

The Economics of Severance Pay

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Abstract

All OECD countries have either legally mandated severance pay or compensations imposed by industry-level bargaining in case of employer initiated job separations. According to the extensive literature on Employment Protection Legislation (EPL), such transfers are either ineffective or less efficient than unemployment benefits in providing insurance against labor market risk. In this paper we show that mandatory severance is optimal in presence of wage deferrals when there is moral hazard of workers, shirkers can get away with it and adverse selection prevents employers to commit not to fire a non-shirker. Our model also accounts for two neglected features of EPL. The first is the discretion of judges in interpreting the law, which relates not only to the decision as to whether the dismissal is deemed fair or unfair, but also to the nature, economic vs. disciplinary, of the layoff. The second feature is that compensation for dismissal is generally increasing with tenure. We provide new cross-country comparable measures of these two features of EPL. The model also explains why severance is generally higher in countries with less efficient judicial systems and why small firms are typically exempted from the strictest EPL provisions.

“You should be aware that tribunals can be unpredictable in their decisions” (Understanding Employment Tribunals, Citizens Advice Bureau, UK)

“The firm does not have a clue about the actual costs of the layoffs. There is a range of costs and then substantial discretion of judges in deciding which cost to apply” (Lucia Zorza, HR Manager, Sirap Group)

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Introduction

Most OECD countries have legally mandated severance pay in case of employer initiated job separations. Such transfers from the employer to the worker are a very important component of dismissal costs as they account for almost 50% per cent of the cross-country variation in the OECD index of the strictness of employment protection legislation (EPL) for regular workers, the reference measure of EPL in the literature. When rules for compensations to workers are not specified by the law, it is collective bargaining at the industry or national level to mandate severance to individual employers.

According to the literature on EPL, severance pay is either neutral with respect to labor market outcomes or it is more distortionary than other institutions in providing insurance against labor market risk. It is neutral when wages are flexible and agents are risk neutral (Lazear [16]). Under rigid wages, severance pay generates unemployment (Garibaldi and Violante [13]) operating *de facto* as a firing tax. With risk-averse employees, severance is less efficient than other institutions – such as experience-rated unemployment benefits – in providing insurance to workers against the risk of job loss (Blanchard and Tirole [5]).

Why do we need then severance pay? In this paper we show that severance pay is efficient under risk neutrality and flexible (entry) wages, even in presence of unemployment benefits putting a floor to wages, provided that there are wage deferrals and the worker can decide not to invest in the productivity of the job. The underlying assumption is that firms can commit to a future wage schedule (not contingent on individual productivity), but not on the employment relationship. Hence a firm cannot commit not to fire a worker if that is in the firm's interest *ex post*, or to any payments to workers who are fired. An analogous assumption is made in several papers in the literature, see Menzio and Moen [20] and the references therein. Under these assumptions, severance deals with the moral hazard problem related to investment in job-specific productivity. The result is general as wage deferrals are a common feature of labor markets: most firms allow for a significant component of remuneration to be postponed for incentive purposes and these tenure-related components of compensation are agreed in advance, conditional on the continuation of a job, but independently of productivity realizations. Moreover, work measuring both wages and productivity (e.g. Flabbi and Ichino [14]) suggests that the effects of seniority on wage profiles observed by a large body of empirical literature can be attributed mainly to incentive reasons and are not necessarily associated with a higher productivity of senior workers.

Our model also allows to explain two neglected features of EPL. The first relates to the discretion of judges in deciding upon the fairness and the nature (economic vs. disciplinary) of the dismissal. This decision deeply affects the costs of dismissals. Compensation is generally not offered to workers being fired for disciplinary reasons unless a court ruling declares that the dismissal is unfair. When the individual layoff is instead motivated by the economic conditions of the firm, that is, it occurs independently of the behavior of the worker, compensation is typically offered also for fair dismissals, that is, cases where there is no evidence of opportunistic behavior of the employer. In the case of unfair dismissals, however, compensation is higher than the severance for fair economic dismissals. There are also countries in which compensation is provided only for unfair dismissals and fair economic dismissals do not involve mandated severance to the workers. Due to these wide differences in the levels of compensation related to the nature of dismissals, there are strong incentives for the employee or the employer to bring the case before a Court. Involvement of judges in the determination of the level of severance cannot be avoided by state contingent contracts, and since workers' effort and employers' investments in the duration of the job are not perfectly observable, the decisions of the judges will tend to be imperfect. Shirkers may receive the compensation offered for unfair disciplinary or economic dismissals, while opportunistic employers claiming that the dismissal is either disciplinary or due to objective economic circumstances may get away without paying the higher severance required for unfair dismissals or not paying severance at all. The unpredictability of the court ruling clearly affects also private settlements out of court, as such settlements will be based on the expected costs had the case gone to court. These relevant interactions between EPL and the efficiency of judicial systems have been neglected to date by the theoretical literature on EPL although there is evidence (Fraisie, Kramarz and Prost [10]) that the organisational structure of judicial systems does affect significantly labor market outcomes.

The second neglected characteristic of EPL is the *tenure profile* of severance pay. Most countries allow for mandated severance pay to be increasing with tenure. A very few countries provide compensation to

workers independently of tenure.

We show that these design features are efficient in dealing with moral hazard and adverse selection. Severance is needed as adverse selection prevent employers from committing not to fire workers investing in the productivity of the job. At the same time, the unpredictability of Court rulings and the distinction between economic and disciplinary dismissals increases the moral hazard problem of workers as they can "get away with it" even when they shirk.

Our model shows under which conditions – in terms of productivity, monitoring technologies, jurisprudence, and design of unemployment benefit systems – tenure-related severance pay increases productivity, reduces inefficient firing and induces an efficient allocation of labor. Problems in monitoring also rationalize why small firms are typically exempted from the strictest EPL regulations: it is easier for employers in small firms to prove opportunistic behavior of workers before Courts as they can better monitor and document the effort made by their workers in increasing the productivity of a job.

Our results are empirically relevant. Cross-country correlations based on OECD measures of effectiveness of judicial systems are consistent with the relationship between severance pay and legal systems implied by the model. Micro data also suggest that on-the-job training is positively correlated with the fact that a job is covered by compensation in case of dismissals, the key mechanism behind our model. The results of this paper are also relevant in evaluating proposals to introduce mandatory compensation increasing steadily with tenure in countries characterized by "contractual dualism", that is, the coexistence of a highly protected segment of the workforce and one segregated into temporary jobs providing low, if any, employment protection. It is also informative as to the optimal slope of the severance tenure profile, depending on the way in which courts typically protect senior workers and on the costs of training for older workers.

The plan of the paper is as follows. Part one evaluates the relevance of severance pay in OECD countries and develops cross-country comparable measures of two neglected features of EPL, the treatment of fair vs. unfair economic and disciplinary dismissals, and the tenure profile of severance pay. Part two develops a simple two-period model and evaluates optimal severance pay under these circumstances. Part three extends the model to n -periods and endogenizes the detection probability. Part four goes back to the data and analyses the correlation between severance and efficiency of judicial systems. Finally, part five summarizes our key results and discusses their empirical relevance.

1 Why Severance Matters

Employment protection legislation is one of the most widely investigated institutions in the labor market¹. The theoretical literature, pioneered by Bentolila and Bertola [1] and Bertola [3], typically treats EPL as a firing tax to be paid to a third party by the employer in case of a layoff. Severance pay, that is, a transfer from the employer to the worker contingent on employer initiated separations² is generally not framed in these models, as Lazear [16] neutrality result indicates that, with wage flexibility and risk neutrality, it only affects the tenure profile of wages leaving employment, hiring and separations unaffected.

However, severance pay accounts for a very large share of the costs of dismissals. According to Garibaldi and Violante [13] who carefully estimated the red tape costs of layoffs in Italy, severance pay accounts for about 2/3 of total dismissal costs. Severance also explains about 50 per cent of the total cross-country variation in the OECD index of strictness of EPL

Severance pay differs from firing taxes in at least two important dimensions. The first is that its amount depends both on the nature – disciplinary vs. economic – of the dismissal, and on whether it is deemed fair or unfair by a court ruling. This is very important in assessing the incentives associated with the provision of severance pay. The second distinguishing feature of severance pay is that it is generally dependent of tenure, while firing taxes are independent of tenure and are indeed modeled by the literature as a flat cost for the employer.

¹See Boeri and vanOurs [6] for a review of this literature.

²Our definition of severance clearly does not encompass deferred compensation schemes, such as private pension arrangements, which are paid at retirement or at any separation, including voluntary quits.

1.1 The unpredictability of Court rulings

Statutory severance pay levels depend on the nature, economic vs. disciplinary, and on the fairness of dismissals. Fairness in the case of *economic dismissals* refers to the behaviour of the employer: she should have tried as much as possible to avoid this outcome. Although the definition of fair economic dismissal differs quite considerably from country to country, it generally implies that some “genuine and serious” exogenous shocks in firm’s performance require “operational changes” in the scale, and possibly, nature of the work organization, making the worker involved redundant. Often evidence of “economic difficulties” or “technological change” is explicitly required.

In the case of *disciplinary dismissals*, the fairness refers to the behavior of the worker. Fair disciplinary dismissals are those for which there is evidence of misconduct on the part of the worker, where “misconduct” is often not defined, and the burden of proof typically falls onto the employer. When the economic or disciplinary dismissal is found by a Court to be “unfair”, the employer in some countries is forced to reinstate the worker. Generally the reinstatement does not take place, but the compensation paid to the worker increases. Everywhere, the costs of unfair dismissals are significantly higher than those of fair economic dismissals. Moreover, the employer, in addition to providing severance pay, typically has to pay the legal costs of the employee and compensate for the foregone months of pay during the legal procedure. The decisions as to the nature of the dismissal and its fairness require some Court ruling. In practice, disputes are mostly settled before the Court ruling, taking in consideration the nature of the dismissal, the probability that is considered fair and the severance and additional compensations envisaged under the different circumstances. Thus, in practice the level of severance ultimately depends on decisions made by third parties having limited information on the behavior of workers and employers. For all of these reasons the actual costs of layoffs are stochastic, and generally depend on the evidence that the employer can provide for a disciplinary or economic dismissal. The theoretical literature on EPL, recently reviewed by Boeri and vanOurs [6] generally treats severance as a deterministic transfer from the employer to the employee. In the few cases where stochastic severance is allowed (Garibaldi [12], Malo [19]) , it is modeled more as an option to fire (a firing permission) than as a distribution of alternative costs of dismissals. Moreover, no reference is made by this literature to the moral hazard problem related to the distinction between economic and disciplinary dismissals. Two partial exceptions are Galdon-Sanchez [11] and Boeri [7]. However, Galdon-Sanchez [11] operates on a reduced form model and both Boeri [7] and Galdon-Sanchez [11] do not address the efficiency of severance pay, but only consider its effects on unemployment and the layoff behavior of firms of different size.

Uncertainty as to the actual costs of the dismissal is increasing, inter alia, in differences in the level of mandatory compensation required under the three types of dismissals discussed above, that is, fair economic, fair disciplinary, and unfair dismissals. Table 1 displays the maximum compensation (severance pay plus notice period) required in these three cases in OECD countries. The table is based on the analysis of the country files used by the OECD in building up the summary measure of strictness of EPL, a report prepared for a European conference of labor lawyers [9], a study by the ILO [4] and a recent survey of Civil Justice also carried out by OECD (Palumbo [21]).

As shown by Table 1, in all countries even fair dismissals command some compensation to the worker, either in terms strictly of severance pay or of a minimum notice period (de facto an extension of pay after the date when the worker is made redundant). The compensation for unfair dismissals (T_U , first column) is, however, always higher than that provided in case of fair dismissals (either economic, T_F^E , or disciplinary, T_F^D , second and third columns). One of the reasons why unfair dismissals cost more than fair dismissals is that in several countries (see Table A2 in the Annex), in addition to a monetary compensation, an unfair dismissal may also be sanctioned with the reinstatement of the worker in the ranks of the firm. Thus, in these countries, the costs of unfair dismissals should include the duration of the trial period, as reinstated workers should be back paid the full wage between the date of the dismissal and that of the Court ruling, and an additional compensation, as the worker and the employer generally agree on a monetary transaction in lieu of an actual reinstatement after the Court ruling. This compensation will be clearly related to the protection provided to job-holders, that is, to the severance in case of unfair dismissals in that specific country. Thus, we estimate the costs of unfair dismissals in countries with reinstatement as given by the statutory notice period (N) and severance (S), plus the average length of the trial period (d), and the compensation for unfair dismissal

(S), as an alternative to the reinstatement itself, the latter two terms multiplied by the likelihood that a reinstatement is actually granted (π), i.e.:

$$T_U = N + S + \pi(d + S) \quad (1)$$

As detailed in Table A2 in the annex, we attribute to π the value obtained by standardizing to the unit interval the 0-3 OECD index on the likelihood of the reinstatement, where 0 means never reinstatement and 3 denotes the case where employees can freely decide upon the reinstatement in the case where the dismissal is ruled to be unfair. As shown by the fourth and fifth columns of Table 1, unfair dismissals are significantly more expensive than fair economic dismissals, while the latter are more expensive than fair disciplinary dismissals, which typically involve only a relatively short notice period.

The above suggests that there is substantial uncertainty as to costs of dismissals for an employer. The sixth column of Table 1 provides a measure of judicial discretion, Σ . The latter is obtained by multiplying the weighted standard deviation of dismissal costs (a measure of dispersion) by the appeal rates before the second instance as a percentage of population (α , see Table A2), a measure of unpredictability of Court rulings. The rationale for using this proxy as a mean-preserving spread factor is that the probability that a case is brought to a higher instance is likely to be increasing in the uncertainty as to the expected outcome of the litigation. The weighted standard deviation uses legal rules concerning the burden of the proof as proxy for the probability that a dismissal is considered unfair. In particular, we arbitrarily assume that this probability, $(1 - p)$ takes the value .75 when the burden of proof is on the employer, .25 when the burden of proof is on the worker and .5 in the intermediate case where it can be on both parties. The probability that a dismissal is ruled as fair economic is then $p(1 - p)$ and fair disciplinary is p^2 . The underlying idea is that an employer, who provides the motivation for the dismissal, would always opt for a disciplinary dismissal as it less costly than an economic dismissal. Formally our measure of unpredictability is given by

$$\Sigma = \sqrt{\alpha(E[T^2] - E[T]^2)} = \sqrt{\alpha((1 - p)T_U^2 + p^2T_F^D + p(1 - p)T_F^E - ((1 - p)T_U + p^2T_F^D + p(1 - p)T_F^E)^2)} \quad (2)$$

where $E[\cdot]$ denotes the expectation operator. To ease the interpretation of the results, we also provide, in the seventh column, the coefficient of variation of the distribution of the costs of dismissals. Notice that the cross-country average for the coefficient of variation is 8.5, pointing to a very large dispersion of dismissal costs across the various judicial outcomes. Notice further that our measure of judicial discretion is not increasing in dismissal costs. For instance, countries with relatively large costs of unfair dismissals, like Sweden, display a much lower index of unpredictability than countries, such as the Czech Republic, where unfair dismissal costs are about 50% than in Sweden.

Consistently with these facts, the model developed in the next section will allow for both economic and disciplinary dismissals and address the moral hazard problem related to potential workers' misconduct and the nature, economic vs. disciplinary, of the dismissals. We will initially assume that the probability that a Court rules that a layoff is disciplinary is exogenous and show that in a model with wage deferrals (e.g., related to career concerns), a properly designed severance scheme maximizes the joint surplus from a match. Later on, we will endogenize the probability that a Court rules in favor of the employer, based on the evidence that can be provided by the firm on the productivity of the worker and evaluate the optimal severance under this endogenous probability of getting away with it. Finally, we will consider a case where can be also moral hazard of the employer in pretending that the dismissal is disciplinary when it is instead due to economic reasons.

1.2 The elasticity of severance to tenure

In order to characterize the severance-tenure profile of EPL in different countries, we developed a simple measure of graded security for regular workers, that is workers with open-ended contracts. The index is obtained by adding up mandatory severance and notice periods for private sector workers at different tenure lengths,

Table 1: Severance and nature of dismissal

Country	T_U	T_F^E	T_F^D	$T_U - T_F^E$	$T_F^E - T_F^D$	st.dev	Σ
Australia	13.90	3.80	1.00	10.10	2.80	4.71	0.41
Austria	20.29	4.00	4.00	16.29	0.00	7.06	0.44
Belgium	31.30	21.00	21.00	10.30	0.00	4.46	-
Canada	-	4.30	2.00	-	2.30	-	-
CzechRepublic	19.99	3.50	2.00	16.49	1.50	7.65	6.58
Denmark	19.97	9.00	6.00	10.97	3.00	5.83	2.00
Finland	20.00	6.00	6.00	14.00	0.00	6.06	1.28
France	27.67	7.40	2.00	20.27	5.40	10.72	6.68
Germany	43.58	17.00	7.00	26.58	10.00	12.77	2.49
Greece	-	12.00	4.00	-	8.00	-	-
Hungary	27.16	9.00	3.00	18.16	6.00	10.07	4.99
Ireland	40.90	6.00	2.00	34.90	4.00	15.57	2.68
Italy	40.14	6.00	6.00	34.14	0.00	14.78	8.00
Japan	10.16	1.00	1.00	9.16	0.00	4.58	0.91
Korea	17.81	1.00	1.00	16.81	0.00	7.28	2.02
Luxembourg	18.20	12.00	6.00	6.20	6.00	3.58	1.75
Netherlands	16.67	4.00	4.00	12.67	0.00	5.48	-
NewZealand	12.49	0.50	0.50	11.99	0.00	5.19	0.62
Norway	29.61	6.00	6.00	23.61	0.00	10.22	-
Poland	11.82	6.00	3.00	5.82	3.00	2.92	1.57
Portugal	62.85	14.50	2.50	48.35	12.00	22.39	9.21
SlovakRepublic	27.79	7.00	3.00	20.79	4.00	10.41	6.64
Spain	36.50	12.50	0.50	24.00	12.00	11.98	6.71
Sweden	38.00	6.00	6.00	32.00	0.00	13.86	2.42
Switzerland	9.00	3.00	3.00	6.00	0.00	2.60	0.84
Turkey	32.00	22.00	2.00	10.00	20.00	7.81	-
UnitedKingdom	17.67	7.60	3.00	10.07	4.60	4.96	1.16

Notes: data are expressed in monthly wages.

Sources: EPLex; OECD (2013);

See equations 1 and 2 in the main text and table A2 in annex for details.

Reference is made to a worker with 20 years of tenure.

drawing on institutional information gathered by the ILO (EPLex project) and the OECD. In particular, we considered the following tenure classes for which cross-country comparable information has been gathered: tenure at nine months; at one, five, ten and twenty years. At each tenure length, we computed an apparent elasticity of severance to tenure (plus notice) in between any two consecutive tenure levels and the ratio of tenure to the number of months in that interval. The largest and the lowest of these elasticities (and their correspondent tenure levels) are displayed in the first two columns of Table 2. This suggests that there is significant cross-country variation in the slope of the severance-tenure profile, but only two countries (Austria and Japan) where the elasticity is zero throughout a 20 years tenure length, denoting a flat severance-tenure profile.³ In the other countries, a flat severance-tenure profile is observed only limited to some tenure lengths.

As there is an apparent elasticity per period, we also developed a summary measure of graded security, by adding up the elasticities using weights proportional to the length of each tenure interval. Finally we normalized these overall apparent elasticities to obtain a unit value for a proportional severance scheme at all tenure lengths (one having always a unit apparent elasticity). Formally, denoting by $S + N$ the months of mandatory severance and compulsory notice period, by τ months of tenure, and by indexing the tenure classes by subscript t , our index of *Graded Security* is given in each country by

$$GS = \sum_{t=0}^5 \frac{\Delta(S_t + N_t)}{\Delta\tau_t} * \frac{\tau_t}{S_t + N_t} * \frac{(\tau_t - \tau_{t-1})}{240} \quad (3)$$

where $t = 0$ denotes the beginning of the tenured contract, $t = 1$ denotes 9 months of tenure, $t = 2$ corresponds to one year of tenure, $t = 3$ to five years, $t = 4$ to ten years and, finally, $t = 5$ to twenty years of tenure. The last column on the right-hand-side of Table 2 provides the value of this index for the OECD countries. Figure 1 displays the severance tenure profiles for the same set countries.

We find that 18 countries out of 29 display an index above 50 per cent. In the two countries paying the same severance at all tenure levels (Austria and Japan), the index is clearly zero and the country-specific diagram displays a flat line. Relatively low levels for GS would also be observed in case of a markedly concave severance - tenure profile, as severance at longer tenures has a larger weight in our index. Both Figure 1, and Table A1 in the Annex displaying the apparent elasticities at each tenure length, suggest that a number of countries start up with a relatively high level of severance and then allow for a mild, but steady, increase of severance with tenure. This generates a relatively low GS.

Overall, the GS index documents that most countries have mandated severance pay (and statutory notice periods) increasing with tenure.

Why do regulations in so many countries allow for severance graded with tenure? Is this profile efficient from the standpoint of the individual worker and firm involved? There may be social efficiency considerations for having employment protection increasing with tenure, e.g. related to the fiscal externalities associated to layoffs in presence of tenure-related unemployment benefit systems and/or job finding rates declining with age. There can also be equity considerations for offering stronger protection against layoffs to older workers, but we are not aware of theories rationalizing these arrangements from the standpoint of purely private efficiency.

Personnel economics offers explanations for why firms offer *tenured jobs*, that is, positions that cannot be severed under any set of circumstances. Tenured jobs can be rationalized as the result of learning about match quality, building on Jovanovic [15] matching model, whereby firms, after observing a sufficiently long string of positive signals on the productivity of a worker decide to retain the employee, irrespective of future negative signals. Another explanation provided for offering tenured jobs is in terms of hiring incentives in organisations where incumbents have control over hirings, e.g., in academic institutions. Tenure prevents the strategic choice of incumbents of hiring only low quality workers in order to reduce competition with outsiders (Carmichael [8]). These theories explain why employers may decide to commit not to layoff some workers, but do not explain why a *mandated* profile of severance increasing with tenure is chosen for potentially *all* private firms, irrespective of whether incumbents in these organizations play any role in hiring

³In Denmark, New Zealand and the US, there is no mandatory severance, hence the elasticity is not defined. Therefore, these countries are not included in the Table.

Table 2: Min and max apparent elasticity and related tenure and GS Index

	Minimum Elasticity	Related Tenure (months)	Maximum Elasticity	Related Tenure (months)	Elasticity Range	GS Index
Australia	0.0	240	3.3	12	3.3	0.31
Austria	0.0	each tenure lenght	0.0	each tenure lenght	0.0	0.00
Belgium	0.2	60	1.0	9	0.8	0.70
Canada	0.7	240	1.0	9, 60	0.3	0.84
Czech Republic	0.0	12, 60, 120, 240	0.6	9	0.6	0.02
Estonia	0.0	240	1.0	9, 12	1.0	0.26
Finland	0.6	60	1.0	9	0.4	0.77
France	0.0	9	0.9	240	0.9	0.74
Germany	0.0	9	1.4	12	1.4	0.91
Greece	0.7	60, 120	4.0	12	3.3	-
Hungary	0.0	9, 12	0.9	60	0.9	0.71
Ireland	0.7	60	2.2	12	1.5	0.79
Israel	0.8	60	3.1	12	2.3	0.95
Italy	0.0	9, 12, 60	0.5	120	0.5	0.33
Japan	0.0	each tenure lenght	0.0	each tenure lenght	0.0	0.00
Korea, Rep.	0.0	9	2.0	12	2.0	0.90
Luxembourg	0.0	9, 12	0.8	60, 120	0.8	0.67
Mexico	0.1	12.0	1.0	9	0.9	0.63
Netherlands	0.0	9, 12	0.7	120	0.7	0.54
Norway	0.0	9, 12, 240	0.7	120	0.7	0.29
Poland	0.0	9, 12, 120, 240	0.8	60	0.8	0.17
Portugal	0.5	9, 12	1.0	9	0.5	0.82
Slovak Republic	0.0	12, 120	0.5	9	0.5	0.10
Slovenia	0.0	9	1.1	240	1.1	0.85
Spain	0.5	9	0.9	60, 120, 240	0.4	0.87
Sweden	0.0	9, 12, 240	1.0	120	1.0	0.42
Switzerland	0.0	60, 240	1.0	9	1.0	0.23
Turkey	0.0	9	2.1	12	2.1	0.87
United Kingdom	0.0	9, 12	1.1	60	1.1	0.79

Source: OECD (2012), World Bank Data (2012)

Figure 1: Severance payments for fair economic dismissal and tenure

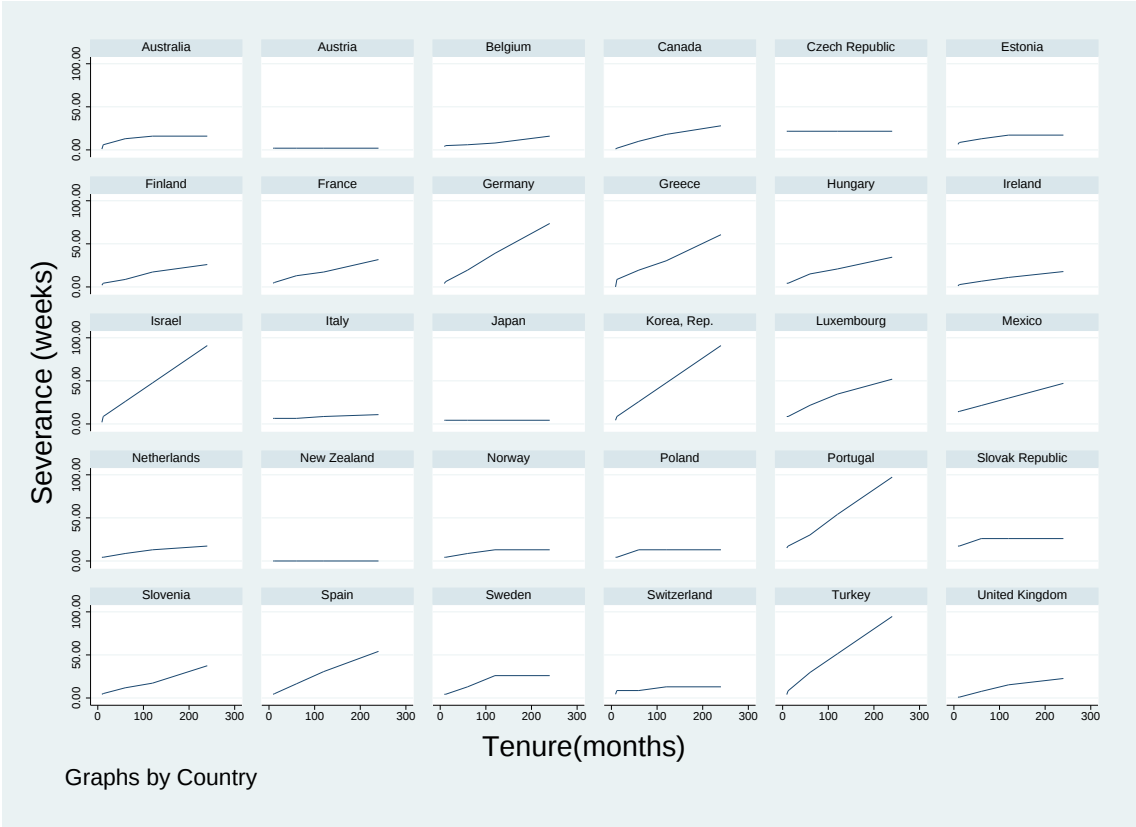
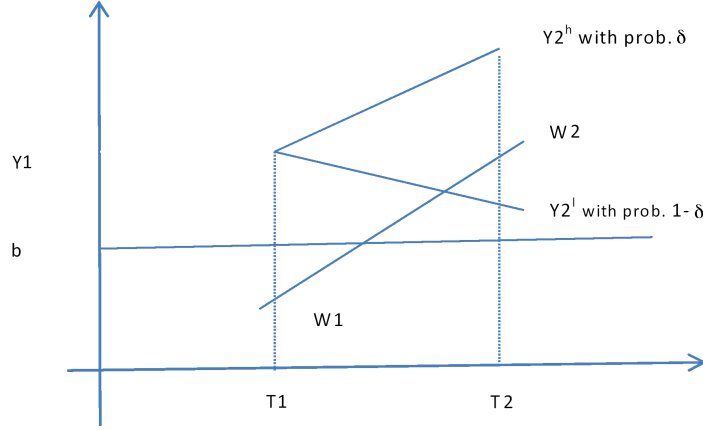


Figure 2: An illustrative example



decisions or there is substantial heterogeneity in the quality of applicants. Moreover, these models do not address problems of commitment: private firms generally cannot credibly commit not to layoff some workers, irrespective of their performance.

In the model presented in Section 2, a privately efficient and positive severance-tenure profile emerges as a result of moral hazard related to the stochastic nature of severance pay and the difference between disciplinary and economic dismissals. The stochastic nature of severance is due to the fact that both the “fairness” and the nature (economic vs. disciplinary) of the dismissal have to be proved before a Court.

2 The Basic Economics of Severance Payments

2.1 An example

A simple motivating example, illustrated in Figure 2, delivers our key intuition as to the inefficiency of separations without severance. Consider a two periods model, where the workers’ outside option is b in both periods. To keep things simple, assume that there is no discounting and there is no specific investment. Wages are given, but for some exogenous reasons, are deferred. Denote the first period and the second period wages by $w_1 < b$ and $w_2 > b$ respectively.

Productivity is y_1 in the first period while in the second period it is stochastic: it can take value y_2^h with probability δ and value y_2^l with probability $1 - \delta$. Assume that

$$y_2^h > w_2 > y_2^l > b$$

Firms can fire in the second period conditional on the realization of the shock. Firing requires a severance payment $T \geq 0$. It follows that expected profits of the firm (the surplus of the employer) are given by:

$$\Pi = y_1 - w_1 + (1 - \delta)[y_2^h - w_2] + \delta \text{Max}[y_2^l - w_2, -T]$$

The total surplus is given in each period by $y - b$. Since $y_2^l > b$ by assumption, the joint surplus is positive in the second period whatever the realization of the shock, and hence, for efficiency reasons, production should take place (both y_2^h and y_2^l are above the horizontal line at b in Figure 2). However, since $w_2 > y_2^l$, when $T = 0$, firms always fire conditional on an adverse shock. Hence the firm fires even if the joint surplus is strictly positive. A severance payment $T^* \geq w_2 - y_2^l$ prevents inefficient separation. When there are wage deferrals, a severance payment can prevent inefficient separation for senior workers.

2.2 Two periods model of specific investments

Consider now a more general two-period setting with endogenous wages being set in the initial period and moral hazard related to the decision of the worker to invest in firm-specific training. In our setup, workers may undertake a costly specific investment with uncertain return. We will keep our assumption that firms cannot commit "not to fire", thus workers expect that firms will always fire when -ex post- returns are too low, even when they have invested in the job. We are not aware of employers in the private sector signing contracts that do not allow them to layoff workers in case of exogenous shocks. At the same time, a worker who does not invest can legitimately be dismissed as a "shirker". This firm initiated dismissal is "disciplinary", but such a case must be proved before a court and there is a certain probability that a disciplinary firing is deemed unfair by judges and a shirking worker "can get away with it". We thus have a moral hazard problem, since shirking workers can obtain severance payments.

The model is partial equilibrium: one worker and one firm have a job opportunity that lasts two periods. We also impose that the worker and the firm are risk neutral. As in the illustrative example above, there is no discounting between periods, and the worker's outside option is b in every period. Denote the baseline productivity on the job as $y \leq b$ in every period. Assume further that wages are unilaterally set by the firm at the beginning of the contract. There is full commitment on the wage schedule and the firm cannot renegotiate ex post on the promised wage. The per period wage is indicated with w_i , $i = \{1, 2\}$

In period 1 the worker faces a specific investment opportunity $s = \{0, 1\}$. The investment opportunity costs to the worker C in the first period. It is only the worker who can undertake the investment opportunity. In other words, s is privately known by the worker in the first period, and revealed to the firm in the second period.

Conditional on the investment being undertaken, productivity in the second period will be $y + \varepsilon$, where ε is the specific component of productivity and it is drawn from a continuous distribution $F(\varepsilon)$ defined over the support $\varepsilon \in [\varepsilon_l, \varepsilon^u]$ with $\varepsilon_l < 0$. The specific component of productivity is observed only by the firm. Since ε is only known to the firm, wages cannot be contingent on the specific component of productivity. In the second period, conditional on having observed the ε draw, the firm can unilaterally fire the worker. The second period wage is therefore a compensation contingent on not having shirked in the first period. Hence there are two types of dismissals in the model. Economic and Disciplinary dismissals.

Definition 1 *Disciplinary Dismissal.* In period 2, a firm is entitled to freely dismiss a shirking worker that did not invest in the first period.

Definition 2 *Economic Dismissal.* In period 2, when productivity is sufficiently low, a firm is entitled to dismiss a worker by paying a severance T .

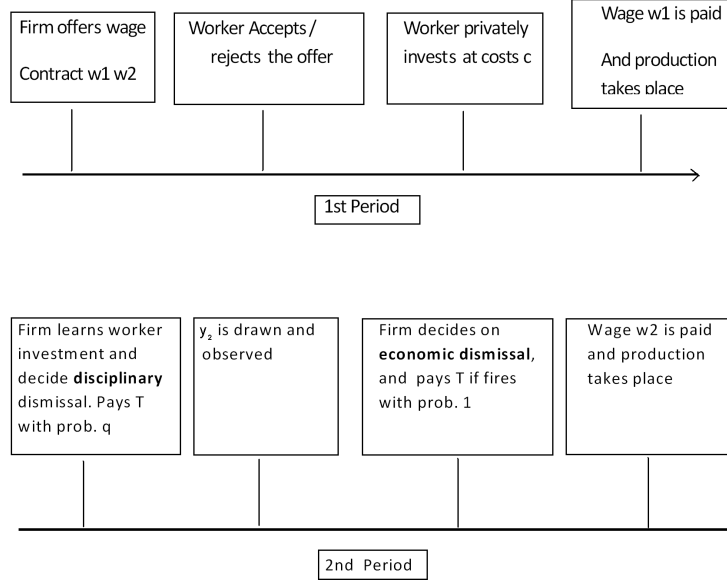
In terms of employment protection legislation, a worker that does not invest is legitimately fired for disciplinary reasons while a productivity related layoff is a fair economic dismissal.

A driving assumption in our model is that the firm can not commit to a severance payment. Hence, in the absence of publicly imposed severance pay, the compensation to the worker in case of economic dismissal will be zero. It follows that the severance payment T is a policy tool.

We rationalize our assumption that the firm cannot contract upon T by alluding to an underlying, unmodelled problem of adverse selection that stands on the way of a private contractual arrangement. If a firm unilaterally commits to a severance payment, it would be a victim of negative selection, and would end up hiring less favourable workers.

Let us be more specific. Suppose there are two types of workers; ordinary workers as described above and shirkers, with $C = \infty$. Hence the shirkers always shirk. The fraction of the "shirkers" may be arbitrarily small, but strictly positive. The firms cannot distinguish between shirkers and ordinary workers. Consider a situation where all firms offer a contract (w_1, w_2, T) , where $T > 0$. We will argue that this cannot be an equilibrium. Consider a firm that deviates and offers a contract $(w_1, w'_2, T' - \varepsilon)$, where $w'_2 > w_2$ and ε can be arbitrarily small. Since ordinary workers are strictly more willing to trade off severance payment for a higher period 2 wage than are shirkers, it is possible to choose w'_2 so that ordinary workers strictly prefer the new contract and shirkers strictly prefer the old contract. Hence the deviator only attracts the more profitable

Figure 3: Timeline



ordinary workers, and the equilibrium unravel. This argument can be used for any equilibrium candidate in which also ordinary workers receive severance pay. Thus, an arbitrarily small fraction of shirkers drives out severance pay for ordinary workers altogether.⁴

A mandatory severance solves this co-ordination problem. The realism of this assumption can be assessed considering that severance is either legislated or established within collective agreements at the industry, state or national level.

Over and beyond economic and disciplinary dismissals, we have to distinguish between fair and unfair dismissals. In our setup the distinction is particularly relevant for disciplinary dismissals. Whether a disciplinary dismissal can be defined as fair can only be proven in court. The court ruling is stochastic. In period 2 the firm observes if the worker has invested or not, but cannot necessarily prove insufficient investments (hereafter shirking) in a court of law. We assume that there is a probability $1 - q$ that the court of law observes shirking and declares the firing as fair. In such a case, the firm is exempted from paying severance payments. Hence, there is a probability q that a shirking worker "gets away with it" and receives severance payment. When this happens, the disciplinary dismissal is defined as unfair, and a severance payment is due. The realization of q is made after the firm has fired the worker, hence the expected severance payment for the firm when firing a shirking worker is qT .⁵ In the case of an economic dismissal, we assume that severance payment is always due, and there is no distinction between fair and unfair dismissals. Hence we abstract from moral hazard on the firm side regarding the nature of the dismissal. The timeline of the model in periods 1 and 2 is described in Figure 3.

We assume that the investments are sufficiently productive, so that the firm finds it profitable to implement them. In what follows we derive the optimal contract of the firm, that is, a set of wages w_1 , w_2 , and a firing policy that maximizes the profit of the firm given 1) the firm's ex post firing behaviour, 2) the incentive compatibility constraint of the worker, and 3) the participation constraint of the firm.

⁴For a more formal treatment of the same argument, see Rothschild, M. and Stiglitz, J. (1976), Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information. *Quarterly Journal of Economics* 17, 557-66, and Moen, E.R. and Rosen, Å. Incentive Contracts and Adverse Selection, *Scandinavian Journal of Economics* 2005, vol 107(2), 279 - 298.

⁵In terms of the definitions used in Section 1, we have that $T_F^D = 0$ and $T_F^E = T$ in this setting, while $1 - p^2 = q$. T_U is introduced in section 3 below. Here we focus only on moral hazard of the employer.

2.3 Optimal contracts

Let us indicate with $W_{(s=0)}$ the value of the job to the worker in case she does not invest. In this case the shirking worker gets the first period wage, and will be fired in period 2 for disciplinary reasons with probability 1.

$$W_{(s=0)} = w_1 + b + qT$$

The worker's expected income if she invests is

$$W_{(s=1)} = w_1 - C + (1 - F(\varepsilon_d))w_2 + F(\varepsilon_d)[b + T]$$

where $F(\varepsilon_d)$ is the probability of being fired in the second period for economic reasons.

Let us then turn to the firm. The period 2 profit is given by

$$\Pi_2(\varepsilon) = \text{Max}[y + \varepsilon - w_2; -T].$$

The firm retains the worker if and only if $\varepsilon \geq \varepsilon_d$, where the threshold ε_d is given by

$$\varepsilon_d = w_2 - y - T \quad (4)$$

The expected profits are⁶

$$\Pi_{1(s=1)} = y - w_1 + \int_{\varepsilon_d}^{\varepsilon_u} [y + \varepsilon - w_2] dF(\varepsilon) - TF(\varepsilon_d) \quad (5)$$

Finally, if the worker does not invest, and the firm fires the worker in period 2, its expected cumulative profits are

$$\Pi_{1(s=0)} = y - w_1 - (1 - q)T$$

where $(1 - q)T$ is the expected severance payment for a fair dismissal

Let us turn to the incentive compatibility constraint (ICC) of the worker. The worker will invest if and only if $W_{(s=1)} \geq W_{(s=0)}$. If the worker does not invest, she is fired with probability 1. Hence the ICC reads

$$(1 - F(\varepsilon_d))w_2 + F(\varepsilon_d)(b + T) - C \geq b + qT$$

The lowest value of w_2 that satisfies the ICC is thus

$$w_2 = b + \frac{C + [q - F(\varepsilon_d)]T}{1 - F(\varepsilon_d)} \quad (6)$$

Note that equation (6) does not have a solution for all C . the reason being that the threshold ε_d is increasing in w_2 . We say that the investment is *implementable* if (6) has a solution and the firm breaks even at this wage.

Let us give some further comments. First, note that if $\varepsilon_d = \varepsilon_l$, i.e., if workers who invest is never dismissed, then $w_2 = b + C + qT$. Hence the worker is compensated for her outside option b , her investment cost C , and the rents qT she would get if shirking.

Second, the nominator in (6) increases in T if $q > F(\varepsilon_d)$. This reflects that the worker in this case is more likely to get the severance if shirking than if not shirking. If $q < F(\varepsilon_d)$, the opposite holds. Finally, if $q = F(\varepsilon_d)$, the expected period two wage premium above the outside option is exactly equal to the investment cost C .

Given the second period wage, the first period wage is set so as to ensure that the worker participation constraint is satisfied. The workers has an outside option equal to b per period, so that the worker participation constraint is $W_{(s=1)} \geq 2b$ which, when strict, simplifies to

$$w_1 = b - qT \quad (7)$$

⁶In what follows we assume that there exists a wage w_2 such that $(1 - F(\varepsilon_d))w_2 \geq b + C$. This is a necessary requirement for investments to be enticeable from the firm standpoint. We also assume that $(w_2 - b)[1 - F(\varepsilon_d)]$ is increasing over the relevant intervals.

This is also intuitive. By shirking and not investing, the worker is able to achieve a rent of qT . In order to satisfy the ICC, the worker gets the same rent when investing. The exact same amount is extracted from the worker (relative to his outside option) through a low period 1 wage. Clearly, the severance does not influence the worker's lifetime income in partial equilibrium, but it makes the wage-tenure profile steeper.

Finally, in order to fully characterize the contract we have to solve for ε_d . From (4) and (6) it follows that

$$\varepsilon_d = b - y + \frac{C - (1 - q)T}{1 - F(\varepsilon_d)} \quad (8)$$

At $\varepsilon_d = \varepsilon_l$, the left-hand side of the equation is strictly negative, while the right-hand side is positive (as long as $C \geq (1 - q)T$). Both the left-hand side and the right-hand side of the equation are increasing in ε , hence the equation may not have a solution.⁷ However, if the investments are sufficiently productive, in a well defined sense, the equation has a solution. To be more precise, suppose the distribution can be written as $\varepsilon = \varepsilon_l + kz$, where z is a stochastic variable on $[0, 1]$ with median value of $z^m > 0$ and expected value of $\bar{z}$. The scalar k is a measure of the productivity of the investment. Furthermore, on intervals of T and C where investments are implementable, ε_d is increasing in C and decreasing in T .

Proposition 1 *Consider an arbitrary investment cost C and severance T . Then, if the investment is sufficiently productive, the investment is implementable. On intervals where the investment is implementable, ε_d is increasing in C*

An interesting special case emerges if $q = 0$, so that shirking workers "never gets away with it", and disciplinary firing is perfectly detected. It follows from (6) that

$$w_{2(q=0)} = b + \frac{C - F(\varepsilon_d)T}{1 - F(\varepsilon_d)} \quad (9)$$

In this case, there is a perfect court monitoring and we can say that *severance payment acts as a discipline device*. Indeed, with perfect court monitoring, the firm needs to use less of the wage to induce workers' investment and the period 2 wage turns out to be decreasing in the severance pay, for two reasons. First, for a given ε_d , severance payments make investments more attractive, while they do not influence the pay-off for shirking workers (who get only b). Second, severance pay (and lower wages) makes firms more reluctant to fire, which also makes investing more attractive (since $w_2 > b + T$).

On the other extreme, if $q = 1$ (shirking workers always get severance pay), *severance payments are neutral*. From (6) we have that

$$w_{2(q=1)} = b + \frac{C}{1 - F(\varepsilon_d)} + T \quad (10)$$

From (8) it follows that

$$\varepsilon_{d(q=1)} = b - y + \frac{C}{1 - F(\varepsilon_d)}$$

In this case, the severance payment is neutral in terms of allocation of labor. For a given ε_d , a severance pay now increases wages by the same amount. Furthermore, when $dT = dw$, ε_d stays constant. It follows that $\frac{dw_2}{dT} = 1$. This is a version of the Lazear (1990) neutrality result.

2.4 Optimal severance

In this subsection we will derive the optimal severance for the firm in question. We think of the firm as a representative firm, so that our results can shed light on optimal severance more generally. We will discuss this more below.

⁷Or it may have multiple solutions, in which case the lowest one is the relevant one since the firm chooses the lowest possible incentive compatible wage

The severance only influences the period 2 hiring decision of the firm. Separation in the second period is efficient when it maximises the joint surplus from the job. Denote worker surplus at time $t = 2$ with $S_{w,2}$ and the firm surplus with $S_{f,2}$. Clearly

$$\begin{aligned} S_{w,2} &= w_2 - (b + T) \\ S_{f,2} &= y + \varepsilon - w_2 - (-T) \end{aligned}$$

where $b + T$ is the worker's outside option while $-T$ is the firm outside option. The joint surplus reads

$$S_2 = y + \varepsilon - b$$

where both wages and severance payments do not enter in the joint surplus, as they are a simple transfer between the two parties. Firing is efficient if and only if $S_2(\varepsilon^*) = 0$, i.e., if

$$\varepsilon^* = b - y. \quad (11)$$

Firing is efficient whenever the productivity from the job ($y + \varepsilon^*$) falls below the worker's outside option b . We call ε^* the efficient reservation productivity.

The first result that we can establish concerns the firing policy of the firm. By comparing (8) and (11) at $T = 0$, it immediately follows that

$$\varepsilon_{d(T=0)} = b - y + \frac{C}{1 - F(\varepsilon_d)} > \varepsilon_d^*.$$

Hence, with no severance payments, firing is too high in the second period, as predicted by the motivating example. As second period wages need to pay for the worker's investments' effort in the first period, the firm has a tendency to over dismiss in the second period a worker that did not shirk and invested in the first period.

Our next step is to derive the optimal severance payment T . That is, find the value of T such that $\varepsilon_d = \varepsilon^*$. By using (4) and (11) we find that

$$T = w_2(\varepsilon_d) - b$$

i.e., is equal to the wedge between the inside and the outside wage. Inserting from (6) gives the following expression for the optimal T , denoted by T^* (for $q < 1$)

$$T^* = \frac{C + [q - F(\varepsilon^*)]T^*}{1 - F(\varepsilon^*)}$$

Solving this for T^* gives

$$T^* = \frac{C}{1 - q} \quad (12)$$

This can also be seen directly from equation (8). Note that Finally, to find w_1 , we insert T^* into (7) to obtain

$$w_2 = b + \frac{C}{1 - q} \quad (13)$$

$$w_1 = b - \frac{q}{1 - q}C \quad (14)$$

The profit of the firm when implementing the project is

$$\Pi_{s=1} = y - b + \int_{\varepsilon=y-b}^{\varepsilon^u} (\varepsilon + y - b)f(\varepsilon)d\varepsilon \quad (15)$$

The project is implementable if it breaks even.⁸ Since there are no externalities associated with the project, firm profits reflect the social value of the project. It follows that the project is implementable if and only if it has positive social value.

Proposition 2 *For $q < 1$, the optimal severance T^* is given by (12), and the project is implementable if and only if it has positive social value.*

If $q = 1$, the severance does not influence the firm's hiring decision, and is then useless as a policy tool for inducing optimal retention by the firm.

We want to point out the remarkable fact that optimal severance is independent of the distribution of ε . Optimal severance pay only depends on q , a property of the legal system, and C , the investment costs. It seems natural to assume that q is the same for all the firms in a country. The investment cost C is probably firm specific, however, one may think that the average value of C may vary from country to country. Hence our theory predicts that countries with a high value of q (inferior judicial system), and where workers tend to have high investment costs, the optimal severance pay is high. Note also that the wage tenure profile is steeper when the severance pay is higher.

3 Extensions

3.1 Many periods

Suppose now that the relationship lasts for n periods. Let C_t and b_t denote investment costs and per period outside option of the worker in the t th period of the employment relationship. Let q_t denote the probability that a worker who shirks in period $t - 1$ gets away with it and get severance in period t . Let T_t denote the severance payment in period t . Finally, let β denote the discount factor.⁹ In each period, the worker has to be incentivized.

Let us first introduce some notation. Let W_t , Π_t , and S_t denote the expected NPV value of the income including period t of a non-shirking worker (net of investment costs), of the profit of the firm, and of the match surplus of the worker and the firm, as a function of ε_t . Let B_t denote the NPV of the outside option, and ε_{dt} denote the period t cut-off for retaining the worker. Then we have that

$$W_t = I(\varepsilon \geq \varepsilon_{dt})[w_t - C_t + \beta E W_{t+1}] + I(\varepsilon \leq \varepsilon_{dt})[B_t + T_t] \quad (16)$$

$$\Pi_t = \max[y + \varepsilon_t - w_t + \beta E \Pi_{t+1}, -T_t] \quad (17)$$

$$S_t = I(\varepsilon \geq \varepsilon_{dt})[y + \varepsilon_t - b_t + \beta E S_{t+1}]$$

$$B_t = b_t + \beta B_{t+1}$$

where $I()$ denotes the indicator function. From (17) it follows that ε_d is given by

$$\varepsilon_{dt} = w_t - \beta E \Pi_{t+1} - T_t - y$$

Let S_t^* denote the value of S_t contingent on efficient separation in all later periods. Let ε_t^* denote the optimal threshold in period t . Efficient separation obtains if the separation threshold in period t is such that $S_t^* = 0$. It follows that for the last period,

$$\begin{aligned} \varepsilon_n^* &= b_n - y \\ ES_n^* &= \int_{\varepsilon_n^*}^{\varepsilon^u} (y + \varepsilon_n - b_t) f(\varepsilon_t) d\varepsilon_t \end{aligned}$$

⁸We assume that the firm, if it closes down after period 1, has to pay the severance.

⁹As above we make the assumption that the NPV value of the outside option in period t is equal to the NPV value of future b 's, that is, the NPV of the outside option is $\sum_{j=t}^n b_j \beta^{j-t}$.

For all earlier periods

$$\begin{aligned}\varepsilon_t^* &= b_t - y + C_t - \beta ES_{t+1}^* \\ ES_t^* &= \int_{\varepsilon_t^*}^{\varepsilon^u} (y + \varepsilon_t - b_t - C_t) f(\varepsilon_t) d\varepsilon_t + (1 - F(\varepsilon_t^*)) \beta ES_{t+1}\end{aligned}\tag{18}$$

Finally, let ER_t denote the expected rent of continuing the relationship for the worker in period t . It follows that $ER_t = EW_t - B_t$.

Calculating the expected incomes for a general time profile of severance pay is cumbersome. We therefore go directly to the efficient time profile. As the next lemma shows, efficiency in period t is ensured if the worker is indifferent between being separated and staying on in the firm in this and all future periods. This is intuitive. If the worker, at any point in time, is indifferent between being fired and being retained, there are no externalities from the firm's retention decisions, and a profit-maximizing firm makes the optimal decision.

Lemma 1 *Suppose the contract $w_t, \dots, w_n$ and the severance payments $T_t, \dots, T_n$ are such that the worker is indifferent between being separated and not. Then the firm's retention decision is optimal, i.e., $\varepsilon_j^d = \varepsilon_j^*$ for all $j \geq t$*

The proof is in the appendix. From equation (16) it follows that the worker is indifferent between being retained and fired whenever

$$w_t - C_t + \beta EW_{t+1} = B_t + T_t\tag{19}$$

In which case W_t is non-stochastic and reads

$$W_t = w_t - C_t + \beta EW_{t+1}$$

Inserted into (19) this gives that $W_t = B_t + T_t$ and hence that (since R_t is non-stochastic we skip the expectations operator)

$$R_t = T_t\tag{20}$$

This is almost trivial: for the worker to be indifferent between being retained and being fired, the rent associated with employment must equal the severance pay. Incentive compatibility in period $t - 1$ requires that $C_{t-1} + \beta R_t \leq \beta q_t T_t$. Inserting for $R_t = T_t$ it follows that the lowest rent that is incentive compatible is

$$R_t = T_t = \frac{C_{t-1}/\beta}{1 - q_t}\tag{21}$$

Proposition 3 *The optimal severance pay in period t is given by (21). It is increasing in the investment cost in the previous period, and in the probability of getting away with it if shirking. It does not depend on investment costs and probability of being caught in any other periods.*

It follows that the severance is increasing with tenure if q_t is increasing with tenure or if C_t is increasing with tenure. Both seems reasonable.

We also want to study wage profiles. By subtracting B_t from W_t given by (16) we find that $R_t = w_t - b_t - C_t + \beta R_{t+1}$. By inserting from (21) we get that

$$w_t = b_t + \frac{C_{t-1}}{\beta} \frac{1}{1 - q_t} - C_t \frac{q_{t+1}}{1 - q_{t+1}}\tag{22}$$

Let us look at some examples. First, suppose $C_1 = \dots C_{n-1} = C$, $q_1 = \dots = q_{n-1} = q$, and $\beta = 1$. Then the wage equation (22) simplifies to

$$\begin{aligned}
w_1 &= b_1 - C \frac{q}{1-q} \\
w_t &= b_t + C, t < n \\
w_n &= b_t + \frac{C}{1-q}
\end{aligned}
\quad \text{for } E < n$$

In this case, the worker is compensated for the investment costs period per period. The carrot is the high wage in the last period, which prevents the worker from shirking. The worker pays for the carrot in the first period.

Suppose then that the cost in period C_t is $C_0 + t\Delta$, keeping q constant and $\beta = 1$. We start at $t = 0$ for convenience. It follows that the wage is given by

$$\begin{aligned}
w_0 &= b_0 - C_0 \frac{q}{1-q} \\
w_t &= b_t + C_0 + (t-1)\Delta - \frac{q}{1-q} \Delta \\
w_n &= b_n + \frac{C_0 + (n-1)\Delta}{1-q}
\end{aligned}
\quad t < n$$

(23)

Hence wages are increasing over tenure with the same amount as the increase in per period investment costs. In the last period, the worker gets a large bonus, and this drags down wages in all earlier periods.

Finally, we assume that costs are constant and the discount factor is constant, but allow q_t to vary. More specifically, we assume that $n = 3$, and that $q_1 = 0$ and $q_2 = q > 0$. It follows that

$$\begin{aligned}
w_1 &= b_1 \\
w_2 &= b_2 + C \frac{1-2q}{1-q} \\
w_3 &= b_3 + C \frac{1}{1-q}
\end{aligned}$$

If $q < 1/2$, wages are increasing with tenure.

3.2 Endogenous "q"

In this section we modify the setting so as to allow for the endogenous determination of the probability that a shirking worker can "get away with it". To keep things simple we go back to the two-periods model, but results can be readily generalized to a n-periods setting.

In particular, we initially assume that the investment in period 1 on the part of the worker shifts the distribution of productivity by a factor Δ , which is common knowledge. Specifically, the distribution of productivity in period 2 for a shirking worker (i.e. a worker that does not invest) is uniform between α and β so that

$$X^S \sim U[\alpha; \beta], \quad (24)$$

where X^S refers to actual productivity in period 2 for a shirking worker. Conversely, the productivity in period 2 for an investment worker is shifted to the right by a factor Δ so that

$$X^I \sim U[\alpha + \Delta; \beta + \Delta], \quad (25)$$

To make the problem interesting, we assume that the support of the two distributions has an area of overlap:

$$\Delta < \beta - \alpha \quad (26)$$

Suppose that a firm- as well as an outside court- can observe only total productivity in period 2, but does not observe whether the worker has invested or not. In other words, the outcome of the distribution X^I and X^S are not observed by the court and by the firm, even though their support is known. All that such outsiders can observe is the productivity y that- at least for some range- can potentially come from either distribution of X . This asymmetric information is the key assumption of this section. In this setting, the model endogenously determines the probability that a worker somehow "gets away with it", either because she is entitled to severance payment or because she is retained in period 2 even if she shirked.

The rest of the setting is analogous to the model of Section 2.

The firm's separation policy in period 2 is simply

$$Max[y - w_2; -T]$$

where y is the worker's productivity as defined above. The reservation productivity is simply

$$y^\star = w_2 - T$$

Since y is observed by the firm and the court, a productivity outcome below $\alpha + \Delta$ is necessarily obtained only by a shirking worker and no severance payments are due in this case. We thus let $\tilde{y} = \alpha + \Delta$ be the productivity below which a court can confidently say that the worker did shirk.

Definition 3 *Disciplinary Dismissal.* A productivity in period 2 below $\alpha + \Delta$ must necessarily be obtained only by a shirking worker and the dismissed worker is not entitled to severance payments

Conversely, a period 2 productivity that is larger than $\tilde{y}$ but lower than $y^\star$ may potentially come from either an "unlucky" non-shirker worker or from a shirking worker.

3.3 Burden of proof on the employer

When the burden of proof is on the employer, there is no way she/he can prove before a Court that the "low" productivity is due to opportunistic behavior of the worker. Thus, we have the following

Definition 4 *Economic Dismissal.* A productivity in period 2 that is below $y^\star$ but larger than $\tilde{y}$ leads to a dismissal with severance payment.

The setting implies that when the firm has a burden of proof vis-a-vis the court, in case of uncertainty the court assumes that severance payments are due.

Before solving the model, one needs to specify where exactly the reservation productivity $y^\star$ lies with respect to the upper support of the distribution of shirking workers β and the lower support of the distribution of investing workers ($\alpha + \Delta$). Depending on the position of the productivity with respect to these supports, the model has different solutions. We here consider the most interesting case¹⁰, where

$$\alpha + \Delta < y^\star < \beta; \tag{27}$$

from which the following economic implications follow

- A shirking worker can get away with it and even be employed in period 2
- A shirking worker can get away with it in the sense that she/he obtains severance payments even if she/he shirked

Obviously, the solution of the model must necessarily be coherent- in terms of parameters- with the assumption specified in (27). The value function for an investing worker reads

$$W^I = -C + w_1 + Pr[(\alpha + \Delta) < X^I < y^\star](b + T) + Pr(X^I > y^\star)w_2 \tag{28}$$

¹⁰When $y^\star < \alpha + \Delta$ no investing worker will ever be laid-off. The case where $y^\star > \beta$ is discussed below when we consider that the burden of proof is on the worker

so that an investing worker is either fired for economic reasons or retained and entitled to severance payments. The endogenous corresponding probability are simply

$$Pr[(\alpha + \Delta) < X^I < y^\star] = \frac{y^\star - (\alpha + \Delta)}{\beta - \alpha}$$

and

$$Pr(X^I > y^\star) = 1 - \frac{y^\star - (\alpha + \Delta)}{\beta - \alpha}$$

where obviously $y^\star = w_2 - T$. Conversely, the value function for a shirking worker reads

$$W^S = w_1 + Pr[X^S < (\alpha + \Delta)]b + Pr[(\alpha + \Delta) < X^S < y^\star](b + T) + Pr(X^S > y^\star)w_2 \quad (29)$$

where the corresponding probabilities are

$$Pr[X^S < (\alpha + \Delta)] = \frac{\Delta}{\beta - \alpha},$$

$$Pr[(\alpha + \Delta) < X^S < y^\star] = \frac{w_2 - T - \alpha}{\beta - \alpha} - \frac{\Delta}{\beta - \alpha},$$

and

$$Pr(X^S > y^\star) = 1 - \frac{(w_2 - T) - \alpha}{\beta - \alpha}$$

The worker ICC is simply obtained by the condition

$$W^I(w_2) = W^S(w_2) \quad (30)$$

Substituting the workers' value functions (28) and (29) in the ICC, after a few steps of simple algebra, the optimal wage reads

$$w_2 = b + c \frac{\beta - \alpha}{\Delta}; \quad (31)$$

Proposition 4 *The incentive compatible wage in period 2 is equal to the reservation wage plus the investment cost "augmented" by a factor $q^\star = \frac{\beta - \alpha}{\Delta}$ that depends on the parameters of the distribution*

Two additional propositions characterize the endogenous premium $q^\star$

Proposition 5 *If $\Delta = \beta - \alpha$ the supports of the two distributions do not overlap and the ICC wage does not involve any premium vis-a-vis the outside option of the worker and the investment cost*

Proposition 6 *If $\Delta \rightarrow 0$ the distributions of investing and shirking workers are identical and the ICC wage grows indefinitely*

To close the model of this section one just needs to obtain the first period wage from the worker's participation constraint and ensure that the firm's expected profits are positive.

To be coherent with the restriction imposed at the beginning of this section, $\alpha + \Delta < w_2 - T < \beta$, making use of the incentive-compatible wage, the severance payments must be such that.

$$\begin{aligned} T &< b + c \frac{\beta - \alpha}{\Delta} - \alpha - \Delta \\ T &> b + c \frac{\beta - \alpha}{\Delta} - \beta \end{aligned}$$

Finally, one can compare the results we just obtained with the optimal severance payment of proposition [10]. By comparing the two results we can say that an efficient severance payment requires

$$T = \frac{C}{1 - q} = \frac{C(\beta - \alpha)}{\Delta} \quad (32)$$

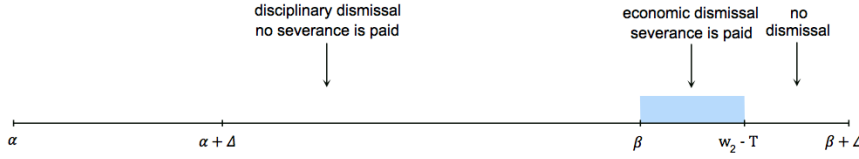
from which it follows that $q = 1 - \frac{\Delta}{\beta - \alpha}$ which in this section corresponds exactly to the probability that a shirking worker gets away with it, either because he is fired with severance payments or because he is retained in period 2.

Figure 4: Court decisions

Figure 1a - Court decisions: burden of proofs on employers



Figure 1b - Court decisions: burden of proofs on workers



3.4 Burden of proof on the worker

In Section 1 we assumed that the probability that a Court rules in favor of a disciplinary dismissal is lower when the burden of proof is on the worker. We can now evaluate this assumption. Our setting implies that, in case of uncertainty, the Court assumes that severance payments are *not* due. This means that a Court can confidently rule out opportunistic behavior of the worker only if $y > \beta$.

When $\alpha + \Delta < y^* < \beta$, only disciplinary dismissals are allowed by Courts. In other words, severance plays no role in this context.

A more interesting case is when $\beta < y^* < \beta + \Delta$, as depicted in Figure 4. In this case, no shirker will ever get away with it, but we will get some economic dismissal.

The ICC now implies:

$$w_1 + b = w_1 - C + Pr[(\alpha + \Delta) < X^I < \beta](b) + Pr[(\beta) < X^I < y^*](b + T) + Pr(X^I > y^*)w_2 \quad (33)$$

Substituting in (33) the endogenous probabilities we obtain:

$$w_2 = b + C \frac{\beta - \alpha}{\beta + \Delta - y^*} - T \frac{y^* - \beta}{\beta + \Delta - y^*}; \quad (34)$$

notice that the further is y^* from β , the more important is the severance in the no-shirking condition. Intuitively, when $y^* = \beta$, there will no economic dismissal ruled by a Court. In the general case, using the condition for efficient severance, and taking into account that $q = 0$, we have that the no-shirking condition requires:

$$w_2 = b + C \frac{2\beta - \alpha - y^*}{\beta + \Delta - y^*}; \quad (35)$$

which satisfies the participation constraint provided that $\beta > \frac{\alpha + y^*}{2}$.

Overall, when the burden of proof is on the worker, shirkers cannot get away with it. Compared with the case where the burden of proof is on the employer, there is also a lower range of productivity realizations for which a severance is paid, as depicted in Figure 4. In other words, the probability that a disciplinary dismissal is ruled fair is higher when the burden of proof is on the worker. However, no investing workers will be laid-off without receiving a severance.

3.5 Double moral hazard

So far we have assumed that the productivity effect of the investment in training, Δ is known to the court. A more realistic case is when the productivity effects of training are private information to the employer, and the Court randomly carries out on-site inspections (or in-depth evaluations) to verify the veridicity of the information provided by the employer at the time of the dismissal.

Without the Court inspections, employers will always have the incentive to state a high productivity effect of training in order to avoid paying the severance justifying the dismissal as due to the misbehaviour of the worker. Let us consider the case in which the burden of proof is on the employer. Under these conditions, stating that $\Delta > \beta - \alpha$ allows the employer to take the disciplinary dismissal route for all workers having productivity realizations in the range $\beta < y < \Delta$. The practice of taking the disciplinary dismissal route, even in case of economic dismissal, is common in France (Galdon-Sanchez and Guell [11]) and Spain (Bentolila [2]; Malo [17]; Malo and Toharia [18]).

A penalty in terms of a higher severance pay to be paid in the case where the Court rules that there are no grounds for a disciplinary dismissal, can reduce the opportunistic behavior of employers. In particular, suppose that the probability that a Court verifies the information produced by the employer is λ and that the productivity effects of training can only take 2 values, say Δ^l and Δ^h , where $\Delta^l < \beta - \alpha < \Delta^h$ and $y^* > \alpha + \Delta^h$.

The penalty T_U for which the employer observing Δ^e is indifferent between cheating and not cheating is given by

$$T_U = \frac{T_F^E}{\lambda} \quad (36)$$

where T_U is the severance (plus notice) in case of unfair dismissal. In other words we expect T_U and T_F^E to be positively correlated, something which is in the data (there is a positive correlation between the two measures displayed in Table 1). More interestingly, combining the above condition with the no-shirking (and participation) condition for the worker we have that

$$T_U = \frac{C}{(1-q)\lambda} \quad (37)$$

which establishes a relationship between optimal severance and quality of the judicial system, as both λ and $(1-q)$ can be interpreted as measures of the inefficiency of the judiciary in monitoring workers' productivity and repressing employers' opportunistic behavior.

4 Back to cross-country variation

4.1 Severance and Efficiency of the Judicial System

The above suggests that we should expect to observe higher levels of severance in the countries where the judicial system is less efficient. Based on recent work done by the OECD in creating cross-country comparable data on legal systems, we can evaluate this prediction of the model against cross-country evidence on various indicators of the efficiency of judicial systems.

The first two panels at the top of the Figure 5 display the correlation between, on the one hand, T_F^E , and, on the other hand, the litigation rate, that is, the number of the new civil cases commenced in any given year normalized by the population or GDP. This indicator captures congestion, and, per given supply of services, a longer duration and lower quality of judicial services. Both indicators appear to be positively correlated with the mandated months of severance in case of fair economic dismissals.

The other four panels of Figure 5 look at the compensation in case of unfair dismissals (T_U) as well as to a broader measure of the compensation to employees in the case of fair and unfair dismissals. They show that T_U is also positively correlated with the litigation rate. Our measure of the expected severance in case of unfair dismissals, T_U , is also positively correlated with trial length, as well as appeal rates before the second instance or higher courts, but it can be a spurious correlation as appeal rates and trial length are used in building up our measure of the costs of unfair dismissals. Thus, we also consider a global measure of the

Table 3: Probit estimation of the probability of on-the-job training

Training	Coef.	Standard Error	p-value
Jobs with severance	0.410	0.025	0.00
Tenure	-0.001	2.35E-05	0.00
Age	-0.012	0.002	0.00
Experience	0.009	0.002	0.00
Occupation	Yes	–	–
Sector	Yes	–	–
Education	Yes	–	–
Gender	Yes	–	–
Constant	-1.028	0.059	0.000
Observations	28093		
Pseudo R2	0.09		
chi2	0.00		

Note: Dummies controlling for occupation, sector, education and gender are included.
Source: ECHP, 2001.

compensation for fair and unfair dismissals from regular contracts produced by the OECD, which does not draw on information on trial length and appeal rates. The correlation is once more positive and statistically significant.

Notice finally that the indicators of the efficiency of the judiciary are positively correlated with subjective evaluations of public opinion as to the quality of the legal system collected within the World Value Survey (Palumbo 2013 [21]).

4.2 Severance and investment in training

In our model severance operates as a commitment device reducing the probability that workers investing in training are laid-off in case of a negative productivity realization.

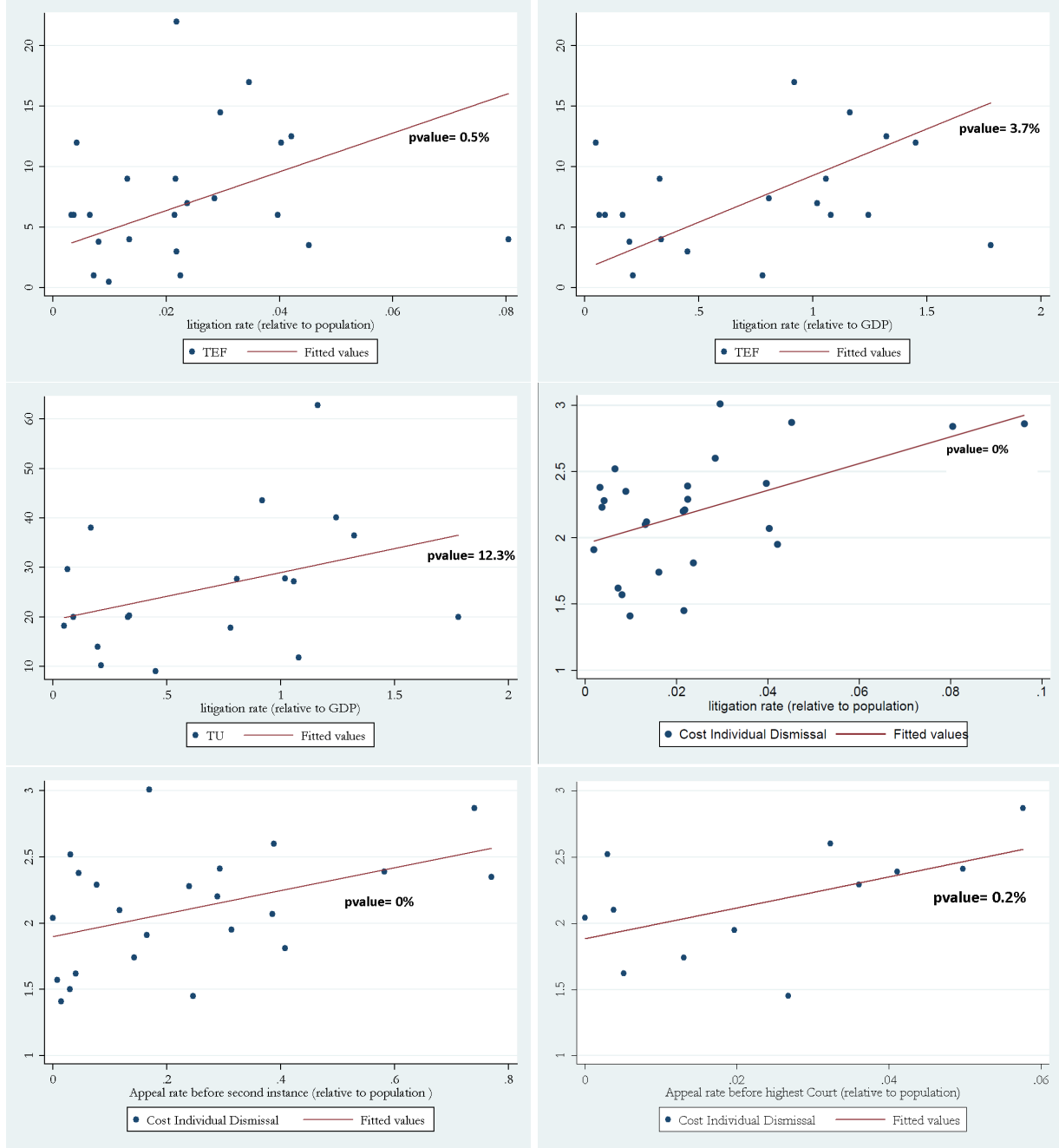
A simple way to assess the empirical relevance of this mechanism is to compare the incidence of on-the-job training across jobs with and without severance, that is, permanent and fixed-term contracts. This is done in Table 3 drawing on data from the EU-Silc survey on the incidence of on-the-job training in the European Union in 2007. Our probit estimates suggest that, other things being equal (we control for education, age, previous experience and the industry affiliation), jobs protected by severance yield more on-the-job training than jobs not protected by severance.

5 Final Remarks

Research on employment protection fails to account for the relevance of mandatory severance pay in OECD countries. It also neglects two critical features of EPL: the tenure profile of severance pay and the fact that dismissal costs are not only stochastic, but also vary depending on whether they are motivated by economic or disciplinary reasons. In this paper we provide a normative theory of tenure-related severance pay which draws on the involvement of third parties in the decision about the nature, fair or unfair as well as disciplinary or economic, of dismissals. In our model severance pay has to be mandated by the Government rather than being provided by the individual firm. This is because adverse selection stands on the way of these voluntary arrangements, potentially attracting more shirkers to the firm unilaterally offering a severance scheme. In other words, mandatory severance acts as a coordination device across firms.

We show that under a rather broad set of circumstances, a severance scheme which is increasing in training costs and in the inefficiency of the legal system is privately efficient in that it avoids separations of

Figure 5: Compensation for dismissal and judicial efficiency



Source of the data:

T_F^E and T_U are as in Table 1.

Cost of Individual Dismissal: Index of Compensation in case of individual dismissal produced by the OECD.

Data on Litigation rate, trial length and appeal rates come from the dataset used in Palumbo [21].

jobs that are still originating a positive surplus. This result, which is new for the literature on employment protection, is in line with the reported correlation between, on the one hand, mandatory severance pay, and, on the other hand, OECD indicators of the inefficiency of the legal systems. It implies that reforms of the judiciary can be more effective than labor market reforms in reducing the level of employment protection.

We also find empirical support for the key mechanism posited by the paper, that is, the role of severance in inducing investment by the worker in on-the-job training.

Graded employment security schemes in our model deal with the moral hazard associated with the initial investment in training. Our theory is therefore particularly useful in assessing the scope for "insertion contracts", involving mandatory compensation increasing steadily with tenure. Such "unifying" contracts have been advocated in a number of countries as a measure to reduce "contractual dualism", that is, the coexistence of a highly protected segment of the workforce and one segregated into temporary jobs providing low, if any, employment security. Moreover our theory suggests that tenure-related severance is efficient even under the typical conditions faced by "temporary workers", that is, under flexible wages, provided that agreed compensation is deferred and that the employer cannot commit not to layoff the worker who has invested in training.

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Annex

Empirical annex

Table A1 Apparent Elasticities at different tenure lengths

	Apparent Elasticities					GS Index
	at 9 months	at 12 months	at 60 months	at 120 months	at 240 months	
Australia	1.00	3.33	0.67	0.38	0.00	0.31
Austria	0.00	0.00	0.00	0.00	0.00	0.00
Belgium	0.75	0.80	0.21	0.50	1.00	0.70
Canada	1.00	2.00	1.00	0.89	0.71	0.84
Czech Republic	0.60	0.00	0.00	0.00	0.00	0.02
Estonia	1.00	0.99	0.42	0.50	0.00	0.26
Finland	1.00	2.15	0.63	1.00	0.67	0.77
France	0.01	0.67	0.75	0.50	0.91	0.74
Germany	0.00	1.41	0.85	1.00	0.94	0.91
Greece	*	4.00	0.69	0.71	1.00	-
Hungary	0.00	0.00	0.90	0.55	0.79	0.71
Ireland	1.00	2.18	0.74	0.80	0.76	0.79
Israel	1.00	3.11	0.83	0.91	0.95	0.95
Italy	0.00	0.00	0.00	0.50	0.40	0.33
Japan	0.00	0.00	0.00	0.00	0.00	0.00
Korea, Rep.	0.00	2.01	0.83	0.91	0.95	0.90
Luxembourg	0.00	0.00	0.75	0.75	0.67	0.67
Mexico	1.00	0.12	0.40	0.57	0.73	0.63
Netherlands	0.01	0.00	0.63	0.67	0.50	0.54
Norway	0.01	0.00	0.63	0.67	0.00	0.29
Poland	0.01	0.00	0.83	0.00	0.00	0.17
Portugal	1.00	0.50	0.54	0.88	0.89	0.82
Slovak Republic	0.50	0.00	0.42	0.00	0.00	0.10
Slovenia	0.00	0.67	0.71	0.63	1.08	0.85
Spain	0.51	0.57	0.87	0.93	0.87	0.87
Sweden	0.01	0.00	0.83	1.00	0.00	0.42
Switzerland	1.00	2.00	0.00	0.67	0.00	0.23
Turkey	0.00	2.08	0.90	0.84	0.92	0.87
United Kingdom	0.00	0.00	1.09	1.00	0.65	0.79

Table A2. Detailed information used to produce Table 2

Country	Severance Economic at20y,Fair	Severance Disciplinary at20y,Fair	Typical Compensation at20y,Unfair	Maximum Notice	Reinstatement Option	Appeal rate (per 100 citizens)	length of trial, first instance, months	Burden of Proof
Australia	2.80	0.00	6.00	1.00	1	0.77	6.42	e
Austria	0.00	0.00	6.00	4.00	3	0.39	4.29	e
Belgium	0.00	0.00	10.30	20	0	-	7.78	e
Canada	2.30	0.00	Court	2.00	1	-	-	e
CzechRepublic	1.50	0.00	6.00	2.00	3	74.02	4.49	w
Denmark	3.00	0.00	6.60	6.00	1	11.71	6.63	w
Finland	0.00	0.00	14.00	6.00	0	4.47	7.31	e
France	5.40	0.00	16.00	2.00	0.5	38.75	9.12	w
Germany	10.00	0.00	15.50	7.00	1.5	3.81	6.65	e
Greece	8.00	0.00	Court	4.00	2	38.49	5.17	e
Hungary	6.00	0.00	12.00	3.00	1	24.55	6.67	w
Ireland	4.00	0.00	24.00	2.00	1	2.96	9.02	e
Italy	0.00	0.00	21.00	6.00	1	29.31	18.81	e
Japan	0.00	0.00	6.00	1.00	1	3.99	3.57	m
Korea	0.00	0.00	6.00	1.00	3	7.66	4.81	w
Luxembourg	6.00	0.00	6.00	6.00	0	23.89	8.75	e
Mexico	1.00	0.00	15.00	n.a.	1.5	16.43	11.40	e
Netherlands	0.00	0.00	7.00	4.00	1	-	10.17	e
NewZealand	0.00	0.00	7.60	0.50	1	1.42	5.70	e
Norway	0.00	0.00	12.00	6.00	2	-	5.33	e
Poland	3.00	0.00	3.00	3.00	1	28.86	5.55	e
Portugal	12.00	0.00	20.00	2.50	2.5	16.93	14.15	e
SlovakRepublic	4.00	0.00	6.00	3.00	2.5	40.75	11.81	w
Spain	12.00	0.00	24.00	0.50	0	31.38	9.07	e
Sweden	0.00	0.00	32.00	6.00	0	3.05	6.20	e
Switzerland	0.00	0.00	6.00	3.00	0	10.43	4.36	w
Turkey	20.00	0.00	10.00	2.00	0	-	7.05	e
UnitedKingdom	4.60	0.00	5.50	3.00	1	5.47	8.34	e
United States	0.00	0.00	Court	0.00	0.5	-	-	e

Sources: EPLex; OECD (2013); ^bCEPEJ (2012)

Notes: Data are expressed in monthly wages. When notice period differs between categories of workers (e.g. white and blue collars) or between reasons of dismissal (e.g. personal and redundancy), the longest period is chosen; Court: Free determination by court. Fair dismissal: severance pay at 20 years of tenure; Unfair dismissal: typical compensation at 20 years of tenure; Length of trial: Data from CEPEJ (2012) represent the average length of proceedings for employment dismissal cases at first instance courts for the latest year available; the other data on length of trial period (OECD, 2013), represent the maximum legal length for this type of proceeding. π : probability (0-1) that, in case of unfair dismissal, the judge opts for the reinstatement of the worker. It is based on the 0-3 measure of the likelihood of the reinstatement provided by OECD (2013): 0= no right or practice; 1= rarely or sometimes made available, 2= fairly often made available, 3= almost always made available. For Netherlands, data refer to PES procedure.

Proof of proposition 1

For any k , the right-hand side of (8) goes to infinity as $\varepsilon_d \rightarrow \varepsilon^u \equiv \varepsilon_l + k$. Hence it is sufficient to show that the left-hand side is greater than the right-hand side for some ε^* in the support of ε . To this end, consider the median $\varepsilon^m = \varepsilon_l + kz^m$. At this value, $F(\varepsilon^*) = 1/2$. Hence, as k increases, the right-hand side of (8) stays constant while the left hand-side increases to infinity with k . Hence, for a sufficiently high value of k , the equation has a solution.

The profit of the firm is given by

$$\begin{aligned}\Pi &= 2y - 2b - qT + \frac{1}{2}E^{\varepsilon \geq \varepsilon_d} \varepsilon \\ &\geq 2y - 2b - qT + \frac{1}{2}[\varepsilon_l + k\bar{z}]\end{aligned}$$

The right-hand side goes to infinity with k , hence the proposition follows.

An increase in C shifts the right-hand side of (8) up, and the left-hand side down. Since the left-hand side crosses the right-hand side from below, it follows that ε_d increases in C and decreases in T .

Proof of lemma 1

The proof is by induction. In period n , the worker is indifferent between being separated and not if $T_n = w_n - b$. It follows from (17) that the firm in this case retain the worker iff $\varepsilon = b_n - y$, which is efficient. Consider an earlier period t , and assume that the firm makes the optimal decisions in all later periods. The NPV profit of the firm by continuing is $E\Pi_{t+1} = ES_{t+1}^* - ER_{t+1}$. The firm is thus indifferent between retaining and firing the worker whenever

$$b_t - y - \varepsilon_t - T_t = \beta(ES_{t+1}^* - ER_{t+1}) \quad (38)$$

The worker is indifferent between being fired and retained whenever $W_t = B_t + T_t$, i.e., whenever

$$w_t - C_t + \beta ER = T_t + b_t. \quad (39)$$

Inserted into (38) this gives

$$\varepsilon_t = b_t - y + C_t - \beta ES_{t+1}^* \quad (40)$$

Which is identical to (18). The proof is thus complete.