Does the market provide sufficient employment protection?☆

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Abstract

We ask whether there is an efficiency rationale for public intervention in the form of an employment protection policy. Unlike most of the literature supporting current employment protection legislation we allow employers and workers to include severance payments in their private contracts. We focus attention on a model where firms learn over time about the value of the match. If future wage bargaining cannot be prevented, and even though severance payments may be part of the equilibrium contract, separations are too frequent (private employment protection is insufficient). Mandatory severance payments are not a remedy for this inefficiency. Instead, a Pigouvian tax/subsidy scheme will correct the inefficiency by enhancing employment protection.

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1. Introduction

This paper contributes to the literature on employment protection (EP) by contrasting the role of “private” EP (voluntary contract provisions) and “public” EP (mandatory rules). In particular, in a world where firms and workers can use contracting arrangements that help to reduce incentives to

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terminate the employment relationship, we explore the efficiency rationale for public intervention and compare optimal policies with current EP legislation.

The availability of voluntary contract provisions has been largely overlooked in the discussions on the desirability of existing EP legislation. In particular, recent literature has suggested that the presence of various types of market frictions provide an efficiency rationale for EP policies. Examples of frictions that have been proposed include the absence of private insurance against idiosyncratic labor income risk (Pissarides, 2001; Bertola, 2004)\(^1\) and firms’ idiosyncratic shocks in efficiency wage models (Saint Paul, 1995; Fella, 2000).\(^2\) However, in all these models firms and workers would find it in their interest to include severance payments in their private contracts. That is, when this literature analyzes public intervention, it explicitly or implicitly rules out the use of severance clauses in private contracts. If, on the contrary, agents were allowed to use severance clauses then public intervention would be redundant: market transactions would involve the right amount of EP.\(^3\) In other words, in these models mandatory severance payments are motivated not only by the presence of market frictions but also (and crucially) by the existence of a “contracting failure”: for some unspecified reason, the set of feasible contracts is severely restricted.

We find this approach unsatisfactory. In the real world it is by no means rare to find EP clauses in private contracts. For instance, workers not covered by common labor-market regulations (such as managers or professional sports people) are often protected against firm-initiated separations by contracts that include large severance payments. Moreover, several authors have reported that in some industries a substantial fraction of collective bargaining agreements include severance payments over and above mandatory levels (See Booth, 1987; Pencavel, 1991; Lorences et al., 1995, for the UK, US, and Spain, respectively). Thus, ruling out EP clauses in private contracts seems at odds with this evidence. Real world contracts are likely to be subject to various types of restrictions and hence they may turn out to be highly incomplete. But apparently, EP clauses, including severance payment provisions, are not among these contracting failures. In fact, we can interpret the literature mentioned above as an explanation of the demand for ‘private’ EP rather than a justification of public intervention. In summary, it is probably fair to say that the literature has not provided a proper motivation for public EP.

A sound theory of public EP policies should not be based on counterfactual assumptions; instead, it should answer the following questions: What motivates the use of EP provisions in private contracts? If parties can use these contractual clauses, do they involve too much or too little EP, from an efficiency viewpoint? What is the optimal form of public intervention, and how does it compare with actual EP policies? In this paper we examine these questions through the lens of a highly stylized model. The main insights can be summarized as follows. Firstly, private EP is a tool to transfer experimentation rents to the worker without exacerbating incentives for separations. Secondly, even though parties can include severance payments in their private contracts the

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\(^1\) These papers are reminiscent of the old literature on implicit contracts. See Rosen (1985) for a survey. In contrast, Alvarez and Veracierto (2001) by calibrating a general equilibrium model with costly search and risk-averse workers conclude that most of the efficiency gains from severance payments are associated to the reduction in search costs rather than to the smoothing of consumption flows.

\(^2\) A key assumption is that disciplinary dismissals and those caused by shocks can be perfectly distinguished. In the real world disciplinary dismissals are declared unfair quite frequently. Thus, severance payments may distort incentives, raise wages, and reduce employment (Galdón-Sanchez and Güell, 2003).

\(^3\) For instance, Pissarides (2001), page 156, claims that inclusion of severance payments in private contracts would not be enforceable. Fella (2000), page 1486, invokes lack of reputational mechanisms and costs of writing private contracts as potential explanations for the existence of legislated dismissal regulations.
laissez-faire equilibrium is characterized by excessive layoffs (the market delivers insufficient EP). Thirdly, in those contexts there is room for efficiency-motivated public intervention, but the optimal policy is very different from existing EP legislation (mandatory severance payments) and requires more active forms of intervention (tax-subsidy scheme).

Our point is complementary to the one recently made by Blanchard and Tirole (2004). They advocate the use of layoff taxes as the optimal way to finance public unemployment insurance, since they lead firms to take efficient layoff decisions. In our model, layoffs are socially excessive (and layoff taxes are useful) even in the absence of unemployment insurance.

At the heart of our model lies the existence of experimentation rents throughout a labor relationship. These rents influence wage formation. At the time of forming a match between a firm and a (group of) worker(s), there is uncertainty about the value of a particular match. This creates the need for (and the rents from) experimentation. This experimentation is characterized by information asymmetries. In particular, we postulate that the employer learns about the value of the match more than the employee does. Then, for reasons that are analogous to those found in the implicit contracts literature, equilibrium contracts would be characterized by constant wage profiles and positive severance payments if workers and firms could commit to the entire stream of future wages. However, in reality employees can always try to renegotiate wages in future times in the hope that their match has turned out to be of high value. Thus, independently of the clauses workers and firms include in their contracts, wages are at some point renegotiated under asymmetric information, and the result we should expect is excessive layoffs (Myerson and Satterthwaite, 1983). This is the market failure that justifies public intervention. If privately-agreed severance payments are enforceable then it is hard to make a case in favor of mandatory severance payments. In the absence of non-pecuniary externalities, setting a floor to the level of transfers between firms and workers cannot help. Such a policy simply imposes a restriction on the set of feasible contracts. This does not imply that there is no room for other forms of public intervention. Indeed, what is needed is the active intervention of a third party that receives or makes payments, as opposed to mere regulation of private relations. In particular, we show that a tax-subsidy scheme can restore efficiency. A tax on layoffs reduces firms’ dismissal incentives without raising workers’ outside options.

We undertake the analysis in an overlapping generations model with infinitely-lived, competitive firms that use labor in a decreasing returns to scale technology. Workers live for two periods. They are untested when young, but their match-specific productivity is known by their employers by the time they get old. By the standard argument of imperfect capital markets,

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4 There is substantial empirical evidence suggesting a negative relationship between the hazard rate of employment separations and job tenure. Two learning processes can explain such a phenomenon: Learning-by-doing and learning about match quality, since in both cases the average productivity of workers increases with tenure. Nagypál (2000) uses a French dataset to distinguish between these two possible explanations and finds that learning about match quality clearly dominates.

5 The asymmetry of information on the realization of the match value is crucial, since it causes inefficient separations. Nagypál (2002) studies a model where both the firm and the worker learn over time about the quality of the match and bargain efficiently about wages (efficient separations). A tax on layoffs reduces productivity and welfare, since it distorts separation decisions.

6 Burguet, Caminal, and Matutes (2002) studied a related model, although both the questions and main results are very different. In particular, the benchmark model of Section 3 is related to their “invisible workers” case. However, the main results of our paper are contained in Sections 4 and 5, where we study wage renegotiation, excessive layoffs and the optimal form of public intervention. Shimer and Wright (2004) also study the optimal contracting problem in a model where firms learn about the value of the match and workers are subject to a moral hazard problem. Their paper is silent with respect to the role of public intervention.
workers prefer smooth labor income. Some of the assumptions are quite drastic but the model is able to convey some insights which are likely to generalize to more general and realistic environments. In particular, our results are robust to changes in some of the special features of the model, like the characterization of severance payments as a pure transfer, the workers’ two-period horizon and the non-correlation of workers’ productivity across firms. Some other characteristics of the model, like the Walrasian nature of the labor market, represent a bigger challenge to the main conclusions. For instance, in the presence of unemployment caused by search and matching frictions, a tax on layoffs would affect the transition probability from unemployment to employment, and hence the workers’ fallback position in a negotiation. The analysis of these important issues is left for future research.

The remainder of the paper is organized as follows. The next section presents the model. As a benchmark, in Section 3 we analyze the solution to this model when parties can commit to future wages. Firms and workers are then able to sign contracts that guarantee an efficient equilibrium. Section 4 contains the main results of the paper. There we analyze the model with all the assumptions, including the crucial one: parties cannot commit to future wages. Equilibrium is characterized by excessive layoffs, but efficiency can be restored by a tax/subsidy scheme and not by mandated severance payments. Section 5 discusses robustness. Finally, Section 6 contains some concluding remarks. A number of formal proofs and extensions are contained in the Appendix.

2. The set up

The purpose of this paper is to study private and public employment protection in a parsimonious model that emphasizes firms’ learning about match quality. Thus, the model abstracts from all other interesting aspects of the labor market, including mobility costs, market power, demand shocks, and labor market institutions other than EP. We consider a partial equilibrium model with infinitely-lived firms and overlapping generations of workers who live for two periods. The size (mass) of generations is constant over time, and denoted by $N$, and the mass of firms is assumed to be 1.

Firms in each period produce output using labor as the only input, according to the production function $Y_t = f(L_t)$, where $f$ is a twice differentiable function, with $f' > 0, f'' < 0$, and $L_t$ is the total mass of labor employed, measured in efficiency units, in period $t$. Although each firm hires a large number of workers, firms are small with respect to both the labor and the output market (whose price is normalized to one). Thus, the realized efficiency units of employed workers (see below how uncertainty is introduced) coincide with the expected number of efficiency units with probability one. Firms maximize the expected present value of profits, and their discount factor is $\gamma$.

Worker $i$ (of any generation) is able to supply $q_{ij}$ efficiency units of labor to firm $j$. All $q_{ij}$ are realizations of independent random variables identically distributed over the interval $[\underline{q}, \bar{q}]$ according to the density function $h(q_{ij})$ with c.d.f. $H(q_{ij})$. The value of the match, $q_{ij}$, is constant over time. The independence assumption allows us to dispose of the subscripts $ij$ when we analyze decisions concerning a single firm-worker pair. For economy of notation, we assume $E(q) = 1$. Let $\Psi(q)$ be the inverse of the hazard rate, i.e., $\Psi(q) = \frac{1 - H(q)}{h(q)}$. We assume that $\Psi'(q) < 0$, which is a standard assumption in the literature on optimal contracting under asymmetric information and implies that $h'$ is not excessively negative. The realization of $q$ is only observed by the incumbent firm after employing the worker for one period. Ex-post efficiency requires that a worker that has worked for a firm when young is retained if and only if $q \geq 1$. Indeed, old workers stay in the market for only one more period, and their expected supply of labor, measured in efficiency units, in any firm other than their former employers equals 1.
The quality of the match is only observed by the firm after one period of employment. Thus, the firm can experiment with young workers and dismiss those who do not perform satisfactorily.

Workers have identical preferences. The utility of a representative worker is given by:

\[ U = u(c^1) + \gamma u(Ec^2) \]  

with \( u' > 0, \ u'' < 0 \), where \( c^i, i=1, 2 \), denotes consumption at age \( i \) and \( E \) is the expectation operator. Implicit in this utility function is the assumption that workers’ labor supply is inelastic. Also, for simplicity, we are assuming that workers and firms discount the future at the same rate. Finally, the concave utility function \( u() \) captures the consumption smoothing motive, which will play some role in the model in combination with capital market imperfections. However, this smoothing motive does not imply that workers are risk averse. In other words, workers wish to smooth their consumption across periods but not necessarily across states of nature.\(^7\) Below we discuss how the analysis would be affected if we assumed instead that workers are risk averse or, alternatively, if their intertemporal elasticity of substitution is infinite.

Capital markets are not perfect. For simplicity, throughout the presentation we assume that workers do not have access to capital markets, and hence in every period their consumption is equal to their labor income.\(^8\) Finally, we assume that both output and labor markets are perfectly competitive and assume away any costs of reallocating workers.

3. A benchmark: full commitment to future wages

As mentioned in the Introduction, we are interested in understanding the consequences of asymmetric learning on the outcomes of labor markets and on public EP when workers may try to renegotiate their wages throughout their employment relationship with firms. However, it is useful to first consider a benchmark model where parties have no restriction on committing to the entire sequence of wages.\(^9\) Thus, for the moment the only restriction on contracting that we assume is the consequence of asymmetric learning: payments cannot depend (explicitly) on performance. We focus on stationary, symmetric equilibria.

Contracting arrangements will depend on the age of the worker. Old workers that change employer face a one-period horizon and they are hired at a wage, \( w^* \). In contrast, in this section contracts for young workers may stipulate a sequence of wages \( \{w^1, w^2\} \), where the superscript refers to the worker’s age. We also allow the contract to include a severance pay, \( s \), to be paid in case of a layoff. In each period the sequence of events is the following:

a) **Stage 1: Labor market.** Firms take hiring and firing decisions, and workers decide whether to quit. Fired workers receive \( s \), and hired workers are offered different types of contracts depending on age: \( w^* \) to old workers and \( \{w^1, w^2, s\} \) to young workers.

b) **Stage 2: Production.** All workers supply their efficiency units, and firms obtain the output and learn the value of \( q \) of their workers.

c) **Stage 3: Payments and consumption.** Wages are paid according to contracts and consumption takes place.

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\(^7\) Hence, our utility specification is in the spirit of Epstein and Zin (1989), in the sense of disentangling intertemporal substitution and risk aversion.

\(^8\) In fact, all we need for most of our results is a small differential between the borrowing and lending rates.

\(^9\) The results of this section are analogous to those found in the literature (Hart, 1983; Hall and Lazear, 1984). Thus, the role of this section is to set the stage for the analysis of Sections 4 and 5, and make intuitions more transparent.
Workers are allowed to quit and quitting penalties are ruled out for the usual reasons. If \( w^* \) is the wage that old workers obtain in the market, the no quitting restriction on contracts is \( w^2 \geq w^* \).10

In a stationary and symmetric competitive equilibrium, prices and allocations are constant over time and all firms employ a set of workers with identical age and productivity composition. Moreover, firms and workers take market prices and utility levels associated to contracts as given. Firms take their hiring and firing decisions as to maximize the present value of profits. Hiring decisions include choosing between old and young workers, and the design of the contract offered to young workers. Workers choose their employment decisions in order to maximize their expected utility. Finally, markets clear. A stationary equilibrium will be characterized by a contract for young workers, \( \{w^1, w^2, s\} \), a wage for old workers, \( w^* \), the set of realizations of \( \tilde{q} \) for which the worker is retained for a second period, \( \Omega \subseteq [\tilde{q}, \bar{q}] \), and the total value of efficiency units employed by each firm, \( L_t \).

If a representative firm hires \( L^y_t \) and \( L^o_t \) young and old workers, respectively, in period \( t \), then the total number of efficiency units, \( L_t \), will be given by:

\[
L_t = L^y_t + L^o_{t-1} \int_{\Omega_t} q \, dH(q) + L^o_t
\]

Let \( \delta_t \) be the probability that a young worker hired in period \( t-1 \) is retained in period \( t \), i.e.,

\[
\delta_t = \int_{\Omega_t} dH(q).
\]

The representative firm’s optimization problem consists of choosing \( \{w^1_t, w^2_t, s_{t+1}, L^y_{t+1}, L^o_{t+1}, \Omega_{t+1}\}_{t=0}^\infty \), given \( L^y_0, w^2_0, s_0, \{w^*\}_{t=0}^\infty \) and expected utility levels of young workers, \( \{\bar{U}_t\}_{t=0}^\infty \), in order to maximize the present expected value of profits at time 0:

\[
\Pi_0 = \sum_{t=0}^\infty \gamma^t \left\{ f(L_t) - [\delta_t w^2_t + (1 - \delta_t) s_t] L^y_{t-1} - w^1_t L^y_t - w^* L^o_t \right\},
\]

subject to the following constraints. First, the contract offered to young workers must be sufficiently attractive:

\[
u(w^1_t) + \gamma u[\delta_{t+1} w^2_{t+1} + (1 - \delta_{t+1}) (w^*_{t+1} + s_{t+1})] \geq \bar{U}_t \]

Second, retention decisions, \( \Omega_t \), must be incentive compatible.11 Incentive compatibility requires that \( q \in \Omega_t \) if and only if retaining a worker of productivity \( q \) increases the present expected value of profits at time \( t \), \( \Pi_t \), i.e., if and only if:

\[
f'(L_t) q - w^2 + s_t \geq 0.
\]

This inequality indicates that a worker will be retained when her marginal contribution minus her wage, \( f'(L) q - w^2 \), is higher than the cost of laying her off, \( s \). Therefore, the set of realizations

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10 Note that the timing of the game implies that laid off workers receive the severance payment in their second period. It is easy to check that if \( s \) is collected in the first period the results would be qualitatively identical. Moreover, letting workers collect their severance pay in the second period is probably a more natural assumption. Wages can be enjoyed throughout the employment relationship, but the severance payment is made only after the relationship is over.

11 There are three additional restrictions that are not binding in equilibrium. Contracts to young workers must satisfy the no quitting condition, \( w^1_t \geq w^*_t \) (we check below that this constraint is indeed not binding) and employment levels must be non-negative, \( L^y_t, L^o_t \geq 0 \). In equilibrium there is full employment and hence the latter two constraints are not binding either.
that induce retention is fully characterized by a cutoff point. That is, \( \Omega_t = \left\{ q | q \leq q^*_t = \frac{w^*_t - s_t}{f^*(L_t)} \right\} \) and \( \delta_t = 1 - H(q^*_t) \).

The first order conditions of the firm’s maximization problem characterize most of the variables of a stationary equilibrium. The condition with respect to \( L_t \), evaluated at a stationary allocation, satisfies: \( f^*(L_t) = w^* \).

We can use Eq. (4) to rewrite the cutoff point: \( q^*_t = \frac{w^*_t - s_t}{w^*} \).

Also, taking Eq. (4) into account, the first order condition with respect to \( L_t \) results in an arbitrage condition:

\[
q^* = w^1 + \gamma[H(q^*)s + (1 - H(q^*))w^2] / [1 + \gamma \int_{q^*}^\bar{q} qdH(q)]
\]

The left hand side is the wage of old workers per efficiency unit. The numerator of the right hand side is the expected present value of payments to a young worker and the denominator is the expected present value of the efficiency units to be supplied by a young worker. That is, the right hand side is the expected payment per unit of efficiency supplied by a young worker.

Also, adding up the first order conditions for \( w^1 + 1 \) and \( s^1 \), we obtain a condition of efficient separations:

\[
q^* = 1
\]

and comparing the first order conditions with respect to \( w^1 \) and \( w^2 \), we obtain an income smoothing condition: \( w^1 = H(q^*) (w^* + s) + (1 - H(q^*)) w^2 \).

The model is closed with the market clearing condition:

\[
L = N \left\{ 1 + \int_{q^*}^\bar{q} qdH(q) + H(q^*) \right\}
\]

\( ^{12} \) Note that \( L_t^0 \) affects the incentive compatibility constraint of period \( t \). Thus, the first order condition with respect to \( L_t^0 \) is:

\[
f^*(L_t) - w^*_t + \frac{\partial H}{\partial q^*_t} dq^*_t = 0
\]

The last term of the left hand side is nil because \( \frac{\partial H}{\partial q^*_t} = 0 \). Given \( w^*_t \) and \( s_t \), \( q^*_t \) is precisely the realization of \( q \) that leaves the firm indifferent between retaining and laying the worker off. Therefore, a small change in the cutoff point has only a second order effect on profits.

\( ^{13} \) Retaining a worker with productivity \( q^* \) costs \( w^2 \), and the costs of laying her off include the severance payment, \( s \), and the cost of buying those efficiency units in the market, \( q^* w^* \). By definition, both options are equally costly.

\( ^{14} \) Eqs. (7) and (8) are also the solutions to the dual problem of maximizing the young worker’s utility subject to Eqs. (5) and (6). Such an equivalent approach is used in Section 6.
The right hand side represents labor, measured in efficiency units, supplied by young workers (each one supplies one unit on average), retained old workers (each one supplies $E(q|q \geq q^c)$ on average), and dismissed old workers (again, each one supplies one unit on average), respectively.

Summarizing, Eqs. (4)–(9) are the equilibrium conditions that determine the values of $q^c$, $L$, $w^1$, $w^2$, $s$, and $w^\ast$.

If we substitute (7) and (8) in the arbitrage condition (6) then we obtain:

$$s = \frac{\gamma}{(1 + \gamma)^2} \frac{1}{E(q|q \geq 1)} - 1\right) w^\ast > 0.$$

The average extra efficiency units supplied by retained workers is $E(q|q \geq 1) - 1$. Since $\gamma$ is the discount factor, $w^\ast$ is the market value of an efficiency unit, and in equilibrium an old worker is retained with probability $\frac{1}{2}$, then $s = \frac{\gamma}{2} [E(q|q \geq 1) - 1] w^\ast$ is the present value of expected experimentation rents. Since labor markets are perfectly competitive young workers are able to appropriate all these experimentation rents. Finally, because of capital market imperfections, workers strictly prefer smooth labor income, which implies that the optimal contract distributes experimentation rents over the life of the contract. As a result the optimal severance pay (which is paid in the second period) is a fraction $\frac{1}{1 + \gamma}$ of the present expected value of experimentation rents.

Also, note that (5) and (7) imply $w^2 = w^\ast + s$. Therefore, $w^2 > w^\ast$ and hence the no quitting condition is not binding.\(^{15}\) This discussion is summarized in the following proposition:

**Proposition 1.** An equilibrium contract for young workers involves smooth labor income profile and efficient layoffs. Moreover, laid off workers receive a positive severance pay.

Thus, under commitment to future wages the market delivers full efficiency, both ex-ante (full employment and smooth labor income) and ex-post (the reallocation of workers is also efficient). As a result, there is no room for efficiency-motivated public intervention.

We have assumed that workers are risk neutral and their intertemporal elasticity of substitution is finite. The latter introduces a wage smoothing motive. Since $w^2 = w^\ast + s$ labor income is the same across different states of nature and therefore risk aversion would not affect this benchmark at all. If, alternatively, workers’ elasticity of substitution were infinite then the two-period contract characterized above would still be part of an equilibrium, although there would exist multiple equilibrium contracts. Thus, the wage smoothing motive plays no role here other than selecting a unique optimal contract.

**4. Wage bargaining**

In the previous section we assumed that firms and workers could commit to future wages. Such commitment may be attempted by writing long-run contracts. However, it is not obvious how parties can commit in practice not to renegotiate the terms of the contract. In fact, explicit contracts with a time horizon of more than two or three years are rarely observed in the real world. Alternatively, firms may attempt to develop commitment devices based on reputation, like wage setting rules or promotion systems, to make their future wage offers credible. However, whatever means firms have at their disposal, the assumption of full commitment to future wages described in

\(^{15}\) Combining (4) and (9) we have that $w^\ast$ is a non monotonic function of $q^c$, decreasing if $q^c < 1$ and increasing otherwise ($w^\ast$ reaches a minimum at $q^c = 1$).
the previous section seems very extreme. We turn to the analysis of the model incorporating the assumption that parties cannot commit to future wages. In particular, workers cannot be prevented from trying to improve their salaries during their employment relationship.

Formally, we now assume that contracts for young workers do not include their second period wage with their current employer, $w^2$. Instead, at the beginning of their second period (when the labor market opens) workers bargain (under asymmetric information) with their employers. In particular, this bargaining is about how to share the possible difference between the value of the worker for the incumbent firm and the worker’s outside opportunity cost ($q_w^* - w^*$).\(^\text{16}\) Contracts can still include severance payments, $s$.

In fact, there is no room to renegotiate this transfer in case of separation, independently of the realization of $q$.

Different bargaining procedures result in different outcomes. Next we analyze a simple, extreme case, where the worker (the uninformed party) makes a take-it-or-leave-it offer to the firm (the informed party). This is to keep the analysis in its simplest terms. Later in this section, we will argue that the qualitative results we are about to present, in particular the existence of excessive layoffs, are generic. For the reader familiar with the literature on bargaining, and with the work of Myerson and Satterthwaite (1983), this should be apparent.

Suppose that firms and young workers can contract on $(w^1, s)$, i.e., the wage for the current period and the severance payment that would be paid to the worker in case of separation.\(^\text{17}\) Most of our equilibrium derivations in the previous section are unaffected. However, now $w^2$ is not chosen in order to meet the required utility level for young workers, but rather chosen to maximize the old worker’s utility. We first analyze this decision.

At the beginning of the second period the worker makes a take-it-or-leave-it, second-period wage demand, $w^2$ to her fully informed incumbent firm. If the firm does not accept it, then the worker leaves the job and collects the severance payment, $s$. Faced with a wage demand $w^2$ from one of its employees, the firm’s acceptance rule is unchanged: it accepts if and only if $q \geq q_c$, where $q_c$ is given by Eq. (5). The only difference is that $w^2$ is not part of a contract, but a decision of the worker. Taking this decision rule into account, the worker chooses $w^2$ in order to maximize the expected second period consumption,

$$E(c^2) = H(q^c)(s + w^*) + [1 - H(q^c)]w^2. \quad (10)$$

The first order condition of this maximization problem characterizes the equilibrium value of $q^c$, and can be written as

$$q^c - \Psi(q^c) = 1. \quad (11)$$

Since $\Psi(q^c)$, the inverse of the hazard rate, is strictly positive, then the solution to Eq. (11), $\tilde{q}^c$, is higher than 1; i.e., the cutoff point is above the efficient level (excessive layoffs). Also, notice that $\tilde{q}^c$ is independent of $w^*$ and $s$. Old workers attempt to obtain a wage over and above their reservation value ($w^* + s$). This reservation value coincides with the employer’s cost of replacing

\(^{16}\) Thus, our model has nothing to do with the existence of market power in the labor market, which is typically associated with unions and the structure of collective bargaining. Union-firm bargaining tends to create a gap between the marginal product of labor and the workers’ reservation wage. As a result, severance payments may also help to improve the efficiency of employment decisions. See Booth (1995).

\(^{17}\) Under bargaining there is no distinction between quits and layoffs: separations occur when parties do not reach an agreement.
a worker whose $q$ has turned out to be equal to 1. Thus, the firm strictly prefers to separate from such workers. That is, $q^c > 1$. Thus, from Eq. (5), the outcome of the bargaining process will be:

$$w^2 = s + w^* q^c.$$  

(12)

Let us now turn to the beginning of the relationship, when firms and young workers sign contracts $(w_1, s)$. Since $q^c$ is independent of the terms of the contract, the equilibrium contract will still imply smooth labor income (8). Thus, taking $w^*$ as given, in equilibrium parties sign contracts $(w_1, s)$ that lead to bargaining outcomes $(q^c, w^2)$, which are characterized by Eqs. (6), (11), (12), and (8). As in the benchmark case, the model is closed with Eqs. (4) and (9); that is firms’ demand for efficiency units of labor and market clearing. The difference here is that workers are inefficiently allocated when old, and hence the gains from experimentation are lower than in the benchmark model, $L$ is lower and $w^*$ is higher.

This discussion is summarized in the following proposition.

**Proposition 2.** If contracts can only stipulate $(w_1, s)$ then separations occur with an inefficiently high probability and as a result employment (in efficiency units) and output are inefficiently low.

Excessive layoffs are a consequence of bargaining between firms and their employees under asymmetric information. As we mentioned above, we have chosen a simple, yet extreme form of bargaining. It is extreme in the sense that it gives all the ex-post bargaining power to the worker (but all the information advantage to the firm). It may be suspected that this assumption is responsible for excessive layoffs (insufficient market-provided EP). This is not so. Bargaining under two-sided asymmetric information, as Myerson and Satterthwaite (1983) have shown, always, and independently of the bargaining mechanism, results in insufficient trade. We are considering a one-sided asymmetric information scenario: only the firm has private information. A straightforward extension of Myerson and Satterthwaite’s result shows that the same result applies to this model unless the firm has all the bargaining power ex-post. That is, unless workers are never able to obtain a salary above $w^* + s$, their fall back option. In summary, if future wages are subject to any meaningful type of negotiation, that is, if employees get a wage $w^2$ above $w^* + s$ with positive probability, then the market outcome will be characterized by excessive layoffs independently of the bargaining procedure.

Note that risk aversion would certainly affect workers’ behavior in the wage negotiation, and hence Eq. (11) would be different. However, for any finite degree of risk aversion the worker would still make a wage offer, $w_2$, above the fallback option, $w^* + s$, and hence $q^c > 1$. This implies excessive layoffs from both the productive efficiency and the risk-sharing points of view. Finally,

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18 For instance, this scenario would correspond to a situation where the firm can make a take-it-or-leave-it wage offer to its employees for their second period in the firm. In this case, the firm has all the bargaining power ex-post, and it can credibly offer to young workers what we found to be the optimal contract under full commitment: $w_2 = w^* + s$. Employees will not be able to obtain a wage above this level, and the firm would not be able to retain workers by offering a second period wage below $w^* + s$ even if the contract did not include that $w_2$.

19 With wage bargaining between employers and employees, retained workers obtain a wage above $w^*$ even in the absence of positive severance payments, and then their second period expected revenue include rents from experimentation. That is, as opposed to what happened in our benchmark model, severance payments are not the only channel through which workers receive experimentation rents when old. A positive severance payment, on the other hand, affects (amplifies) the wage that employees will demand in the second period. In fact, even with no severance payments these wage demands may be excessive as compared to the experimentation rents, and then equilibrium may call for negative severance payments.
note that the intertemporal elasticity of substitution plays no role in Eqs. (10) and (11), and hence the wage smoothing motive is quite irrelevant in the case of short-run contracts.

5. Optimal public intervention

The previous section has shown that layoffs are excessively frequent (there is too little private EP) due to the inability of parties to commit to future terms of trade in the presence of asymmetric learning. This raises the question of whether public intervention can improve market performance. Given the type of market failure, welfare enhancing policies require that firms and workers make payments to or receive them from a third party.20 This is where a public authority can make a difference by means of a Pigouvian tax/subsidy scheme.

Consider a combination of a tax on layoffs, \( \tau \), and a subsidy on hiring young workers, \( \sigma \). We require that the scheme balances the budget. The firm’s firing decision must now consider the extra cost that the tax represents: besides paying the severance payment \( s \), a firm has to pay the tax if negotiations with the employee break down, i.e., if a separation occurs. Then, firms will not accept a wage demand \( w^2 \) from workers with \( q < q^c \), where this threshold is given by:

\[
q^c = \frac{w^2 - (\tau + s)}{w^*}.
\] (13)

The worker’s ex-post problem is not affected, although she now takes this new layoff decision rule into account. Thus, substituting this rule into the first order condition for the optimal offer, \( w_2 \), we have:

\[
q^c - \Psi(q^c) = 1 - \frac{\tau}{w^*}.
\] (14)

Note that, since we are assuming that the inverse of the hazard rate, \( \Psi(q^c) \), is a monotonically decreasing function, then for given \( w^* \), \( q^c \) is decreasing in \( \tau \). The arbitrage (cost minimization) condition (6) becomes:

\[
w^* = \frac{w^1 - \sigma + \gamma H(q^c)(s + \tau) + [1 - H(q^c)]w^2}{1 + \gamma \int q^c q dH(q)}.
\] (15)

Finally, the balanced budget condition is \( \sigma = -H(q^c) \gamma \tau \).

Let us denote with a hat the equilibrium values prevailing in the benchmark model of Section 3. Suppose firms face the wage of old workers prevailing in that equilibrium, \( w^* = \hat{w}^* \). Then, from Eq. (14) we can compute the value of \( \tau \) that implies that \( q^c = 1 \), that is \( \tau = \hat{w}^* \Psi(1) \). This determines (Eq. (13)) the optimal wage demand: \( w^2 = \hat{w}^* + s + \tau \). Anticipating this behavior, parties sign contracts \((w^1, s)\) designed to smooth labor income, which implies that \( w^1 = w^2 - \frac{\tau}{2} \). Plugging the balanced budget condition, the efficiency condition, the optimal wage demand, and the first period wage that guarantees labor income smoothing, into the arbitrage condition (15) gives the equilibrium value of \( s \), which is \( \frac{1}{2} \) units lower than in the benchmark model, \( s = \hat{s} - \frac{1}{2} \). As a result, expected second period labor income, \( \frac{1}{2}(\hat{w}^* + s + w^2) = \hat{w}^* + s + \tau \) is the same as first period labor income, and identical

\[20\] Any measure that does not imply transfers from or to third parties would be covered by the theorem of Myerson and Satterthwaite (1983), and then we should expect excessive layoffs if the worker is to obtain any positive surplus from bargaining with positive probability.
to the level obtained in the benchmark model. Finally, since the experimentation rents are the same as in the benchmark model, \((w^*, L)\) will also be the same. Hence, it is possible to implement an efficient allocation of workers without distorting workers’ consumption profile.

The next proposition summarizes this discussion:

**Proposition 3.** If contracts can only stipulate \((w_1, s)\), then there exists a tax/subsidy scheme that implements the first best, i.e., eliminates inefficient layoffs, without distorting workers’ intertemporal allocation of consumption, and hence increasing welfare.

The tax decreases the incentives of firms to break off negotiations without increasing the workers’ threat point. It does so by introducing a gap between what a firm pays and what a worker receives. This sort of third party intervention is what is needed to guarantee efficiency under asymmetric information. Excessive layoffs call for public employment protection, but this employment protection cannot be obtained by restricting the contracting possibilities of parties.21

In most European countries the main instrument for employment protection is mandatory severance payments. However, in the current model mandatory severance payments cannot improve welfare. A binding, minimum level of \(s\) cannot affect firms’ layoff decisions and hence can only make things worse, raising \(w^2\) at the cost of a lower \(w^1\), thereby distorting the workers’ consumption profile. This results in lower utility for the worker, with no effect on the level of employment (measured in efficiency units).22

6. Extensions and robustness

We have made a series of simplifying assumptions that could be regarded as unrealistic. In this section we discuss in turn the consequences of relaxing some of these assumptions. In particular, attention will be focused on the consequences of relaxing two assumptions: the absence of correlation of workers’ performance across firms and the role of severance payments as a pure transfer between firms and workers. We show that our main conclusions would be unaffected by such changes. We also discuss more informally robustness with respect to some other assumptions, such as the workers’ two-period horizon and the inability of workers to borrow and lend. We argue that all we need for our results is that learning not be infinitely fast and that capital markets not be perfect.

6.1. Correlation

Let us assume that all \(q_{ij}\) are identically but not independently distributed. As before, all of them are distributed according to the density function \(h(q)\) with c.d.f. \(H(q)\) and mean 1. We still assume independence across workers, but allow for the possibility of (symmetric) correlation across firms. We further make the natural assumption that \(E(q_{ij}|q_{il}=1)=1\), and \(\frac{dE(q_{ij}|q_{il}=x)}{dx}|_{x=1} = 0\) for all \(i\) and \(j \neq l\). Hence, \(z_1=1\) is the unique solution to \(E(q_{ij}|q_{il}=z_1)=z_1\). Efficiency still implies that separations occur if and only if \(q<1\). Let us denote \(\theta(x)=E(q_{ik}|q_{il} \leq x), k \neq l\). Also note that if \(z_2\) solves \(\theta(z_2)=z_2\), then \(z_2<1\). For the moment, we assume that contracts and negotiations are publicly observable. We consider the case of non-observable contracts and non-observable negotiations below.

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21 For the reasons discussed in the previous section, this insight would not affected by the existence of risk aversion or the absence of a wage smoothing motive.

22 In fact, if we assumed an elastic supply of labor, this lower utility of workers would translate into a lower level of employment.
Consider first the case where future wages can be contracted. Given a contract \( \{ w^1, w^2, s \} \), the dismissal decision is still characterized by Eq. (5). Also, as before, in equilibrium firms must be indifferent between hiring old and young workers, so that the arbitrage condition (6) holds. However, a worker that is dismissed after having signed a contract \( \{ w^1, w^2, s \} \) is now expected to supply an alternative employer with \( \theta(q^c) \) efficiency units. Thus, an equilibrium contract maximizes the worker’s expected utility:\(^\text{23}\)

\[
U = u(w^1) + \gamma u\{ H(q^c)[w^*\theta(q^c) + s] + [1 - H(q^c)]w^2 \}
\]

subject to Eqs. (5) and (6). Substituting (5) for \( w^2 \) and (6) for \( w^1 \), the objective function can be written as a function of \( s \) and \( q^c \). The first order condition with respect to \( s \) is once again consumption smoothing, i.e., Eq. (8). Given this, and since

\[
H(q^c)\theta(q^c) = \int_q^{\bar{q}} E(q_{ij}|q_{il} = q)dH(q),
\]

the first order condition with respect to \( q^c \) implies that \( E(q_{ij}|q_{il} = q^c) = q^c \), and hence the equilibrium contract induces efficient separations, \( q^c = 1 \). Thus, when performance of workers is correlated across firms, private contracts that specify future wages implement the efficient allocation by including the right level of severance payments, and Proposition 1 still holds.

Now let us consider the case that future wages, \( w^2 \), cannot be contracted. In the second period, the worker’s take-it-or-leave-it offer is the value of \( w^2 \) that maximizes expected consumption:

\[
Ec^2 = H(q^c)[s + w^*\theta(q^c)] + [1 - H(q^c)]w^2,
\]

where \( q^c \) is given by Eq. (5). The first order condition characterizes the equilibrium value of \( q^c \), and can be written as

\[
E(q_{ij}|q_{il} = q^c) = q^c - \Psi(q^c).
\]

The slope of the right hand side is larger than 1, and that of the left hand side smaller than 1. At \( q^c = 1 \), the right hand side is smaller than the left hand side. We conclude that \( q^c > 1 \). That is, layoffs are excessive.\(^\text{24}\) Note that a tax on separations would have the same type of effect with correlation. Indeed, the dismissal decision \( (q^c) \) is affected in the same way, and therefore we can also conclude that such a tax reduces separations.

Whether outsiders can or cannot observe contracts and negotiations may be important in some cases. Firstly, it can be shown that under wage commitment if contracts are not observable then in equilibrium we have that \( \theta(q^c) = q^c < 1 \). In this case, there are too few dismissals as compared to the efficient level. In this case the pair worker-employer does not maximize the expected supply of efficiency units since they cannot influence outsiders’ expectations. Secondly, without wage commitment, if negotiations are not observable by outsiders, the worker maximizes

\[
Ec^2 = H(q^c)(s + w^*\theta^e) + [1 - H(q^c)]w^2,
\]

\(^\text{23}\) See footnote 13.

\(^\text{24}\) Note that in fact \( q^c \) is larger with correlation than in the independent case: when the worker decides on \( w_2 \), she takes into account that higher demands improve the expected productivity with outsiders if they are rejected. Also, note that with correlation dismissals are involuntary.
where now $\theta^e$ is the amount of efficiency units that outsiders expect from dismissed workers. The first order condition of the worker’s optimization problem is $q^c - \Psi(q^c) = \theta^e$. In equilibrium expectations must be correct and we should have that $\theta^e = \theta(q^c)$. Thus, in equilibrium

$$\theta(q^c) = q^c - \Psi(q^c).$$

This equation has only one root. It is above 1 if and only if $1 - \Psi(1) < \theta(1)$. Sufficient (although far from necessary) conditions for the above inequality to hold are that $H(1) \geq \frac{1}{2}$ (the mode is below the mean) and $\theta'(x) \leq 1$. Both assumptions are sensible: workers’ performance is probably right-skewed, and a better performance with a firm should not reduce the gap between the expected performance inside and outside that firm. These are sufficient conditions for any degree of correlation. Thus, even though dismissals were inefficiently low under wage commitment, dismissals are excessive from an efficiency point of view when future wages cannot be contracted. Again, a tax on separations would reduce this inefficiency.

We should point out that when negotiations are not observable and workers’ performance is correlated across firms, the excessive layoffs result is not immune to the assumptions on the ex-post bargaining power of workers. Indeed, under the opposite extreme assumption that the firm has all the bargaining power, the equation $\theta(q^c) = q^c$ characterizes the equilibrium layoff decisions. Therefore, just as with commitment to future wages, the rate of separations would be inefficiently low. Thus, when negotiations cannot be observed by outsiders, separations are excessive unless either correlation is very high or the ex-post bargaining power of the worker is too low.

### 6.2. Real costs associated to severance payments

Suppose that a dismissed worker receives only a fraction $\alpha$ of the dismissal cost borne by the firm. The rest may be lost due to litigation or other (real) costs. The most important victim of such separation costs is income smoothing. Indeed, $s$ is still an instrument that allows the pair worker-employer to transfer experimentation rents without increasing the incentives for separations. However, this instrument is now costly. If future wages can be contracted, the equilibrium contract must balance the costs associated with uneven consumption profiles and insufficient separations. Eqs. (5) and (6) are still valid. However, using Eq. (5), the worker’s expected utility can be written as:

$$U = u(w^1) + \gamma u\{H(q^c)(w^* + xs) + [1 - H(q^c)](q^c w^* + s)\}.$$

An equilibrium contract maximizes this utility with respect to $w_1, s$, and $q^c$ subject to condition (6). Substituting this arbitrage condition for $w_1$, the first order conditions of this problem can be written as

$$\frac{u'(c^1)}{u'(Ec^2)} = 1 - H(q^c)(1 - \alpha),$$

and

$$\frac{u'(c^1)}{u'(Ec^2)} = 1 - \frac{q^c - 1 + \frac{1 - \alpha}{w^*} s}{\Psi(q^c)}.$$
The first condition implies that \( c^1 > Ec^2 \), and given this, the second shows that
\[
q^* - 1 + \frac{1 - x}{s} > 0.26
\]
When \( w^2 \) cannot be contracted, the worker chooses \( w^2 \) so as to maximize second period expected consumption, which can be written as a function of \( q^c \):
\[
Ec^2 = H(q^c)(w^* + x) + \left[1 - H(q^c)\right](q^c w^* + s),
\]

The first order condition of this problem satisfies
\[
\frac{dEc^2}{dq^c} = -\left( q^c - 1 + \frac{1 - x}{w^*} s - \Psi(q^c) \right) = 0.
\]

Evaluated at the values \( s \) and \( w^* \), and \( q^c \) prevailing with wage commitment, \( \frac{dEc^2}{dq^c} \) is positive. Thus, if \( \frac{w^*}{w} \) were the same in both cases then separations would be too frequent when future wages cannot be contracted. The values of \( s \) and \( w^* \) will in general be different in the two equilibria. However, on the one hand, differentiating the first order condition above, we can check that there is a negative relationship between \( q^c \) and \( \frac{w^*}{w} \). On the other hand, we should probably expect that when \( w^2 \) is not contractible \( \frac{w^*}{w} \) will tend to be lower, since a high severance payment tends to interfere with labor income smoothing, and experimentation rents should be lower. A lower value of \( \frac{w^*}{w} \) would imply yet more frequent separations (higher \( q^c \)), which reinforces the conclusions obtained for a given \( \frac{w^*}{w} \).

Finally, note that the conclusion that a tax on separations reduces \( q^c \) is immune to the fact that part of the severance payment may be lost for the pair worker-employer.

Summarizing, in cases where privately agreed severance payments involve a real cost (associated, for instance, with litigation) the analysis is slightly more complicated but the main message still holds: if \( w^2 \) is not contractible then layoffs are too frequent and layoff taxes may help to reduce this inefficiency.

### 6.3. Other issues

We have assumed that workers live for two-periods and that the value of the match is only learnt at the end of the first period. It is possible to extend the analysis to any finite time horizon \( T > 2 \), although we have decided to spare the reader the considerable notation and derivations involved.27 The main qualitative results of the paper still hold for any \( T \) finite. However, the fact that learning takes a positive amount of time does play a role. If learning were arbitrarily fast then arbitrarily many firms could be informed at no cost. One of the main driving forces of the present model, i.e., the need for managing experimentation rents, would be absent. As long as learning takes time the implications would be similar to those of our model.

We have also assumed that workers do not have access to capital markets. Again, this assumption is stronger than needed and made in order to simplify the presentation. In fact, in a preliminary version of this paper (Burguet and Caminal, 2005) we show that all we need is that the discount factor associated with workers’ lending and borrowing, \( \beta \) and \( \bar{\beta} \) respectively, satisfy the inequality \( \beta < \gamma < \bar{\beta} \). Under this condition firms still want to provide the worker with income

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26 Note that given \( s \) and \( w^* \), and under constant marginal utility of consumption, efficient separations would dictate
\[
q^* - 1 + \frac{1 - x}{s} = 0.
\]
Indeed, the third term is the cost (waste) of a separation measured in efficiency units. Of course, under constant marginal utility of consumption there would be no reason to use positive \( s \).

27 The results for the case \( T = 3 \) are available upon request.
smoothing in order to reduce their wage bill. Whether or not workers have access to capital markets is irrelevant in most of the analysis, except in the case that the equilibrium contract involves a negative severance payment. Indeed, if future wages cannot be contracted, the equilibrium contract may involve a negative severance payment for some distributions of types. If, for reasons exogenous to the model, including a negative severance payment in the contract was not feasible, then workers may want to resort to borrowing or lending in order to smooth their consumption profiles. In that case, taxes on separations still provide a Pareto improvement upon the market outcome.28

7. Concluding remarks

Most of the arguments in favor of existing EP legislation tend to ignore the fact that employers and workers can use voluntary contract provisions that help to reduce future incentives to terminate their employment relationship. However, in the real world it is not rare to find employment protection clauses (including severance payments) in private contracts and collective bargaining agreements.

In this paper we have argued that, even when parties can include in their contracts severance payments and other provisions that discourage separations, the rate of separations is inefficiently high. As a result, there is room for public intervention. However, a legal restriction on the set of feasible contracts (mandatory severance payments) cannot improve efficiency. Yet, a more active public policy, a tax-subsidy scheme, can.

We have made these points in the context of a model where the quality of the matches between workers and their employers is uncertain and is only revealed through experience. Learning is asymmetric in that firms learn more than workers. Labor contracts must address the problem of how to share the resulting experimentation rents and at the same time provide the right incentives for workers’ reallocation and an adequate labor income profile. These two goals would be compatible if contracts could stipulate the sequence of wages for the entire employment relationship (and severance payments in case of dismissal). However, when firms and workers cannot commit to future wages, the two goals are no longer compatible. In this case, negotiations under asymmetric information will result in excessive dismissals (too little employment protection). Equilibrium contracts may still include positive severance payments, but labor relations will nevertheless break down too often.

The main results of the paper, excessive separations under laissez faire and the potential role of layoff taxes, are likely to play a central role in much more general and realistic environments. However, it is important to understand how the effects considered in this paper interact with other features of the labor market, including search and matching frictions, market power and other institutions.

Our point is related to the discussion on the desirability of experience rated unemployment insurance.29 In the US, a firm’s contribution to the unemployment insurance fund depends on the number of workers who claimed unemployment benefits after being laid off by that firm. Such a scheme works as a tax on layoffs. According to our theory, even in the absence of unemployment insurance, layoff taxes are a more appropriate device for discouraging layoffs than the standard European EP.

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28 A formal discussion of this issue is also available upon request.

29 See Blanchard and Tirole (2004). Fuest and Huber (2003) and Fath and Fuest (2005) provide a rich discussion of the pros and cons of experience rated unemployment insurance and review the existing literature.
References


