Relational Retention*

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Version: February 17, 2019

Abstract

This paper uses a repeated-game model to study the retention of talented workers in the face of competition for talent. When the job benefits that workers value are non-contractible, retention cannot be achieved by a sequence of spot contracts, but must be based on self-enforcing long-term agreements, which we call relational retention contracts. Retention then is successful only if workers trust their employers' promises. We demonstrate that relational contracts are valuable even if there are no incentive problems inside firms, and that firms with a relatively low valuation for talent may be able to retain talented workers. The latter finding generates a rationale for inefficient, but stable assignments of workers to jobs.

Keywords: Retention, Talent, Relational Contracts, Repeated Games

JEL Classification: C73, L14, M51

*We are grateful to Tobias Brünner, Daniel Ferreira, Maitreesh Ghatak, Florian Hett, Michael Kosfeld, Jeanine Miklós-Thal, Volker Nocke, Michael Raith, Markus Reisinger, and Patrick Rey for valuable comments and discussions. We are indebted to Guido Friebel for his continued support and advice. The usual disclaimer applies.

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1 Introduction

Retaining a company's top talents has become one of the single most important corporate goals. In many industries, employing workers with superior skills and abilities constitutes a key source of competitive advantage.[1] As a consequence, firms devote an increasing share of their resources to HR departments and talent management.[2] However, firms differ considerably in their ability to retain their most talented workers.[3] It is unclear why – despite the widespread awareness of the importance of talent retention – some firms manage to implement effective retention policies, while many other firms do not.[4]

In this paper, we propose an incomplete contracting approach to analyze the key drivers behind successful retention policies. It is motivated by the fact that many forms of compensation play an important role for a worker's decision to stay or leave, but are typically difficult to specify in a formal employment contract and therefore cannot be legally enforced. These can be monetary benefits like discretionary bonuses, or non-monetary benefits,[5] such as the provision of training (Ichniowski and Shaw 2003), flexible working hours and child care (Flabbi and Moro 2012), procedural and distributive fairness (Pfeffer 2007), decision-making authority (Rotemberg 1993, Athey and Roberts 2001, Brown et al. 2011), teamwork and information sharing (Hamilton et al. 2003, Chi et al. 2011), as well as corporate culture, trust and recognition (Akerlof and Kranton 2005, Dur 2009).

Workers' beliefs about whether their employer will offer non-contractible benefits play a crucial role for their job market behavior. To solve the commitment problem, firms must have a reputation for providing the benefits that workers value. We study the scope for such reputation by analyzing the retention of talent in a repeated-games model. Two firms compete for the services of a talented worker in an infinite time horizon. They have different valuations for talent. Making an offer to the talented worker is costly in the sense that the firm cannot simultaneously make an offer to a less talented (henceforth "untalented") worker. If both firms make an offer to the talented worker, one offer will be rejected and the corresponding firm's period payoff is below the payoff from contracting with an untalented worker.

In this framework, retention cannot be achieved by a sequence of spot contracts. If the high-value firm retains the talented worker in each period, then, anticipating this, the low-value firm does not bother to poach her and instead hires an untalented worker. Thus, when retention is

[1] The positive impact of employing individuals with superior skills on firm productivity is well-documented; see Bertrand and Schoar (2003), Abowd et al. (2005), Fox and Smeets (2011), or Lazear et al. (2015).

[2] See Cappelli (1999) or Michaels et al. (2001).

[3] See, for example, Pfeffer (2007) or Brown et al. (2011).

[4] See Pfeffer (2007).

[5] See Stum (1998), Lazear and Shaw (2009), Allen et al. (2010), or Brown et al. (2011).

successful, the talented worker receives no offer from the low-value firm. The retaining firm is then tempted to exploit the worker's weak bargaining position by offering her a compensation that matches her outside option. In this case, the worker can gain by accepting an offer from the low-value firm that is slightly below that firm's valuation (so that it is profitable for the low-value firm to make such an offer). Consequently, retention must be based on a self-enforcing long-term agreement under which the retaining firm never exploits the talented worker's weak bargaining position. We term such an agreement a *relational retention contract*.

We show that if firms are sufficiently patient, there exists a relational retention contract in which the high-value firm employs the talented worker in all periods ("efficient retention"). This contract ensures that the high-value firm has no incentive to exploit the talented worker's low outside option value and that the talented worker has no incentive to accept a poaching offer that the low-value firm is willing to make. This leads to our first main result, which says that relational contracts are valuable even if there are no incentive problems inside firms.

Furthermore, we find that when the two firms' valuations for talent are sufficiently close to each other, then there also can exist a relational retention contract in which the low-value firm employs the talented worker in all periods ("inefficient retention"). In this case, the maximal self-enforcing compensation each firm can offer through relational retention is the same for both the high- and low-value firm. Intuitively, this is because this maximal compensation does not depend on firms' willingness to pay for talent, but on what a firm can credibly promise to pay in a long-term relationship. This value, in turn, only depends on the low-value firm's valuation of talent. Thus, our second main result is an incomplete-contracting-based explanation for the persistence of a stable, but inefficient assignment of workers to firms.

We check in an extension to what extent our results obtain if firms can offer long-term contracts at the beginning of the contractual relationship. Through long-term contracts, they can commit to a base wage and/or employment in all periods. We show that relational retention contracts with both types of firms can occur in equilibrium if some (non-wage) benefits cannot be regulated through long-term contracts. Specifically, this is the case if effort provision must be motivated through non-contractible bonuses, or if the worker values perks that are complements to wage payments and that cannot be defined in a formal contract (such as the non-monetary benefits mentioned above). Moreover, if the non-contractible aspects of the firm-worker relationship are perks, then again relational contracts are valuable even in the absence of incentive problems inside firms.

Our results shed light on the driving forces behind successful retention policies and on the reasons why some firms tend to be more successful in retaining their talented workers than others. Existing work on implicit contracts has either focused on the provision of effort incentives (see Malcomson 2013 for a survey) or on risk-sharing (see Thomas and Worrall

1988). These models typically assume that outside options are given exogenously, which neglects interactions between parties on the same side of the market. We endogenize the worker's outside option by introducing a second employer and show that this modification constrains the shape of the relational contract.

Pfeffer (2007) discusses several cases of firms that have been successful in keeping their employees happy by providing what he calls "high-commitment work practices." As ingredients of such practices, he lists the provision of training, information sharing, as well as decentralized, team-based decision making. He writes that "[...] there is evidence of substantial variation in human resource management practices across companies within the same industry, with some companies choosing to use a "high road," commitment-based strategy including higher wages and employment security, while other, seemingly similar companies pursue a "low road" approach [...]. More importantly, there is little evidence that firms that use a "low road" approach end up being more competitive or productive." Pfeffer (2007) argues that a likely reason for this reluctance is that managers are myopic, viewing the costs of implementing these practices as more salient than the benefits which typically lie further in the future. This line of reasoning is highly consistent with our interpretation that the inability to retain top talents may reflect a lack of commitment to provide non-contractible job benefits. Our model suggests that the retention of talented workers may be an equilibrium selection problem. Successful retention is characterized by situations where firms continue offering non-contractible job benefits that workers value, while workers do not accept poaching offers that may appear more attractive in the short run.

Relatedly, in business economics, the "employer brand" describes a firm's reputation as an employer. The literature on employer branding emphasizes that in order to build up a reputation for being an attractive employer, firms must make sure that their announcements to new potential hires regarding the benefits from employement are in line with what current employees experience inside the organization (e.g., Barrow and Mosley 2005).

Some types of organizations may be more successful in making credible promises than others. High-skill workers sometimes reject job offers from large, more productive firms in favor of smaller, less productive companies. Cappelli (1999) reports that an increasing share of MBAs from prestigious schools were rejecting job offers with the highest pay (such as positions in investment banking or consulting) and instead choosing to work for small companies and start-up ventures. Friebel and Giannetti (2009) argue that it is easier for small companies to credibly promise the realization of an employee's ideas. Another example of firms who may find it easier to make credible promises to their employees are family-run businesses. A large survey by PriceWaterhouseCoopers (2012) with key decision makers indicates that family-run businesses tend to have a long-term perspective and are more committed to the community they are located in. According to one interviewee, "[f]amily-run businesses tend to have more loyality toward their staff – people are not just a number." So indeed firms may differ in their credibility with respect to future commitments, which may give less productive – but more credible – companies a competitive edge in the labor market.

Finally, for the case of non-contractible bonuses, there are many examples where the failure to pay a promised bonus let workers to quit their jobs. Jonathan Levin (2003) cites the cases of First Boston (Stewart 1993) and Goldman Sachs (Endlich 1999) in which many managers quit as a result of year-end bonuses being lower than expected. Another example is the case of Lincoln Electric (Hastings 1999), cited by Li and Matouschek (2013). Despite huge losses abroad, Lincoln decided to pay their workers bonuses out of a fear that workers would not understand the relationship between foreign losses and their own bonus, and would take a withheld bonus as a breach of trust. Indeed, many small and non-listed companies (whose financial matters are less transparent) face the risk that their workers may not understand whether a low bonus is due to lower profits or due to a breach of trust. Our results suggest that this may have the advantage that it allows firms to commit to provide workers certain benefits.

The remainder of the paper is organized as follows. Section 2 surveys the related literature. Section 3 introduces the formal model. Section 4 analyzes the stage game equilibrium, the scope for relational contracts, and discusses an equilibrium selection argument. Section 5 contains several extensions of the base model, including a version of our model that allows for long-term contracts. Section 6 concludes. All proofs are relegated to the appendix.

2 Related Literature

In their survey on personnel economics, Oyer and Schaefer (2011) lament the scarcity of economic models on firms' retention policies. An exception is Rotemberg (1993) who analyzes the trade-off between the allocation of decision-making authority and the retention of good workers. Further, Hvide and Kristiansen (2012) and Englmaier et al. (2014) study the firm's problem of retaining knowledge-workers. Their focus is on how the acquisition of valuable information by workers affects incentives and retention. In contrast, we study the retention problem by considering the strategic interaction between firms who compete for talent.

Another strand of the literature examines the role of retention for providing incentives, e.g., by offering deferred compensation (Lazear 1981), efficiency wages (Shapiro and Stiglitz 1984), or up-or-out contracts (Kahn and Huberman 1988, Waldman 1990, or Banks and Sundaram 1998). These models view retention as an instrument to provide incentives rather than as an end in itself. In this paper, we are especially interested in the conditions under which employers can retain talented workers.

On a general level, this paper is related to labor search models that allow workers to conduct an on-the-job search; see, for example, Burdett and Mortensen (1998), Postel-Vinay and Robin (2002), Stevens (2004), or Shimer (2006). As in our framework, workers' outside options in these models are determined by the strategic behavior of competing firms. However, they assume search frictions so that workers meet alternative employers at random. This rules out any strategic relationship between the employer and an outside firm that makes poaching offers, which is the central theme in this paper. Moreover, while search frictions naturally imply short-term monopsony power and the existence of match rents, the present paper shows that such rents can exist even in the absence of search frictions when making an offer is costly.

This paper contributes to the large literature that models employment relationships as repeated games between employer and employee. As discussed in the introduction, this literature is mainly concerned with how the ongoing nature of trade can be used to provide incentives or risk-sharing; see, for example, Radner (1985), Thomas and Worrall (1988) and Levin (2003). This paper contributes by studying how relational contracts govern parties' continued participation decision when the strategic interaction between competing employers makes the retention problem non-trivial.

Finally, the strategic form of the stage game underlying the dynamic interaction analyzed in this paper is akin to that of the one-shot matching games studied in Konishi and Sapozhnikow (2008). In the spot market equilibrium of the dynamic game, players' strategies are by construction independent of the play in past periods. The associated equilibrium strategies are then similar to those in the unique equilibrium in the model by Konishi and Sapozhnikow (2008). However, our results on the existence of relational retention equilibria imply that the inefficiency of the stage game equilibrium can be overcome if the game is repeated.

3 The Model

Basic Framework. We consider a talented worker and two firms, H and L, who value the worker's labor services. All parties are risk-neutral and interact in infinitely many periods $t = 1, 2, ...$ In each period, firms must fill a job to generate revenue. They can offer the job either to the talented worker or hire an untalented worker at a zero wage.[6] If in period t firm $i \in \{H, L\}$ employs the talented worker, it generates a revenue of y_{i1}, while if it employs an untalented worker, its revenue is y_{i0}. Firms generate zero revenues whenever their position remains vacant. We assume that revenues increase in talent, $y_{i1} > y_{i0} > 0$ for $i \in \{H, L\}$; firm H is more productive than firm L, $y_{H1} > y_{L1}$ and $y_{H0} \geq y_{L0}$; and talent is more valuable for firm H than for firm L, $\Delta y_H \equiv y_{H1} - y_{H0} > \Delta y_L \equiv y_{L1} - y_{L0}$. Thus, efficiency requires that firm H

[6]Untalented workers are non-strategic players who can be hired at a zero wage.

employs the talented worker in each period.

At the beginning of period t, firms decide simultaneously and non-cooperatively about the wage[7] w_{it} and to which worker x_{it} they offer the job; $x_{it} = 1$ ($x_{it} = 0$) means that firm i offers the job to the talented (to an untalented) worker in period t. Denote by $\mathcal{A} \equiv \mathbb{R}\times\{0, 1\}$ the firms' action space with typical element a_{it}. The talented worker then can choose between the firms' offers or reject all of them. Denote by d_t the talented worker's acceptance decision in period t, where $d_t = H$ ($d_t = L$) if she accepts firm H's (firm L's) offer, and $d_t = 0$ if she rejects all offers.[8] If she chooses $d_t = 0$, her period payoff equals zero. We break ties by assuming that if she is indifferent between the firms' offers, she accepts firm H's offer. Denote by $\mathcal{D} = \{H, L, 0\}$ the talented worker's action space. If firm i's revenue in period t is y_{it} and it employs a worker at wage w_{it}, its period payoff is $y_{it} - w_{it}$, while the worker's payoff is w_{it}.[9] Figure 1 summarizes the sequence of events.

If a firm makes an offer to the talented worker, it also has to provide some time for this worker to contemplate about its acceptance. In the meantime, other applicants (the untalented workers) may accept other offers. Hence, in the case of a rejection, the firm ends up hiring nobody or only a temporary worker who is strictly less qualified than the talented or untalented workers. This assumption is in accordance with a large part of the matching literature, e.g., Konishi and Sapozhnikow (2008).[10]

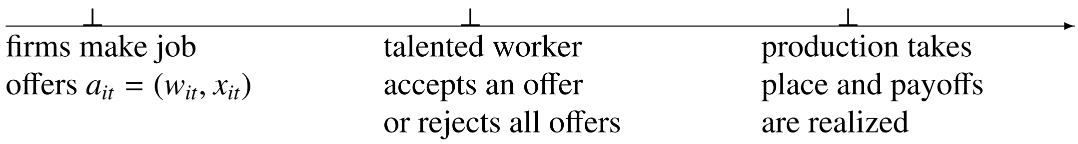

Figure 1: Sequence of events in period t

Strategies and Equilibrium. Let the set of publicly observable outcomes in period t be given by $\varphi_t = (a_{Ht}, a_{Lt}, d_t)$. The history of play up to period t is denoted by $h_t^0 = (\varphi_1, ..., \varphi_{t-1})$. Let H_t^0 be the set of such histories up to period t and $H^0 = \bigcup_{t\geq 1} H_t^0$ the set of all finite histories. Firm i's (behavior) strategy σ_i maps the histories in H^0 into job offers, $\sigma_i : H^0 \to \Delta\mathcal{A}$. The talented worker chooses her action upon observing the job offers. Denote the history of play up

[7] The firms' wage includes all informal aspects of the worker's compensation that are not enforceable.

[8] We assume that if $d_t = i$ and firm i did not make an offer to the talented worker, $x_{it} = 0$, the talented worker's period payoff is $-\infty$.

[9] In our model firms have limited commitment power to retain a worker. One may get similar results in a model with full commitment power when parties have to renew their contract from time to time due to the arrival of new information (as, for example, in Harris and Holmstöm 1987).

[10] Alternatively, the opportunity costs of making an offer may reflect the administrative costs of the process.

to the point when she chooses between offers in period t by $h_t^1 = (\varphi_1, ..., \varphi_{t-1}, a_{Ht}, a_{Lt})$. Let H_t^1 be the set of such histories up to period t and $H^1 = \bigcup_{t\geq 1} H_t^1$. The talented worker's (behavior) strategy σ_W maps the histories in H^1 into a participation decision, $\sigma_W : H^1 \to \Delta\mathcal{D}$.

The strategy profile $\sigma \equiv (\sigma_H, \sigma_L, \sigma_W)$ summarizes the strategies of all parties. Players discount future payoffs by the common discount factor δ. Our equilibrium concept is perfect public equilibrium. A strategy profile σ is a perfect public equilibrium if for given σ and all histories $h_t^0 \in H^0$ strategy $\sigma_i(h_t^0)$ maximizes firm i's expected discounted continuation payoff, and for all histories $h_t^1 \in H^1$ strategy $\sigma_W(h_t^0)$ maximizes the talented worker's expected discounted continuation payoff.

4 Relational Retention Contracts

4.1 The Stage Game Equilibrium

To show that the firms' retention problem is non-trivial, we first characterize stage game equilibrium. Suppose the game is played only once. The talented worker then accepts the offer with the highest wage, and in case of a tie, she chooses firm H's offer.

Proposition 1. *A stage game equilibrium exists and exhibits the following properties. Firm H always offers its job to the talented worker and offers a wage w_{H1} in the range $[0, \Delta y_L]$ according to the probability distribution*

$$F_H(w) = \frac{y_{L0}}{y_{L1} - w}. \tag{1}$$

Firm L offers its job to an untalented worker with probability $\frac{y_{H1}-\Delta y_L}{y_{H1}}$ and with the reverse probability to the talented worker; in the latter case, it offers a wage w_{L1} in the range $(0, \Delta y_L]$ according to the probability distribution

$$F_L(w) = \frac{y_{H1} - \Delta y_L}{\Delta y_L} \frac{w}{y_{H1} - w}. \tag{2}$$

Firm H's equilibrium payoff is $y_{H1} - \Delta y_L$, while firm L's equilibrium payoff is y_{L0}.

Thus, in an equilibrium of the stage game, each firm employs the talented worker with positive probability. To see why, suppose that firm H always offers its job to the talented worker at wage $w_{H1} = \Delta y_L$, which equals firm L's valuation for the talented worker's services. Firm L is then unable to hire the talented worker profitably and therefore offers its job to an untalented worker. However, in this case, the talented worker would accept any non-negative wage offer from firm H. Thus, in equilibrium, firm H will not always offer a wage of $w_{H1} = \Delta y_L$ to the talented worker. Next, suppose that firm H always offers its job to the talented worker at wage $w_{H1} = 0$. Since both firms have a positive valuation for the talented worker's services, this also cannot happen in equilibrium. To prevent firm H from always offering a zero wage, firm L must offer its job to the talented worker with strictly positive probability, which implies that it also must hire her with positive probability. Therefore, both firms mix over wage offers in equilibrium.

Firm H can secure itself a payoff of $y_{H1} - \Delta y_L$, while firm L can earn y_{L0} with certainty. In equilibrium, firms are indifferent between securing these safe payments and choosing any action in the support of their equilibrium strategy. Since firm L hires the talented worker with positive probability, the joint surplus is not maximized in equilibrium. Denote by u^{sg} the talented worker's expected payoff in the stage game equilibrium. The maximal joint surplus in the stage game is $y_{H1} + y_{L0}$ and the joint surplus in equilibrium is $(y_{H1} - \Delta y_L) + y_{L0} + u^{sg}$. Therefore, the inefficiency in the stage game equilibrium amounts to $\psi \equiv \Delta y_L - u^{sg}$.

4.2 Efficient Retention

The stage game equilibrium implies that firms can permanently retain the talented worker only if employment relationships are based on implicit self-enforcing long-term agreements. We call such agreements relational retention contracts.

Definition 1. *A relational retention contract is a perfect public equilibrium in which one firm employs the talented worker in all periods. A proper relational retention contract is a relational retention contract in which every continuation equilibrium is either a relational retention contract or the (finitely or infinitely) repeated play of the stage game equilibrium.*

In a proper relational retention contract, deviations from the equilibrium path of the retaining firm are deterred by the threat of retention by the other firm or by reversal to the stage game equilibrium. That is, we rule out relational retention contracts that require collusion between firms after certain off-equilibrium events (i.e., firms cannot agree on a finely orchestrated punishment path that neither constitutes relational retention nor Nash reversion). In the rest of this section, we study which firm can establish proper relational retention contracts and which of these contracts appears to be the most plausible equilibrium outcome.

As a first step, we analyze how firm H can retain the talented worker ("efficient retention"). For successful retention by firm H the talented worker must not accept a poaching offer that firm L would find worthwhile making. Hence, the wage that firm H pays under the relational rentention contract (henceforth the retention wage) cannot be too small. Next, by construction, firm L will never make an offer to the talented worker on the equilium path of firm H's relational retention contract. This creates a myopic incentive for firm H to offer a zero wage to the talented worker. Hence, the relational retention contract must prevent firm H from exploiting the talented worker's low outside option. The retention wage therefore cannot be too large.

The joint period payoff in a relational retention contract between firm H and the talented worker is y_{H1}, while it is only $y_{H1} - \psi$ in the stage game equilibrium. Hence, the two parties can increase their joint period payoff by ψ. Suppose they agree on the following strategy profile to realize this gain: In each period, firm H offers the retention wage w_H^R to the talented worker and the talented worker accepts it. If at some date t firm H fails to offer w_H^R or the talented worker rejects this offer, all parties revert to the stage game equilibrium from date $t+1$ on.

Consider the talented worker's incentives under this profile. The maximal poaching offer firm L can profitably make, given the suggested strategy profile, is its valuation for talent, Δy_L. Accepting this poaching offer would yield the talented worker a total payoff of

$$(1-\delta)\Delta y_L + \delta u^{sg} = \Delta y_L - \delta\psi. \tag{3}$$

Hence, she sticks to the agreement and always accepts firm H's retention wage if

$$w_H^R \geq \Delta y_L - \delta\psi, \tag{4}$$

which imposes a lower bound on the retention wage that potentially sustains the relational retention contract. Next, consider firm H's incentives. If firm H deviates, it can save the wage costs of w_H^R in the current period, but it will have to compete for the talented worker from the next period on. Its maximal total payoff from deviating is

$$(1-\delta)y_{H1} + \delta(y_{H1} - \Delta y_L). \tag{5}$$

Thus, firm H will stick to the agreement if $y_{H1} - w_H^R \geq (1-\delta)y_{H1} + \delta(y_{H1} - \Delta y_L)$, which we can rewrite as

$$w_H^R \leq \delta\Delta y_L. \tag{6}$$

This inequality puts an upper bound on the retention wage. This bound is the maximal wage firm H can credibly promise to the talented worker in the long-term employment relationship.

A relational retention contract in which firm H always employs the talented worker exists if the incentive constraints in (4) and (6) are satisfied simultaneously. This is the case if

$$\delta\psi \geq (1-\delta)\Delta y_L. \tag{RH}$$

Condition (*RH*) is satisfied if the discount factor δ is sufficiently large. We then can find a retention wage $w_H^R \in [(1-\delta)\Delta y_L, \delta\psi]$ so that the corresponding strategy profile constitutes an equilibrium. We thus get the following result.

Proposition 2. *There exists $\delta^H < 1$ such that for all $\delta \geq \delta^H$ a proper relational retention contract exists in which firm H employs the talented worker in all periods.*

The preceding analysis illustrates the properties of a successful retention strategy. The talented worker must have sufficient incentives to perpetually extend her employment contract, and firm H must find it optimal to offer her a satisfactory compensation package. Firm H's ability to successfully retain the talented worker depends not so much on its superior valuation of her services, but on the credibility of its promise to constantly provide the benefits that the worker values. Thus, relational contracts can be valuable even if there is no incentive problem inside firms.

4.3 Inefficient Retention

Suppose that firm L and the talented worker form a long-term relationship. Their joint period payoff then is y_{L1}, while in the stage game equilibrium their joint payoff is only $y_{L1} - \psi$. Thus, they can raise their joint period payoff by ψ, which is the same value as for the efficient relational retention contract.

We examine whether firm L can retain the talented worker ("inefficient retention"). Consider the same relational retention contract as for firm H and denote by w_L^R the corresponding retention wage. The talented worker's incentive to reject w_L^R depends on the maximum poaching offer that firm H would be willing to make. Note that by returning to the stage game equilibrium, firm H's period payoff would increase from y_{H0} to $y_{H1} - \Delta y_L$. Hence, the maximal poaching offer is $\Delta y_H + \frac{\delta}{1-\delta}(\Delta y_H - \Delta y_L)$. Accepting this offer would yield the talented worker a total payoff of

$$(1-\delta)\left[\Delta y_H + \frac{\delta}{1-\delta}(\Delta y_H - \Delta y_L)\right] + \delta(\Delta y_L - \psi). \tag{7}$$

The talented worker does not accept this offer if

$$w_L^R \geq \Delta y_H - \delta\psi. \tag{8}$$

Since firm H is willing to make more aggressive poaching offers than firm L, this constraint is tighter than the one for the relational retention contract with firm H in inequality (4). Next, consider the incentives of firm L. If firm L deviates, it can save up to w_L^R in the current period, but would then have to accept reversion to the stage game equilibrium. Hence, its maximal payoff from deviation is

$$(1-\delta)y_{L1}+\delta y_{L0}. \tag{9}$$

Firm L has no profitable deviation if $y_{L1}-w_L^R \geq (1-\delta)y_{L1}+\delta y_{L0}$, which we rewrite as

$$w_L^R \leq \delta\Delta y_L. \tag{10}$$

Note that this upper bound on the retention wage is the same as for firm H in inequality (6). At first sight, this might seem surprising since firm L earns a strictly lower payoff from retaining the talented worker at a given retention wage. However, recall that firm L also earns a strictly lower payoff than firm H in the stage game equilibrium, and that the stage game equilibrium is the punishment profile for both relational retention contracts. As a result, the maximum wage that firms can credibly promise in a long-term employment relationship is independent of the firm's valuation for the worker's services.

A relational retention equilibrium in which firm L always employs the talented worker exists if the constraints in (8) and (10) are satisfied simultaneously, which is the case if

$$\delta\psi \geq \Delta y_H - \delta\Delta y_L. \tag{RL}$$

This condition is satisfied if and only if $\Delta y_L > \Delta y_H - \psi$ and the discount factor δ is sufficiently close to one. We get the following result.

Proposition 3. *If $\Delta y_L > \Delta y_H - \psi$, there exists $\delta^L < 1$ such that for all $\delta \geq \delta^L$ a proper relational retention contract exists in which firm L employs the talented worker in all periods.*

Even though firm H has a strictly higher valuation for the worker's services than firm L (and although information about players' payoff functions is symmetric), there exist equilibria in which the talented worker is permanently retained by firm L. The reason for this is that retention cannot be achieved by spot contracts. As a consequence, firms' ability to retain the talented worker does not depend on their relative valuation for her services, but on their ability to credibly promise to constantly provide the unenforceable benefits the worker values.

4.4 Equilibrium Selection

Propositions 2 and 3 imply that it may not be clear which firm retains the talented worker. To make a plausible prediction about which equilibrium outcome materializes, we develop an appropriate equilibrium selection criterion. Note that in each of the outlined relational retention contracts the talented worker's period payoff is strictly larger than in the stage game equilibrium. It appears plausible to use the talented worker's total payoff as the criterion to select among different relational retention contracts. In particular, one can imagine that, before the game starts, firms compete in relational retention contracts for the talented worker's labor services. We therefore define the following selection criterion.

Definition 2. *A proper relational retention contract σ is switching-proof if there does not exist another proper relational retention contract $\tilde{\sigma}$ under which (i) the talented worker is retained by the other firm, (ii) she earns a strictly higher total payoff, and (iii) in which a non-switching-proof proper relational retention contract does not constitute a continuation equilibrium.*

This selection criterion captures the idea that each firm could "propose" a proper relational retention contract to the talented worker. Such proposals must be credible in the sense that they are indeed perfect public equilibria. The worker then "chooses" the proposal that maximizes her total discounted payoff. A proper relational retention contract σ with firm i is switching-proof if firm $-i$ cannot come up with an alternative proper relational retention contract $\tilde{\sigma}$ which is strictly better for the talented worker than σ and which does not employ a non-switching-proof proper relational retention contract as continuation equilibrium.

Trivially, when condition (*RH*) holds while (*RL*) does not, any proper relational retention contract between firm H and the talented worker is switching-proof. Note that when condition (*RL*) holds, then also condition (*RH*) is satisfied. Applying switching-proofness then yields the following result.

Proposition 4. *If condition (RL) holds, then for each firm $i \in \{H, L\}$ there is a switching-proof proper relational retention contract in which firm i employs the talented worker in all periods and pays the retention wage $w_i^R = \delta \Delta y_L$.*

When condition (*RL*) holds, two proper relational retention contracts satisfy switching-proofness, one for each firm and each one paying the maximal possible retention wage. This result shows that even after applying an appropriate equilibrium refinement, it is not possible to eliminate inefficient equilibria in which the talented worker is permanently retained by firm L. Thus, an inefficient assignment of workers to firms can be stable even in the absence of informational frictions. As argued above, the reason for this is that the costs of reneging on a given wage promise are exactly the same for both firms.

The result in Proposition 4 depends on the restriction to proper relational retention contracts (which do not involve cooperation between firms off the equilibrium path). In the appendix, we construct a (non-proper) relational retention contract under which firm H pays a retention wage $w_H^R > \delta \Delta y_L$. However, this contract employs a continuation equilibrium off the equilibrium path in which the two firms collude and pay a zero wage to the talented worker (which would raise the question why firms do not collude on the equilibrium path).

5 Extensions

We consider several extensions of our base model. In Subsection 5.1, we introduce incentive problems and analyze under what conditions our main results remain unchanged. In Subsection 5.2, we evaluate how the value of the talented worker's outside option affects the scope for relational retention. In Subsection 5.3, we study whether our main results remain valid if firms can offer long-term contracts.

5.1 Incentive Problems

Relational contracts are usually motivated by the need to provide incentives for the worker to exert effort. In this subsection, we introduce an incentive problem in our base model and demonstrate under what circumstances our results generalize to the new setup. In order to compare the equilibrium set in the updated model to that in the base model, we make the following assumptions. If firm i hires the talented worker in period t, the talented worker decides whether to exert effort ($e_t = 1$) or not ($e_t = 0$). The cost of effort is $c > 0$, while the cost of no effort is zero. If she exerts effort, firm i's revenue is y_{i1}; if she does not exert effort, firm i's revenue is y_{i0}. Firm i's revenue from hiring an untalented worker is y_{i0} as before (there is no effort decision).[11] At the beginning of period t, each firm i specifies the wage w_{it}, the bonus payment b_{it} in case of revenue y_{i1}, and to which worker x_{it} it offers the job. Denote by $W_{it} = w_{it} + b_{it}$ the total compensation firm i offers to a worker in period t. The rest of the model remains the same. We analyze the updated model under two scenarios. First, we assume that the bonus is contractible so that the firm offering the bonus is committed to paying it. Second, we assume that the bonus is non-contractible. A bonus promise is then credible only if it is enforced through a relational contract.

Contractible Bonus. Suppose that the bonus payment is contractible. When the talented worker accepts an offer with bonus b_{it}, she exerts effort only if $b_{it} \geq c$. Firm i therefore offers the job to the talented worker at a positive total compensation $W_{it} > 0$ only if $b_{it} \geq c$. For firm L such an offer is profitable only if $c < \Delta y_L$. In the following, we assume that the cost of effort c is small enough so that $c < \delta \Delta y_L$.

We can derive the stage game equilibrium outcome as in Subsection 4.1. In a stage game equilibrium, firm H always offers its job to the talented worker and offers a total compensation

[11] We thereby avoid making an untalented worker a strategic player.

in the range $[c, \Delta y_L]$ according to the probability distribution

$$F_H(W) = \frac{y_{L0}}{y_{L1} - W}. \tag{11}$$

Firm L offers its job to an untalented worker with probability $\frac{y_{H1}-\Delta y_L}{y_{H1}-c}$ and with the reverse probability to the talented worker; in the latter case, it offers a total compensation in the range $(c, \Delta y_L]$ according to the probability distribution

$$F_L(W) = \frac{y_{H1} - \Delta y_L}{\Delta y_L - c}\frac{W - c}{y_{H1} - W}. \tag{12}$$

Firm H's equilibrium payoff is $y_{H1} - \Delta y_L$, while firm L's equilibrium payoff is y_{L0}. Observe that the firms' payoffs are unaffected by the incentive problem. Denote again by $\psi = \Delta y_L - u^{sg} - c$ the inefficiency in the stage game equilibrium. Since firm L does not hire any worker with some positive probability, we have $\psi > 0$.

Given the inefficiency of the stage game equilibrium, relational retention is again valuable. The proper relational retention contract outcomes outlined in the preceding subsections remain equilibrium outcomes; the only difference is that the retention wage w_i^R is now split up between a wage and a bonus payment of at least c. Denote by W_i^R the corresponding retention compensation. Both firms can retain the talented worker, depending on whether condition (RH) and (RL), respectively, is satisfied for the updated value of ψ. Hence, we get the following result.

Proposition 5. *Consider the model with incentive problems and contractible bonus. If condition (RL) holds, then for each firm $i \in \{H, L\}$ there is a switching-proof proper relational retention contract in which firm i employs the talented worker in all periods and pays a retention compensation of $W_i^R = \delta \Delta y_L$.*

Non-Contractible Bonus. Suppose now that the bonus is non-contractible. The bonus in an offer is only a promise. In equilibrium, it must be in firm i's best interest to pay the promised bonus in case of output y_{i1}. Clearly, in the stage game equilibrium, firms would never pay a bonus and anticipating this the talented worker also does not exert effort. Thus, in any stage game equilibrium firm i's payoff is y_{i0}, while the talented worker earns zero.

Effort can now only be motivated through a relational contract. We consider the following proper relational retention contract between firm i and the talented worker. Firm i offers a total compensation W_i^R with $\Delta y_L > W_i^R > c$ that includes a bonus of $b_i^R = c$; the talented worker always accepts this offer; if any party deviates from this agreement, play returns to the stage game equilibrium immediately. For each party this is the strongest possible punishment.

We show that this agreement constitutes an equilibrium if the discount factor is large enough. Firm i has no incentive to make a different offer, otherwise play reverses to the stage game equilibrium immediately (there are no short-term gains from deviation). Firm i also has no incentive not to pay the promised bonus b_i^R if $-(1-\delta)c + \delta(y_{i1} - W_i^R) \geq \delta y_{i0}$, which we can rewrite as

$$\frac{1-\delta}{\delta}c + W_i^R \leq \Delta y_i. \qquad (RR)$$

Since $W_i^R < \Delta y_L$, this inequality is satisfied if δ is sufficiently close to unity. Finally, observe that firm $-i$ cannot gain by making a poaching offer that the talented worker would accept. Anticipating that firm $-i$ would not pay a bonus, the talented worker would not exert effort after accepting the poaching offer. Hence, firm $-i$ has no incentive to make a poaching offer. We conclude that if δ is large enough, then for any firm $i \in \{H, L\}$ there is a proper relational retention contract in which firm i employs the talented worker in all periods. Note that the value of the relational contract now comes from the resolution of the incentive problem and no longer from the prevention of mis-coordination.[12]

The incentive problem with non-contractible bonus increases the scope for inefficient retention. Recall that in the base model inefficient retention was constrained by the extent to which firm H could poach the talented worker. This constraint no longer exists in the present setting. However, we also see from condition (RR) that only efficient retention can be switching-proof. Since $\Delta y_H > \Delta y_L$ firm H can credibly offer a higher total compensation than firm L. Therefore, only relational retention by firm H with a total compensation of $W_H^R \geq \Delta y_L - \frac{1-\delta}{\delta}c$ is switching-proof. We summarize our results.

Proposition 6. *Consider the model with incentive problems and non-contractible bonus. For each firm i there exists $\delta^i < 1$ such that for all $\delta \geq \delta^i$ a proper relational retention contract exists in which firm i employs the talented worker in all periods. If $\delta \geq \delta^H$, there is a switching-proof proper relational retention contract in which firm H employs the talented worker in all periods and pays a retention compensation of $W_i^R \geq \Delta y_L - \frac{1-\delta}{\delta}c$. There is no such contract for firm L.*

If the cost of effort c is not too large, the critical discount factor for the existence of a proper relational retention contract with firm $i \in \{H, L\}$ is smaller when the bonus is non-contractible (see the appendix for details). The same is true for switching-proof relational retention contracts with firm H. The reason for this is that under formal contracts (contractible bonus) relational retention is constrained by the firms' short-term incentive to exploit the agent's weak bargaining position and by the agent's temptation to accept a poaching offer. These constraints

[12]One can change the payoff structure so that in the stage game equilibrium there is again mis-coordination. Relational retention then creates value both by avoiding mis-coordination and by providing incentives.

vanish if the bonus is non-contractible. The only restriction on δ is then the firms' short-term incentive not to pay the promised bonus, which can be small if c is small.

5.2 Outside Options

So far, we assumed that the talented worker's outside option has the same value as the lowest possible wage in the stage game equilibrium, i.e., she gets a payoff of zero if she does not get (or does not accept) an offer. However, the talented worker may have (self-)employment opportunities that an untalented worker does not have. We now analyze our base model under the assumption that the talented worker has an outside option of value $\bar{w} > 0$ in each period. Firms have to pay at least $\bar{w}$ to her in order to hire her. We assume $\bar{w} < \Delta y_L$ so that both firms can profitably hire the talented worker.

We first check how the outside option changes the stage game equilibrium. As in the previous subsection, we find that in any equilibrium firm H always offers its job to the talented worker at a wage $w_{H1} \in [\bar{w}, \Delta y_L]$, distributed according to

$$F_H(w) = \frac{y_{L0}}{y_{L1} - w}. \tag{13}$$

Firm L offers its job to an untalented worker with probability $\frac{y_{H1} - \Delta y_L}{y_{H1} - \bar{w}}$ and with the reverse probability to the talented worker; in the latter case, it offers a wage w_{L1} in the range $(\bar{w}, \Delta y_L]$ according to the probability distribution

$$F_L(w) = \frac{y_{H1} - \Delta y_L}{\Delta y_L - \bar{w}} \frac{w - \bar{w}}{y_{H1} - w}. \tag{14}$$

The firms' stage game equilibrium payoffs are not affected by the talented workers' outside option. Again, firm H's equilibrium payoff is $y_{H1} - \Delta y_L$, while firm L's equilibrium payoff is y_{L0}. Note that firm H offers on average higher wages than in the base model; firm L offers its job to the talented worker less often, but if it makes an offer to her, it also offers on average a higher wage than when the outside option value is zero. Hence, the talented worker's equilibrium utility, now denoted by $u^{sg}(\bar{w})$, continuously increases in $\bar{w}$ (see the appendix for details), and for $\bar{w} \to \Delta y_L$ it converges to Δy_L.

We can now examine the effect of the talented worker's outside option value on relational retention. As long as $\bar{w} < \Delta y_L$, the stage game equilibrium is inefficient so that relational retention produces gains of $\psi(\bar{w}) = \Delta y_L - u^{sg}(\bar{w})$. As in Subsection 4.2, we can show that if the discount factor δ is large enough, there is a proper relational retention contract in which firm H employs the talented worker in all periods. However, the same is not true for firm L. Recall from Proposition 3 in Subsection 4.3 that an inefficient proper relational retention contract exists only if $\Delta y_L > \Delta y_H - \psi(\bar{w})$. This condition is violated if $\bar{w}$ is close enough to Δy_L. We can show that in this case there exists no proper relational retention contract in which firm L employs the talented worker in all periods. The intuition is that firm H then can make a poaching offer that is more attractive for the talented worker than staying in the relationship with firm L, regardless of how the parties split the gains from retention $\psi(\bar{w})$. Hence, good outside options on the talented worker's side reduce the scope for inefficient retention.

Proposition 7. *There is a value $\bar{w}^* \in (0, \Delta y_L)$ so that if $\bar{w} > \bar{w}^*$, then there exists no proper relational retention contract in which firm L employs the talented worker in all periods, while such a contract exists for firm H when δ is sufficiently large.*

This result adds to recent literature that analyzes how a minimum wage can change relational contracts (one can interpret $\bar{w}$ as a minimum wage that applies to the talented worker, but not to untalented ones).[13] Board and Meyer-ter Vehn (2015) and Fahn (2017) show that a minimum wage can make relational contracts more productive (and increase welfare) by partially removing the firms' commitment problem. In our case, the minimum wage makes inefficient relational retention less likely.

5.3 Relational Retention and Long-term Contracts

So far, the contracting parties had no commitment power regarding transactions in future periods. However, in reality, firms can commit at least to the base wage in long-term employment contracts. In this subsection, we study under what circumstances our main results remain valid if the two firms in our model have this kind of commitment power. Specifically, we assume that, before the game starts, each firm $i \in \{H, L\}$ chooses a base wage $\bar{w}_i$ for the talented worker and an employment guarantee $\bar{x}_i \in \{0, 1\}$. If firm i has chosen $\bar{w}_i$ and $\bar{x}_i$, then in any period $t \geq 1$ it can only offer wages $w_{it} \geq \bar{w}_i$ to the talented worker and make offers so that $x_{it} \geq \bar{x}_i$. For example, if it chooses $\bar{w}_i = \Delta y_L$ and $\bar{x}_i = 1$, firm i commits to making an offer to the talented worker in each period and to never offer a wage smaller than Δy_L. We analyze the influence of this commitment power on the scope for relational retention in three settings: in the base model without incentive problems; in the model with incentive problems and non-contractible bonus; and in an extension of the base model in which the agent derives utility from both her wage and non-contractible perks.

Base Model. We study how the availability of long-term contracts affects relational retention in our base model. First, we examine the stage game equilibrium for given $\bar{w}_i, \bar{x}_i, i \in$

[13]Fong and Li (2017) provide a general analysis of relational contracts when the agent is protected by limited liability and a minimum wage.

$\{H, L\}$. Suppose that $\bar{w}_i \leq \Delta y_L$, $\bar{x}_H \in \{0, 1\}$, and $\bar{x}_L = 0$. The analysis is then similar to that in Section 5.2. In the stage game equilibrium, firms play mixed strategies (if possible), firm H's expected payoff is $y_{H1} - \Delta y_L$, and firm L's expected payoff is y_{L0}. Next, suppose that firm L commits to making offers to the talented worker, $\bar{w}_i \leq \Delta y_L$, $\bar{x}_H \in \{0, 1\}$, and $\bar{x}_L = 1$. Then, in the unique stage game equilibrium, both firms offer the wage $w_{it} = \Delta y_L$ to the talented worker, so that, by the tie-breaking rule, firm H's payoff is $y_{H1} - \Delta y_L$, while firm L's payoff is zero.[14]

Since firm H's payoff in the stage game equilibrium is the same for all $\bar{w}_H \in [0, \Delta y_L]$, there exists an equilibrium in which firm H commits to wage $\bar{w}_H = \Delta y_L$ and employment of the talented worker, $\bar{x}_H = 1$, while firm L contracts with an untalented worker in each period. Thus, relational retention contracts are now no longer needed to overcome the potential inefficiency in the stage game equilibrium. Moreover, there does not exist an equilibrium in which firm L employs the talented worker in all periods. In such an equilibrium, the talented worker's period payoff is at most Δy_L, while firm H's period payoff would be y_{H0}. Firm H could then increase its payoff by offering $\bar{x}_H = 1$ and $\bar{w}_H = \Delta y_L + \varepsilon$ with $\varepsilon > 0$ small enough so that it always employs the talented worker and earns more than y_{H0} in all periods. Therefore, our main results are not valid in the base model once we allow for long-term contracts. However, as we show next, this changes if some aspects of the employment relationship are non-contractible.

Effort Motivation, Non-Contractible Bonus. We consider the setting from Subsection 5.1 with long-term contracts. The talented worker has to exert costly effort in order to produce the additional output Δy_i at firm i. To motivate effort in period t, the firm i that hires the talented worker has to credibly promise a bonus of $b_{it} \geq c$. Suppose that this bonus is non-contractible. Then, in the stage game equilibrium, the talented worker never exerts effort, and each firm i either hires the talented worker at the lowest possible wage $\bar{w}_i$ with no credible bonus promise, or hires an untalented worker. This holds regardless of the chosen values $\bar{w}_i$, $\bar{x}_i$ for $i \in \{H, L\}$. Thus, effort must again be motivated through a relational contract.

We show that both firms can retain the talented worker in equilibrium. Consider the following relational retention contract between firm i and the talented worker. Firm i offers a total compensation W_i^R with $\Delta y_L > W_i^R > c$ that includes a bonus of $b_i^R = c$ and a guaranteed fixed wage of $w_i^R = \bar{w}_i = W_i^R - c$; moreover, firm i commits to employing the talented worker in all periods, $\bar{x}_i = 1$; if any party deviates from this agreement, play returns to the stage game equilibrium immediately. As in the case without long-term contracts, firm i has no incentive to make a different offer and the talented worker cannot gain by not exerting effort. Firm i also has no incentive not to pay the promised bonus if $-(1 - \delta)c + \delta(y_{i1} - W_i^R) \geq \delta(y_{i0} - \bar{w}_i)$, which we can rewrite as $c \leq \delta \Delta y_i$. Since we assumed $c \leq \delta \Delta y_L$, firm i cannot profitably renege on the promised bonus, which shows our claim.

[14]We can ignore cases with $\bar{w}_i > \Delta y_L$ since they would not be chosen in equilibrium.

By committing to long-term employment, $\bar{x}_i = 1$, firm i reduces the short-term gains from deviating from the relational contract. Note that we can rewrite the incentive constraint (*RR*) as $c + \delta w_i^R \leq \delta \Delta y_i$. If w_i^R is the base wage of the long-term contract and employment is guaranteed, this constraint is relaxed to $c \leq \delta \Delta y_i$. Thus, the combination of long-term and relational contracts can be valuable. Finally, as in the case without long-term contracts, only proper relational retention contracts with firm H can be switching-proof.

Base Model with Perks. As a last step, we show that our two main results are unaffected by long-term commitment if the worker not only cares about the wage w_{it} she gets, but also about the perks that her employer offers. These perks may comprise non-monetary benefits like flexible working hours or corporate culture; they may also be bonus payments that not only increase the monetary compensation, but also signal the employer's recognition of the worker's performance. We assume that wage and perks are complements in the worker's utility function. If in period t the talented worker is employed by firm i at wage w_{it} and perks b_{it}, her period utility equals $U_t = w_{it}^{\alpha} b_{it}^{1-\alpha}$. Firm i's period profit is then $y_{i1} - w_{it} - b_{it}$. The parameter $\alpha \in [0, 1)$ captures the relative importance of wage and perks for the agent. If $\alpha = 1$, perks have no value and we are back in the base model.

Firms can commit to a base wage, but not to a certain level of perks. If firm i wishes to offer utility U to the talented worker in period t, the optimal way to do this is to offer

$$w_{it} = \left(\frac{\alpha}{1-\alpha}\right)^{1-\alpha} U \text{ and } b_{it} = \left(\frac{\alpha}{1-\alpha}\right)^{-\alpha} U. \tag{15}$$

We abbreviate $\Lambda = \alpha^{\alpha}(1-\alpha)^{1-\alpha}$. The minimal costs for the firm to provide utility U are $\frac{U}{\Lambda}$. Note that if firm i chose the base wage $\bar{w}_i > 0$ and U is small enough, the compensation no longer can be chosen efficiently according to (15). Let $C(U \mid \bar{w}_i)$ denote the lowest possible costs of providing utility U when the base wage is $\bar{w}_i$. We can calculate

$$C(U \mid \bar{w}_i) = \frac{U}{\Lambda} \quad \text{if} \quad \bar{w}_i \leq \left(\frac{\alpha}{1-\alpha}\right)^{1-\alpha} U,$$
$$C(U \mid \bar{w}_i) = \bar{w}_i + \left(\frac{U}{\bar{w}_i^{\alpha}}\right)^{\frac{1}{1-\alpha}} \quad \text{if} \quad \bar{w}_i > \left(\frac{\alpha}{1-\alpha}\right)^{1-\alpha} U.$$

Without loss of generality we can restrict the maximal base wage $\bar{w}_i$ to $\alpha \Delta y_L$.[15] Denote by $\bar{U}_L = \Lambda \Delta y_L$ the maximal level of utility firms can offer if they spend Δy_L on the talented worker (wage and perks combined). We can now characterize the stage game equilibrium. Suppose that $\bar{w}_i \in [0, \alpha \Delta y_L]$, $\bar{x}_H \in \{0, 1\}$, and $\bar{x}_L = 0$. Firm H always offers its job to the talented worker

[15]This is the maximal base wage so that a firm can offer utility $\Lambda \Delta y_L$ efficiently. Our results below do not depend on this restriction (in particular, this is true for the qualitative features of the stage game equilibrium).

and offers utility U in the range $[0, \bar{U}_L]$ according to the probability distribution

$$F_H(U) = \frac{y_{L0}}{y_{L1} - C(U \mid \bar{w}_L)}. \tag{16}$$

Firm L offers its job to an untalented worker with probability $\frac{y_{H1}-\Delta y_L}{y_{H1}-C(0|\bar{w}_H)}$ and with the reverse probability to the talented worker; in the latter case, it offers utility U in the range $(0, \bar{U}_L]$ according to the probability distribution

$$F_L(U) = \frac{y_{H1} - \Delta y_L}{\Delta y_L - C(0 \mid \bar{w}_H)} \frac{C(U \mid \bar{w}_H) - C(0 \mid \bar{w}_H)}{y_{H1} - C(U \mid \bar{w}_H)}. \tag{17}$$

Firm H's equilibrium payoff is $y_{H1} - \Delta y_L$, while firm L's equilibrium payoff is y_{L0}. Next, suppose that firm L commits to making offers to the talented worker, $\bar{w}_i \in [0, \alpha \Delta y_L]$, $\bar{x}_H \in \{0, 1\}$, and $\bar{x}_L = 1$. Then, in the unique stage game equilibrium, both firms offer utility $\bar{U}_L$ to the talented worker, so that firm H's payoff is $y_{H1} - \Delta y_L$, while firm L's payoff is zero. Note that the stage game equilibrium is efficient if $\bar{x}_L = 1$, while it is always inefficient if $\bar{x}_L = 0$. If a stage game equilibrium would be played in each period, firm L would never guarantee employment. Thus, the equilibrium outcome is inefficient in the absence of relational contracts.

Denote by $u^{sg}(\bar{w}_H, \bar{w}_L)$ the talented worker's expected utility in the stage game equilibrium when the base wages are $\bar{w}_H, \bar{w}_L$ and firm L does not commit to employment, $\bar{x}_L = 0$. The monetary value of the inefficiency is then $\psi(\bar{w}_H, \bar{w}_L) = \Delta y_L - \frac{1}{\Lambda} u^{sg}(\bar{w}_H, \bar{w}_L)$. Let $\bar{\psi}$ be the smallest possible value of $\psi(\bar{w}_H, \bar{w}_L)$ for all feasible $\bar{w}_H, \bar{w}_L$. Note that $\bar{\psi}$ is strictly positive since firm L offers the job to the talented worker with strictly positive probability.

We now can show that there can exist a proper relational retention contract between firm L and the talented worker. Denote by U_L^R the period utility firm L offers to the worker on the equilibrium path of this contract. Let firm L commit to the wage component of this compensation, $\bar{w}_L = \alpha \frac{U_L^R}{\Lambda}$, but without committing to employment, $\bar{x}_L = 0$. Play returns to the stage game equilibrium as soon as some party does not comply to the term of the contract. As in Subsection 4.3 we find that the talented worker does not accept a poaching offer firm H is willing to make if

$$\frac{U_L^R}{\Lambda} \geq \Delta y_H - \delta \bar{\psi}, \tag{18}$$

and firm L has no incentive to deviate from its promise if

$$\frac{U_L^R}{\Lambda} \leq \delta \Delta y_L + (1 - \delta) \bar{w}_L. \tag{19}$$

Thus, the proper relational retention contract is an equilibrium if $\Delta y_L > \Delta y_H - \bar{\psi}$ and δ is close enough to one. Naturally, also a proper relational contract between firm H and the talented worker exits if δ is sufficiently close to 1. Thus, in the present setting, our two main results obtain: Relational contracts are valuable even in the absence of incentive problems, and the firm with low valuation for talent may be able to retain the talented worker.

6 Conclusion

This paper analyzed the firms' problem to retain scarce talent from an incomplete-contracting perspective. Business scholars and practitioners alike agree that retaining the best employees is a key determinant of organizational success. At the same time, many firms struggle with preventing their most talented workers from leaving to other companies. The driving force behind the failure to retain workers is frequently firms' reluctance to provide job benefits that are important determinants of job satisfaction, such as discretionary bonuses, decision-making authority, job design, work-life balance, organizational culture, trust and recognition, as well as promotion opportunities. Pfeffer (2007) offers an organizational-behavior interpretation of this phenomenon. He claims that from an economics perspective it is puzzling why firms are unwilling to adopt human resource practices that are well-known and not so costly to implement. The present paper provides a resolution to this puzzle based on economic analysis. It suggests that firms' inability to retain their best workers reflects a commitment problem regarding the provision of non-contractible job benefits. Since many forms of compensation are difficult to specify explicitly in a formal employment contract, their constant provision must be self-enforcing. But in that case, the prospect of short-term gains through reductions in personnel expenses may render a firm's promise to constantly provide these benefits non-credible. This notion is also highly consistent with the view that firms may refrain from adopting such human resource practices because their costs are more salient than their benefits.

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Appendix

Proof of Proposition 1. Denote by $supp(\sigma_i)$ the set of wages firm i may offer to the talented worker according to strategy σ_i. The proof proceeds by steps. **Step 1.** We show that for both firms the set of wage offers to the talented worker can be reduced through iterated elimination of strictly dominated strategies to $[0, \Delta y_L]$. If firm L hires the talented worker at wage w_{L1}, its payoff is $y_{L1} - w_{L1}$, while if it hires an untalented worker at zero wage, its payoff is y_{L0}. Hence, we must have $w_{L1} \leq \Delta y_L$ in equilibrium. By the tie breaking rule, all wages $w_{H1} > \Delta y_L$ are therefore strictly dominated for firm H. Next, observe that the talented worker would never accept an offer with a negative wage. Since $y_{i0} > 0$ for both firms i, job offers to the talented worker at a negative wage are also strictly dominated. This completes the proof. **Step 2.** We show that there cannot be a pure strategy equilibrium. Assume by contradiction that such an equilibrium exists. Suppose that in this equilibrium firm L offers $(w_{L1}, 1)$ with $w_{L1} \in [0, \Delta y_L]$. Then firm H optimally makes the same offer and hires the talented worker. But then firm L can increase its payoff by hiring an untalented worker at a zero wage, a contradiction. Next, suppose that firm L hires an untalented worker. Then firm H optimally offers $(0, 1)$. But then firm L can increase its payoff by offering $(\varepsilon, 1)$ with ε close enough to zero, a contradiction. Similar arguments show that in equilibrium both firms must play mixed strategies. **Step 3.** We show that in any equilibrium firm H always offers the job to the talented worker, while firm L offers the job to both worker types with positive probability. From this step it also follows that firm L will never offer $(0, 1)$. First, consider firm H. By offering $(\Delta y_L, 1)$, it can ensure itself a profit of $y_{H1} - \Delta y_L > y_{H0}$. Thus, firm H never offers a job to an untalented worker. Next, consider firm L. Assume by contradiction that there is an equilibrium in which firm L always offers the job to the talented worker. Denote $\underline{w}_H = \inf\{w_{H1} \mid w_{H1} \in supp(\sigma_H)\}$. Assume w.l.o.g. that firm H offers $\underline{w}_H$ with strictly positive probability. By the tie-breaking rule, firm L will then never offer a wage smaller or equal to $\underline{w}_H$. But then it is also not rational for firm H to offer $\underline{w}_H$, a contradiction. Thus, firm L offers the job to an untalented worker with positive probability. **Step 4.** We derive the equilibrium payoffs. From Steps 2 and 3 it follows that firm L's equilibrium payoff is y_{L0}. To derive firm H's equilibrium payoff, define $\overline{w}_H = \sup\{w_{H1} \mid w_{H1} \in supp(\sigma_H)\}$. Suppose that in an equilibrium we have $\overline{w}_H < \Delta y_L$.

Then firm L could increase its profit above y_{L0} by offering $(w_{L1}, 1)$ with $w_{L1} \in (\overline{w}_H, \Delta y_L)$, a contradiction. We therefore must have $\overline{w}_H = \Delta y_L$ in equilibrium. This implies that firm H's equilibrium payoff is $y_{H1} - \Delta y_L$. **Step 5.** Recall from Step 4 that $\overline{w}_H = \Delta y_L$. We show that there is no gap $(a, b) \subset [0, \Delta y_L]$ with $a < b$ in $supp(\sigma_H)$. Assume by contradiction, that there is one. Assume w.l.o.g. that b is a limit point of $supp(\sigma_H)$. Firm L then also does not offer a wage $w_{L1} \in (a, b)$ in this equilibrium. Suppose that firm H offers $w_{H1} = b$ with positive probability. By the tie-breaking rule, firm L then does not offer this wage with positive probability. But then firm H can increase its profit by offering $w_{H1} = b - \varepsilon$ for some $\varepsilon < b - a$; to see this, note that the probability of hiring at wage b for firm H must weakly exceed $\frac{y_{H0}}{y_{H1}}$. Next, suppose that firm H does not offer $w_{H1} = b$ with positive probability. Then we can find a $w^*_{L1} \in supp(\sigma_L)$ close enough to (or equal to b) so that firm L can increase its profit by offering $w^*_{L1} - \varepsilon$ instead of w^*_{L1} for some $\varepsilon < b - a$, a contradiction. **Step 6.** We characterize the firms' equilibrium strategies. From Step 5 it follows that there is no gap $(a, b) \subset (0, \Delta y_L]$ with $a < b$ in $supp(\sigma_L)$. We choose for each firm i the distribution F_i over wages w_{i1} in $[0, \Delta y_L]$ that makes firm $-i$ indifferent between wages w_{-i1} in $(0, \Delta y_L]$ for $-i = L$ and $[0, \Delta y_L]$ for $-i = H$. Let $1 - p_L$ be the probability that firm L hires an untalented worker. We then have

$$(1 - p_L)y_{H1} = y_{H1} - \Delta y_L, \tag{20}$$

$$F_H(w)(y_{L1} - w) = y_{L0}, \tag{21}$$

$$(1 - p_L + p_L F_L(w))(y_{H1} - w) = y_{H1} - \Delta y_L. \tag{22}$$

Solving these equations for p_L, F_L and F_H gets us the equilibrium strategies stated in Proposition 1. □

Proof of Proposition 4. We show that the proper relational retention contract σ of firm L from Subsection 4.3 with retention wage $w^R_L = \delta \Delta y_L$ is switching-proof. Assume by contradiction that there exists a proper relational retention contract $\tilde{\sigma}$ under which the talented worker is retained by firm H, earns a strictly higher total payoff than under σ, and in which a non-switching-proof proper relational contract does not constitute a continuation equilibrium. Note that $\tilde{\sigma}$ must specify a continuation equilibrium (after some deviation by firm H) in which firm H's continuation payoff is strictly smaller than under the infinitely repeated play of the stage game equilibrium. By assumption, retention by firm L cannot be part of this continuation equilibrium (since no proper relational retention contract by firm L can be switching-proof; note that in equilibrium the smallest possible continuation payoff for firm L is y_{L0}). Thus, by definition, any continuation equilibrium off the equilibrium path either specifies retention by firm H or the repeated play of the stage game equilibrium. Firm H's equilibrium strategy then implies that its payoff is weakly larger than under the infinitely repeated play of the stage game equilibrium (note that firm H can always offer a wage of zero when continuation play specifies retention by firm H), a contradiction. The result then follows from the fact that if condition (RL) holds, then also condition (RH) holds. □

A relational retention contract with $w_H^R > \delta \Delta y_L$. In the following, we assume that a public correlation device realizes at the beginning of each period so that parties can correlate their actions. We consider the following relational retention contract:

- Phase I: Firm H offers the retention wage w_H^R to the talented worker, firm L hires an untalented worker, and the talented worker accepts firm H's offer. If firm H deviates in period t, play continues in phase II in period $t+1$. Otherwise, play continues in phase I.
- Phase II: Firm H hires an untalented worker, firm L offers its job to the talented worker at a zero wage, and the talented worker accepts this offer. If the talented worker does not deviate in this phase after getting an offer from firm L, play continues in phase III in the next period. Otherwise, play continues in phase IV in the next period.
- Phase III: All parties play according to the stage game equilibrium forever.
- Phase IV: The firms use the public correlation device to play according to the following strategy. With probability p firm H offers its job to the talented worker at a zero wage, while firm L hires an untalented worker; with probability $1-p$ firm L offers its job to the talented worker at a zero wage, while firm H hires an untalented worker. If any firm deviates in this phase in period t, play continues in phase III in period $t+1$. Otherwise, play continues in phase IV.

We show that if δ is large enough, we can find a value p and $w_H^R > \delta \Delta y_L$ so that this relational retention contract is indeed an equilibrium. **Step 1.** Consider phase IV. Suppose that both firms comply to the strategy profile and the talented worker accepts the firms' offers. Then with probability p firm H (firm L) earns y_{H1} (y_{L0}) and with probability $1-p$ it earns y_{H0} (y_{L1}). Hence, there exists a $\bar{\pi} > 0$ so that for each $\pi \in [0, \bar{\pi}]$ we can find a $p \in (0,1)$ so that in expectation firm H earns $y_{H1} - \Delta y_L + \pi$ and firm L earns in expectation strictly more than y_{L0}. Standard arguments show that if for given $\pi > 0$ the discount factor δ is close enough to 1, no party can deviate profitably in phase IV. **Step 2.** Consider phase II. Suppose that the talented worker gets a poaching offer of $\hat{w}_H$ from firm H. Since she earns zero in phase IV, it is not profitable for her to accept the offer if $(1-\delta)\hat{w}_H \leq \delta u^{sg} = \delta(\Delta y_L - \psi)$. Note that the largest poaching offer firm H is willing to make is $y_{H1} + \frac{\delta}{1-\delta}\pi$, where π is the difference in firm H's expected period payoff between phase IV and phase III. Thus, no party can deviate profitably in phase II if $(1-\delta)y_{H1} + \delta\pi \leq \delta(\Delta y_L - \psi)$. By Step 1, if δ is sufficiently large, we can choose

p (and thereby π) so that this inequality holds. **Step 3.** Suppose that all parties comply to the proposed strategy profiles in phase II, III and IV. Then firm H's continuation payoff after offering a wage different from w_H^R is strictly smaller than $\delta(y_{H1} - \Delta y_L)$. Thus, we can find a $w_H^R > \delta \Delta y_L$ so that the suggested strategy profile constitutes an equilibrium. This completes the proof. □

Mathematical Details of Subsection 5.1. We show that if c is sufficiently small, then the critical discount factor for the existence of a proper relational retention contract with firm $i \in \{H, L\}$ is smaller when the bonus is non-contractible. Consider a proper relational retention contract with firm L. If the bonus is contractible, a lower bound for the critical discount factor of *any* proper relational retention contract with firm L is defined by (RL) and equals $\delta^C = \frac{\Delta y_H}{\Delta y_L + \psi}$, where $\psi = \Delta y_L - u^{sg} - c$. If the bonus is non-contractible, the critical discount factor is defined by (RR) when we choose the lowest possible compensation $W_L^R = c$. It is then given by $\delta^{NC} = \frac{c}{\Delta y_L}$. We have $\delta^{NC} < \delta^C$ if $\frac{c}{\Delta y_L} < \frac{\Delta y_H}{2\Delta y_L - c}$, which holds if c is sufficiently small. Similar arguments show the same for (switching-proof) proper relational retention contracts with firm H. □

Mathematical Details of Subsection 5.2. We show that $u^{sg}(\bar{w})$ continuously increases in $\bar{w}$. For given $w_{H1} \in (\bar{w}, \Delta y_L)$ denote by $\mathbb{E}[w_{L1} \mid w_{L1} > w_{H1}]$ firm L's expected equilibrium wage offer w_{L1} to the talented worker provided that it exceeds w_{H1}. We derive the density of firm L's wage offers to the talented worker and get

$$f_L(w) = \frac{y_{H1} - \bar{w}}{\Delta y_L - \bar{w}} \frac{y_{H1} - \Delta y_L}{(y_{H1} - w)^2}. \tag{23}$$

Observe that $f_L(w)$ strictly increases in $\bar{w}$ and that $\frac{d}{dw} f_L(w)$ strictly increases in w. Thus, we have that $\mathbb{E}[w_{L1} \mid w_{L1} > w_{H1}]$ strictly increases in $\bar{w}$. The result then directly follows from firm H's equilibrium strategy. □

Proof of Proposition 7. We show that there is no proper relational retention contract in which the talented worker's total payoff is less than $u^{sg}(\bar{w})$. The proposition then directly follows from this result. Suppose that there is a relational retention contract with firm i in which the talented worker's total payoff is less than $(1-\delta)\Delta y_L$ and $(1-\delta)\Delta y_L < u^{sg}(\bar{w})$. Then firm $-i$ could profitably offer a wage w_{-i1} sufficiently close to Δy_L so that the talented worker breaches the contract, a contradiction. Next, suppose that there is a proper relational retention contract with firm i in which the talented worker's total payoff is less than $(1-\delta)\Delta y_L + \delta(1-\delta)\Delta y_L$ and this term is less than $u^{sg}(\bar{w})$. Then firm $-i$ could profitably offer a wage w_{-i1} sufficiently close to Δy_L so that the talented worker breaches the contract, a contradiction; to see this, note that the continuation equilibrium is either the repeated play of the stage game equilibrium or a proper relational contract. Continuing in this fashion shows the result. □