Golden cages for showy birds: Optimal switching costs in labor contracts

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Abstract

Under what circumstances do workers sign contracts with high quitting penalties? Our answer points to market transparency. When the worker’s performance is privately observed by the incumbent firm, alternative employers face an adverse selection problem. As a result, efficient separations can only take place through involuntary layoffs and there is no role for quitting fees. In contrast, when performance is public, quitting fees are useful devices to appropriate the surplus from workers’ reallocation. Separations are amicable and take the form of quitting after downwardly renegotiating the fees. Qualitative features of contracts are independent of the distribution of ex-post bargaining power. The impact of switching costs on total welfare and its distribution depends on the degree of market transparency and the ex-ante distribution of market power. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

Various types of switching costs are frequent in labor contracts. The most common of these switching costs is the severance payment incurred by the firm that chooses to lay the worker off.\footnote{In some countries there are mandatory firing costs, but very often private contracts and collective bargaining agreements include provisions which push the severance payment above the minimum legal level.} Some types of workers who choose to quit, however, often incur costs as well. For instance, managers and other highly qualified workers may be unable to exercise stock options that were given as bonuses. Many types of workers are also entitled to seniority benefits (like pension funds) that they may partially or totally lose if they quit. More generally, workers face implicit quitting costs whenever their total compensation increases with seniority over and above the level explained by the accumulation of generic human capital.

Explicit restrictions on the worker’s mobility can also be observed in some segments of the labor market. For instance, managers’ contracts often stipulate that in the case of quitting, they cannot work for another firm in the industry for some period of time. Professional sports people, such as soccer players in Europe or baseball and basketball players in the US sign contracts whereby both the team and the player are in principle completely locked in for the duration of the contract. More specifically, the player can only quit and move to a different team if the incumbent accepts certain monetary compensation for letting the player go, and the team can only get rid of the player by paying the full stream of committed wages. Furthermore, separations often occur after bargaining over the quitting fee. Contracts with very large quitting fees are also prevalent in other segments of the labor market. For instance, pop stars sign long-term contracts with record labels whereby they commit themselves not to perform for another company; similarly, actors sign contracts with movie studios so that, unless the incumbent agrees, the actor cannot play in a movie filmed by another studio.

Thus, the nature and magnitude of switching costs varies considerably across types of workers. In one extreme, workers can freely quit but firms can only end the relationship at a cost. In the other extreme, both the worker and the firm are in principle completely locked in the relationship and hence separations only occur when both parties agree. The objective of this paper is to propose a theory of switching costs in labor contracts that stresses the importance of the quality of the information about the worker’s productivity obtained by potential employers. Specifically, we address the following three questions. First, we study under which circumstances labor contracts are expected to include large firing and quitting penalties, and their impact on efficiency. Second, we investigate the interplay between the information
structure and contracting features in determining whether separations take the
form of voluntary quits or involuntary layoffs (from the worker’s point of
view). Third, we study how quitting and firing costs affect firm profitability
and workers’ welfare and uncover the implications of regulations preventing
large and explicit penalties on quits, which can be interpreted as voluntary
servitude.

Undoubtedly, when a worker is first hired there is usually much uncertainty
about her productivity. An important distinguishing feature among various
types of workers is how much potential employers learn about her skills and
characteristics once the worker has been hired and has started to work for
the incumbent firm. It could be argued that, in most cases, the incumbent
firm gets a signal of better quality than outside firms, although this quality
differential varies substantially across different segments of the labor market.
We start by considering two extreme cases. We borrow from Milgrom and
Oster (1987), the term ‘visible workers’ to refer to those individuals whose
performance becomes public, so that, after the worker has been employed
for some time, all firms learn how valuable the worker is to all of them.
By contrast, we term ‘invisible workers’ those whose performance is the
incumbent firm’s private information. Thus, after some time, the incumbent
firm learns the value of the worker to itself but no other firm is able to
observe anything.

Thus, it could be argued that most workers are better represented by the
‘invisible worker’ case, while some particular types (like movie actors, artists,
and professional sports players) are closer to the ‘visible worker’ characteri-
ization.

In our model, visible workers sign contracts with sufficiently high buy-out
fees (that is, explicit monetary transfers from the worker to the firm when
the worker quits) and severance payments (explicit monetary transfers from
the firm to the worker when the firm lays the worker off). High buy-out
fees protect the pair worker-incumbent firm from ex-post competition. On
the other hand, severance payments are meant to eliminate incentives to lay
the worker off since this would increase the outsiders’ rents. Despite these
high switching costs the worker is actually relocated when there are gains
from this move: when outsiders value the worker more than the incumbent
firm, the latter finds it optimal to reduce the buy-out fee, induce the worker
to quit and collect the gains generated by the reallocation.

Invisible workers sign contracts that involve a positive and relatively mod-
erate severance payment, tailored to induce the firm to take the efficient layoff
decision. In equilibrium workers do not (voluntarily) quit and thus separations
take the form of involuntary layoffs. Indeed, the market for invisible work-
ers is tainted with the adverse selection problem first pointed out by Akerlof
(1970). Whenever a firm succeeds in attracting a worker away from a bet-
ter informed incumbent it revises down its expectations about the worker’s
productivity (‘winner’s curse’), provided productivity is positively correlated across firms. Therefore, if the reallocation of the worker were to take place through voluntary quits, such an adverse selection problem would imply a tendency for workers to stay with their current employers more often than efficient. An appropriately set severance payment, on the other hand, can help reducing this inefficiency. Thus, in equilibrium all separations are initiated by the firm (layoffs) and are ex-post undesirable for the worker.

Thus, first, according to our model, contracts with large explicit quitting penalties are more likely in segments of the labor market where the performance of the worker is widely observed; in contrast we would not expect them to prevail in markets where the asymmetry of information across firms results in an adverse selection problem.\(^2\) And second, accordingly, we should expect quits as opposed to layoffs when the market is transparent, while layoffs should be expected when ex-post asymmetric information is important and a lemons problem is likely to arise. Such predictions seem to fit quite well the examples mentioned above.

These two results are quite robust. Specifically, they are robust to the distribution of market power, both ex-ante (at the contracting stage) and ex-post (at the reallocation stage). However, market power is obviously crucial to explain the distribution of surplus. In our baseline model firms compete head-to-head for the worker at the contracting stage and contracts are designed in such a way that the worker is efficiently allocated. Thus, the answer to the third question posed above is that ex-ante competition allows the worker to appropriate all potential surplus. In particular, visible workers benefit considerably from giving up the right to move away. Switching costs do not interfere with efficiency and allow the worker to capture the gains from trade. In contrast, if firms enjoy some market power at the contracting stage then buy-out fees help firms in extending their initial market power over time. If workers suffer from a sufficiently weak position at the contracting stage then a ban on quitting fees (due, for instance, to legal restrictions on voluntary servitude) would increase the worker’s welfare.

The literature has emphasized two motives for the existence of switching costs in labor contracts. The first one has to do with the protection of relation-specific investments. For instance, Hashimoto (1981)\(^3\) argued that

\(^2\) The relationship between the predictions of the model and the facts may be biased by enforceability problems. In general, explicit quitting penalties are enforceable only if justified by the damages caused by the quit. In some cases, like in most professional sports, quitting penalties are enforced through self-regulating bodies and contracts are rarely challenged in ordinary courts. As a result, contracts with high quitting fees may not be observed in some of the markets for visible workers, entirely for institutional reasons. In Section 5.4 we discuss this issue in more detail.

\(^3\) Akerlof and Katz (1989) show that upward sloping wage profiles help reducing the costs associated with the shirking problem.
the quitting costs implicit in upward sloping wage profiles can be part of an optimal arrangement to share the costs of firm-specific human capital investments (see Gibbons and Waldman (1999) for a survey of this literature). The second one, provided by the implicit labor contracts literature, has focused on the role of severance payments as instruments for optimal risk sharing (Hart (1983) contains an early survey of this literature. See, also, Malcolmson (1999)). Abstracting from these motives, we propose an alternative theory that offers a rationale for different types of switching costs (firing and quitting costs) for different types of workers, defined according to the degree of market transparency. For each type, switching costs serve a different purpose. In the visible worker case quitting penalties are tools for rent extraction. In the invisible worker case, firing costs ensure the efficient allocation of the worker in the presence of an adverse selection problem that has been widely studied in the literature (see, for instance, Greenwald, 1986).  

The result that full efficiency is attainable is not general, but an artifact of the extreme information assumptions used in the paper, as we show in Section 5. If the incumbent firm as well as rival firms have some private information ex-post, then the optimal contract trades-off ex-post efficiency and rent appropriation. This is in line with Hall and Lazear (1984) who examine the impact of two-sided asymmetric information on the contracting problem between firms and workers and conclude that in general it is not possible to attain ex-post efficient quitting and dismissal decisions. Myerson and Satterthwaite (1983) obtain the same result in a more general setting.  

Although our model is motivated by labor market phenomena it could also be applied to other situations where contracts include compensation damages. In this sense, the questions are similar to those addressed by Aghion and Bolton (1987), Spier and Whinston (1995), and Gilbert and Shapiro (1997). These papers consider a fixed information structure similar to our visible workers case, and investigate the impact of buy-out fees either when

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4 We assume that courts can distinguish between quits and layoffs, which may not be very accurate in the case of invisible workers. In some instances, instead of laying the worker off and paying the corresponding severance payment, the firm may have a way of making the life of the worker miserable so as to induce quitting. Those moral hazard issues are less likely to arise when the degree of transparency is significant. Another important feature is that in regular labor markets, firms tend to contract with a union rather than with individual workers. Thus, employment decisions could be partially separated from individual compensation schemes. In contrast, in the 'visible' worker examples we have discussed it is the individual worker who signs the contract, and aggregate employment is quite irrelevant.

5 The literature on adverse selection in the labor market typically abstracts from contracting issues. Two exceptions are Laing (1994) and Waldman (1990), although both the model specification and the focus of these papers are very different from ours.

6 In their model the worker’s outside option is exogenous (and the worker’s private information), while in our model the whole purpose of the ex-ante contract is to alter such an outside option.
renegotiation is ruled out (Aghion and Bolton, 1987) or when the effect of buy-out fees is through the induced investments (Spier and Whinston, 1995; Gilbert and Shapiro, 1997). Our contribution is to show that a key ingredient to obtain equilibrium contracts with compensation damages is precisely the information structure, in a framework where renegotiation is allowed but still quitting fees have a direct effect on the strategies of outsiders.

The next section presents the basic model, discusses the class of admissible contracts and explains how contracts affect the worker’s reallocation. Sections 3 and 4 study the visible and invisible worker cases, respectively, and contain the main results of the paper. In Section 5, we check the robustness of our results and explore the policy implications of regulating switching costs. Some concluding remarks close the paper.

2. The baseline model

In this section we present a partial equilibrium model of the labor market. In the demand side there are three ex-ante identical firms, indexed by \( i, \ i = A, B, C \), and labor is supplied by a single worker. Any finite number of firms larger than two would yield the same results and would make the presentation unnecessarily cumbersome. Indeed, three is the minimum number of firms necessary to allow for some competition among firms that have not hired the worker.

The productivity of the worker is uncertain and may differ across firms. More precisely, the value of the worker to firm \( i \) is denoted by \( q_i \), where \( (q_A, q_B, q_C) \) is distributed according to the joint density function \( h(q_A, q_B, q_C) \) which takes strictly positive values on \( [\underline{q}, \overline{q}] \times [\underline{q}, \overline{q}] \times [\underline{q}, \overline{q}] \). Function \( h \) satisfies the following properties:

- **A1** – \( h(q_A, q_B, q_C) \) is permutation invariant (symmetric firms).
- **A2** – \( E(q_i) = 1 \).
- **A3** – \( E(q_i | q_j = q) > 0, \ i \neq j \).
- **A4** – \( E(q_i | q_j = \overline{q}) = 1, \ i \neq j \).
- **A5** – \( 0 < \frac{dE(q_i | q_j)}{dq_j} < 1, \ i \neq j \).

Assumption A2 is just a normalization. Assumption A3 helps to simplify the characterization of equilibria in the case of invisible workers, but it is not essential. Symmetry of \( h \) with respect to the mean vector implies assumption A4 but it is not necessary. Finally, assumption A5 implies that \( q_i \)'s are positively but imperfectly correlated.

We assume that the worker is indifferent with regard to working at any of the three firms and only derives utility from her wage income. We normalize the wage reservation value (the opportunity cost in other segments of the
labor market) to 0. All the firms and the workers are assumed to be risk neutral. Finally, firms face no bankruptcy constraints, in the sense that ex-post they can make large negative profits.

2.1. Timing and information structure

Stage 1: Contracts are signed

(1.1) Firms simultaneously offer contracts knowing \( h(q_A, q_B, q_C) \).
(1.2) The worker signs one of the contracts. The chosen firm is called the incumbent, and the contract is observable to all parties.

Stage 2: Information revelation and contract revision

(2.1) The values of the random variables \( (q_A, q_B, q_C) \) are realized.
(2.2) The incumbent firm can implement the contract or offer the worker to revise it, subject to some restrictions which we specify below.
(2.3) Outside firms simultaneously offer employment to the worker at a certain wage.
(2.4) The worker chooses within the feasible set. Again, the set of alternatives will be specified below.\(^8\)

Stage 3: Production

(3.1) Production takes place and players obtain their payoffs.

The distinguishing feature that we wish to emphasize about various types of workers is how much firms learn about their characteristics. In the ‘visible worker’ game (Section 3) we assume that the realizations of \( (q_A, q_B, q_C) \) become common knowledge (and also the offer of the incumbent to revise the contract). Thus, the basic model of visible workers is a game of complete information at stage 2, where given that the firms’ valuations for the worker are imperfectly correlated implies that outsiders have different willingness to pay to attract the worker.

We wish to argue that the job performance of, say, movie actors, popular singers, professional sports people, etc. fits well with such a characterization of visible workers. Also, the performance of top executives and other highly qualified workers is generally well known to (the relevant) outsiders. For the sake of clarity we make the most extreme assumption about how much information firms learn. The results that we will present generalize as long

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\(^7\) \( q \) could be higher or lower than 0. In the latter case, there are realizations of the random variables for which efficiency requires the worker to leave the industry.

\(^8\) As usual, we assume that when the worker is indifferent, she makes the socially efficient choice.
as there is an important flow of information although some uncertainty and asymmetry of information remain (see Section 5).

In the ‘invisible worker’ game, rival firms do not observe the realization of any of the \( q \)'s (stage 2.2). For simplicity, we also assume that the incumbent’s offer to revise the contract is not observed by the rivals. As we show in Section 5, our main conclusions remain even if outsiders can upgrade their beliefs about the quality of the worker after observing the revision of the contract (after observing the moves made by the incumbent firm at stage 2.2). Again, the important difference among the two types of workers is the amount of information the market gets with respect to their productivity. The outsiders’ uncertainty about the value of the worker together with the symmetry of the model results in outsiders competing à la Bertrand.

The timing of our model is analogous to the one used in most of the labor contracting literature (see, for instance, Hart, 1983). It would be natural to give an explicit dynamic interpretation of the model by assuming that the worker is engaged in productive activities at stage 1. In this alternative setting, the contract would determine two different wages, one for the first period (before \( q \)'s are realized) and another for the second period. In our model this would be formally equivalent to allowing for side payments at the time of signing the contract. Hence, if we were to follow this path we would introduce additional considerations associated with the possibility of bonding, the potential role of wage smoothing, and so on, which would considerably complicate the analysis.\(^9\)

2.2. Admissible contracts

We make the plausible assumption that the productivity of the worker is not verifiable by the courts and hence the terms of the contract cannot be made conditional on the realization of the \( q \)'s even when they are observable. Thus, we are dealing with incomplete contracts. A novel aspect of our model is that it allows for payments of different signs and absolute values depending on who initiates the separation. More specifically, a contract can specify three numbers \((w, b, s)\), where \( w \) is the wage, \( b \) is the buy-out fee, i.e., the amount of money that the worker has to pay the firm if she chooses to quit at the end of stage 2, and \( s \) is the severance payment, i.e., the sum the firm must pay the worker if it lays her off at stage 2. In other words, if the firm does not pay \( s \) at stage 2, then the worker is entitled to work at the firm at stage 3 at the contracted wage \( w \). Similarly, if the worker does not pay \( b \) to the firm at stage 2, then the worker must work for the incumbent firm at stage 3 at the contracted wage, \( w \). Hence, before information is revealed, the firm and the worker can commit themselves to trade at a given price \((w)\), but after

\(^9\)See Section 5 for a discussion of some of these issues.
some information is revealed each party can break its commitment by paying a predetermined amount to the other party (\( b \) and \( s \) for the worker and the firm, respectively). Of course, this is so unless the contract is revised, as specified below.

2.3. Contract revision

At stage (2.2) the incumbent firm has the following alternative options: 10

• fire the worker and pay \( s \),
• offer the worker the opportunity of remaining in the firm at a salary \( w' \).
• offer the worker a different buy-out fee, \( b' \).

Clearly, the incumbent firm may offer \( w' = w \) and \( b' = b \), but we assume that it can only modify either the second period wage or the buy-out fee. The idea is that the firm might have to raise the salary if it wants to keep the worker, or might have to reduce the buy-out fee if it prefers to induce her to quit. Again, such an assumption is not important for the main qualitative results but it simplifies the presentation. 11

If the worker is not laid off by the firm he/she either stays and picks \( \max\{w, w'\} \) or else quits and pays the firm \( \min\{b, b'\} \) and chooses one of the outside options.

The timing, and not only the information revealed, can influence the relative bargaining power of the parties. We assume that the incumbent moves first in the renegotiation stage (2.2), which in case of complete information implies an extremely high bargaining power, similar to the ability of making ‘take it or leave it’ offers in a ‘sharing of the pie’ game. Again, in order to check that it is not this extreme division of the bargaining power what drives our results, in Section 5 we generalize the renegotiation process in the case of visible workers and show that our main results do not change in nature. Indeed, the discussion that follows is ‘generic’, in the sense that it describes the results for any distribution of bargaining power, except the most extreme cases favoring the outsider or the worker. This last, extreme case would be equivalent to letting the outsider move first (as in Spier and Whinston, 1995).

In the ‘invisible worker’ case it is relevant whether the incumbent firm can commit itself not to make new offers to the worker after laying her off, that is, at stage 2.3. In principle, the incumbent firm could lay the worker off, pay

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10 Revisions of the severance payment are ruled out since they are only a redundant way of inducing the worker to quit. First, the incumbent firm never finds it optimal to increase \( s \). Second, whenever the incumbent firm offers the worker a lower severance payment, since it would have to be acceptable to the worker, the firm would in fact be inducing the worker to quit, which (by definition) can always be implemented by revising down the buy-out fee.

11 See Section 5.
s, and then offer the worker employment again at any wage. If the parties wish to avoid such a possibility then the contract can simply state that the incumbent firm cannot employ the worker at a wage $w' < w$. Such a clause is renegotiation-proof and only requires that the initial contract be filed (even when terminated) so that the worker can eventually claim the rights stated there.\textsuperscript{12}

2.4. Selection of equilibria

At the revision stage, especially in the case of the visible worker, where offers are publicly observable, any contract will have multiple continuation equilibria. In order to characterize equilibrium contracts, we would then have to specify an equilibrium selection criterion. In our case, the following weak requirement is sufficient for uniqueness of the equilibrium path: at stage 2 no firm makes an offer to the worker that, if accepted, could only result in a payoff below the status quo.

The criterion above precludes wage revisions $w' > w$ by an incumbent with valuation $q$ for the worker, so that $q - w' < b$. Indeed, such an offer might not prevent the worker from leaving, and then the payoff for the incumbent would not change. However, it may have an effect because the worker stays in either case, or because the worker stays only for a revised wage $w'$. In the former case, the incumbent obtains $q - w'$ instead of $q - w$. In the latter, the incumbent gets $q - w'$ instead of $b$. The criterion precludes outside firms’ offers above their valuation, too: an outside firm can guarantee zero profits by not making offers.\textsuperscript{13}

3. The case of ‘visible workers’

In this section we consider the case in which at stage 2.1 the realization of all $q$’s becomes common knowledge. Outside firms observe the contract revision too (stage 2.2).

\textsuperscript{12}In other words, suppose that the incumbent firm executes the contract firing the worker (and paying $s$) and then offers employment (a new contract) at a wage below $w$. If the worker accepts, at the end of the second period she can take the firm to court and claim the initially contracted wage $w$. If instead we assume that the incumbent firm, after paying $s$, can employ the worker again at a wage below $w$, some of the specific results change without altering the general message. Formal arguments are available upon request.

\textsuperscript{13}One could postulate other more ‘game-theoretical’ refinement criteria to deal with a problem that has to do with the fact that an omniscient firm has no preference among many offers that all imply that the worker quits and pays the same buy-out fee. The one offered here is, in our view, the most intuitive.
Let $Q$ denote the maximum total surplus of this market from an ex-ante (beginning of the game) point of view: $Q \equiv E(\max\{q_A, q_B, q_C, 0\})$, and let firm $I$ (incumbent) denote the one that hires the worker at the beginning of the game, firm $O$ denote the outside firm with the highest $q$, and firm $R$ (the residual firm) the outside firm with the lowest $q$, i.e., $q_O \geq q_R$, although $q_I$ can be higher or lower than $q_O$ and $q_R$.

In searching for the set of equilibrium contracts, we first need to analyze the equilibrium behavior after the information is revealed for any given contract. Appendix A contains a careful characterization of this behavior and the associated pay-offs for the firms and the worker. Here it suffices to note the following. Consider a team incumbent-worker deciding together the design of a rent maximizing contract under the constraint that ex-post all parties will be opportunistic. In order to characterize such a contract we have to take into account the following two points.

First, after $(q_R, q_B, q_C)$ are realized layoffs are not an appropriate way to transfer the worker. Indeed, once the worker is laid off the outside firm offers the worker max $(q_R, 0)$ and earns min $(q_O - q_R, q_O)$. Thus, the equilibrium contract must discourage layoffs by setting a high enough severance payment. Second, high buy-out fees do not interfere with the efficient allocation of the worker. Indeed, a sufficiently high buy-out fee can always be reduced to $b' = q_O - w$, which induces the worker to quit, since the outsider in this case has incentives to attract the worker by offering $q_O$. The incumbent firm prefers to let the worker go if and only if $b' = q_O - w \geq q_I - w$; that is, if and only if it is efficient. On the other hand, these high buy-out fees allow the extraction of outsiders’ rents: whenever the worker quits the incumbent appropriates all the profits from the reallocation. Finally, low buy-out fees cannot be ex-post adjusted upwards: the worker would never agree. In particular, if $b < q_O - w$ and $q_I < w + b$, in the continuation game the outsider gets the worker by paying a buy-out fee of $b$, a wage of $w$, and making profits of $q_O - \max\{w + b, q_R\} > 0$. Thus, if the buy-out fee is not high enough the outsider will appropriate some rents.

Proposition 1 formally states that these features indeed characterize an equilibrium contract and it investigates the properties of the equilibrium path:

**Proposition 1.** (a) An equilibrium contract requires sufficiently high switching costs (both severance payments and buy-out fees) and grants the worker the entire surplus. More specifically, a contract is an equilibrium contract.

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14 This is where our selection criterion plays a role: the incumbent, knowing that the outsider would match any wage offer $w'$ so that $q_O \geq w' + b$, could also raise the wage offered to the worker to levels that, if accepted, would result in a loss for it. This ‘charitable’ behavior by the incumbent is what the selection precludes.
if and only if it satisfies the following conditions:

(i) \( s \geq w \),
(ii) \( b \geq q - w > 0 \), and
(iii) \( w = Q \).

(b) The equilibrium contract induces an efficient allocation of the worker, and there are no layoffs along the equilibrium path. That is, the worker quits whenever it is efficient. Furthermore, in order to quit the worker must pay a revised down buy-out fee, which is positive with positive probability.

Proof. See Appendix A. □

Under complete information and imperfectly correlated values the main goal of a contract is to eliminate all the potential profits of outside, well-informed, and perhaps ex-post stronger, competitors. The team incumbent-worker is able to appropriate all the potential gains from the worker reallocation.\(^{15}\) The worker happily accepts important ex-post mobility restrictions, since they result in higher wages. Thus, in those labor markets where there is ex-ante uncertainty about the productivity of the worker and the ex-post value of the worker becomes known and differs across firms, equilibrium contracts will tend to be characterized by high switching costs.

Proposition 1 is based in arguments that are in line with Gilbert and Shapiro (1997). This is not surprising, since in the visible worker game the information structure is identical in both models. Unlike the literature on entry deterrence through provisions on liquidated damages, however, our contract design problem explicitly addresses the issue of which party should initiate the separation. Accordingly, we allow for different payments depending on who initiates the separation, and show that in equilibrium contracts include in either case high compensations to the passive party.

Notice that \( b = s = \infty \) are included in the set of equilibria. These are rather common among soccer players in Europe or basketball and baseball players in the US. As we have argued in Section 1, such athletes are an extreme case of ‘visible workers’ in the sense that their performance is by definition observed by rival teams. This is also a clear instance where layoffs are rare and where buy-out fees are very often renegotiated down, sometimes even to negative amounts: some teams are willing to transfer the worker to a different team after paying part of the player’s salary.

The issue arises as to what is the economic rationale of legal restrictions on voluntary servitude in our framework, since mobility costs create no

\(^{15}\) It is important that the number of potential employers is finite. In fact, as the number of firms go to infinity the difference between the highest and the second highest productivity of a worker should go to zero, and hence the value of ex-ante contracting should also go to zero.
inefficiencies and allow the worker to appropriate all the surplus. This issue is taken up in Section 5.\footnote{Our results are in contrast with some of the literature on the economics of sports, which predicts that infinite quitting penalties simply result in lower salaries and larger profits (Fort and Quirk, 1995). The reason why this is so in Fort and Quirk is that there is built-in market power of teams when they first hire a player. Our model makes it clear that when clubs compete ex-ante for the player, she can appropriate all the surplus so that penalties by themselves are not the source of the problem. As we will see in Section 5, however, ex-ante competition between clubs is essential, and when this fails to be the case penalties on quits allow clubs to extend their monopoly power over time.}

4. The case of ‘invisible workers’

We now consider the case in which at the end of the first period the incumbent firm only learns its own $q$, but nothing else is directly revealed to anyone else. Hence, in the second period outside firms find themselves in an identical position (we cannot distinguish between firm $O$ and firm $R$). In this section we also assume for simplicity that outside firms are not able to observe the revision of the contract. Then they make their offers in the understanding that they will succeed in attracting the worker only when she is of low value to the incumbent firm. In Section 5, we show that this assumption is not crucial, although it simplifies the analysis.

As in many other models of the labor market (like in Greenwald, 1986), in the renegotiation stage potential alternative employers face an adverse selection problem. Thus, the contract signed by the incumbent and the worker must deal with this problem. That is, in contrast with the visible worker case, where the contract was designed to protect the incumbent-worker team from potential outside strong competitors, here the contract is designed to mediate a situation where these competitors are reluctant to outbid the incumbent. Indeed, winning in the competition for the worker means that the worker was not very productive at the incumbent’s. If the productivity of the worker at various firms is correlated, the situation is one of a winner’s curse. Reallocation through voluntary quits is then problematic. Thus, even though it depresses the worker’s wage prospects ex-post, (costly) firing may be the only way to ensure an efficient allocation of the worker, which is the main goal of the contract from an ex-ante point of view. Certainly, extracting rents from outsiders is not an issue here: the mere lack of differentiated information makes outside firms compete à la Bertrand. Next we show how efficient reallocation is attained in equilibrium.

The second best allocation consists of the worker staying at the incumbent firm if $q_I \geq 1$, and otherwise moving to either of the other two firms. Thus,
the potential expected surplus from an ex-ante point of view, \( Q' \), is in this case

\[
Q' = E(\max\{q_i, E(q_i|q_I)\}), \quad i \neq I.
\]

Therefore, in a second best efficient equilibrium, the sum of expected profits and worker’s expected income is equal to \( Q' \).

Given a signed contract \((w, b, s)\) a (pure strategy, perfect Bayesian) equilibrium corresponding to such a subgame could be summarized by:

1. strategy for the incumbent as to when to lay the worker off and how much to offer \((w'\) or \(b'\) otherwise).
2. beliefs for outsiders as to when the incumbent either fires the worker or makes an offer \(w'\) so that \(w + b < x\), or when it makes an offer \(b'\) so that \(w' + b' < x\), set \(Q_x \subset [q, q']\), for any outside offer \(x\).
3. the highest wage offer by outside firms, denoted by \(w^e\),
4. beliefs should be (common among equally informed firms and) consistent with strategies, and agents should maximize pay-offs given their beliefs.

Let us first argue that in a second best efficient equilibrium the worker never quits voluntarily. Suppose she does. Efficiency implies that outsiders believe that they can attract the worker if and only if it is efficient, i.e., \(Q^{w^e} = [q, 1]\). But, \(E[q_i|q_I < 1] < 1\), and therefore \(w^e < 1\) in any efficient equilibrium, since otherwise expected profits would be negative. But, whenever \(w^e < q_i < 1\) the incumbent prefers to match \(w^e\) (i.e., keep the worker by offering appropriate revisions) rather than let the worker go. Then, efficiency is violated.

Let us define the following notation:

\[
\alpha \equiv [1 - H(1)]E(q_i|q_I \geq 1) + H(1)1,
\]

\[
\beta \equiv E(q_i|q_I \leq 1), \quad i \neq I,
\]

where

\[
H(q_I) = \int_{q}^{q} \int_{q}^{q} \int_{q}^{q} h(x, y, z) dx dy dz
\]

is the marginal distribution function of \(q_I\). Notice that \(\alpha > 1 > \beta\). Proposition 2 shows how equilibrium contracts set the proper incentives for reallocating the worker.

**Proposition 2.** (a) The equilibrium contract does not require a positive buy-out fee, but it does require a positive severance payment. Specifically, a contract \((w, b, s)\) is an equilibrium contract if and only if the following
conditions hold:

(i) \( s = w - 1 > 0 \),
(ii) \( b > 1 - w < 0 \),
(iii) \( w = z > Q' \).

(b) The equilibrium induces a (second best) efficient allocation of the worker and the worker gets the entire expected surplus. Separations take place through layoffs. Despite the existence of positive severance payments, if the worker is laid off her utility drops.

Proof. See Appendix A.

Notice that \( b \) could even be negative, and moreover no buy-out fee is paid along the equilibrium path. Condition (ii) ensures that the worker does not quit voluntarily. However, given the equilibrium contract outside firms will still get the worker when it is efficient, i.e., if \( q_I < 1 \), since the incumbent lays the worker off in that case (condition (i)). Thus, they are willing to pay \( \beta \). Given that the contracted wage is equal to \( z \), quits will be discouraged with no (or even negative) buy-out fees.

Finally, ex-ante competition among firms implies that the worker gets the entire surplus. That is, the expected surplus of the worker is

\[
[1 - H(1)]w + H(1)(\beta + s) = Q'
\]

and since

\[
Q' = [1 - H(1)]E(q_I|q_I \geq 1) + H(1)\beta
\]

and

\[
s = w - 1
\]

condition (iii) is satisfied in equilibrium. Notice that the wage is above the unconditional expected value of the worker when she is reallocated efficiently. This is so because the worker’s income drops in case her productivity is low. That is, the severance payment plus the wage with outside firms is lower than the contracted wage \( w \), and thus separations are indeed against the worker’s will.

Summarizing, with ex-post asymmetric information separations take the form of involuntary layoffs. Because of the adverse selection problem a contract that induces voluntary quits involves excessive retention of the worker. Thus, there is no role for positive buy-out fees and the severance payment must be set appropriately so as to induce the incumbent to fire the worker only when efficient.
5. Discussion

In this section we argue that ex-post market transparency is the key ingredient that explains when buy-out fees are used, while the remaining assumptions of the baseline model simplify the analysis but are not essential. We keep the discussion informal and relegate to the appendix formal statements and proofs. Also, we explore the policy implications of the paper regarding legal restrictions on switching costs in labor contracting.

5.1. Ex-post bargaining power

In Sections 3 and 4 we made extreme assumptions concerning the distribution of bargaining power in the renegotiation stage. In the visible worker case, the incumbent firm enjoys a first mover advantage and hence a great deal of bargaining power. Real life renegotiation processes are probably much more complex. They usually involve several simultaneous bargaining problems (the incumbent versus the worker and the worker versus potential alternative employers). The bargaining position of the worker in one of these negotiations is obviously affected by the developments in the other negotiation. One should therefore question whether our results hinge on the bargaining implications of the order of moves rather than on the information structure.

In order to investigate this question, we extend the visible worker model and allow for a more flexible and complex renegotiation process (see Appendix B). In particular, stages 2.2–2.4 are replaced by two simultaneous pair-wise bargaining processes: worker-incumbent and worker-outsider. The solution to each negotiation is modelled as a generalized Nash bargaining solution with exogenous bargaining power for each party. On the other hand, threat points are determined endogenously: they are the equilibrium outcomes in the other negotiation.

In the extreme case in which we give to the incumbent all the bargaining power vis-à-vis the worker (and thus, indirectly, vis-à-vis the outsider) we obtain the same outcome as in the baseline model. In this sense the new model is a generalization that shows the robustness of the results obtained in previous sections. In particular, the outsider extracts strictly lower rents with contracts that include high buy-out fees and severance payment than when contracts include zero switching costs. The reason is that buy-out fees improve the incumbent’s bargaining position, which implies that the worker must give up a larger share of the rents obtained in her negotiation with the outsider. This, in turn, makes the worker a tougher negotiator vis-à-vis the outsider and reduces outsiders’ rents.\footnote{In the extreme case that one of the parties has all the bargaining power in the negotiation between the worker and the outsider, buy-out fees are redundant.} Hence, we must conclude that
buy-out fees are a consequence of the information structure and not just an artefact of the order of moves of our initial model.

5.2. Ex-ante bargaining power and implications of legal restrictions on voluntary servitude

Legal restrictions on voluntary servitude may rule out contracts that, somehow, tie the worker to the firm and thus, outlaw payments from the worker to the firm at the moment of separation. In the context of our baseline model, if buy-out fees are forbidden no firm is willing to offer visible workers any positive wage at the contracting stage (see Appendix B). Thus, in equilibrium the contract includes $w = s = 0$ (spot market), the worker is also efficiently allocated (total surplus remains unchanged) and firms make positive expected profits. Therefore, it seems that provisions restricting payments from the worker to the firm at the moment of separations do not effectively protect the workers’ interests. This, however, is a consequence of the ex-ante distribution of bargaining power that we have assumed. Alternatively, let us assume in the visible worker case that all the bargaining power is in the hands of one of the firms at the contracting stage. This would be the case, for instance, if only one of the firms knows initially the existence of the worker, and the rest only get to know her after observing her performance. In this case, it is clear that $b$ will be sufficiently high and $w = 0$ ($s$ will be irrelevant). Ex-post, whenever $q_o > q_l$, the incumbent firm finds it optimal to reduce the buy-out fee to $q_o$ and let the worker go (the allocation of the worker will be, once again, ex-post efficient). When payments from the worker to the firm in case of separation are ruled out, the initial contract will still include $w = s = 0$, but ex-post the worker will get a wage equal to the second highest $q$, instead of zero.

Similarly, in the invisible worker case the firm with initial monopoly power will offer a contract with a negative severance payment if voluntary servitude was lawful. Indeed, the firm will offer a contract that maximized total surplus and kept the worker at her reservation utility of 0. Such contract involves $w - s = 1$ (efficient separations) and $w = [1 - H(1)](1 - \beta)$, which implies $s < 0$: the worker is required to pay a positive amount to the incumbent if she is fired. On the other hand, if payments to the firm were forbidden, then the contract would be irrelevant ($w = s = 0$), and competition ex-post would insure the worker a positive surplus.

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18 Monetary compensations specified in employment contracts are enforceable only “if they reflect a reasonable estimate of the actual damages caused by the breach” (Malcomson, 1999, p. 2295). However, in some particular cases, like in most professional sports, buy-out fees are enforced essentially through self-regulatory bodies.
We conclude that buy-out fees can be an effective device to extend the incumbent’s market power over time, and thus a ban on such clauses undermines the ability of firms to take advantage of their privileged position in early stages of the worker’s life. Regarding efficiency, legal restrictions on servitude are neutral in the visible worker case, but may imply that invisible workers are inefficiently allocated.

5.3. Observability of contract revision

Our baseline model of the visible worker assumes that outsiders observe the proposal to revise the contract made by the incumbent. On the other hand, the baseline invisible worker case involves not only asymmetric information ex-post but also presumes unobservability of the renegotiation proposal. We should point out that, in fact, only the degree of transparency of the worker’s performance matters, whereas the observability of the renegotiation proposal is not critical for our conclusions.

If rival firms cannot observe the proposal made by the incumbent to the visible worker, then firms are effectively moving simultaneously at stage 2. This means that for virtually all contracts the renegotiation stage has a continuum of equilibria in all of which the firm that values the worker the most ends up employing her. The multiplicity refers to the price paid (in all equilibria, firms tie in bidding for the worker). In Appendix B we show that, for almost all monotone equilibrium selections, the contract still includes high buy-out fees, separations are efficient and are initiated by the worker (quits).

Likewise, if we assume that outsiders observe the offer made to invisible workers the results do not change substantially. The offer may signal the performance of the worker. Again, this means that, in this case, we should not expect uniqueness of (the continuation) equilibrium for any given contract. However, in Appendix B we show that the second best efficient signalling equilibrium requires a contract with severance payments but does not call for buy-out fees. Along the equilibrium path severance payments induce efficient separations which always take the form of ex-post involuntary layoffs. That is, buy-out fees that leave the worker indifferent cannot be a credible signal to rival firms.

5.4. More on robustness

We have checked that some other specific assumptions, such as the inability to simultaneously revise wages and quitting fees, the full enforceability

---

19 An equilibrium selection is a choice of continuation equilibrium for each realization of the productivity vector, and monotonicity refers here to the intuitive idea that higher buy-out fee does not result in lower renegotiated buy-out fees when the worker does leave the incumbent.
of buy-out fees, and firms’ commitment not to rehire the worker after laying her off, are simplifications of the model that do not seriously affect the main results. More substantially, buy-out fees may still be an effective device to expropriate outsiders, even if ex-post some asymmetric information remains. At least this is the case when firms’ valuations have a common component, whose realization is made public, and an idiosyncratic component (independent across firms), whose realization is the firm’s private information. However, in this case buy-out fees may cause some inefficiencies and the optimal contract trades off rent appropriation and efficiency. Finally, our insights carry through dynamic settings provided bonding is ruled out and there are reasons for wage smoothing.20

6. Concluding remarks

We have offered a theory of switching costs in labor contracts based on the degree of observability of the worker’s performance. When performance is observable, in the sense that the market gets as much information as the incumbent, equilibrium contracts include quitting penalties, which reduce the rents available to outsiders. However, when the incumbent has an informational advantage over outsiders, the main goal of switching costs is to induce an efficient allocation of the worker in the presence of an adverse selection problem. Buy-out fees are not appropriate instruments for such a goal, and equilibrium contracts include instead firing costs. In equilibrium, visible workers change employers voluntarily, after probably renegotiating their buy-out fee clauses, whereas invisible workers leave the jobs only when fired.

In both cases, and given our stylized assumptions, switching costs do not interfere with efficiency. Under more general assumptions, this may not be the case, and the equilibrium contract may have to trade-off rent extraction and efficiency. Nevertheless, the relative significance of quitting fees and firing costs is likely to increase and decrease, respectively, with the degree of market transparency.

The distribution of both ex-ante and ex-post bargaining power seem quite irrelevant to explain the characteristics of equilibrium contracts. However, legal restrictions on voluntary servitude effectively protect the workers’ interests only if their bargaining power in early stages of their lives is low.

Our model does not contemplate relation-specific investments. We conjecture that qualitative results would not change if we include such investments on the part of the firm. High buy-out fees make the firm the (ex-post) residual claimant of the productivity of the worker. Thus, rent extraction and incentives to invest are aligned goals. On the contrary, any relation-specific

20 Formal arguments are available upon request.
investment would exacerbate the adverse selection problem in the invisible worker case, and buy-out fees would still be of no use in efficiently allocating the worker. Matters are more complex when we consider relation-specific investments on the part of the worker. Indeed, high buy-out fees would allow the firm to extract all the return of the investment, which creates a serious incentive problem. Thus, in this case, incentives to invest and rent extraction are conflicting goals. However, in most of the examples of visible workers discussed in the introduction, it is the firm that carries out most of the relation-specific investment (training, advertisement, etc.).

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Appendix A.

A.1. Proof of Proposition 1

At stage 2.2 firm $I$ considers three possibilities: (1) retaining the worker; (2) letting the worker go; and (3) firing the worker.

(1) Firm $I$ can retain the worker at the contracted wage $w$ only if it faces no competition, i.e., if $w + b \geq \max\{q_O, 0\}$; otherwise either firm $O$ can make an offer that the worker finds profitable or the worker prefers to leave the market. Therefore, when $w + b < \max\{q_O, 0\}$, then firm $I$ has to offer the worker a higher salary to keep her. Specifically it must offer a salary equal to $\max\{q_O, 0\} - b$, i.e., the firm is forced to renegotiate a higher salary if it intends to keep the worker. Thus, if firm $I$ chooses to retain the worker, then it obtains $q_I - \max\{w, q_O - b, -b\}$. The worker obtains $\max\{w, q_O - b, -b\}$, and outsiders earn zero profit.

(2) Letting the worker go is only viable when the worker is willing to quit. Since by remaining in the firm the worker has guaranteed $w$, she will not quit unless she earns that much.

Assume $q_O \geq 0$. If firm $I$ offers to reduce the buy-out fee to $q_O - w$, then firm $O$ is willing to pay such a buy-out fee plus the contracted wage $w$, so that the worker would accept a move to firm $O$. Of course, the worker would only accept the revised buy-out fee if it is lower than $b$ (after receiving
offers from the outsider, and if she accepts them, the worker does not have any reason to pay more than \( b \) in order to quit). Thus, if \( b < q_0 - w \), letting the worker go implies receiving \( b \). Given our selection criterion, the firm would not raise \( w \), and then \( w' = w \) is the equilibrium revision offer.

Thus, by letting the worker go the incumbent makes \( \min\{b, q_0 - w\} \). The worker makes \( w \). The outsider makes zero rents if \( b \geq q_0 - w \) and positive rents \( q_0 - w - b \) otherwise.

If \( q_0 < 0 \) the worker quits the market, if she quits the incumbent. The payoffs are straightforward in this case, and \( b' = \min\{b, -w\} \).

(3) If it fires the worker, the firm must pay \( s \). Next, rival firms will compete for the worker and if \( q_0 > 0 \), firm \( O \) will offer \( \max\{q_R, 0\} \), which will be accepted by the worker. Therefore, if firm \( I \) fires the worker then it gets \(-s\), the worker earns \( s + \max\{q_R, 0\} \) and the outside firm \( \max\{0, q_0 - \max\{q_R, 0\}\} \).

After these preliminary considerations, we can show that conditions (i)–(iii) are necessary and sufficient conditions for an equilibrium contract.

(I) First, we prove that the three conditions are sufficient for an equilibrium contract.

(I.1) Conditions (ii) and (iii) imply that \( b \geq \bar{q} - w \). Hence \( b \geq q_0 - w \) (and \( b \geq 0 \)) for all \( q_0 \). Thus, whenever firm \( I \) lets the worker go, then firm \( O \) makes zero profits and the worker has no preference between staying and quitting. Moreover, firm \( I \) does not have to raise the wage in order to retain the worker.

(I.2) Under conditions (i)–(iii) firm \( I \) always prefers to reduce the buy-out fee to \( \max\{q_0 - w, -w\} \) to laying the worker off

\[
\max\{q_0, 0\} - w \geq -w = -s.
\]

(I.3) Firm \( I \) retains the worker if and only if it is efficient:

\[ q_I - w \geq \max\{q_0, 0\} - w, \] which is equivalent to \( q_I = \max\{q_0, 0\} \).

(I.4) Given that the allocation is efficient, the expected surplus is equal to \( Q \) and in all cases the outsider’s rents are zero. Thus, the contract maximizes the expected payoff of the worker subject to non-negative expected profits for the incumbent firm.

(II) Second, we show that the three conditions are necessary.

(II.1) Suppose that \( b < \bar{q} - w \). Then there is a positive probability that \( \bar{q} \geq q_0 > b + w > q_I > q_R \), in which case the worker is (efficiently) reallocated but the outsider earns \( q_0 - (b + w') > 0 \) for some \( w' \) in the interval \([w, q_0 - b]\), so that the worker would not appropriate the entire potential surplus. Increasing \( b \) so as to reduce this probability to zero would then increase the profits for the incumbent (with no effect on the worker’s payoff), and then the contract cannot be an equilibrium one.
(II.2) Suppose that $s < w$. Then there is a positive probability that $\max\{q_O, 0\} - w < -s$ (firm $I$ prefers to lay the worker off rather than induce her to quit by reducing the buy-out fee), and $q_I - w < -s$ (firm $I$ prefers to lay the worker off rather than retaining her). Once the worker is laid off firm $O$ makes profits equal to $q_O - q_R$. Thus, outside firms would make strictly positive expected profits and the worker would not appropriate all the potential surplus. The worker would be happy to decrease the wage slightly in exchange of an increase in $s$ that reduces the probability of being laid off with a loss.

(II.3) If $w \neq Q$, then firm $I$ makes either negative expected profits ($w > Q$) or strictly positive profits ($w < Q$). The firm’s participation constraint rules out the first possibility out, and ex-ante competition between identical firms rules out the second. □

A.2. Proof of Proposition 2

A.2.1. Sufficiency

Let (i)–(iii) be satisfied. Also, let $w^e$ be the equilibrium offer by outsiders at stage 2.3.

(1) If $w^e \leq w + b$, then the best reply is retain the worker by offering $b' = w^e - w$, if $q_I - w \geq -s$ (i.e., $q_I \geq 1$) and $q_I - w \geq w^e - w$ (i.e., $q_I > w^e$). If $-s > q_I - w$ and $-s > w^e - w$, then the best reply is to lay the worker off. Finally, if $w^e - w > q_I - w$ and $w^e - w > -s$ the best reply is to set $b' = w^e - w$ and let the worker go. Then, for $w^e$ to be an equilibrium offer $w^e = E[q_i | q_I \leq y]$, where $y = w + \max\{w^e - w, -s\}$ (Bertrand competition by outsiders plus consistency of beliefs).

(2) If $w^e > w + b$, then whenever $q_I - (w^e - b) > b$, $q_I - (w^e - b) > -s$, the best reply for the incumbent is to set $w' = w^e - b$ and keep the worker. If $-s > q_I - (w^e - b)$, and $-s > b$, then the best reply is to fire the worker, and if $b > -s$ and $b > q_I - (w^e - b)$, the best reply is to let the worker go by keeping $w' = w$ and $b' = b$. Again, for $w^e$ to be an equilibrium, $w^e = E[q_i | q_I \leq y]$, where this time $y = \max\{w^e, w^e - b - s\}$.

Notice that, since $b > -s$, this second region requires $w^e = E[q_i | q_I \leq w^e]$, an equation in $w^e$ which has no solution given our assumption A5 on $h$ (Section 2).

On the other hand region 1 has only one candidate $w^e$, satisfying $y = E[q_i | q_I \leq y]$ and $y = \max\{w^e, w - s\} = \max\{w^e, 1\}$, which is $y = 1$ and $w^e = \beta$. (again, $w^e \leq 1$, since $E[q_i | q_I \leq y] \leq 1$). This is indeed an equilibrium provided $b' > 1 - w$ ($< 0$) when $q_I \geq 1$: if outsiders bid above $\beta$, they obtain workers whose $q_I \leq 1$ only (and expect losses) unless $w^e > 1$, in which case the outsider firms expects losses too ($E[q_i | q_I \leq 1] = 1$).

The contract is efficient, all separations take the form of layoffs.
A.2.2. Necessity

In equilibrium, outsiders get zero rents for any contract. If the contract does not implement efficiency it could not be an equilibrium contract. Indeed, notice that, by the reasoning above, and for any \( w^e \) offered by outsiders, \( Q^w \) is an interval \([0, y]\) for some \( y \) (if the incumbent prefers to keep the worker for some \( q_I \) if also prefers to keep her for any \( q'_I > q_I \)). Then, offering \( w^e + \varepsilon \) can only increase \( E[q_I|q_I \in Q^w] \), and then, increasing slightly the offer an outsider can always virtually double profits (by breaking ties with other outsiders). But this immediately implies that the equilibrium contract gives all the rents to the worker, and, given that a contract satisfying the proposition is efficient, it also implies that any equilibrium contract is efficient.

Then, in any equilibrium contract, \( w^e = \beta \). Now, assume that there are voluntary quits with positive probability in equilibrium. If \( b < \beta - w \), then \( b \geq -s \) (i.e., the incumbent can get rid of the worker with a maximum revenue of \( b \)). However, for the incumbent to keep the worker if and only if it is efficient to do so, \( 1 - (\beta - b) = b \), that is, \( \beta = 1 \), which is a contradiction, since \( \beta < 1 \).

If \( b \geq \beta - w \), then the maximum buy-out fee that the incumbent can obtain is \( \beta - w \), and for voluntary quits to be as good as firing \( \beta - w \geq -s \). But then efficiency requires \( 1 - w = \beta - w \), which contradicts the fact that \( \beta < 1 \). Then, voluntary quits cannot be observed in an efficient equilibrium path.

We then look at contracts with only firing in (efficient) equilibrium. In that case, the worker is retained by offering some wage \( w' = \max\{\beta - b, w\} \), and the worker leaves the firm only when she is fired. For an equilibrium to be efficient, \( 1 - \max\{\beta - b, w\} = -s \).

Assume \( \beta - b > w \). Then, the incumbent should offer \( w' = \beta - b \) to keep the worker. But then a deviation by an outsider who offers \( \beta + \varepsilon \) obtains the worker for any realization of \( q_I \), and then this could not be an equilibrium. Thus, efficient equilibrium requires \( w \geq \beta - b \). In this case \( 1 - w = -s \), which is (i) in Proposition 2. Also, if \( 1 - b > w \), then an outsider could deviate offering \( w + b \), obtain the worker for any \( q_I \), and then a value \( 1 - (w + b) > 0 \). Thus \( 1 - b < w \), and we obtain (ii) in Proposition 2. Finally, in any contract satisfying (i) and (ii) with only firing \( w = z \) for the total surplus to accrue to the workers, and this is (iii) in Proposition 2.

\[ \square \]

Appendix B.

B.1. Ex-post bargaining power

Consider the following model of bargaining among the worker, the incumbent firm, and the outsider after the realizations of \( q \)'s become common knowledge. In order to simplify the presentation assume that \( q_I \)'s are always non-negative. We envision renegotiation as a process in which the worker is
involved in two simultaneous negotiations, one with each of the firms. We take contracts \((w, b, s)\) as given. Then the outcome of renegotiation, as in the benchmark model, is a triple \((w_O, w', b')\).

The solution we propose is in the spirit of the Nash bargaining solution. Specifically, parties will strike agreements that satisfy:

(i) in each negotiation surplus is shared according to the (exogenous) bargaining power of the parties involved: the payoffs of incumbent-worker, and outsider-worker satisfy the (generalized) Nash bargaining solutions for the two negotiations given some threat points.

(ii) the threat point of a party in one negotiation is the outcome of the other negotiation (what the party gets if the current negotiation breaks but the other succeeds).

(iii) the worker chooses where to work, given the outcomes of the two negotiations. Whenever she is indifferent we assume that she goes to the most efficient firm.

(iv) no offer is meaningless, i.e., in a negotiation no party concedes anything that in case it is implemented implies lower payoffs than those the party can ensure for itself.

Condition (iv) implies that \(q_O \geq w_O\) and \(w' \geq w\). The first inequality states that the outsider makes no wage offers above its reservation level. The second inequality states that the worker never agrees to accept a wage offer below the contract wage.

Then, define \(\delta_I\) and \(\delta_O\), respectively, as the bargaining power of firm \(I\) and firm \(O\) vis-à-vis the worker. We will consider only the two extreme forms of contracts that can be signed by the incumbent and the worker: a ‘spot’ market contract, with \(b = s = w = 0\), and our equilibrium contract, \(b = s = \infty\), \(w > 0\). We analyze the renegotiation of each in turn.

(1) Suppose \(b = s = w = 0\), and take realizations \(q_I\) and \(q_O\). Consider a candidate solution for the renegotiation \((w', b', w_O)\).

The incumbent and the worker can share a surplus equal to \(\max\{q_I, w_O\}\). If the negotiation with the incumbent breaks (and \(w_O \geq 0\)), then the worker chooses to move to the outsider firm and gets the wage \(w_O\), and the incumbent makes zero profits. Thus, the threat point in their negotiation is \((w_O, 0)\). Suppose \(w_O = q_I\). Then the threat point is in the Pareto frontier, and therefore is itself a solution. Thus, the outcome of bargaining with the incumbent yields \(b' = 0\), and \(w' \in [0, q_I]\). On the other hand, if \(w_O < q_I\), then the incumbent and the worker get the following payoffs:

\[
\begin{align*}
u_I &= \delta_I(q_I - w_O), \\
u'_w &= w' = (1 - \delta_I)q_I + \delta_Iw_O
\end{align*}
\]
and to be consistent with these payoffs $b'$ must satisfy

$$b' \geq - (1 - \delta_l)(w_O - q_I).$$

Consider now the bargaining problem between the outsider and the worker. They can share a surplus equal to $q_O - b'$. If their negotiation breaks, then the worker has only the possibility of working for the incumbent, with a payoff of $w'$, and the outsider gets zero. This is the threat point in the negotiation. If $q_O - b' \geq w'$, then the solution should also satisfy:

$$u_O = \delta_O(q_O - b' - w'),$$

$$u'_O = w_O = (1 - \delta_O)(q_O - b') + \delta_O w'.$$

If $q_O - b' < w'$, the threat point is outside the bargaining set and therefore $u_O = 0$. Then condition (iv) requires that $w_O \in [0, q_O]$.

Therefore, if $q_I > q_O$, any solution satisfies $w' > q_O$, the worker stays at firm $I$ and firm $O$ makes zero profits. If $q_I < q_O$, $w_O$ can be any number in the interval $[(1 - \delta_O)q_O, (1 - \delta_O)q_O + \delta_O q_I]$ and hence, the outsider profits are any number in the interval $[\delta_O(q_O - q_I), \delta_O q_O]$.

(2) Assume $b = s = \infty$, $w > 0$. Again, the incumbent and the worker can share a surplus equal to $\max\{q_I, w_O\}$. Now, however, their threat points are respectively, $q_I - w$ and $w$, since in case their negotiation breaks they are locked-in by their contract ($b = s = \infty$). Also by condition (iv) $w' = w$, since the worker’s reservation utility is now $w$ and the incumbent can guarantee for itself $q_I - w$. If $q_I \geq w_O$, then the threat point is in the Pareto frontier, and therefore itself a solution. In this case, $b' \geq w_O - w$. If $q_I < w_O$, then the outcome of their negotiation yields the following payoffs:

$$u_I = b' = \delta_I w_O + (1 - \delta_I)q_I - w,$$

$$u'_I = w + (1 - \delta_I)(w_O - q_I).$$

The outsider and the worker can share a surplus equal to $q_O - b'$, and their threat points are, respectively, $0$ and $w$. If $q_O - b' - w < 0$, then the threat point dominates any point in the feasible set and the outcome of the negotiation is $u_O = 0$, and $w_O \in [0, q_O]$. Instead, if $q_O - b' - w \geq 0$ then

$$u_O = \delta_O(q_O - b' - w),$$

$$u'_O = w_O - b' = \delta_O w + (1 - \delta_O)(q_O - b').$$

Therefore, if $q_I > q_O$, $w_O < q_I$ the worker stays at firm $I$ and firm $O$ makes zero profits. If $q_I < q_O$, then

$$b' = - w + \frac{\delta_I(1 - \delta_O)}{1 - \delta_I \delta_O} q_O + \frac{1 - \delta_I}{1 - \delta_I \delta_O} q_I.$$
which implies that
\[ u_O = \frac{\delta_O (1 - \delta_I)}{1 - \delta_I \delta_O} (q_O - q_I). \]

Notice that the outsider makes lower expected profits with infinite switching costs than with spot market contracts, for any distribution of bargaining power, except if \( \delta_0 = 1 \). In this case with infinite switching costs \( b' = q_I - w \) and the outsider makes \( u_O = q_O - q_I \) under both contracts, i.e., contracts with infinite switching costs are redundant. The same result would be obtained if we revert the order of moves between the outsider and the incumbent in the baseline model, at the renegotiation stage. Also note that in the limit case of \( \delta_I = 1 \), with infinite switching costs then \( b' = q_O - w \) and the outsider makes \( u_O = 0 \), like in our baseline model.

That is, unless \( \delta_0 = 1 \), or \( \delta_O = 0 \) switching costs are useful in extracting rents from outsiders, and hence must be part of equilibrium contracts.

### B.2. Ruling out switching costs

#### B.2.1. Visible workers

A contract with \( w > 0 \) will be offered in equilibrium only if the firm who attracts the worker makes at least as much expected profits as the other firms.

Let \( q_H, q_M, q_L \) be the highest, middle and lowest realizations, respectively. If \( 0 < w \leq q_M \) then the value of \( w \) is irrelevant for the continuation game, as the worker goes to the firm with the highest valuation and receives \( q_M \).

If \( q_M \leq w \leq q_H \) then the worker still goes to the firm that values her most. If it is the incumbent firm the one with the highest valuation then this firm makes \( q_H - w \), but if it is an outside firm then it makes at least \( q_H - q_M \geq q_H - w \).

Similarly, if \( w \geq q_H \), the incumbent firm always fires the worker (and makes zero profits) and the outside firm with the relatively higher valuation makes positive profits.

Because of the symmetry of firms (assumption A1, permutation invariance of \( h \)), for any \( w > 0 \) the incumbent firm makes strictly lower expected profits than the outside firms. Hence, the only possible equilibrium contract includes \( w = 0 \). From the above argument it follows that no firm wishes to deviate from such a contract. Hence, firms earn positive expected profits. This type of reasoning does not change if we restrict \( b = 0 \) but allow for \( s > 0 \), i.e., apply antislavery laws only.

#### B.2.2. Invisible workers

Again, the worker will be laid off if and only if \( q_I - w < 0 \). Given that such behavior is anticipated by outside firms, whenever the worker is laid off she
gets a wage equal to \( E(q_i|q_I \leq w), \ i \neq I \). Thus, the worker’s expected payoff as a function of \( w \) is given by \( U_w \). This can be written as a function of \( w \):

\[
U_w = \int_{q_i}^{\hat{q}_i} \int_{q_I}^{w} q_i h'(q_i, q_I) \, dq_I \, dq_i + \int_{q_i}^{\hat{q}_i} \int_{w}^{q_i} w h'(q_i, q_I) \, dq_I \, dq_i,
\]

where \( h'(q_i, q_I) = \int_{q_I}^{q_i} h(x, q_i, q_I) \, dx \).

This is a concave function of \( w \), under some regularity conditions

\[
\frac{d^2 U_w}{dw^2} = -2 \int_{q_i}^{\hat{q}_i} h'(q_i, w) \, dq_i + \int_{q_i}^{\hat{q}_i} (q_i - w) \frac{\partial h'}{\partial q_I}(q_i, w) \, dq_i < 0
\]

and since

\[
\frac{dU_w}{dw}(w = 1) = \int_{q_i}^{\hat{q}_i} \int_{1}^{q_i} h'(q_i, q_I) \, dq_I \, dq_i > 0
\]

the optimal wage is higher than 1.

**B.3. Information on renegotiation**

**B.3.1. Visible workers**

We first show that when performance is public but renegotiation is secret (i.e., the incumbent’s action in stage 2.2 is not observable to outsiders) the main features of Proposition 1 still hold.

When renegotiation is secret, virtually all contracts will have a continuum of continuation equilibria even without considering ‘dominated bids’. Thus, in order to compare different contracts, when they are offered to the worker, we will have to specify a more stringent equilibrium selection. That is, for each contract we will have to specify what equilibrium agents choose in each subgame starting in the node corresponding to each realization of the \( q \)’s. These subgames are complete information subgames of imperfect information (simultaneous offers by all parties). To give some economic content to the analysis, we will restrict our attention to monotone selections. The monotonicity refers to the choices across contracts and for the same realization of the \( q \)’s. Thus, we say that a selection (for all contracts) is monotone if for any two contracts A and B so that \( w + b \) is higher in contract A, then the offers of all firms in contract A are not lower than the offers in contract B for the same realization of the \( q \) vector. In particular, assume that \( q_I < q_O \) and consider two contracts with the same wage \( w \) but different \( b \)’s. Then, if the incumbent offers to revise down the buy-out fee it will not be to a higher value in the contract with a lower stipulated buy-out fee. That means that higher buy-out fees do not mean lower protection for the incumbent against outside competition (may mean just the same protection).

Under this restriction, the following proposition extends the results of Proposition 1.
Proposition 3. Assume that all \(q\)'s become common knowledge once the contract is signed, and that renegotiation of the contract is secret. Then:

(a) For almost all monotone equilibrium selections \(Z\), an equilibrium contract requires

(i) \(s \geq w\),
(ii) \(b \geq \tilde{q} - w\),
(iii) \(w = S(Z)\) and \(S(Z) = Q - 1.5E\pi_o(w = S(Z))\),

where

\[E\pi_o(w = S(Z))\] are the expected profits of the outsider when \(w = S(Z)\),

(b) For almost all monotone equilibrium selections, the equilibrium contracts induce an efficient allocation of the worker and there are no layoffs along the equilibrium path. Moreover, whenever the worker quits she pays a revised down buy-out fee, which is positive with positive probability.

Proof. We follow the following strategy for proving the result. We look at the renegotiation stage, once the \(q\)'s are realized, and analyze in turn those cases for which the incumbent has a higher valuation and those in which the outsider has a higher valuation for the worker. We show that the allocation of the worker will be efficient for any contract unless the worker is fired. Among all contracts without firing we then look for the contract that minimizes outsider’s rents: as usual, that would be the equilibrium contract unless distorting the allocation (i.e., designing the contract so that firing occurs in equilibrium) can help reducing outsider’s rents. We finally argue, for each case, that firing can only increase these rents, and therefore the equilibrium contract is obtained.

Thus, consider any contract \((w, b, s)\). After both \(q_o\) and \(q_I\) are known, and if \(q_I > q_O\), the incumbent will ‘bid’ the maximum between \(w + b\) and \(q_O\). That is, if \(w + b\) is higher than \(q_O\) then the outsider will (may) bid up to her valuation, but the incumbent prefers not to lower \(b\) and keep the worker paying \(w\) (unless it is more interesting to fire flat out). If \(w + b < q_O < q_I\) then \(I\) prefers to increase the wage to \(w' = q_O - b\) and keep the worker unless \(-s > q_I - (q_0 - b)\). The important thing here is that the allocation will be efficient and the outsider makes no profits. However, if the worker is fired, then the outsider does make a profit. Thus, the severance payment that minimizes the outsider’s rents in this region satisfies \(s \geq w\).

Now assume that \(q_R < q_I < q_O\). Here we will have multiplicity of continuation equilibria:

(i) If \(\max\{w + b, q_R\} < q_I < q_O\), the only equilibrium (with undominated bids) is for both the incumbent and the outsider to bid \(q_I\) (offer a wage
\[ w' = q_I - b \) and the same for the outsider. The worker works for the outsider, who makes \( q_O - q_I \) profits. The incumbent makes \( b \).

(ii) If \( b + w > q_I \), let \( K \in [q_I, \min\{q_O, b + w\}] \). Then, for any such \( K \) there exists an equilibrium where both firms bid \( K \) (the incumbent offers \( b' = K - w \)), the outsider gets the worker and makes \( q_O - K \), and the incumbent makes \( K - w \).

Now assume that \( q_I < q_R < q_O \). Then:

(iii) If \( q_R > \max\{q_I, b + w\} \), the only equilibrium in undominated strategies is for both the outsider and the residual firms to bid \( q_R \). Then the outsider gets the worker with a profit of \( q_O - q_R \), and the incumbent makes a profit of \( b \).

(iv) If \( q_R < b + w \), again for any \( K \in [q_R, \min\{q_O, b + w\}] \) there is an equilibrium in which both the residual, the outsider, and the incumbent bid \( K \) (the incumbent sets \( b' = K - w \)), the outsider gets the worker and makes \( q_O - K \), and the incumbent makes \( K - w \). The wages obtained by the worker can easily be computed from the above.

Notice that both in (ii) and (iv) the wage is always \( w \) and that the allocation is efficient in (i)–(iv). Also, we have multiplicity, and then need to define an equilibrium selection for each contract, in (ii) and (iv). One such monotone (as defined above) equilibrium selection has \( K = q_O \) in (ii) and \( K = q_R \) in (iv) in all contracts. With such equilibrium selection neither the allocation nor the outsider’s rents depend on \( w \) or \( b \), since then rents and allocation are the same in (i) and (ii), and in (iii) and (iv). However, any other monotone equilibrium selection (that is, in which the outsider does not get the entire income when renegotiating) makes rents in (ii) lower than in (i) and in (iv) lower than in (iii). But, notice that whether we are in (i) or (ii), in (iii) or in (iv) for a given realization of the \( q \)’s depends on \( w + b \). In particular, if \( w + b \geq \bar{q} \), then the probability of being in (i) or (iii) is driven down to zero. Thus, for all but one monotone equilibrium selections the contract that minimizes an outsider’s rents for an efficient allocation of the worker has \( w + b \geq \bar{q} \).

Of course, it may be in the interest of the pair incumbent-worker to introduce distortions in the allocation of the worker if that helps to reduce an outsider’s rents. However, notice that the only possibility of introducing distortions is by firing the worker (setting \( s \) low enough so that for some realizations of \( q_I \) it is in the incumbent’s interest to fire the worker). But this distortion, not only reduces total surplus, but also increases the outsider’s rents.

We now argue that an equilibrium contract has to be efficient. Indeed, assume otherwise. As we have seen, that only means that the worker is fired for some realizations of the \( q \). That is, \( q_I - \max\{w, q_O - b\} < -s \) for some \( q_I, q_O \) with \( q_I \geq q_O \). Consider increasing \( b \) so that \( q_I - q_O + b > -s \) for any
$q_0 < q_I$ for instance, $b \geq \tilde{q}$. Consider also increasing $s$ so that $s \geq \tilde{q} - w$. Then firing is also eliminated when $w > q_0 - b$. This reduces outsiders’ rents whenever $q_I > q_0$ (no firing), increases efficiency for those cases of firing, and does not increase rents for outsiders for realizations $q_0 > q_I$ (equilibrium selection). Thus, the pair worker-incumbent obtains extra rents, which they can share via $w$ (so that $w + b$ is not reduced).

Then, an equilibrium contract is efficient with no layoffs, and then Proposition 3 follows. \(\square\)

B.3.2. Invisible workers

We next show that when performance is not public but renegotiation is (i.e., the incumbent’s actions at stage 2.2 are observable to outsiders), in all second best efficient equilibria the main qualitative features of the equilibrium described in Proposition 2 hold.

Given that outside firms are able to perfectly observe the revision of the contract, they can update their beliefs about the value of the worker by using the information contained in the actions taken by the incumbent firm (and given that $q$’s are positively correlated). This is a signalling game. Our goal here is to characterize the set of contracts for which there exist second best efficient equilibria. That is, we are only searching for Pareto efficient equilibria of the entire game.

Given the contract parameters $(w, b, s)$, and given the realization of $q_I$, the choice of the incumbent firm consists of either firing the worker (and paying $s$), offering an alternative salary $w'$, or a buy-out fee $b'$.\(^{21}\) Outside firms make conjectures about the realization of $q_I$, and about the strategy played by the incumbent firm which imply beliefs about the expected value of their own $q$’s conditional on different actions taken by the incumbent firm. We summarize beliefs in the expected value of the worker for an outsider in the different information sets, that is:

\[
\begin{align*}
E(q_i|\text{firing}), \\
E(q_i|b'), \\
E(q_i|w').
\end{align*}
\]

Given the conjectures held by outsiders, firm $I$ chooses an action, outside firms offer to employ the worker at a certain wage, and the worker chooses a particular firm in order to maximize her expected utility. In equilibrium these conjectures must be compatible with firm $I$'s strategy. (In particular, $E(q_i|b' = b) = E(q_i|w' = w)$). Let us define $\gamma \equiv E(q_i|q_I \geq 1)$. The next result characterizes the set of contracts that implement a second best efficient equilibrium.

\(^{21}\)Of course, the option of neither firing the worker nor revising the terms of the contract is a particular case of the above options, where $w' = w$ and $b' = b$. 
Proposition 4. Assume that the only information revealed at the beginning of stage 2 is $q_I$ which is observed by the incumbent firm only. Also, assume that renegotiation of the contract is public. Then:

(a) A contract $(w, b, s)$ is offered in a second best efficient equilibrium if and only if the following conditions hold:

(i) $s = w - 1$,
(ii) $b \geq \gamma - w$,
(iii) $w = x$.

(b) In a second best efficient equilibrium all separations take place through layoffs. Despite the existence of a positive severance payment, if the worker is laid off her utility drops. Firms make zero expected profits.

Condition (ii) guarantees that the worker does not quit, that is, that buy-out fees are sufficiently high. Now, the signalling aspect of contract revision increases competitive pressures from outsiders and, as a result, the contract requires a higher lower bound on buy-out fees (although the minimum lower bound may still be negative). Conditions (i) and (iii) are identical to those in Proposition 2.

Proof. (I) Suppose that conditions (i)–(iii) hold; then there exist an equilibrium that is second best efficient, i.e., the worker remains with the incumbent firm if and only if $q_I \geq 1$.

Consider the following strategy for firm $I$ once $q_I$ is revealed:

If $q_I \geq 1$ then $b' = b$ and $w' = w$ (stay put).
If $q_I < 1$ then fire the worker and pay $s$.

Suppose that outsiders’ beliefs are such that:

\[
E(q_I|\text{firing}) = \beta, \\
E(q_I|b') < 1 \text{ for all } b' \neq b, \\
E(q_I|w') = E(q_I|b' = b) = \gamma \text{ for all } w'.
\]

Notice that these beliefs are consistent with the proposed strategy for firm $I$.

Given that outside firms have the same information and the same beliefs they will offer a wage equal to the expected value of the worker (Bertrand competition). Thus, if the worker is fired she will accept the wage $\beta$. If she is not fired she will decide not to quit, since in this case the outsiders’ offer is equal to $\gamma$, and the gains from staying are greater than the gains from quitting: $\gamma - b \leq w$ (condition (i)).

Let us now consider firm $I$’s action in the second period. Quitting will only take place if firm $I$ reduces the buy-out fee. Given the outside firms’ beliefs, the revisions of the buy-out fee that the worker could accept (so that
she leaves the firm with a net wage above \( w \) satisfy \( b' < E(q_i|b') - w < 1 - w \). Thus, from condition (ii), firm \( I \) strictly prefers firing to letting the worker quit

\[-s = 1 - w \geq b'.\]

Hence, in the proposed equilibrium there is never quitting. Also, firm \( I \) prefers retaining the worker to firing her if and only if

\[q_I - w \geq -s\]

which by condition (ii) holds if and only if \( q_I \geq 1 \). Thus, given the strategies played by outside firms and the worker, the proposed strategy for firm \( I \) in the second period is optimal.

Finally, at the beginning of the game all firms are identical, and thus have incentives to offer such a contract, since this maximizes the expected surplus of the worker subject to the incumbent firm making non-negative profits.

(II) Next we show that if in a second best efficient equilibrium a contract \((w, b, s)\) is offered, then conditions (i), (ii) and (iii) must hold.

In a second best efficient equilibrium, the following must hold:

If \( q_I \geq 1 \) the worker stays at the incumbent firm and works at \( w'(q_I) \).
If \( q_I < 1 \) the worker either quits or is fired.

First we prove that the probability of quitting along the equilibrium path is zero. Suppose not, i.e., \( \exists \Omega \subseteq \{ q_I | q_I < 1 \} \) with a positive measure, so that \( \forall q_I \in \Omega \) firm \( I \) offers a buy-out fee \( b'(q_I) \) and the worker accepts. First, it has to be the case that \( \forall q_I \in \Omega, b'(q_I) = b' \), i.e., whenever the worker quits she pays the same revised buy-out fee. Otherwise firm \( I \) always chooses the highest of these \( b' \) values, since by construction it is always accepted, and then beliefs would be inconsistent with \( I \)'s strategy. Notice, on the other hand, that \( E(q_i | q_I \in \Omega) < 1 \). That is, similarly as in Proposition 2, \( w + b' < 1 \), and then for \( q_I \) smaller but very close to 1, the equilibrium must involve firing since the incumbent is better off keeping the worker than letting her go \((1 - w > b')\). Thus, if there is voluntary quitting with revision of \( b \), then \(-s = 1 - w \). This again means no quitting by revising the buy-out fee, since we have \(-s > b'\).

With respect to revising \( w \), assume that in equilibrium the worker quits for some wage \( w' \geq w \). Then if the equilibrium is efficient, \( E(q_i | w') < 1 \) and so \( w' + b < 1 \) too. Let \( w^* \) be the smallest of all wages for which the worker stays. Then, for all \( q_I \geq 1 \), \( w'(q_I) = w^* \) (all firms that keep the worker offer her the smallest wage that allows them so).\(^{22}\) Then outsider's beliefs when observing \( w^* \) must be that \( q_I \geq 1 \), and then their offer to the worker should be \( \gamma > 1 \). Thus, if firm \( I \) manages to keep the worker offering \( w^* \) it should be

\(^{22}\) Note that this trivially means that \( w^* \) must exist for such an equilibrium to exist also.
because $w^s + b \geq \gamma > 1$. Thus, $w^s > w' \geq w$. But for efficiency, the firm should be willing to keep the worker for $q_I = 1$, i.e., $1-w^s \geq b$, which contradicts the fact that $w^s + b > 1$. This contradiction shows that the worker cannot be willing to leave the firm for any wage offer $w' \geq w$. Then voluntary quits cannot occur by revising wages either. The only possibility left is that the worker is fired whenever $q_I < 1$, and kept with $w^s = w$ in an efficient equilibrium. Thus, in any second best efficient contract we will have quitting through firing in equilibrium, and $s = w - 1$. Also, $b \geq \gamma - w$, and for the worker to get the entire surplus, $w = \alpha$. □

References


