_i\right)\Delta\theta\right)\Delta w_2\left(x_i\right)-\mathbf{c}_2\left(\theta_N,x_i\right)\right)\right) \\
& +\xi_1 w_1+\zeta_1\Delta w_1+\sum_{i=\{L,H\}}\left(\phi_{2i}w_s\left(x_1\right)+\psi_{2i}w_2\left(x_i\right)+\chi_{2i}\Delta w_2\left(x_i\right)\right)
\end{aligned} \tag{A.1}$$

where $\lambda_1$, $\lambda_L$, $\lambda_H$, $\nu_L$, $\nu_H$, $\xi_1$, $\zeta_1$, $\phi_{2L}$, $\phi_{2H}$, $\psi_{2L}$, $\psi_{2H}$, $\chi_{2L}$, $\chi_{2H}$ is the set of weakly positive Kuhn Tucker multipliers that account for all incentive and feasibility constraints in periods one and two.

We can now take the first-order conditions with respect to all contract components. Lemma A.1 in Appendix B shows that $\xi_1, \zeta_1, \psi_{2L}, \psi_{2H} > 0$, implying that $w_1 = \Delta w_1 = w_2\left(x_L\right) = w_2\left(x_H\right) = 0$. Furthermore, it holds that $\lambda_L > 0$, implying that $\Delta w_2\left(x_L\right) = \frac{c}{e_2(\theta_G)\Delta\theta}$. It also holds that $\lambda_1 > 0$ and, thus, $\Delta w_2\left(x_H\right)$ is given by (14). In this expression, it

is taken into account that if $e_2(\theta_N) \geq c\frac{(\theta_N+\theta_G e_2(\theta_G))\Delta\theta}{\frac{c}{\delta e_1}+\theta_G c+\frac{\theta_N c}{e_2(\theta_G)}}$, the bonus $\Delta w_2(x_H)$ is high enough to incentivize the manager to invest in firm-specific human capital in the second period even after being a bad fit in the first period. **Q.E.D.**

**Lemma A.1** *From the first-order conditions of program (A.1), it holds that* $\xi_1, \zeta_1, \psi_{2L}$, $\psi_{2H} > 0$, *implying that* $w_1 = \Delta w_1 = w_2(x_L) = w_2(x_H) = 0$. *Furthermore, it holds that* $\lambda_L, \lambda_1 > 0$, *implying that* $\Delta w_2(x_L) = \frac{c}{e_2(\theta_G)\Delta\theta}$, $\Delta w_2(x_H)$ *is given by expressions (14), and* $w_s(x_L)$ *and* $w_s(x_H)$ *are given by expressions (15) and (16).*

**Proof of Lemma A.1.** From the first-order condition

$$\frac{\partial L_1}{\partial w_1} = 0 = -1 + \xi_1, \tag{A.2}$$

we have that $\xi_1 = 1$ and so $w_1 = 0$. From

$$\begin{aligned} \frac{\partial L_1}{\partial w_s(x_L)} &= 0 = -(1-e_1)(1-\theta_N) - \lambda_1 e_1(1-\theta_N) + \nu_L + \phi_{2L} && \text{(A.3)} \\ \frac{\partial L_1}{\partial w_s(x_H)} &= 0 = -(1-e_1)\theta_N - \lambda_1 e_1 \theta_N + \nu_H + \phi_{2H} && \text{(A.4)} \end{aligned}$$

we have that $\nu_i + \phi_{2i} > 0$ for both $i = \{L, H\}$. Hence, the severance pay is either zero or pinned down by the incentive constraints that a bad fit does not mimic a good fit. In this proof, we focus on the case in which the severance pay is always positive (i.e., $\frac{\theta_N c}{e_2(\theta_G)\Delta\theta} > \overline{U}$), which implies that $\nu_i > 0$ and $\phi_{2i} = 0$. Furthermore, using that

$$\frac{\partial L_1}{\partial w_2(x_L)} = 0 = -e_1\delta(1-\theta_G) + \lambda_1\delta e_1(1-\theta_G) - \nu_L\delta + \psi_{2L} \tag{A.5}$$

we obtain that

$$\begin{aligned} 0 &= \frac{\partial L_1}{\partial w_2(x_L)} + \delta\frac{\partial L_1}{\partial w_s(x_L)} \\ &= -\delta(1-(\theta_N + e_1\Delta\theta)) - \delta\lambda_1 e_1\Delta\theta + \psi_{2L} \end{aligned}$$

implying that $\psi_{2L} > 0$. Similarly, using that

$$\begin{aligned} \frac{\partial L_1}{\partial \Delta w_1} &= 0 = -(\theta_N + e_1\Delta\theta) + \lambda_1 e_1\Delta\theta + \zeta_1 && \text{(A.6)} \\ \frac{\partial L_1}{\partial w_2(x_H)} &= 0 = -e_1\delta\theta_G + \lambda_1 e_1\delta\theta_G - \nu_H\delta + \psi_{2H} && \text{(A.7)} \end{aligned}$$

we obtain that

$$\begin{aligned} 0 &= \frac{\partial L_1}{\partial w_2(x_H)} - \delta \frac{\partial L_1}{\partial w_s(x_H)} \\ &= -\delta(\theta_N + e_1\Delta\theta) + \lambda_1 e_1 \delta \Delta\theta + \psi_{2H} \\ &= -\delta\zeta_1 + \psi_{2H} \end{aligned}$$

Hence, $\psi_{2H} > 0$ if and only if $\zeta_1$ is positive.

We now argue that $\Delta w_1 = 0$ (i.e., $\zeta_1 > 0$). Suppose not, then from condition (A.6), we have that $\lambda_1 = 1 + \frac{\theta_N}{e_1\Delta\theta}$. Using now that, from condition (A.4), $\nu_H = (1-e_1)\theta_N + \lambda_1 e_1 \theta_N$, we can plug into the first-order condition

$$\begin{aligned} \frac{\partial L_1}{\partial \Delta w_2(x_H)} = 0 &= -e_1\delta\theta_G(\theta_N + e_2(\theta_G)\Delta\theta) + \lambda_1 e_1\delta\theta_G(\theta_N + e_2(\theta_G)\Delta\theta) \qquad \text{(A.8)} \\ &\quad + \lambda_H e_2(\theta_G)\Delta\theta - \nu_H\delta(\theta_N + \mathbf{e}_2(\theta_N, x_1)\Delta\theta) + \chi_{2H} \\ &= \frac{\theta_N}{\Delta\theta}\delta\theta_G(e_2(\theta_G) - \mathbf{e}_2(\theta_N, x_1))\Delta\theta + \lambda_H e_2(\theta_G)\Delta\theta + \chi_{2H} > 0 \end{aligned}$$

giving the desired contradiction. Hence, it must be that $\Delta w_1 = 0$.

We turn now to $\Delta w_2(x_L)$ and $\Delta w_2(x_H)$. From condition (A.3), we have that $\nu_L = (1-e_1)(1-\theta_N) + \lambda_1 e_1(1-\theta_N)$. Plugging into

$$\begin{aligned} \frac{\partial L_1}{\partial \Delta w(x_L)} = 0 &= -e_1\delta(1-\theta_G)(\theta_N + e_2(\theta_G)\Delta\theta) + \lambda_1 e_1\delta(1-\theta_G)(\theta_N + e_2(\theta_G)\Delta\theta) \qquad \text{(A.9)} \\ &\quad + \lambda_L e_2(\theta_G)\Delta\theta - \nu_L\delta(\theta_N + \mathbf{e}_2(\theta_N, x_1)\Delta\theta) + \chi_{2L} \\ &= -\delta(e_1(1-\theta_G)(\theta_N + e_2(\theta_G)\Delta\theta) + (1-e_1)(1-\theta_N)(\theta_N + \mathbf{e}_2(\theta_N, x_1)\Delta\theta)) \\ &\quad + \lambda_L e_2(\theta_G)\Delta\theta + \lambda_1 e_1\delta\Big((1-\theta_G)(\theta_N + e_2(\theta_G)\Delta\theta) \qquad \text{(A.10)} \\ &\quad - (1-\theta_N)(\theta_N + \mathbf{e}_2(\theta_N, x_1)\Delta\theta)\Big) + \chi_{2L} \end{aligned}$$

Note that if the term in brackets following $\lambda_1$ is negative, it must be that $\lambda_L$ and/or $\chi_{2L}$ are positive. The same holds even if the term in brackets following $\lambda_1$ is positive. To see this, note in this case, we can use from condition (A.6) that $\lambda_1 \leq 1 + \frac{\theta_N}{e_1\Delta\theta}$ to plug in (A.10) to obtain

$$\begin{aligned} \frac{\partial L_1}{\partial \Delta w(x_L)} &= 0 \leq -\frac{\theta_G}{\Delta\theta}\delta(1-\theta_N)(\theta_N + \mathbf{e}_2(\theta_N, x_1)\Delta\theta) + \frac{\theta_N}{\Delta\theta}\delta((1-\theta_G)(\theta_N + e_2(\theta_G)\Delta\theta)) \\ &\quad + \lambda_L e_2(\theta_G)\Delta\theta + \chi_{2L} \\ &< -\frac{\theta_G}{\Delta\theta}\delta(1-\theta_N)\theta_N + \frac{\theta_N}{\Delta\theta}\delta(1-\theta_G)\theta_G + \lambda_L e_2(\theta_G)\Delta\theta + \chi_{2L} \\ &= -\delta\theta_N\theta_G + \lambda_L e_2(\theta_G)\Delta\theta + \chi_{2L}. \end{aligned}$$

Hence, we must have again that $\lambda_L$ and/or $\chi_{2L}$ are positive. However, since the manager will not exert effort in the second period if $\Delta w_2(x_L) = 0$, it follows that $\chi_{2L} = 0$ and $\lambda_L > 0$. Hence, from the effort constraint (6), we obtain that $\Delta w(x_L) = \frac{c}{e_2(\theta_G)\Delta\theta}$. Note that this implies that the manager does not exert in the second period, following low cash flows in the first period, if she is a bad fit but stays with the firm by misreporting her fit, i.e., $\mathbf{e}_2(\theta_N, x_L) = 0$.

Finally, to derive $\Delta w(x_H)$, observe that condition (11) that the manager exerts effort in the first period demands that

$$\Delta w_2(x_H) \geq \frac{\frac{c}{\delta e_1} + \theta_G c - \theta_N \mathbf{c}_2(\theta_N, x_H) + \frac{\theta_N c}{e_2(\theta_G)}}{(\theta_N + \theta_G e_2(\theta_G) - \theta_N e_2(\theta_1, x_H))\Delta\theta}, \tag{A.11}$$

where we use that $w_1 = \Delta w_1 = w_2(x_L) = w_2(x_H) = 0$, $\Delta w_2(x_L) = \frac{c}{e_2(\theta_G)}$ and that $w_s(x_L)$ and $w_s(x_H)$ are given by (15) (16), respectively. Since this condition is more difficult to satisfy than the condition that the manager exerts effort in the first period, $\Delta w_2(x_H) \geq \frac{c}{e_2(\theta_G)\Delta\theta}$, it follows that $\Delta w_2(x_H)$ is given by the right-hand side of (A.11). Note that condition (A.11) implies $\Delta w_2(x_H) \geq \frac{c}{e_2(\theta_G)\Delta\theta}$. That is, if $\Delta w_2(\theta_H)$ is high enough to guarantee that the manager invests in firm-specific human capital in the first period, it also guarantees that the manager also invests in firm-specific human capital in the second period (if she was a good fit and retained after the first period).

Finally, observe that it holds that

$$\begin{aligned} 0 \quad &\leq \quad \frac{\frac{c}{\delta e_1} + \theta_G c - \theta_N c + \frac{\theta_N c}{e_2(\theta_G)}}{(\theta_N + \theta_G e_2(\theta_G) - \theta_N e_2(\theta_N))\Delta\theta} - \frac{c}{e_2(\theta_N)\Delta\theta} \\ &\iff \quad e_2(\theta_N) \geq \frac{c(\theta_N + \theta_G e_2(\theta_G))}{\frac{c}{\delta e_1} + \theta_G c + \frac{\theta_N c}{e_2(\theta_G)}} \end{aligned} \tag{A.12}$$

Note that this is the same condition as that guaranteeing that $\frac{\frac{c}{\delta e_1} + \theta_G c + \frac{\theta_N c}{e_2(\theta_G)}}{(\theta_N + \theta_G e_2(\theta_G))\Delta\theta} \geq \frac{c}{e_2(\theta_N)\Delta\theta}$. Thus, following high cash flows in the first period, if a manager with a bad fit misreports and stays with the firm in the second period, she exerts effort, i.e., $\mathbf{e}_2(\theta_N, x_H) = e_2(\theta_N)$, if and only if condition (A.12) is satisfied. **Q.E.D.**

**Case (ii):** *The board does not offer severance pay at end of the first period and fires the*

*manager if and only if the firm's cash flows are low.* Define

$$
\begin{aligned}
L_2 \;=\; & -e_1\left(w_1+\theta_G\Delta w_1+\delta\left(\theta_G\left(w_2+\left(\theta_N+e_2\left(\theta_G\right)\Delta\theta\right)\Delta w_2-c\right)+\left(1-\theta_G\right)\overline{U}\right)\right) \qquad \text{(A.13)}\\
& -\left(1-e_1\right)\Bigg(w_1+\theta_N\Delta w_1\\
& \qquad +\delta(\theta_N(w_2+\left(\theta_N+\mathbf{e}_2\left(\theta_N,x_L\right)\Delta\theta\right)\Delta w_2-\mathbf{c}_2\left(\theta_N,x_L\right))+\left(1-\theta_N\right)\overline{U})\Bigg)+c\\
& +\lambda_1\Bigg(e_1\Bigg(\Delta\theta\Delta w_1+\delta\left(\theta_G\left(w_2+\left(\theta_N+e_2\left(\theta_G\right)\Delta\theta\right)\Delta w_2-c\right)+\left(1-\theta_G\right)\overline{U}\right)\\
& \qquad -\delta\left(\theta_N\left(w_2+\left(\theta_N+\mathbf{e}_2\left(\theta_N,x_L\right)\Delta\theta\right)\Delta w_2-\mathbf{c}_2\left(\theta_N,x_L\right)\right)+\left(1-\theta_N\right)\overline{U}\right)\Bigg)-c\Bigg)\\
& +\lambda_2\left(e_2\left(\theta_1\right)\Delta\theta\Delta w_2-c\right)\\
& +\xi_1 w_1+\zeta_1\Delta w_1+\psi_2 w_2+\chi_2\Delta w_2
\end{aligned}
$$

where $\{\lambda_1,\lambda_2,\xi_1,\zeta_1,\psi_2,\chi_2\}$ is the set of weakly positive Kuhn Tucker multipliers. In the fifth line of expression (A.13), $\theta_1$ should be replaced by $\theta_H$ or $\theta_L$ depending on whether the the board's wants to incentivize the manager to exert effort in the second period if her fit in the first period was $\theta_L$.

In Lemma A.2 in Appendix B, we show that $\xi_1,\zeta_1,\psi_2>0$, implying that $w_1=\Delta w_1=w_2=0$. The bonus in the second period, $\Delta w_2$, is derived from the constraints that this bonus is high enough that the manager exerts effort in both periods one and two. The main difference to part (i) is that the board may decide to provide the manager with incentives to invest in firm-specific human capital in the second period, even if she was a bad fit in the first period. That would require guaranteeing in addition that $\Delta w_2\geq\frac{c}{e_2(\theta_N)\Delta\theta}$. **Q.E.D.**

**Lemma A.2** *From the first-order conditions of program (A.13), it holds that* $\xi_1,\zeta_1,\psi_2>0$, *implying that* $w_1=\Delta w_1=w_2=0$. *Furthermore,* $\Delta w_2\left(x_H\right)$ *is given by expressions (18) or (19), respectively.*

**Proof of Lemma A.2.** Taking the first-order conditions of program (A.13), we obtain

$$
\begin{aligned}
\frac{\partial L_2}{\partial w_2} \;=\; & 0=-\delta\left(\theta_N+e_1\Delta\theta\right)+\lambda_1 e_1\delta\Delta\theta+\psi_2 && \text{(A.14)}\\
\frac{\partial L_2}{\partial\Delta w_2} \;=\; & 0=-\delta\theta_N\left(\theta_N+\mathbf{e}_2\left(\theta_N,x_L\right)\Delta\theta\right)-e_1\delta\left(\theta_G\left(\theta_N+e_2\left(\theta_G\right)\Delta\theta\right)-\theta_N\left(\theta_N+\mathbf{e}_2\left(\theta_N,x_L\right)\Delta\theta\right)\right) && \text{(A.15)}\\
& +\lambda_1\delta e_1\left(\theta_G\left(\theta_N+e_2\left(\theta_G\right)\Delta\theta\right)-\theta_N\left(\theta_N+\mathbf{e}_2\left(\theta_N,x_L\right)\Delta\theta\right)\right)+\lambda_2 e_2\left(\theta\right)\Delta\theta+\chi_2\Delta w_2\\
\frac{\partial L_2}{\partial w_1} \;=\; & 0=-1+\xi_1 && \text{(A.16)}\\
\frac{\partial L_2}{\partial\Delta w_1} \;=\; & 0=-\left(\theta_N+e_1\Delta\theta\right)+\lambda_1 e_1\Delta\theta+\zeta_1. && \text{(A.17)}
\end{aligned}
$$

From condition (A.16), we have that $\xi_1 = 1$ and so $w_1 = 0$. From conditions (A.14) and (A.17), we have that $\delta\zeta_1 = \psi_2$. Suppose to a contradiction that $\zeta_1 = 0$. From condition (A.17), we have that $\lambda_1 = \frac{(\theta_N + e_1\Delta\theta)}{e_1\Delta\theta}$. From condition (A.15), we must then have that

$$\begin{aligned}
0 &= \frac{\delta\theta_N\left(\theta_N + \mathbf{e}_2\left(\theta_N, x_L\right)\Delta\theta\right) - \left(\lambda_2 e_2\left(\theta_1\right)\Delta\theta + \chi_2\Delta w_2\right)}{\delta\left(\theta_N + \theta_G e_2\left(\theta_G\right) - \theta_N \mathbf{e}_2\left(\theta_N, x_L\right)\right)} - \theta_N \\
&= \delta\theta_N \frac{\left(\theta_N + \mathbf{e}_2\left(\theta_N, x_L\right)\Delta\theta\right) - \left(\theta_N + \theta_G e_2\left(\theta_G\right) - \theta_N \mathbf{e}_2\left(\theta_N, x_L\right)\right)}{\delta\left(\theta_N + \theta_G e_2\left(\theta_G\right) - \theta_N \mathbf{e}_2\left(\theta_N, x_L\right)\right)} \\
&\quad - \frac{\left(\lambda_2 e_2\left(\theta_1\right)\Delta\theta + \chi_2\Delta w_2\right)}{\delta\left(\theta_N + \theta_G e_2\left(\theta_G\right) - \theta_N \mathbf{e}_2\left(\theta_N, x_L\right)\right)} \\
&= \delta\theta_N\theta_G \frac{\mathbf{e}_2\left(\theta_N, x_L\right) - e_2\left(\theta_G\right)}{\delta\left(\theta_N + \theta_G e_2\left(\theta_G\right) - \theta_N \mathbf{e}_2\left(\theta_N, x_L\right)\right)} - \frac{\left(\lambda_2 e_2\left(\theta_1\right)\Delta\theta + \chi_2\Delta w_2\right)}{\delta\left(\theta_N + \theta_G e_2\left(\theta_G\right) - \theta_N \mathbf{e}_2\left(\theta_N, x_L\right)\right)} < 0
\end{aligned}$$

giving a contradiction. Hence, we must have $\delta\zeta_1 = \psi_2 > 0$ (i.e., $\Delta w_1 = w_2 = 0$). Since we cannot also have $\Delta w_2 = 0$, it must be that $\chi_2 = 0$. To derive $\Delta w_2$, observe that from the manager's second period effort constraint, (6), we have that

$$\Delta w_2 \geq \frac{c}{e_2\left(\theta_1\right)\Delta\theta},$$

where $e_2\left(\theta_1\right)$ is either $e_2\left(\theta_G\right)$ or $e_2\left(\theta_N\right)$ depending on whether the board wants to make sure that the managers invests in firm-specific human capital even if she is a bad fit in the first period. Furthermore, from (11), we have

$$\Delta w_2\left(x_H\right) \geq \frac{\frac{c}{\delta e_1} + \theta_G c - \theta_N \mathbf{c}_2\left(\theta_N, x_H\right) + \Delta\theta\overline{U}}{\left(\theta_N + \theta_G e_2\left(\theta_G\right) - \theta_N \mathbf{e}_2\left(\theta_N, x_H\right)\right)\Delta\theta}.$$

Combining both conditions, we obtain expression (18).

Finally, observe that

$$\begin{aligned}
&\frac{\frac{c}{\delta e_1} + \theta_G c - \theta_N c + \Delta\theta\overline{U}}{\left(\theta_N + \theta_G e_2\left(\theta_G\right) - \theta_N e_2\left(\theta_N\right)\right)\Delta\theta} \geq \frac{c}{e_2\left(\theta_N\right)\Delta\theta} \\
\iff\quad & e_2\left(\theta_N\right) \geq \frac{c\left(\theta_N + \theta_G e_2\left(\theta_G\right)\right)}{\left(\frac{c}{\delta e_1} + \theta_G c + \Delta\theta\overline{U}\right)} \qquad \text{(A.18)}
\end{aligned}$$

which is the same condition as that guaranteeing that $\frac{\frac{c}{\delta e_1} + \theta_G c + \Delta\theta\overline{U}}{\left(\theta_N + \theta_G e_2(\theta_G)\right)\Delta\theta} \geq \frac{c}{e_2(\theta_N)\Delta\theta}$ and

$$\frac{\frac{c}{\delta e_1} + \theta_G c - \theta_N c + \Delta\theta\overline{U}}{\left(\theta_N + \theta_G e_2\left(\theta_G\right) - \theta_N e_2\left(\theta_N\right)\right)\Delta\theta} \geq \frac{\frac{c}{\delta e_1} + \theta_G c + \Delta\theta\overline{U}}{\left(\theta_N + \theta_G e_2\left(\theta_G\right)\right)\Delta\theta}.$$

That is, if condition (A.18) is satisfied, $\Delta w_2(x_H) = \frac{\frac{c}{\delta e_1} + \theta_G c - \theta_N c + \Delta\theta \overline{U}}{(\theta_N + \theta_G e_2(\theta_G) - \theta_N e_2(\theta_N))\Delta\theta}$, and that bonus incentivizes the manager to invest in firm-specific human capital in the second period, even if her fit in the first period is $\theta_N$. **Q.E.D.**

**Proof of Lemma 1.** Plugging the manager's bonus from expression (14) into the manager's severance pay, given by expressions (15) and (16), we obtain that $\frac{\partial w_s(x_L)}{\partial \overline{U}} = \frac{\partial w_s(x_H)}{\partial \overline{U}} = -\delta < 0$. Furthermore, defining $e_2(\theta_G) = e_1 + \varepsilon$ and $e_2(\theta_N) = e_1 - \varepsilon$, we have that

$$\begin{aligned}
\frac{\partial w_s(x_L)}{\partial \varepsilon} &= \delta\theta_N \frac{\partial}{\partial \varepsilon}\left(\frac{c}{e_2(\theta_G)\Delta\theta}\right) < 0 \\
\frac{\partial w_s(x_H)}{\partial \varepsilon} &= \delta \frac{\partial}{\partial \varepsilon}\left((\theta_N + \mathbf{e}_2(\theta_N, x_H)\Delta\theta)\frac{\frac{c}{\delta e_1} + \theta_G c - \theta_N \mathbf{c}_2(\theta_N, x_H) + \frac{\theta_N c}{e_2(\theta_G)}}{(\theta_N + \theta_G e_2(\theta_G) - \theta_N \mathbf{e}_2(\theta_N, x_H))\Delta\theta}\right) < 0.
\end{aligned}$$

**Q.E.D.**

**Proof of Proposition 2.** If the initial manager is replaced in the first period, a new manager is hired only for the remaining one period. Let $\{w_{new}, \Delta w_{new}\}$ be the contract offered to the new manager. Incentivizing that manager to invest in firm-specific human capital requires that

$$e_1 \Delta\theta \Delta w_{new} \geq c.$$

As in the proof of Proposition 1, it is optimal to set $\Delta w_{new} = \frac{c}{e_1\Delta\theta}$ and $w_{new} = 0$. The new manager's expected payoff is, thus,

$$U_{new} = e_1\theta_G \Delta w_{new} + (1 - e_1)\theta_N \Delta w_{new} - c = \frac{\theta_N c}{e_1 \Delta\theta}.$$

Hence, the firm's expected payoff is

$$\begin{aligned}
V_{new} &= x + (\theta_N + e_1\Delta\theta)\left(\Delta x - \frac{c}{e_1\Delta\theta}\right) \\
&= x + (\theta_N + e_1\Delta\theta)\Delta x - c - \frac{\theta_N c}{e_1\Delta\theta}. \qquad \text{(A.19)}
\end{aligned}$$

The firm's expected payoff from offering the initially-hired manager severance pay in the

first period is

$$\begin{aligned} V_1^{sp} &= x + (\theta_N + e_1\Delta\theta)\,\Delta x + \delta e_1\left(x + (\theta_N + e_2(\theta_G)\,\Delta\theta)\,(\Delta x - \Delta w_2(x_H))\right) \\ &\quad + (1-e_1)\left(-\theta_N w_s(x_H) - (1+\theta_N)\,w_s(x_L) + \delta V_{new}\right) \\ &= x + (\theta_N + e_1\Delta\theta)\,\Delta x + \delta e_1\left(x + (\theta_N + e_2(\theta_G)\,\Delta\theta)\,\Delta x\right) \\ &\quad -U_1^{sp} + \delta(1-e_1)\left(\overline{U} + V_{new}\right) \end{aligned} \tag{A.20}$$

in which case the initial manager's expected payoff is

$$U_1^{sp} = -c + e_1\delta U_2^e(\theta_G) + (1-e_1)\,\delta U_2^e(\theta_N)$$

Using from Proposition 1 that condition (11) is binding, $U_1^{sp}$ reduces to

$$\begin{aligned} U_1^{sp} &= -c + \delta U_2^e(\theta_N) + \frac{c}{e_1} \\ &= -c + \delta\left(\theta_N\left((\theta_N + \mathbf{e}_2(\theta_N, x_H)\,\Delta\theta)\,\Delta w_2(x_H) - \mathbf{c}_2(\theta_N, x_H)\right) + (1+\theta_N)\,\theta_N\Delta w_2(x_L)\right) \\ &\quad + \frac{c}{e_1} \end{aligned} \tag{A.21}$$

The firm's expected payoff from hiring a manager without severance pay in the first period is

$$\begin{aligned} V_1^{nsp} &= x + (\theta_N + e_1\Delta\theta)\,\Delta x + \delta e_1\theta_G\left(x + (\theta_N + e_2(\theta_G)\,\Delta\theta)\,\Delta x\right) \\ &\quad + \delta(1-e_1)\,\theta_N\left(x + (\theta_N + \mathbf{e}_2(\theta_N, x_H)\,\Delta\theta)\,\Delta x\right) - U_1^{nsp} \\ &\quad + \delta\left(e_1(1-\theta_G) + (1-e_1)(1-\theta_N)\right)\left(\overline{U} + V_{new}\right). \end{aligned} \tag{A.22}$$

in which case the initial manager's expected payoff is

$$\begin{aligned} U_1^{nsp} &= -c + \delta e_1\left(\theta_G\left((\theta_N + e_2(\theta_G)\,\Delta\theta)\,\Delta w_2 - c\right) + (1-\theta_G)\,\overline{U}\right) \\ &\quad + \delta(1-e_1)\left(\theta_N\left((\theta_N + \mathbf{e}_2(\theta_N, x_H)\,\Delta\theta)\,\Delta w_2 - \mathbf{c}_2(\theta_N, x_H)\right) + (1-\theta_N)\,\overline{U}\right). \end{aligned} \tag{A.23}$$

For use in Proposition 3, note that if (11) is binding, $U_1^{nsp}$ reduces to

$$U_1^{nsp} = -c + \delta\left(\theta_N\left((\theta_N + \mathbf{e}_2(\theta_N, x_H)\,\Delta\theta)\,\Delta w_2(x_H) - \mathbf{c}_2(\theta_N, x_H)\right) + (1-\theta_N)\,\overline{U}\right) + \frac{c}{e_1} \tag{A.24}$$

Plugging in for $\Delta w_2(x_1)$, we obtain from expressions (A.20)-(A.23) that

$$\begin{aligned}
\frac{\partial V_1^{sp}}{\partial \overline{U}} &= \delta(1-e_1) > 0 \\
\frac{\partial V_1^{nsp}}{\partial \overline{U}} &= -\frac{\partial U_1^{sp}}{\partial \overline{U}} + \delta(e_1(1-\theta_G) + (1-e_1)(1-\theta_N)) \\
&\leq -\delta(e_1((1-\theta_G)) + (1-e_1)(1-\theta_N)) + \delta(e_1(1-\theta_G) + (1-e_1)(1-\theta_N)) = 0.
\end{aligned}$$

**Q.E.D.**

**Proof of Proposition 3.** To derive the comparative statics with respect to $\overline{U}$, $\Delta x$, and $\varepsilon$, take the difference between $V_1^{sp}$ and $V_1^{nsp}$ and compute the derivative with respect to these parameters.

**Outside option.** From Proposition 2, we have that

$$\frac{\partial(V_1^{sp} - V_1^{nsp})}{\partial \Delta \overline{U}} < 0.$$

**Cash-flow upside.** Furthermore, it holds that

$$\frac{\partial(V_1^{sp} - V_1^{nsp})}{\partial \Delta x} = \delta(e_1(1-\theta_G)(e_2(\theta_G) - e_1)\Delta\theta - (1-e_1)\theta_N((\mathbf{e}_2(\theta_N, x_H) - e_1)\Delta\theta)) > 0.$$

**Persistence.** It holds

$$\frac{\partial(V_1^{sp} - V_1^{nsp})}{\partial \varepsilon} = \left(e_1(1-\theta_G) - (1-e_1)\theta_N \frac{\partial \mathbf{e}_2(\theta_N, x_H)}{\partial \varepsilon}\right)\delta\Delta\theta\Delta x + \frac{\partial(U_1^{nsp} - U_1^{sp})}{\partial \varepsilon}. \tag{A.25}$$

Since the first term in brackets in expression (A.25) is strictly positive, it suffices to show that $\frac{\partial\left(U_1^{nsp} - U_1^{sp}\right)}{\partial \varepsilon} > 0$.

There are three cases depending on whether the manager who is a bad fit in the first period would (or should) have incentives to invest in firm-specific human capital in the second period.

(i) Suppose, first, that $e_2(\theta_N) < c\frac{\theta_N + \theta_G e_2(\theta_G)}{\frac{c}{\delta e_1} + \theta_G c + \Delta\theta\overline{U}}$. In this case, if the board does not offer severance pay, it must set $\Delta w_2(x_H) = \frac{c}{e_2(\theta_N)\Delta\theta}$ to incentivize the manager to invest in firm-specific human capital in the second period if she was a bad fit in the first period. In this

case, it holds that

$$\begin{aligned} U_1^{nsp} &= -c + e_1\delta\left(\theta_G\left(\left(\theta_N + e_2\left(\theta_G\right)\Delta\theta\right)\Delta w_2\left(x_H\right) - c\right) + \left(1-\theta_G\right)\overline{U}\right) \\ &\quad + \left(1-e_1\right)\delta\left(\theta_N\left(\left(\theta_N + e_2\left(\theta_N\right)\Delta\theta\right)\Delta w_2\left(x_H\right) - c\right) + \left(1-\theta_N\right)\overline{U}\right) \end{aligned}$$

and hence

$$\frac{\partial U_1^{nsp}}{\partial \varepsilon} = \frac{\partial}{\partial \varepsilon}\left(\left(e_1\theta_G\left(\theta_N + e_2\left(\theta_G\right)\Delta\theta\right) + \left(1-e_1\right)\theta_N\left(\theta_N + e_2\left(\theta_N\right)\Delta\theta\right)\right)\delta\frac{c}{e_2\left(\theta_N\right)\Delta\theta}\right) > 0.$$

Furthermore, from the expression for $U_1^{sp}$, given by (A.21), we have that

$$\begin{aligned} \frac{\partial U^{sp}}{\partial \varepsilon} &= \delta\frac{\partial}{\partial \varepsilon}\left(\theta_N\left(\left(\theta_N + \mathbf{e}_2\left(\theta_N, x_H\right)\Delta\theta\right)\frac{\frac{c}{\delta e_1} + \theta_G c - \theta_N \mathbf{c}_2\left(\theta_N, x_H\right) + \frac{\theta_N c}{e_2(\theta_G)}}{\left(\theta_N + \theta_G e_2\left(\theta_G\right) - \theta_N \mathbf{e}_2\left(\theta_N, x_H\right)\right)\Delta\theta} - c\right)\right. \\ &\quad \left. + \left(1-\theta_N\right)\left(\theta_N\frac{c}{e_2\left(\theta_G\right)\Delta\theta}\right)\right) < 0, \end{aligned}$$

implying that $\frac{\partial\left(U_1^{nsp} - U_1^{sp}\right)}{\partial \varepsilon} > 0$.

Suppose, next, that, if the board does not offer severance pay, it does not explicitly seek to stimulate the manager to invest in firm-specific human capital in the second period if she was a bad fit in the first period. We have two subcases to consider:

(ii) If the manger stays with the firm in the second period after being a bad fit in the first period, her decision to invest in firm-specific human capital in the second period would be the same regardless of whether her contract offers severance pay in the first period. Plugging in for the contract components from Proposition 1 into (A.21) and (A.24), we obtain

$$U_1^{nsp} - U_1^{sp} = -\delta\left(\frac{\theta_N\left(\theta_N + \mathbf{e}_2\left(\theta_N, x_H\right)\Delta\theta\right)}{\left(\theta_N + \theta_G e_2\left(\theta_G\right) - \theta_N \mathbf{e}_2\left(\theta_N, x_H\right)\right)} + \left(1-\theta_N\right)\right)\left(\frac{\theta_N c}{e_2\left(\theta_G\right)\Delta\theta} - \overline{U}\right),$$

and it holds again that $\frac{\partial\left(U_1^{nsp} - U_1^{sp}\right)}{\partial \varepsilon} > 0$.

(iii) Finally, it remains to consider the case in which the manager would invest in firm-specific human capital in the second period if she was a bad fit in the first period if the contract offers severance pay (this would only happen off-equilibrium) but not if her contract does not offer severance pay in the first period.[15] We have then

[15] The opposite case does not occur, since the assumption that $\frac{\theta_N c}{e_2(\theta_G)\Delta\theta} > \overline{U}$ implies that we cannot have that $\frac{\theta_N + \theta_G e_2(\theta_G)}{\frac{c}{\delta e_1} + \theta_G c + \frac{\theta_N c}{e_2(\theta_G)}} > e_2\left(\theta_N\right) > c\frac{\theta_N + \theta_G e_2(\theta_G)}{\frac{c}{\delta e_1} + \theta_G c + \Delta\theta\overline{U}}$.

$$
\begin{aligned}
&\frac{\partial\left(U_1^{nsp}-U_1^{sp}\right)}{\partial\varepsilon}\\
=\;&\delta\frac{\partial}{\partial\varepsilon}\left(\frac{\theta_N}{\Delta\theta}\left(\theta_N\frac{\frac{c}{\delta e_1}+\theta_G c+\Delta\theta\overline{U}}{\left(\theta_N+\theta_G e_2\left(\theta_G\right)\right)}-\left(\theta_N+e_2\left(\theta_N\right)\Delta\theta\right)\frac{\frac{c}{\delta e_1}+\theta_G c-\theta_N c+\frac{\theta_N c}{e_2(\theta_G)}}{\left(\theta_N+\theta_G e_2\left(\theta_G\right)-\theta_N e_2\left(\theta_N\right)\right)}\right)\right.\\
&\left.+\theta_N c+\left(1-\theta_N\right)\left(\overline{U}-\frac{\theta_N c}{e_2\left(\theta_G\right)\Delta\theta}\right)\right)\\
>\;&\delta\frac{\theta_N}{\Delta\theta}\frac{\partial}{\partial\varepsilon}\left(\theta_N\frac{\frac{c}{\delta e_1}+\theta_G c}{\left(\theta_N+\theta_G e_2\left(\theta_G\right)\right)}-\left(\theta_N+e_2\left(\theta_N\right)\Delta\theta\right)\frac{\frac{c}{\delta e_1}+\theta_G c-\theta_N c}{\left(\theta_N+\theta_G e_2\left(\theta_G\right)-\theta_N e_2\left(\theta_N\right)\right)}\right.\\
&\left.+\theta_N\frac{\Delta\theta\overline{U}}{\left(\theta_N+\theta_G e_2\left(\theta_G\right)\right)}-\left(\theta_N+e_2\left(\theta_N\right)\Delta\theta\right)\frac{\frac{\theta_N c}{e_2(\theta_G)}}{\left(\theta_N+\theta_G e_2\left(\theta_G\right)-\theta_N e_2\left(\theta_N\right)\right)}\right)
\end{aligned}
$$

It is straightforward to verify that the derivative is strictly positive, proving the claim. **Q.E.D.**

**Proof of Proposition 4.** Recall that $U_1^{sp}$ and $U_1^{nsp}$ denote the manager's expected payoffs depending on whether the board offers severance pay. If $U_1^{nsp}>U_1^{sp}$, the board always offers severance pay, and the claim follows trivially. Suppose, therefore, that $U_1^{nsp}<U_1^{sp}$. As $\overline{U}_0$ increases from zero, the constraint that $U_1\geq\overline{U}_0$ binds first for the case in which board does not offer severance pay. This explains why the cost advantage of not offering severance pay decreases, and offering severance pay becomes more likely, when $\overline{U}_0$ increases.

As $\overline{U}_0$ increases even more and $U_1^{sp}\geq\overline{U}_0$ also becomes binding, it is always optimal for the board to offer severance pay, as not doing so has no cost advantage. The main addition to Proposition 1 is that $\Delta w\left(x_H\right)$ is implicitly defined by the condition that $U_1^{sp}=\overline{U}_0$, and it holds that $\Delta w_2\left(x_H\right)$ increases in $\overline{U}_0$. By (10), we obtain that $w_s\left(x_H\right)$ increases in $\overline{U}_0$. **Q.E.D.**

**Proof of Proposition 5.** In what follows, the proof analyzes the effect of a separate informative signal about the manager's fit. The firm's expected payoff from offering severance pay remains unchanged. Thus, it is sufficient to show that there is a contract that uses the public signal and leads to a higher expected payoff compared to the contract in part (ii) of Proposition 1. Since it is sufficient to show for at least some parameter values, assume that $e_2\left(\theta_N\right)>c\frac{\theta_N+\theta_G e_2(\theta_G)}{\frac{c}{\delta e_1}+\theta_G c+\Delta\theta\overline{U}}$. This condition will guarantee that the manager always invests in firm-specific human capital in the second period even if her fit in the first period is $\theta_N$ both with the new contract proposed below and the contract from part (ii) of Proposition 1.

Suppose that the board stipulates that the manager is replaced without severance pay

not only if the manager generates low cash flows but also if she generates high cash flows but the public signal shows that her fit is $\theta_N$. Since this happens with probability $\sigma$, the manager is replaced with probability $1-\theta_N+\sigma\theta_N$. Suppose further that $w_1 = w_2 = \Delta w_1 = 0$ and

$$\Delta w_2 = \frac{\frac{c}{\partial e_1} + \theta_G c - (\theta_N - \sigma\theta_N)\, c + (\Delta\theta + \sigma\theta_N)\, \overline{U}}{\theta_G\,(\theta_N + e_2\,(\theta_G)\,\Delta\theta) - (\theta_N - \sigma\theta_N)\,(\theta_N + e_2\,(\theta_N)\,\Delta\theta)}.$$

Similar to Proposition 1, this contract satisfies all incentive and participation constraints. It is straightforward to verify that $\frac{\partial \Delta w_2}{\partial \sigma} < 0$.

The firm's expected payoff is

$$\begin{aligned} V_1^{nsp} &= x + (\theta_N + e_1\Delta\theta)\,\Delta x + \delta e_1\theta_G\,(x + (\theta_N + e_2\,(\theta_G)\,\Delta\theta)\,\Delta x) \\ &\quad +\delta\,(1-e_1)\,(\theta_N - \sigma\theta_N)\,(x + (\theta_N + \mathbf{e}_2\,(\theta_N, x_H)\,\Delta\theta)\,\Delta x) - U_1^{nsp} \\ &\quad +\delta\,(e_1\,(1-\theta_G) + (1-e_1)\,(1-\theta_N+\sigma\theta_N))\left(\overline{U} + V_{new}\right). \end{aligned}$$

where $V_{new}$ is given by expression (A.19) and

$$\begin{aligned} U_1^{nsp} &= -c + \delta e_1\left(\theta_G\,((\theta_N + e_2\,(\theta_G)\,\Delta\theta)\,\Delta w_2 - c) + (1-\theta_G)\,\overline{U}\right) \\ &\quad +\delta\,(1-e_1)\left((\theta_N - \sigma\theta_N)\,((\theta_N + e_2\,(\theta_N)\,\Delta\theta)\,\Delta w_2 - c) + (1-\theta_N+\sigma\theta_N)\,\overline{U}\right). \end{aligned}$$

Taking the derivative with respect to $\sigma$, we have

$$\begin{aligned} \frac{\partial}{\partial\sigma}V_1^{nsp} &= -\delta\,(1-e_1)\,\theta_N\left((e_2\,(\theta_N) - e_1)\,\Delta\theta\Delta x + \frac{\theta_N c}{e_1\Delta\theta} - (\theta_N + e_2\,(\theta_N)\,\Delta\theta)\,\Delta w_2\right) \\ &\quad -\delta e_1\theta_G\,((\theta_N + e_2\,(\theta_G)\,\Delta\theta) + (1-e_1)\,(\theta_N - \sigma\theta_N)\,((\theta_N + e_2\,(\theta_N)\,\Delta\theta)\,\Delta w_2 - c))\,\frac{\partial\Delta w_2}{\partial\varepsilon} \\ &> 0. \end{aligned}$$

proving the claim. **Q.E.D.**

# Appendix B Enforceability Index (Malsberg, 2004)

**Question 1**. Is there a state statue of general application that governs the enforceability of covenants not to compete?

*Threshold 1.* States that enforce non-competition agreements outside a sale-of-business context receive a score of one.

**Question 2**. What is an employer's protectable interest and how is it defined?

*Threshold 2.* States in which the employer can prevent the employee from future independent dealings with all the firm's customers, not merely with the customers with whom the employee had direct contact, receive a score of one.

**Question 3**. What must the plaintiff be able to show to prove the existence of an enforceable covenant not to compete?

*Threshold 3.* Laws that place greater weight on the interests of the firm relative to those of the former employee are above the threshold. For example, a law that requires that the contract be reasonably protective of the firm's business interests and only meet the condition of not being unreasonably injurious to the employee's interests would receive a score of one.

**Question 4**. Does the signing of a covenant not to compete at the inception of the employment relationship provide sufficient consideration to support the covenant?

*Threshold 4.* States for which the answer to Question 4 is clearly "Yes" are above the threshold.

**Question 5**. Will a change in the terms and conditions of employment provide sufficient consideration to support a covenant not to compete entered into after the employment relationship has begun?

*Threshold 5.* States for which the answer to Question 5 is clearly "Yes" are above the threshold.

**Question 6**. Will continued employment provide sufficient consideration to support a covenant not to compete entered into after the employment relationship has begun?

*Threshold 6.* States for which the answer to Question 6 is clearly "Yes" are above the threshold.

**Question 7**. What factors will the court consider in determining whether time and geographic restrictions in the covenant are reasonable?

*Threshold 7.* Jurisdictions in which courts are instructed not to consider economic or other hardships faced by the employee are above the threshold.

**Question 8**. Who has the burden of proving the reasonableness or unreasonableness of the covenant not to compete?

*Threshold 8.* States in which the burden of proof is clearly placed on the employee are

above the threshold.

**Question 9**. What type of time or geographic restrictions has the court found to be reasonable? Unreasonable?

*Threshold 9*. Jurisdictions in which three-year statewide restrictions have been upheld receive a score of one.

**Question 10**. If the restrictions in the covenant not to compete are unenforceable because they are overbroad, are the courts

permitted to modify the covenant to make the restrictions more narrow and to make the covenants enforceable?

*Threshold 10*. States for which the answer to Question 10 is clearly "Yes" are above the threshold.

**Question 11**. If the employer terminates the employment relationship, is the covenant enforceable?

*Threshold 11*. States for which the answer to Question 11 is clearly "Yes" are above the threshold.

**Question 12**. What damages may an employer recover and from whom for breach of a covenant not to compete?

*Threshold 12*. If, in addition to lost profits, there is a potential for punitive damages against the former employee, the state receives a score of one. States that explicitly exclude consideration of the reasonableness of the contract from the calculation of damages are also above the threshold.

**Table 1: Descriptive statistics.** $Weakenforcement$ is an index of the enforcement of noncompetition agreements, which proxies for managers' outside options conditional on leaving the firm. The enforcement of noncompetition agreements over 1992–2017 is defined as in Garmaise (2011) and Malsberger (2004) based on the 12 questions and thresholds, stated in Appendix C. The index increases by one point for every question whose answer is above the threshold. The weakening and strengthening of the enforceability of noncompetition agreements in different states over time comes from Ewens and Marx (2018), Marx (2018), and Kini et al. (2018). To obtain an index of weak enforcement, the scores are multiplied by minus one. $Tobin's\ Q$ is the market value of equity plus assets minus the book value of equity over book assets. $Log(sales)$ is the log of sales in 2004 U.S. dollars. $Log(age)$ is the log of the firm's age. $Lagged\ cash\ flow\ volatility$ is the volatility of the net operating cash flows in the preceding year. $Total\ Similarity$ is Hoberg and Phillips' (2016) index of the similarity of a firm to its peers. $Severance\ pay/(salary + bonus)$ is the ratio of severance pay to the manager's average salary and bonus from the last three years. All accounting variables are winsorized at the $1^{st}$ and $99^{th}$ percentile.

Panel A: *Enforcement of noncompetition agreements*

| State | Score | Strengthened | Relaxed | State | Score | State | Score |
|---|---|---|---|---|---|---|---|
| Florida | 7 | 1996 | | Alaska | 3 | Missouri | 7 |
| Louisiana | 4 | 2003 | 2001 | Alabama | 5 | Montana | 2 |
| Ohio | 5 | 2004 | | Arizona | 3 | Nebraska | 4 |
| Vermont | 5 | 2005 | | Arkansas | 5 | Nevada | 5 |
| Idaho | 6 | 2008 | | California | 0 | New Jersey | 4 |
| Wisconsin | 3 | 2009 | | Connecticut | 3 | New Mexico | 2 |
| Georgia | 5 | 2011 | | Delaware | 6 | New York | 3 |
| Virginia | 3 | 2013 | | District of Columbia | 7 | North Carolina | 4 |
| Colorado | 2 | 2011 | 2013 | Indiana | 5 | North Dakota | 0 |
| Illinois | 5 | 2011 | 2013 | Iowa | 6 | Oklahoma | 1 |
| Texas | 5 | 2009,2011 | 1995 | Kansas | 6 | Pennsylvania | 6 |
| Oregon | 6 | | 2008 | Maine | 4 | Rhode Island | 3 |
| South Carolina | 5 | | 2010 | Maryland | 5 | South Dakota | 5 |
| New Hampshire | 2 | | 2012 | Massachusetts | 6 | Tennessee | 7 |
| Kentucky | 6 | | 2014 | Michigan | 5 | Washington | 5 |
| Hawaii | 3 | | 2015 | Minnesota | 5 | West Virginia | 2 |
| Utah | 6 | | 2016 | Mississippi | 4 | Wyoming | 4 |

Panel B: *Descriptive statistics*

| | Mean | Median | SD | | Mean | Median | SD |
|---|---|---|---|---|---|---|---|
| Contract years | 3.004 | 3.000 | 1.317 | Total similarity | 6.885 | 1.991 | 15.517 |
| Weak enforcement | -4.152 | -4.000 | 2.119 | Log(sales) | 6.890 | 6.913 | 1.745 |
| Tobin's Q | 1.777 | 1.360 | 1.463 | Log(age) | 2.833 | 2.890 | 0.825 |
| Lagged cash flow volatility | 0.058 | 0.037 | 0.177 | Sev. pay/(salary + bonus) | 1.282 | 1.000 | 1.008 |

**Table 2: Contract length and weak enforcement.** The table analyzes the determinants of contract length. *Contract years* is the length of the contract. $Weak\ enforcement$ is an index of the enforcement of non-competition agreements, which proxies for managers' outside options conditional on leaving the firm. The enforcement of noncompetition agreements over 1992–2017 is defined as in Garmaise (2011) and Malsberger (2004) based on the 12 questions and thresholds, stated in Appendix C. The index increases by one point for every question whose answer is above the threshold. The weakening and strengthening of the enforceability of noncompetition agreements in different states over time comes from Ewens and Marx (2018), Marx (2018), and Kini et al. (2018). To obtain an index of weak enforcement, the scores are multiplied by minus one. $Tobin's\ Q$ is the market value of equity plus assets minus the book value of equity over book assets. $Log(sales)$ is the log of sales in 2004 U.S. dollars. $Log(firm\ age)$ is the log of the firm's age. $Lagged\ cash\ flow\ volatility$ is the volatility of the net operating cash flows in the preceding year. $Total\ Similarity$ is Hoberg and Phillips' (2016) index of the similarity of a firm to its peers. All accounting variables are winsorized at the $1^{st}$ and $99^{th}$ percentile.. All regressions include year and industry fixed effects at the three-digit SIC level. Model (1) presents the results with state fixed effects; models (2), (3), and (4) include firm fixed effects. Model (4) only includes contracts for which it was possible to extract all severance pay information. Robust standard errors clustered at the state level are reported in parantheses. ***,**,* represents statistical significance at the 1%, 5%, and 10% level, respectively.

| | Contract years | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Weak enforcement | 0.107*** | 0.101** | 0.116** | 0.191** |
| | (0.037) | (0.048) | (0.054) | (0.084) |
| Tobin's Q | | | 0.073*** | 0.099* |
| | | | (0.027) | (0.054) |
| Lagged cash flow volatility | | | 0.225*** | 0.277*** |
| | | | (0.079) | (0.088) |
| Total similarity | | | -0.023*** | -0.026** |
| | | | (0.008) | (0.012) |
| Log(sales) | | | -0.088 | -0.067 |
| | | | -0.076 | -0.103 |
| Log(firm age) | | | 0.226 | 0.371 |
| | | | (0.218) | (0.338) |
| Constant | 2.696*** | 3.498*** | 3.505*** | 3.173*** |
| | (0.253) | (0.258) | (0.673) | (0.795) |
| State fixed effects | Yes | Yes | Yes | Yes |
| Firm fixed effects | No | Yes | Yes | Yes |
| Year & industry fixed effects | Yes | Yes | Yes | Yes |
| Only contracts with info on severance pay | No | No | No | Yes |
| Observations | 2,066 | 2,066 | 1,919 | 1,407 |
| Adjusted R-squared | 0.056 | 0.036 | 0.045 | 0.077 |

**Table 3: Severance pay and managers' outside options.** The table analyzes the determinants of severance pay. $Severance\ pay/(salary + bonus)$ is the ratio of severance pay to the manager's average salary and bonus from the last three years. $Weak\ enforcement$ is an index of the enforcement of non-competition agreements, which proxies for managers' outside options conditional on leaving the firm. The enforcement of noncompetition agreements over 1992–2017 is defined as in Garmaise (2011) and Malsberger (2004) based on the 12 questions and thresholds, stated in Appendix C. The index increases by one point for every question whose answer is above the threshold. The weakening and strengthening of the enforceability of noncompetition agreements in different states over time comes from Ewens and Marx (2018), Marx (2018), and Kini et al. (2018). To obtain an index of weak enforcement, the scores are multiplied by minus one. $Tobin's\ Q$ is the market value of equity plus assets minus the book value of equity over book assets. $Log(sales)$ is the log of sales in 2004 U.S. dollars. $Log(firm\ age)$ is the log of the firm's age. $Lagged\ cash\ flow\ volatility$ is the volatility of the net operating cash flows in the preceding year. $Total\ Similarity$ is Hoberg and Phillips' (2016) index of the similarity of a firm to its peers. All accounting variables are winsorized at the $1^{st}$ and $99^{th}$ percentile. All regressions include year and industry fixed effects at the three-digit SIC level. Model (1) presents the results with state fixed effects; models (2) and (3) include firm fixed effects. Robust standard errors clustered at the state level are reported in parantheses. $^{***}$,$^{**}$,$^{*}$ represents statistical significance at the 1%, 5%, and 10% level, respectively.

| | Severance pay/(salary + bonus) | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Weak enforcement | -0.100*** | -0.180*** | -0.175*** |
| | (0.026) | (0.027) | (0.031) |
| Tobin's Q | | | 0.004 |
| | | | (0.033) |
| Lagged cash flow volatility | | | 0.199*** |
| | | | (0.066) |
| Total similarity | | | -0.021*** |
| | | | (0.007) |
| Log(sales) | | | 0.060 |
| | | | -0.064 |
| Log(firm age) | | | -0.003 |
| | | | (0.181) |
| Constant | 0.975*** | 0.076 | -0.172 |
| | (0.344) | (0.390) | (0.687) |
| State fixed effects | Yes | Yes | Yes |
| Firm fixed effects | No | Yes | Yes |
| Year & industry fixed effects | Yes | Yes | Yes |
| Only contracts with info on severance pay | Yes | Yes | Yes |
| Observations | 1,499 | 1,499 | 1,397 |
| Adjusted R-squared | 0.047 | 0.084 | 0.095 |