DISCUSSION PAPER SERIES

IZA DP No. 1170

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June 2004

Forschungsinstitut
zur Zukunft der Arbeit
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Discussion Paper No. 1170
June 2004

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IZA Discussion Paper No. 1170
June 2004

ABSTRACT

The Shape of Hiring and Separation Costs*

In this article, we estimate the structure of costs of hiring, terminating, and retiring employees in France. We use a representative panel data set of French establishments that contains direct measures of these various costs as well as measures of entries and exits for the years 1992 and 1996. This data set results from the match of two sources: the Wage Structure Survey and the Workforce Movement Questionnaire. We show that the cost of hiring into permanent contracts is larger than the cost of hiring into fixed-term contracts. But these costs are small in comparison to the costs of retiring or terminating workers. Furthermore, collective terminations (dismissal of at least 10 workers during a 30 days period) are much more expensive than individual terminations. Hiring and separations are similar in one aspect: they entail no or little firm-specific fixed cost. Furthermore, termination and hiring costs are concave and induce firms to group their permanent hirings and separations. Retirement costs are linear. These estimates show that regulations imposed by French labor laws significantly affect the structure and the magnitude of these costs.

JEL Classification: J30, D21

Keywords: adjustment costs, firm behavior, entry, exit

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* We are grateful to Pierre Cahuc, Emmanuel Duguet, Eric Maurin, Gerard Pfann, Fabien Postel-Vinay and to seminar participants at University Paris 1, IZA, JMA meetings in Rennes, NASM meeting in Los Angeles, ESEM and EEA meetings in Venice and EALE meeting in Paris for valuable remarks and suggestions. We are solely responsible for remaining errors.

1 Introduction

Employment protection legislation is often pointed out as the most important source of rigidity on continental European labor markets. Theoretical models (Bentolila and Bertola [1990], Bertola [1990], Garibaldi [1998], etc.) tend to show that employment should be more stable and individual employment relationships more durable when employment protection is stricter: in other words, stringent legislation reduces hiring and firing, but also affects the structure of unemployment. Empirical evidence (for recent surveys, see Layard and Nickell [1999], Machin and Manning [1998], see also Blanchard and Wolfers [2000]), on the other hand, is mixed; the effects of labor market regulation on labor market adjustments are apparently not overwhelming.

Whereas all the above papers, and a flurry of others, study the consequences of various measures of employment protection on labor market performances, only a few try to precisely relate firing costs and labor market flows (see in particular Kugler with co-authors in Kugler and Saint-Paul [2004] or Kugler [2002]). And even fewer attempt to measure the directs costs associated to employment protection legislation. Hamermesh [1989] examines the costs firms face in adjusting labor demand to exogenous shocks. He shows, using monthly plant-level US data, that adjustment proceeds in jumps and that smooth adjustments used in the macro-economic literature results from aggregation. Hamermesh [1993] summarizes various estimates of the magnitude and the structure of adjustment costs from international data, in particular the asymmetry in these costs. Even though the structure of adjustment costs appear to vary across specifications, skills, or countries, symmetry seems rejected by most studies using micro-economic data sources. For instance, in the United States separation costs are much smaller than hiring costs.

Recent papers give a different picture of the European situation. Goux, Maurin and Pauchet [2001] estimates the costs of firing and hiring, using a dynamic model of labor demand for France. Among other results, they show separations are more costly than hiring, in particular when workers are employment under long-term contracts.

In contrast with the rest of the literature, who examine adjusment costs by indirect methods, we **directly** measure the costs of hiring and separation. Our study follows that of Abowd and Kramarz [2003], who estimated the costs of hiring, separation, and retirement of employees for a representative **cross-section** of French establishments matched with a representative sample of their employees.[1] They showed that both retirement and termination costs were increasing and mildly concave in the number of retired and terminated workers. Moreover, the fixed costs that they estimated were very large, giving the firm

[1] See also Pfann [2002] who uses direct measures of firing costs for a Dutch firm to study the selection of workers for a massive layoff plan.

an incentive to group exits instead of adjusting them gradually. Termination costs were largest for collective terminations as opposed to individual ones, and they were also largest for highly skilled employees. In Abowd and Kramarz [2003], hiring costs were concave, also with a strong fixed component. However, hiring costs did differ by skill-level. Only hires of managers on long-term contracts had an increasing and concave impact on the costs. For all other skill levels and types of contracts, hiring costs did not depend upon the number of entries. Finally, costs of hiring were found to be much less important in France than separation costs.

The results of Abowd and Kramarz [2003]'s paper are of substantial interest since they explain different French labor market features. They rationalize why French firms hire primarily on short-term contracts, why they reduce entries in bad times without increasing separations, why young workers find it difficult to get a job from unemployment, and address the way in which adjustment costs interact with economic shocks to affect employment flows. Nevertheless, these estimates are based on a single cross-section of establishments; hence the results may be due to compositional effects rather than reflect any single firm's cost structure.

To have better a insight on firms' costs structures, we use a newly available version of the survey used by the previous authors in order to build a panel of French establishments with hiring and termination costs for two dates. This longitudinal component allows us to control for unobserved heterogeneity in the cost functions. Central to our goal, this panel aspect will give us a better control of the fixed component of these costs, the magnitude of which was found to be particularly (too ?) high in Abowd and Kramarz [2003].

The data sources used in this article were collected in 1992 and 1996. We compute establishment-based measures of costs and movements in France using two sources that are matched using a common establishment identifier. The first source is a Wage Structure Survey (called ESS), which provides the establishments measures of the hiring and firing costs. This source also gives the number of hires and separations for some of these establishments. However, for units for which this last piece of information is missing, we use data from the Workforce Movement Questionnaire (called DMMO) for the same years which collects, for every establishment with at least 50 employees, the number of new hires and separations.

To control for unobserved heterogeneity, we formulate a simple modeling hypothesis: the costs of adjustments comprise a fixed cost component, assumed to be firm-specific.

In line with Abowd and Kramarz [2003], our results show that separation costs are significantly larger than hiring costs. The cost of hiring into permanent contracts is larger

than the cost of hiring into fixed-term contracts. Collective terminations (dismissal of at least 10 workers during a 30 days period) are much more expensive than individual terminations. But in stark contrast with Abowd and Kramarz [2003]' estimates, we find that hiring and separations entail no firm-specific fixed cost. However, and in line with these authors' conclusions, the costs are concave and induce firms to group their hiring and separations.

The paper is organized as follows. In the next section we present information on French policies and institutions that affect the costs of adjusting employment. Section 3 contains a description of our data sets. Theoretical and statistical models that motivate our econometric specification are presented in section 4.1. The results of the empirical analysis are given in section 4.2. Finally, section 5 concludes.

2 Hiring and Separations : The French Labor Laws

French labor laws[2] allow firms to hire workers on two types of regular employment contracts : indefinite-term contracts (*Contrats à Durée Indéterminée*, CDI) and fixed-duration contracts (*Contrats à Durée Déterminée*, CDD). The current architecture of CDDs, introduced in 1979, dates back to an agreement signed in March 1990. Under this agreement, CDDs can be offered by firms for only very precise reasons : CDD cannot be used to fill a job that would exist under normal and permanent business conditions for a given firm (Article L.122). CDDs are subject to a very short trial period, typically one month. They have a fixed duration, they can only be renewed once and their length, including renewal, cannot exceed 18 months (24 months for youth employment programs). If the worker is kept, she must be hired on a regular contract. If the worker is not kept, she receives a 6 percent severance payment by law (10% since January 2002). Although their use is formally restricted, CDDs are the most common method of hiring. For example, in 1990, 58% of all hires were through CDD, they were 68% in 1996 and 75% in 1999 (Coutrot [2000]). On the other hand, during the 1990's, more than 90% of the stock of employees in private for-profit or semi-public establishments were on CDIs. For those hired under CDD approximately one in three is eventually converted to CDI (Abowd, Corbel and Kramarz [1999b]).

Insofar as they have a fixed duration, termination of a CDD is not an issue. Termination of CDIs is a more complex process, since these contracts are subject to employment protection. Employer-initiated termination of a permanent employee can take two broad

[2]For more details about French Labor Laws, see Abowd and Kramarz [2003] for an executive summary in english, and Lamy [1992] for an explanation of the text of the law.

forms : firing for "economic reasons", in which case the firm must prove that it needs to reduce its employment, or for "personal reasons"[3], in which case the firm has to show the worker cannot do the job he was hired for; and early or normal retirement, both of which are considered terminations under French Labor Laws (30 July 1987).

For terminations (except firing for very serious misconduct) and for retirements, the employer must observe a mandatory waiting notice period and pay a severance payment.

The notification period is the delay between reception by the worker of the formal letter announcing the termination and the actual end of the CDI. Workers with less than 6 months seniority are not given notice. For workers with 6 months to 2 years seniority, the notice period is 1 month. The notice period is 2 months for workers with more than two years of seniority. For engineers, professionals, and managers the notice period is 3 months. If the notice period is not respected, the worker must be fully compensated for the difference between the minimum notice period and the delay actually experienced in the termination. There are, however, no punitive damages.

Severance payments are calculated as follows. Unless the sector collective bargaining agreement, the firm-level collective bargaining agreement, or the individual contract specify a more generous formula, the legal minimum severance payment must be paid to workers with at least two years of seniority. For every year of seniority at the firm, the employer must pay 20 hours if the worker is paid by the hour or 1/10th of the reference wage if the worker is paid by the month. The reference wage is computed as the average monthly wage over the last three months of service at the firm. Furthermore, for most workers, an additional 1/15 of a second monthly reference wage must be added for every year of service beyond 10. This second reference wage is the maximum of the first reference wage and the average wage over the last twelve months. Apparently, most workers are compensated well above their reference severance pay (Abowd *and al.* [1999b]).

It is worth noting that, in France, different rules apply to individual and collective terminations (the dismissal of at least 10 workers during a 30 days period). The August 2, 1989 law requires that firms with 50 or more employees formulate a "social plan" before implementing a collective termination. This social plan must place a limit on the total number of terminations and lay out solutions that facilitate reemployment of terminated workers. The plan may also offer a re-training program.

When terminated workers are not entitled to receive a full-rate retirement pension, early retirement may be an option for the firm in case of terminations for economic reason,

[3]Firing for "personnal reasons" can take two forms : firing for "serious reasons" or for "very serious misconduct".

if the worker is old enough. On retirement and early-retirement, two laws must be singled out. First, an employer can mandatory retire a worker if that person is currently eligible to receive the full pension paid by the Social Security system. Before 1993, to be eligible, a worker had to be employed in a covered job for at least 37.5 years and be at least 60. Since July 22, 1993 Law with application starting in 1995, the worker had to be employed for at least 40 years. Second, since 1987, terminations of employees aged at least 50 have been subject to *Contribution Delalande*. If the employer decides to dismiss those employees, he has to pay a penalty of at most one year of gross wage. The severance payment depends on the age of the employee. The purpose of this *contribution* was to promote early-retirement. Because of these changes, we decided to leave the question of early-retirement for future research.

3 Data Description and Basic Facts

3.1 Creation of the Matched Data File

This section describes the two sources that we use and our procedure for matching them. We build a panel data set from two surveys, conducted jointly by the French National Statistical Institute (INSEE) and the Ministry of Labor: the Wage Structure Survey (ESS, in 1992 and 1996) and the Workforce Movement Questionnaire (DMMO, in 1992 and 1996). All our cost data comes from the former but some firms do not respond to the number of hiring and separations in the former whereas the DMMO measures all workforce movements in establishments with at least 50 employees. Hence, in our matched data file, establishments with 50 or more employees will be over-represented.

3.1.1 The Wage Structure Survey

Our first data source was the Wage Structure Survey (Enquête sur la Structure des Salaires, ESS), initiated in 1966 by the European Statistical Office (ESO)[4]. After the 1978 survey, the ESS was abandoned by the ESO but INSEE decided to resume this survey given the usefulness and quantity of information collected during each wave.

The 1992 and 1996 ESS collect information from establishments (manufacturing) or firms (construction and services) with at least ten employees. Agriculture, transportation, telecommunication and the services supplied to households are excluded from the scope of the ESS. Insurance companies, banks, and all other industries where services are supplied to businesses are in the scope of the survey.

The sampling procedure is the following. All establishments with 200 employees or more

[4] for more details on the survey, see Guigon [1996].

are sampled with probability one, whereas establishments with 100 to 199 employees are sampled with probability one-third, establishments with 50 to 99 employees with probability one-sixth, establishments with 20 to 49 employees with probability one-twelfth and establishments with 20 employees or less are sampled with probability one-twenty-fourth. So the probability of having the same establishments in the two survey with at least 200 employees is one, whereas the other probabilities decrease with the size of establishments.

Data were collected on the wage-setting policy of the establishments. In the 1992 survey, data were also collected on wages and characteristics of a representative sample of the individuals employed at an establishment in that year. Unfortunately the 1996 survey failed to ask those questions. Consequently, in this analysis, we use the following establishment-level variables :

- total employment : the average full-time monthly employment during the years 1992 and 1996 ;
- total employment by skill-level (in 4 groups : manager, technician, clerk and blue-collar worker) ;
- total hiring, CDD : the number of employees hired on fixed duration, short-term contracts ;
- total hiring, CDI : the number of employees hired on long-term contracts ;
- total retirement : the number of employees retiring or taking early retirement ;
- total termination (economic reasons) : the number of employees terminated for economic reasons in each of the two years ;
- total termination (other reasons) : the number of employees terminated for cause in each of the two years ;
- total termination (all reasons) : the sum of the two categories of terminations defined above ;
- retirement costs : the sum of early retirement payments paid directly to employees and regular retirement compensation paid directly to the employees ;
- severance payments : legally-mandated separation payments discussed above (section 2) plus any other payment made by the employer at separation ;
- hiring costs : reported employer expenses on job advertising, search firm fees ;

- training costs, including training hours, direct training costs and trainees' compensation.

Finally, we use the following ESS variables, asked of the responding manager at every establishment or firm, for 1992 only :

- business conditions in 1992 : good, normal or bad ;
- business conditions during the last 5 years : good, normal or bad ;
- expected change of employment : stable, increasing, decreasing.

The ESS working file contains 15,619 establishments for 1992 and 13,313 establishments for 1996. Note the answer rate was 66% in 1992 and 80% in 1996.

3.1.2 The Workforce Movement Questionnaire

Our second data source is the Monthly Worker Movement Report (Déclaration Mensuelle de Mouvement de Main-d'Oeuvre, DMMO), which is an administrative record of all worker movements at all establishments with at least 50 employees[5]. Although this administrative report was created in 1975 as a part of the government's monitoring of employees terminations, it was fully computerized in 1987 for all of France. Each establishment with at least 50 employees must report for each employment movement :

- The nature of the transaction (hire, transfer, quit, retirement and termination) ;
- The skill level of the job involved ;
- Age and seniority of the employee involved.

For this study, we used an analysis file in which the data were summed up to the annual level and to the establishment level. The variables used in our analysis are :

- Total hiring on long-term and short-term contracts ;
- Total retirement and early retirements ;
- Total terminations including terminations for economic reasons as defined in section 2.

The DMMO working file contains 38,638 establishments for 1992 and 41,171 establishments for 1996.

[5] for more details on the survey, see Chazal, Thiery and Torelli [1992].

3.1.3 The Matched Data File

We matched our two sources by establishment code (SIRET code) separately in 1992 and in 1996. Then, the two years were matched by SIRET to constitute our panel data set. In the first matched file (by year), we required the establishment to be in the Wage Structure Survey. Given the sampling procedure, large establishments are over-represented in the resulting data source. In the final matched file, we required the establishment to be present both in 1992 and in 1996 in order to measure the costs for all establishments. Notice that we kept all establishments present in both years in the Wage Structure Survey, even those that declare no hiring or no separation. However, because the sampling frame in 1992 and 1996 includes all establishments with 200 employees or more but a sample of those establishments with less than 200 employees, the match yields are relatively small final data set comprising $1,328$ establishments.[6] These establishments constitute our analysis file. In this analysis panel, some variables have missing values (not all establishments report retired workers, terminated or hired employees). We explain now our methods for imputing missing data, when required for the statistical analysis.
For those establishments with no data on total employment from the ESS, we used the available information from the DMMO. An equivalent procedure was adopted for the following variables : total hires, total separations for economic reasons and for cause, regular and early retirement. Finally, we used data on entry by type of contract only for those establishments with non-missing data.

The number of observations used in the different regressions is shown in our results section (section 4.2). Appendix A gives some basic statistics for the data. We present some preliminary evidence in the next subsection.

3.2 Summary Statistics

Table A1 (appendix A) reports summary statistics for our sample of establishments. Of the 1,328 establishments included in our sample, only 1,004 give their industrial affiliation; however most responding establishments belong to manufacturing industries. More than half of our establishments have more than 50 employees.[7] The two basic components of our estimation strategy, hiring and separation flows and hiring and separation costs are described in turn.

Employment flows Figure A1 (appendix A) reports distributions of terminations

[6] Establishments with less than 200 employees were sampled independently in the two surveys. This explains the decrease in the number of establishments. But, conditional on size, our analysis file is representative of French establishments.

[7] According to the French distinction, we will call establishments with less than 50 employees as "small" ones and those with more than 50 as "large" ones.

and retirements for the establishments included in the sample separately for 1992 and 1996. The distributions for hiring are reported on Figure A2. More workers are terminated in 1992, a sharp trough in the French business cycle, whereas more workers are hired in 1996; approximately one quarter of the establishments in our sample terminate 10 or more employees in 1992. The number of hires, especially on long-term contracts, is larger in 1996 than in 1992. Flows to retirement are acyclical.

In 1992, there were on average 62 hires (70% on short-term contracts, in line with Abowd *and al.* [1999b]), 14 terminations (half of them for economic reasons) and 5 retirements. In 1996 the average numbers of hires and retirements were stable whereas the average number of terminations dropped to 8.

Hiring and separation costs Figure A3 (appendix A) reports distribution of termination costs in 1992 and 1996, distributions of retirement costs are reported on Figure A4 and distributions of hiring costs on Figure A5. Those firms reporting zero terminations, retirement, or hiring are included in these graphs.

The termination costs reported in the ESS include all severance payments paid for economic reasons and for cause (other than very serious misconduct). However, the DMMO and the ESS report the number of workers terminated for cause and for economic reasons, and the number of workers for cause reported in the two surveys includes both workers who were terminated for serious reasons (with severance payment) and workers who were terminated for very serious misconduct (without severance payment). Hence, we compute two measures of the costs for termination. The first is the ratio of termination costs to the total number of workers terminated either for economic reasons or for cause; the second is the ratio of the termination costs to the number of workers terminated only for economic reasons. The second number gives an upper bound on the termination costs whereas the first one gives a lower bound since the total number of terminated workers may include terminations for "very serious misconducts", which are exempted from severance payments. Termination costs are essentially stable over the period.

Total retirement cost as well as retirement costs per head, as we can see on Figure A4, are stable. Figure A5 indicates than hiring costs are small and more than half of the establishments of the sample report zero hiring costs, even when these firms hire. Indeed, among firms that hire at least one employee in 1992, 48.90% declare a zero hiring cost; in 1996, this fraction increases to 62.25%.

Of course, this descriptive analysis does not account for potential selection biases and composition effects since hiring and firing are the outcome of complex decision procedures. Hence, we present in the next section our econometric specification that tries to take into

account some of the complexity of adjustment decisions. We also present our econometric estimates for the cost functions.

4 The Shape of Hiring and Separation Costs

4.1 Theoretical and Statistical Models

Hiring and separating from workers is a complex decision for any employer, especially because of the ensuing adjustment costs. There obviously different types of costs incurred when adjusting employment. Some are related to workplace reorganizations when the firm expands or shrinks. Some are directly related to the arriving or departing flows. They include search costs, training costs, severance payments. This paper provides measures of these last set of costs, some of them being inflated by labor rules. As mentioned by Hamermesh and Pfann [1996], knowledge of the adjustment costs as shaped by labor rules is one essential step into the evaluation of those public policies targeted to employees protection.

Theoretical model The theoretical model motivating our econometric specification is inspired from Bentolila and Saint-Paul [1994], who set up a discrete-time model to study the effects of firing costs on labor demand by a firm facing linear adjustment costs under serially independent revenue shocks. The model is partial equilibrium with rational expectations.

The output of the representative firm at date t, which employs homogeneous labor L_t as sole input, is denoted $y_{it} \equiv F(L_t, e_t)$ where F is a production function and e_t represents random productivity shocks affecting the labor input at date t. Workers entries and exits are assumed to take place at the beginning of the different periods after the realization of the shock. We denote h_t the number of hiring and f_t the number of involuntary separations (firing, retirement and early-retirement) at date t.

We suppose that both hiring and firing are costly. We denote $C_h(.)$ (resp. $C_f(.)$) the hiring costs function (resp. firing).

The representative firm is risk neutral and chooses employment after the current shock realization is observed. She maximizes the present discounted value of expected profit, over an infinite horizon. Given previous notations, at date t the objective of the firm writes

$$\begin{cases} V(L_{t-1}) = \max\limits_{L_t} \sum_{i=0}^{\infty} \delta^i \mathrm{E}_t \pi_{t+i} = \max\limits_{L_t} \left[\pi_t + \delta V(L_t)\right] \\ \\ s.c.\ L_t \geq 0 \end{cases} \tag{1}$$

where $0 < \delta < 1$ represents the real discount rate and π_{it} the instantaneous profit

$$\pi_t = y_t - wL_t - C_f(f_t) - C_h(h_t) \tag{2}$$

with w the real wage.

The Euler conditions governing workforce adjustment are then given by:

- If
$$\frac{\partial F(L_t, e_t)}{\partial L_t} - w + C_f'(f_t) + \delta V'(L_{t-1}) < 0 \tag{3}$$
then the firm fires. Equation (3) is the marginal condition for firing.

- If
$$\frac{\partial F(L_t, e_t)}{\partial L_t} - w + C_h'(h_t) + \delta V'(L_{t-1}) > 0 \tag{4}$$
then the firm hires. Equation (4) is the marginal condition for hiring.

Under this simple economic model, employment is left unchanged in states where both equations do not hold.

The econometric specification Our establishment-level econometric specification can be stated in terms of the economic model above, even though we do not claim to estimate a structural version of it. Indeed, this model sheds some light on the hiring and separation decisions, given costs of adjusting the workforce. In this paper, we are here solely interested in estimating those costs. This modelling decision is fully driven by information that our data sources contain. Indeed, our measures of costs and flows at entry and exit in both 1992 and 1996 are unique. Unfortunately, and even though some useful information needed to understand and model the exact decisions is present in 1992, there is no measures of the economic environment of the establishment in 1996. Furthermore, since the information on costs and flows is only available at the establishment level, there is no other data source in the French statistical system that could help us because all accounting measures are collected at the firm level and never at the establishment level.

Nonetheless, the potential offered by the longitudinal dimension of our data is, we believe, exceptional. And, we rely on this feature in our statistical model. The description of the model is made for hiring costs, but separation costs are modelled exactly in the same way.

We assume that adjustment costs comprise a fixed cost component, assumed to be firm-specific, and a variable component. Hence, we write the hiring costs paid by firm j in 1992 and 1996 as:

$$\begin{aligned} y^*_{2j;92} &= X_{2j;92}\beta_2 + \alpha_{2j} + \varepsilon_{2j;92} \\ y^*_{2j;96} &= X_{2j;96}\beta_2 + \alpha_{2j} + \varepsilon_{2j;96} \end{aligned}$$

where $X_{2j;t}$ are observable characteristics of the firm that potentially affect the costs, most notably the number of entries, and α_{2j} the fixed cost of adjustment. This hiring cost is

only observed when the firm decides to hire. The modeling hypothesis on the firm-specific fixed cost allows us to write the hiring cost in difference:

$$\Delta y_{2j}^* = \Delta X_{2j}\beta_2 + \Delta\varepsilon_{2j}$$

Here, this cost difference can only be observed when the firm hires twice, both in 1992 and in 1996. Note that the firm specific fixed cost has been differenced out.

According to the simple economic model outlined above, hiring depends on various economic variables, including the cost structure of adjusting employment. Given our data constraints, we do not model the hiring decision but rather estimate a reduced form equation that comprise both parts of the problem: the decision to hire in both years, 1992 and 1996; the changes in hiring costs between these two dates. Therefore, we write our problem

$$\begin{cases} y_{1j}^* = X_{1j}\beta_1 + \varepsilon_{1j} \\ \Delta y_{2j} = \Delta y_{2j}^* \times 1(y_{1j}^* > 0) = \Delta X_{2j}\beta_2 + \Delta\varepsilon_{2j} \end{cases}$$

where $\left(y_{1j}^*, \Delta y_{2j}^*\right)$ are latent variables; y_{1j}^* models the decision to hire in both years in firm j (*i.e.* if the firm hired twice then $y_{1j}^* > 0$) and Δy_{2j} is the cost difference paid by firm j, a variable directly observed in the data when the firm hired twice, and where X_{1j} comprises economic variables likely to affect firm j hiring decisions at the **exclusion** of the cost of hiring. This system is essentially of the generalized Tobit type.

Choice of covariates for the decision We only observe the following variable y_{1j} :[8]

$$y_{1j} = \begin{cases} 1 \text{ if } y_{1j}^* > 0 : \text{ hired in both years, 1992 and 1996} \\ 0 \text{ if } y_{1j}^* = 0 : \qquad\qquad\qquad\qquad \text{otherwise} \end{cases}$$

For hiring, the Tobit selection equation is based on (4) with observable characteristics of the establishment replacing the value function. Indeed, as explained previously, we are forced to rely solely on those variables contained in the 1992 ESS to model the hiring decisions in the two years. Obviously, our selection equation is reduced form. These variables are the share of managers, clerks and blue-collar workers in total employment in 1992 (the excluded category being the fraction of technicians and foremen), business conditions in 1992 ("facing bad business conditions"), expected increase in employment in 1992. And for no indisputable reason, these variables are excluded from the continuous part of the system and, therefore, help us in the identification of the parameters. Notice though that the structure by skill level certainly plays a role, for instance because the

[8] Indeed, we could use the fact that the firm hired once or did not hire in both years. Our attempts have shown that this strategy does not make any difference in the results, essentially because we do not have the right variable to capture the difference between hiring once and not hiring at all.

training costs for managers are quite different from those for blue-collar workers. However, results are not sensitive to the inclusion of the skill structure in the cost difference equation.

Choice of covariates for the cost The cost of hiring (in first-difference), Δy_{2j} is observed if and only if the firm has hired at both dates, so :

$$\Delta y_{2j} = \begin{cases} \Delta y_{2j}^{*} \text{ if } y_{1j} = 1 \\ 0 \quad \text{if } y_{1j} = 0 \end{cases}$$

with,

$$\Delta y_{2j}^{*} = \Delta X_{2j}\beta_2 + \Delta\varepsilon_{2j} \tag{5}$$

and :

$$\begin{aligned} \Delta y_{2j}^{*} &= C_h\left(h_{j96}\right) - C_h\left(h_{j92}\right) \\ \Delta X_{2j} &= \begin{pmatrix} h_{j96} - h_{j92} \\ h_{j96}^2 - h_{j92}^2 \\ Intercept \end{pmatrix} \end{aligned}$$

where $C_h\left(h_{j,t}\right)$ denotes the hiring cost incurred by firm j in year t and $h_{j,t}$ is the number of workers hired by firm j in year t.

Finally, our estimated equations are the following:

$$\begin{cases} y_{1j} = \begin{cases} 1 \text{ if } X_{1j}\beta_1 + \varepsilon_{1j} > 0 \text{ firm } j \text{ hired both in 1992 and in 1996} \\ 0 \text{ if } X_{1j}\beta_1 + \varepsilon_{1j} = 0 : \qquad\qquad\qquad\qquad \text{otherwise} \end{cases} \\ \Delta y_{2j} = \begin{cases} \Delta X_{2j}\beta_2 + \Delta\varepsilon_{2j} \text{ if } y_{1j} = 1 \\ 0 \qquad\qquad\qquad\quad \text{if } y_{1j} = 0 \end{cases} \end{cases} \tag{6}$$

with $\left(\varepsilon_{1j}; \Delta\varepsilon_{2j}\right) \overset{\text{i.i.d.}}{\sim} N\left(0, \Sigma\right)$:

$$\Sigma = \begin{pmatrix} \tau^2 & \rho\tau\sigma \\ \rho\tau\sigma & \sigma^2 \end{pmatrix}$$

where ρ is the correlation coefficient between the two residuals ε_{1j} and $\Delta\varepsilon_{2j}$. This model will be estimated by maximum likelihood.

The fixed cost After estimating the structure of hiring costs in first-difference, we are now able to compute an estimate of the fixed cost of hiring. Using the estimated $\widehat{\beta}_2$ from equation 5, we can write :

$$\begin{aligned} \alpha_{2j;92} &= y_{2j;92}^{*} - \widehat{\beta}_2 X_{2j;92} - \varepsilon_{2j;92} \\ \alpha_{2j;96} &= y_{2j;96}^{*} - \widehat{\beta}_2 X_{2j;96} - \varepsilon_{2j;96} \end{aligned}$$

where α_{2j} is the fixed cost of hiring of firm j. A measure of the fixed cost is then the average between the fixed cost computed in 1992 and the one computed in 1996 for those

firms that hired twice. As noted in Abowd, Kramarz and Margolis [1999a], the estimation of the individual effect is unbiased and asymptotic in the number of observations per firm. However, this estimation problem is not necessarily crucial since we use α_{2j} as a descriptive statistics as well as a dependent variable in a second-stage equation where we try to explain the components of this individual fixed cost.[9]

4.2 Estimation Results

4.2.1 Terminations

The subsample In our analysis data set, 531 establishments fired workers in both years. For Tobit estimation, we keep those establishments that have no missing variable used in the equation and that have either positive costs and positive terminations or zero cost and zero termination.

The marginal cost of termination Table 1 reports our results for the determinants of the termination costs based on equation 6 for termination decision. The first column of Table 1 presents OLS estimates using observations for those establishments with strictly positive costs and strictly positive terminations in both years. The second column presents our maximum likelihood estimates of the generalized Tobit model using all observations with either positive costs and positive terminations or zero cost and zero termination. All coefficients are expressed in French Francs[10].

In estimates presented in Table 1, most coefficients are significantly different from zero, whereas the intercept – a measure of the temporal trend between the two years – is not significantly different from zero in the generalized Tobit estimation. Apart from the intercept, the OLS and Tobit estimates are quite similar: the linear part is very large and the costs are strongly concave. Notice also that the correlation between the decision and the cost equations is always very small and never significantly different from zero. A possible interpretation being that the two decisions are only weakly related because the decision to terminate is taken knowing the costs, most of them stemming from the stringency of labor laws.

An estimate of the marginal cost of terminating N workers is equal to $115,006 - 28.44N$. The marginal cost of terminating 1 worker represents 11 months of the cost paid by the employer for a minimum wage's worker or 14 months at the median wage (not the cost). For comparison Abowd and Kramarz [2003] estimated this cost for the year 1992 to be equal to $56,299 - 31.2N$ with a fixed cost of $1,138,117$FF. Moreover, the concavity of the

[9] We do not correct for the fact that the fixed cost is estimated since it is used as a left handside variable.

[10] We estimated models for establishments with at least 50 employees. Coefficients were virtually identical to those presented here, hence not reported but they are available from the authors.

	Least Squares Estimates	Generalized Tobit Model
Probit (selection)	–	Coef. (Std)
Intercept	–	**−0.650** (0.175)
Share of Manager	–	**0.943** (0.352)
Share of Clerks	–	−0.170 (0.215)
Share of Blue-Collar Workers	–	**0.643** (0.209)
Situation in 1992 (good=1)	–	**0.455** (0.082)
Growth in 1992 (positive=1)	–	**0.129** (0.077)
Termination Costs	Coef. (Std)	Coef. (Std)
Total Terminations	**114,987.66** (940.45)	**115,006.67** (938.29)
Total Terminations (squared)	**−28.43** (7.59)	**−28.44** (7.57)
Intercept	**7,192.64** (2,868.91)	7,818.42 (10,452.36)
Correlation	–	−0.012 (0.196)
Number of Observations	531	1,127
R-Squared	0.488	–
Log-likelihood	–	−7,319.44

Table 1: The Costs of Termination : maximum likelihood estimates
Sources : ESS and DMMO
OLS estimates rely on establishments with strictly positive costs and strictly positive terminations.

termination costs (according to our estimates) implies that French firms should "optimally group" their terminations, a conclusion that is shared with that of Abowd and Kramarz [2003].

Individual and Collective Terminations The distinction between collective and individual terminations is an important element of French labor laws. One way to address this distinction, not measured in the data, is to assume that any firm that terminates 10 workers or more either in 1992 and 1996 uses the collective termination procedure whereas those that terminate less than 10 workers necessarily use the individual termination procedure.

Results distinguishing individual and collective terminations are given in Table 2. Models are estimated by maximum likelihood using all observations of establishments with 50 or more employees, the critical size threshold above which firms have to implement a "social plan" for collective terminations. In the costs equation, all coefficients are significantly different from zero (we do not report the results for the selection equation, similar to those given just above). The collective termination procedure[11] is much more expensive than the

[11] So the termination cost for one worker when the total number of terminations is greater or equal to

Generalized Tobit Model	
Termination Costs	Coef. (Std)
Individual Terminations	**489,009.7** (188,701.6)
Individual Terminations (squared)	**−48,235.1** (12,533.16)
Collective Terminations	**1,305,852.3** (125,428.9)
Collective Terminations (squared)	**−431.0** (97.64)
Correlation	0.076 (0.067)
Number of Observations	922
Log-likelihood	−7,085.134

Table 2: The Costs of Termination : distinguishing collective and individual terminations: maximum likelihood estimates
Note : Collective termination costs are given per head
Sources : ESS and DMMO

individual termination procedure. As mentioned in section 2, French labor law requires that firms with 50 or more employees formulate a "social plan" before implementing a collective termination: it undoubtedly increases the separation costs. The structure of the cost for collective terminations is less concave than that for individual terminations. But, although French firms should group their individual terminations, they also have to be pay attention to the legislative limit imposed by the law defining "collective" terminations.

The structure of skills within the establishment In the French labor law, the skill of the worker is an important element of the termination costs. Of course, severance payments depend on workers' wages, an obvious function of skills. But the length of the notice period also depends on the skill of the worker. Therefore, we present some complementary results, that take into account this aspect of the French legislation.

Since we do not know the skill-structure of costs and of flows (terminations, here), we estimate the model with interactions between the number terminations and the shares of managers, clerks and technicians, and blue-collar workers (in 1992). We report these results in Table C1 (appendix C). The coefficients of the share of managers and blue-collar workers are significantly different from zero, whereas the coefficient of the share of clerks is not. Results are in line with French institutions. Indeed, we see that terminating a blue-collar worker is almost ten times cheaper than terminating a manager. Costs are apparently concave for the blue-collar workers category. So establishments should only group their terminations of blue-collar workers but have no obvious incentive to group managers' layoffs. The concave shape of termination costs must be related with the large number of blue-collar workers within French establishments. Indeed, establishments of the

10.

subsample have 40% of blue-collar workers, 21% of technicians, 25% of clerks and 14% of managers. Also worth of notice is the positive and significant correlation, albeit small, between the decision and the cost equations. Those firms that fired twice tend to pay slightly higher termination costs.

The Fixed Cost of Termination Using the estimated structure of termination costs, we are able to compute an estimate of the fixed cost component of termination costs. Results are given in Table 3 for establishments which have terminated workers twice (both in 1992 and 1996) and for establishments which have terminated workers once (either in 1992 or in 1996).

Nb. Obs	531	531	203	203
Mean	5,700.22	43.17	7,445.23	7.83
Std	58,804.42	113.76	37,372.89	19.78

Table 3: Fixed Cost of Termination
Sources: ESS and DMMO
Notes : Column (1) and (2) reports estimates for establishments that terminated twice. Column (3) and (4) reports estimates for establishments that terminated once. Column (1) and (3) reports estimates for the fixed cost of termination. Column (2) and (4) reports estimates for the number of workers involved in terminations.

Fixed costs of termination are small, in average $5,700$FF for establishments that terminated workers in 1992 and in 1992. In fact, fewer establishments fired once rather than twice. And, our fixed cost estimates for the former, $7,445$FF is slightly larger than for the latter. This result is consistent with the theoretical model; firms with larger fixed costs should fire less often than those with a smaller fixed component in their firing cost function. Comparing with Abowd and Kramarz [2003], our estimated fixed costs are tiny. This result is striking. When controlling for unobserved heterogeneity, we find that the major component of the costs of terminating workers is due to the number of terminated workers. There is apparently almost no firm-specific fixed costs. To check the robustness of this conclusion, we looked at the distribution of separations for establishments terminating workers in both years. This distribution is presented in Table B1 (appendix B). Among these firms terminate, a very large number (129) terminate 5 or less workers in each of the two years, potential evidence that the fixed cost of separating is small for a large fraction of firms. But, at the same time, many firms fire a large number of workers in both years, a further proof of the concavity of the costs.

Decomposition of the Fixed Cost Results for our decomposition of the fixed cost of termination are given in Table 4[12].

[12] The covariate "manufacturing industries" is a dummy variable equals to 1 if the establishment belongs to secondary industries and 0 otherwise.

Variable	Coef. (Std)
Fixed Cost	dep.
Gross Earning per Worker	−5.62 (6.77)
Share of Blue-Collar Workers	**−18.29** (2.38)
Share of Clerks	−12.34 (10.37)
Share of Managers	**127.11** (11.03)
Manufacturing Industries	**7,518.49** (3,035.01)
Long-Term Contracts	**−131.15** (76.34)
Number of Observations	531
R^2	0.27

Table 4: Fixed Cost of Termination : least squares estimatesSources: ESS and DMMO

Most coefficients are significantly different from zero. The structure by skill-levels of the establishment as well as the number of long-term contracts are positively associated with the level of this fixed cost. This result is, once again, consistent with French labor laws, since severance payments and notice periods depend upon wages and skill-levels at the moment of termination. Moreover, long-term contracts are subject to employment protection (consequently termination costs) whereas short-term contracts are not. Finally, note that the fixed cost does not differ by size of the establishment (we do not report the coefficient of the size variable in the Table since it was not significantly different from zero).

4.2.2 Retirement

The subsample In our analysis data set, 326 establishments retired some workers in both 1992 and 1996. All these establishments have positive retirements and positive costs in both years. 95% of the establishments of these units have 50 or more employees, not surprisingly given the structure of our data source and the necessity to use the DMMO when the ESS information is missing. Hence, we do report separate estimates for such establishments.

The Marginal Cost of Retirement Tables 5 reports our results for the determinants of the retirement costs based on equation 6 applied to the retirement decision. Table 5 has the same structure as previous Tables, with the OLS estimates in the first column and the maximum likelihood estimates of the generalized tobit model using all observations with either positive costs and positive retirements or zero cost and zero retirement, in the

last column.[13] Coefficients are expressed in Francs.[14].

	Least Squares Estimates	Generalized Tobit Model
Probit (selection)	–	Coef. (Std)
Intercept	–	−0.203 (0.178)
Share of Manager	–	−0.489 (0.370)
Share of Clerks	–	**−0.954** (0.223)
Share of Blue-Collar Workers	–	**−0.442** (0.214)
Situation in 1992	–	0.111 (0.086)
Growth in 1992	–	**0.147** (0.081)
Retirement Costs	Coef. (Std)	Coef. (Std)
Total Retirement	**53,030.92** (23,821.99)	**53,026.02** (23,712.39)
Total Retirement (squared)	136.88 (2,111.88)	136.73 (210.24)
Intercept	−1,521.51 (201,123.94)	52,698.93 (1,295,722.5)
Correlation	–	−0.013 (0.313)
Number of Observations	326	1,134
R-Squared	0.091	–
Log-likelihood	–	−4,456.14

Table 5: The Costs of Retirement and Early Retirement
Sources : ESS and DMMO
OLS estimates rely on establishments with strictly positive costs and strictly positive retirements.

For the various estimates presented in Table 5, the linear component of the retirement cost is the only coefficient that is significantly different from zero. The intercept – a measure of the temporal trend between the two years – is not; the institutional changes that took place between 1992 and 1996 did not translate into costs increases. Therefore, the shape of the retirement costs differs from those estimated for terminations; the former are linear whereas the latter are concave.

The least squares and tobit estimates are quite similar: the decision to retire workers and the entailed costs are apparently independent. This independence may have multiple origins. The most likely being that the legislation (collective agreements as well as labor laws) constrains retirement costs on one side and, on the other, retirement is clearly strongly related to age of the workforce and the decision to retire is also very constrained by the legislation.

[13] Note that establishments with positive retirements and zero cost are deleted from the retirement analysis file. The size of the resulting file is $1,134$.

[14] All numbers are expressed in nominal French Francs of the year (1992 Francs for the costs in 1992 and 1996 Francs for the costs in 1996).

The cost of retiring N workers is equal to $53,026N$ (the marginal cost of retirement is independent of N). Thus, the marginal cost of terminating 1 worker represents 5 months of the cost paid by employer for a minimum wage's worker, or 6.5 months at the median wage (not cost). For comparison, Abowd and Kramarz [2003] estimated this marginal cost (in 1992) to be equal to $27,435 - 176N$ with a fixed cost of 579,549FF.

The structure of skills within the establishment For reasons similar to those invoked for the termination costs, workers' skills is an important element of retirement costs. In Table C2 (appendix C), we report estimates of the costs of retirement when taking into account the structure by skill-level of the establishments (by interacting retirements with the share of managers, clerks and technicians, and blue-collar workers in 1992)[15]. Once again, the two decisions appear only weakly related. Estimates are not precise. And, as mentioned in section 2, French labor laws require the payment made at retirement to be proportional to the wage of the retired worker. Our estimates, showing that only the fraction of managers matters, are not in contradiction with this fact.

The Fixed Cost of Retirement As before, we compute an estimate of the fixed cost of retirement.

Nb. Obs	326	326	221	221
Mean	15,547.01	3.41	6,437.75	6.55
Std	27,593.08	16.34	12,990.18	27.35

Table 6: Fixed Cost of Retirement
Sources: ESS and DMMO
Notes : Column (1) and (2) gives computation for establishments that terminated twice. Column (3) and (4) gives computation for establishments that terminated once. Column (1) and (3) gives computation for the fixed cost of termination. Column (2) and (4) gives computation for the number of workers involved in terminations.

Results are given in Table 6 for establishments that have retired workers twice (both in 1992 and 1996) and for establishments that have retired workers once (either in 1992 or in 1996). Fixed costs of retirement are three times larger than the fixed costs of termination for those firms that retired workers twice, in comparison with those firms that fired workers in both years. For the less active firms, the fixed cost is of the same magnitude as the one estimated for firms that fired workers only once. Notice though that in all cases, these estimates of fixed costs are rather small and much smaller anyway than those presented in Abowd and Kramarz [2003].
Our least squares analysis of the fixed cost of retirement is given in Table 7. Once again, costs are related positively to the share of managers.

[15] Remember that we do not measure the separations or hiring by skill-level.

Variable	Coef. (Std)
Fixed Cost	dep.
Gross Earning per Worker	−0.01 (0.16)
Share of Blue-Collar Workers	1,707.26 (4,399.68)
Share of Clerks	**−6,614.08** (4,265.93)
Share of Managers	**20,782.00** (7,548.72)
Manufacturing Industries	−384.87 (2,966.26)
Number of Observations	326
R^2	0.0305

Table 7: Fixed Cost of Retirement : least squares estimatesSources: ESS and DMMO

4.2.3 Hiring

The subsample In our analysis sample, 252 establishments hired twice. Notice here that among firms that we use in our Tobit equation, more establishments have less than 50 employees.

The Marginal Cost of Hiring Table 8 presents our results for the costs of hiring based on equation 6 for the hiring decision. Our numbers provide estimates of the direct hiring costs, without taking into account training costs and other adjustment costs (such as production lost). Unfortunately, firms are not asked in the ESS to report the training costs that they incur for their new hires. This is unfortunate since they probably constitute a large fraction of adjustment costs in case of a hire.

Table 8 gives, on the one hand, least squares estimates using observations of establishments with strictly positive costs and strictly positive hiring, and on the other hand, maximum likelihood estimates of the generalized tobit model using all observations with either positive costs and positive hiring or zero cost and zero hiring.[16] Notice here that elimination of establishments that hired and reported no hiring cost will bias the estimates upwards. In contrast to the previous cases (terminations and retirements) where it was clearly impossible to associate retirement of terminations with no associated cost, a zero hiring cost is clearly a possibility. Therefore, our estimates must be seen as upper bounds of the costs. Coefficients are expressed in Francs.[17]

In estimates presented in Table 8, most coefficients are significantly different from zero, including the intercept – a measure of the temporal trend between the two years. The

[16] Note that 280 establishments with positive hiring and zero reported cost are deleted from the recruitment analysis file.

[17] All numbers are expressed in nominal French Francs of the year (1992 Francs for the costs in 1992 and 1996 Francs for the costs in 1996).

	Least Squares Estimates		Generalized Tobit Model	
Probit (selection)		–	Coef. (Std)	Coef. (Std)
Intercept		–	**−0.877** (0.225)	**−1.574** (0.260)
Share of Manager		–	**1.253** (0.442)	**2.932** (0.555)
Share of Clerks		–	−0.402 (0.284)	**1.194** (0.363)
Share of Blue-Collar Workers		–	**0.459** (0.270)	**1.724** (0.328)
Situation in 1992		–	**0.221** (0.113)	0.163 (0.133)
Growth in 1992		–	**0.204** (0.107)	0.226 (0.125)
Hiring Costs	Coef. (Std)	Coef. (Std)	Coef. (Std)	Coef. (Std)
Total Hiring	**1910.57** (437)	**1910.57** (437)	**1,926.96** (436.32)	**1,917.89** (435.72)
Total Hiring (squared)	**−0.89** (0.23)	**−0.89** (0.23)	**−0.91** (0.23)	**−0.91** (0.23)
Intercept	**214.65** (29.64)	**214.65** (29.64)	**330.57** (85.12)	**291.84** (59.28)
Correlation	–	–	−0.249 (0.165)	−0.226 (0.148)
Number of Observations	212	210	628	438
R-Squared	0.25	0.25	–	–
Log-likelihood	–	–	−1,945.909	−1,842.032

Table 8: The Costs of Hiring
Sources : ESS and DMMO
OLS estimates rely on establishments with strictly positive costs and strictly positive hiring. Columns (1) and (3) give estimates for all establishments. Columns (2) and (4) give estimates for establishments with 50 or more employees.

OLS and Tobit estimates are quite similar: the linear part is small and the hiring costs are roughly linear. Estimates for the largest firms do not differ from those obtained for all establishments.

The marginal cost of hiring N workers is estimated as $1,926 - 0.9N$. For comparison Abowd and Kramarz [2003] estimated this cost for the year 1992 as $2,015 - 2.84N$ with a fixed cost of 385,364FF.

Fixed-Term Contracts and Permanent Contracts Table 9 reports costs of hiring by contract type. As mentioned above, French labor laws distinguish between two types of contracts, short-term contracts (up to 18 months, CDD) and indefinite duration contracts (CDI).

Results are interesting as they show that hiring on long-term contracts (CDI) is rather expensive; in particular hiring on such contracts is much more expensive than hiring on short-term contracts. Remember though that separations are much more expensive than any type of hiring. Moreover, the costs of hiring on long-term contracts are more concave

	Generalized Tobit Model
Hiring Costs	Coef. (Std)
Total Hiring (CDI)	**3556.92** (1726.15)
Total Hiring (CDI, squared)	**−10.04** (6.66)
Total Hiring (CDD)	**1749.61** (504.19)
Total Hiring (CDD, squared)	**−0.96** (0.27)
Intercept	**334.01** (85.26)
Correlation	−0.246 (0.167)
Number of Observations	628
Log-likelihood	−1945.61

Table 9: The Costs of Hiring by Contract Type : maximum likelihood estimates
Sources : ESS and DMMO

than the costs of hiring on short-term contracts: establishments should optimally group their hiring on CDIs and adjust gradually their workforce with CDDs (in line with Abowd *and al.* [1999b]). It is worth noting that the industry affiliation of the establishment influences the hiring costs. In unreported results, hiring in services industries appears to be more expensive than in manufacturing industries. In contrast, size of the employing establishment does not matter.

The structure of skills within the establishment The recruitment procedure for a manager is often thought to be longer than that for a blue-collar. This is confirmed by results presented in Table C3 (appendix C) where we report estimates for the costs of hiring when taking into account the structure by skill-level of the establishment (by interacting hiring with the share of managers, clerks and technicians, and blue-collar workers as measured in 1992). The coefficients for the share of managers are significantly different from zero, whereas the other coefficients are not. Estimated costs show that, in line with Abowd and Kramarz [2003], only hires of managers have an increasing and concave impact on the costs.

The Fixed Cost of Hiring We present now our estimates of the fixed cost of hiring. Results are given in Table 10 for establishments that have hired workers twice (in 1992 and 1996) and for establishments that have hired workers once (either in 1992 or in 1996).

Fixed costs of hiring are very small (negative on average). Table B3 shows that there are fewer establishments that hired once than establishments that hired twice. This result is consistent with our theoretical model given our costs estimates: small fixed costs and cheap hiring (on short-term contracts). Indeed, when they hire on CDD, establishments

Nb. Obs	212	212	54	54
Mean	−219.18	9.15	−185.49	6.37
Std	254.88	169.61	190.96	220.69

Table 10: Fixed Cost of Hiring
Sources: ESS and DMMO
Notes : Column (1) and (2) gives computation for establishments that terminated twice. Column (3) and (4) gives computation for establishments that terminated once. Column (1) and (3) gives computation for the fixed cost of termination. Column (2) and (4) gives computation for the number of workers involved in terminations.

do not have to pay training costs insofar as CDD may act as a training period.

Volatility of the Fixed Cost Even though the negative means of the previous Table tend to show that fixed costs do not exist for many firms, there is some variation across establishments. This variation is analyzed now in Table 11.

Variable	Coef. (Std)
Fixed Cost	dep.
Gross Earning per Worker	**−1.18** (0.36)
Share of Blue-Collar Workers	**−183.58** (81.91)
Share of Clerks	**−249.75** (81.89)
Share of Managers	**377.81** (169.47)
Manufacturing Industries	60.84 (57.75)
Training Costs	**2.72** (0.51)
Number of Observations	212
R^2	0.447

Table 11: Fixed Cost of Hiring : least squares estimates

Most of coefficients are significantly different from zero. The signs are all in line with expectations. In particular, firms which train workers also have higher fixed costs of hiring (admittedly small).

5 Conclusion

In this paper, we examine the structure of costs that firms face when adjusting their employment, using panel data on individual establishments for which we directly measure adjustment costs.

Our results show that termination costs are increasing and mildly concave in the number of terminated workers. Collective terminations are much more expensive than individual terminations: legislation, namely the requirement to set up a "social plan" in case of

collective terminations, magnifies firing costs. The estimated firm specific fixed component of the termination cost function appears to be small.

The costs of retirement are linear in the number of retired workers. The fixed cost of retiring workers is slightly larger than the one estimated for terminations, but way smaller than that obtained by Abowd and Kramarz [2003]. When controlling for unobserved heterogeneity in separations – retirement and terminations – the major component of the exit costs is directly related to the size of the adjustment.

Finally, we find that hiring costs are small and seem only present when hiring on CDI; costs of hiring on short-term contracts are almost zero, confirming the finding that fixed-term contracts represent the bulk of hires in France (see Abowd *and al.* [1999b]). Finally, the fixed (firm-specific) component of hiring costs is very small.

Our results provide direct evidence on the shape and structure of firm-level adjustment costs in contrast to the vast amount of indirect evidence based upon estimating dynamic labor demand equations. In France, adjustment costs display at least one source of lumpiness – the concave shape of these costs, which may explain why firms tend to prefer large adjustments over small ones. Legislation, when imposing a distinction between individual terminations and collective terminations for instance, has a strong and clear impact on the level and structure of termination costs.

Because we use two waves of the Wage Structure Survey, our analysis yields insights that were not available to Abowd and Kramarz [2003]. In particular, our estimates of the fixed cost component of adjustment costs is much smaller than the one obtained by these authors. By contrast, Abowd and Kramarz [2003] had access to matched employer-employee data that allowed them to contrast costs as paid by the firm with retirement or severance payments received directly by the workers.

Abowd *and al.* [1999b] have shown the existence of a considerable amount of worker turnover in France. Indeed most of these movements stem from the entry and exit of workers on short-term contracts (CDD). Since the termination or retirement of workers on long-term contracts (CDI) causes adjustment costs in our estimates while termination of CDD workers does not, the conjunction of rigid wages, high firing costs for workers on CDI, and easy hiring and separation for workers on CDD seems to explain the observed behavior of many French firms. In particular, our estimates explain why these firms hire primarily on short term contracts, why and how they reduce entries in bad times without increasing separations, a feature common to many countries. Interestingly, our estimates also show that firms can also terminate workers relatively easily, *i.e.* without paying a large fixed cost. Even though costly, small adjustments appear to be possible in France.

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A Summary Statistics

Industrial Sector	Obs.	%
Manufacturing Industries	659	50.38
Service Industries	345	25.98
No response	324	23.64
Size	**Obs.**	**%**
10−50 employees	213	16.04
50−100 employees	134	10.09
100−200 employees	152	11.45
more than 200 employees	829	62.42
Nb. Obs.	1,328	

Table A1: Size and Industrie of the establishments

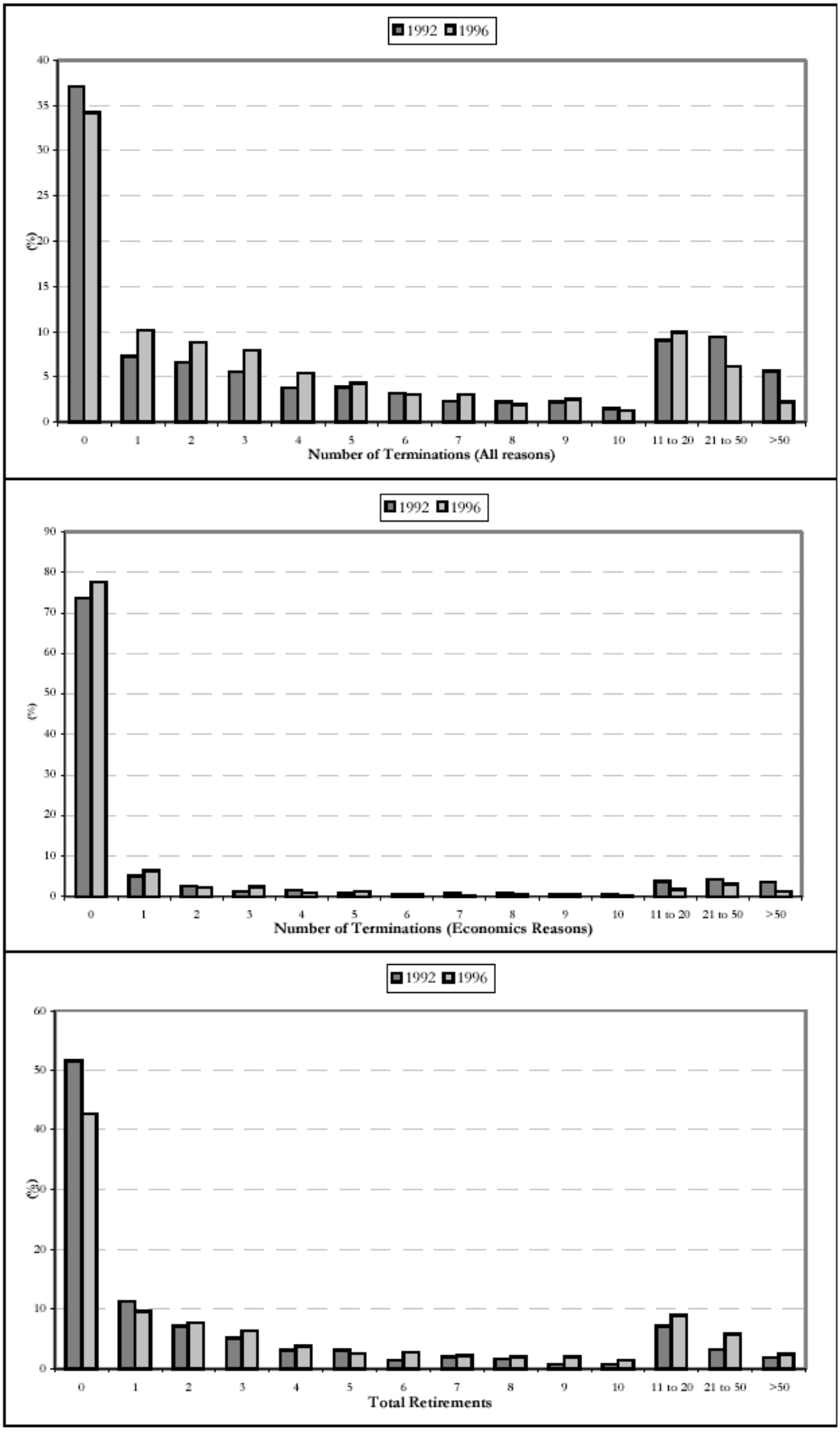

Figure A1: Terminations and retirements in 1992 and 1996

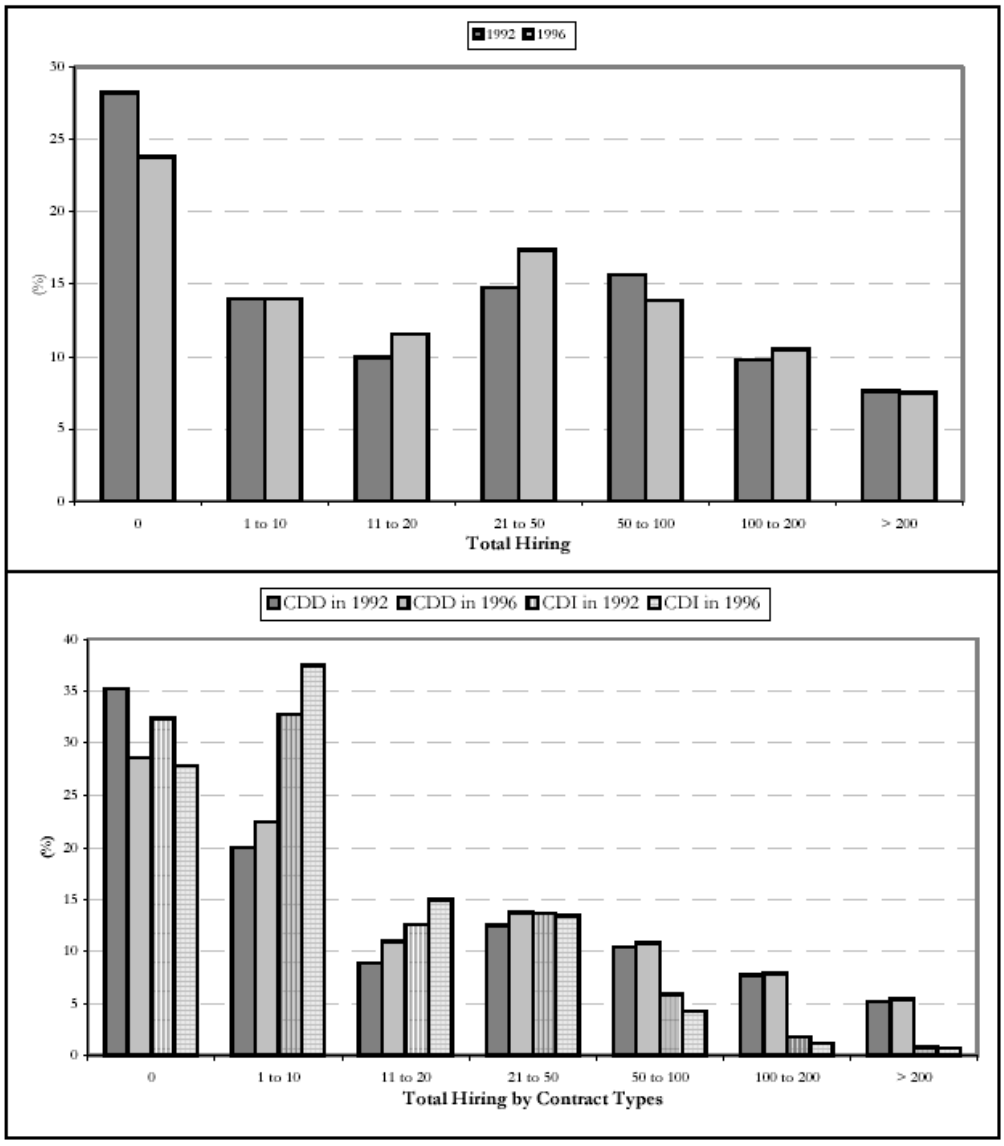

Figure A2: Hiring in 1992 and 1996

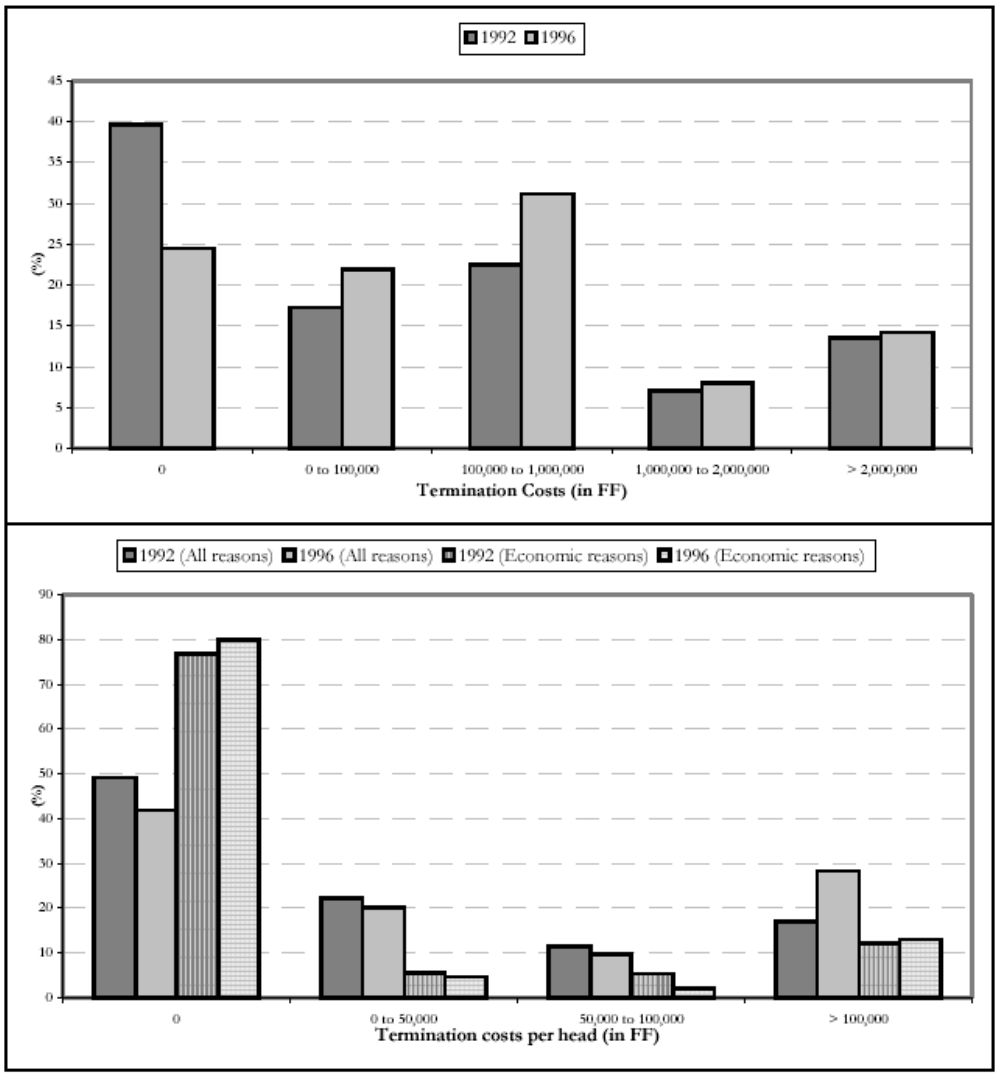

Figure A3: Termination costs in 1992 and 1996

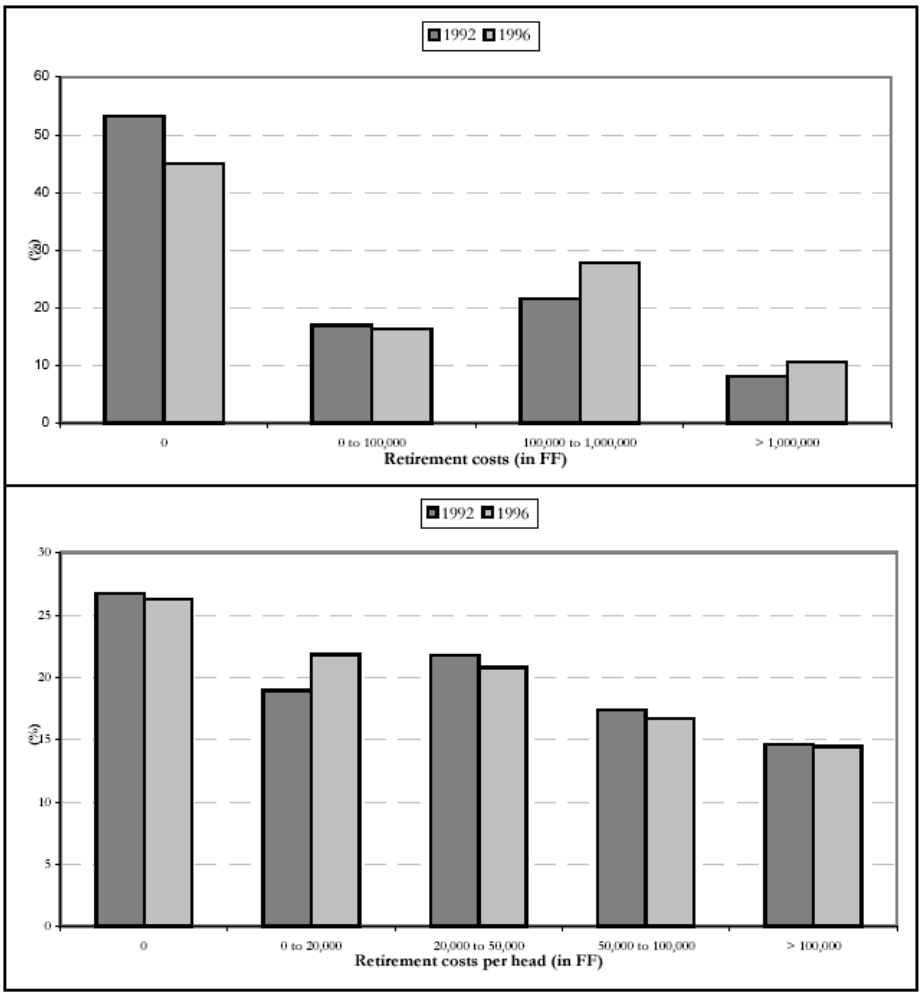

Figure A4: Retirement costs in 1992 and 1996

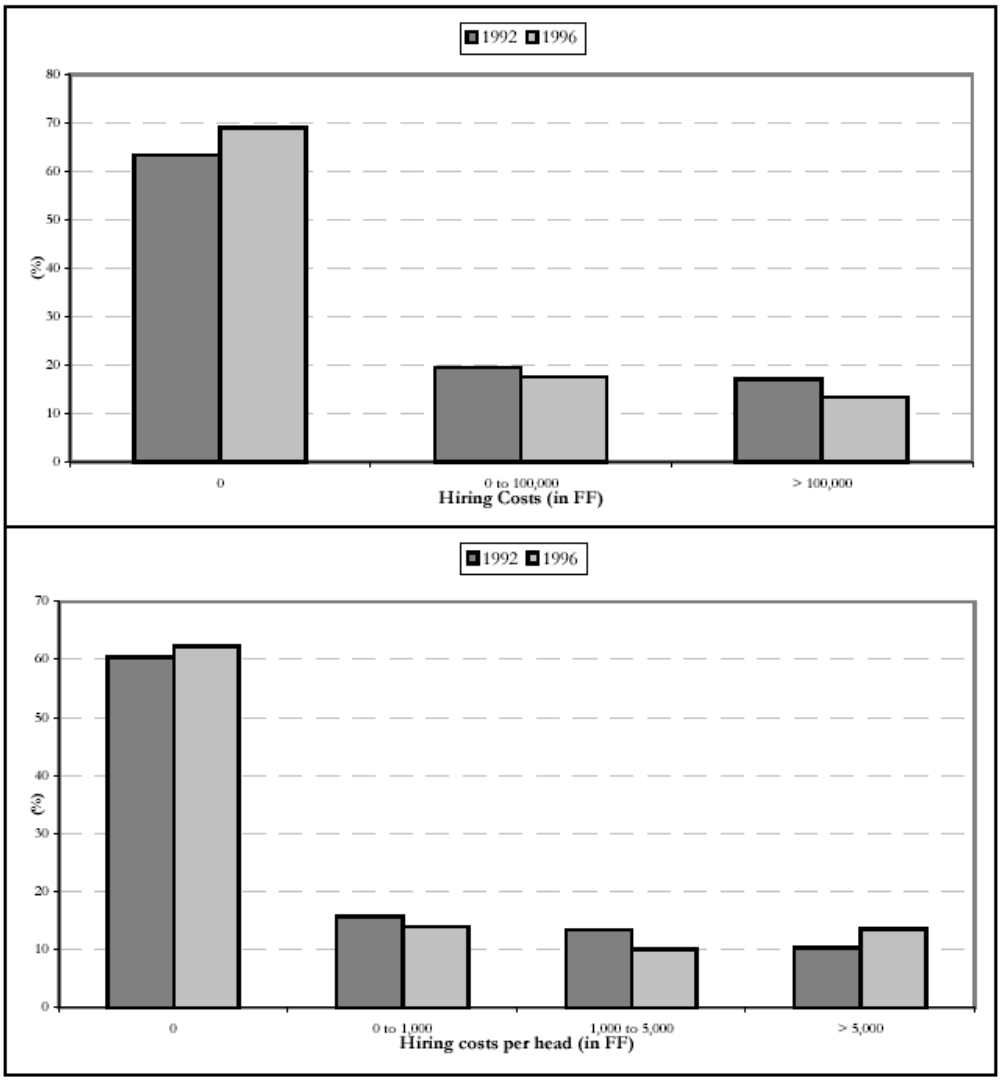

Figure A5: Hiring costs in 1992 and 1996

B Subsamples used for estimation

96 / 92	1	2-5	6-9	10-20	20 and more
1	**8**	16	3	1	1
2-5	24	**81**	22	15	13
6-9	10	32	**21**	18	4
10-20	5	30	12	**25**	19
20 and more	10	34	18	38	**52**

Table B1: Number of establishments that fired twice

Note: Table gives statistics for establishments that fired twice

Reading: Within establishments that fired only one worker in 1992, 8 fired one and only one worker in 1996, 16 fired 2 to 5 workers, 3 fired 6 to 9 workers, 1 fired 10 to 20 workers and 1 fired more than 20 workers. Diagonal of the table indicates number of establishments that acted in the same way both in 1992 and 1996.

96 / 92	1	2-5	6-9	10-20	20 and more
1	**5**	24	8	10	6
2-5	14	**49**	31	23	3
6-9	3	11	**10**	21	5
10-20	2	15	11	**22**	15
20 and more	1	2	3	6	**26**

Table B2: Number of establishments that retired twice

Note: Table gives statistics for establishments that retired twice

Reading: see Table B1

96 / 92	1	2-5	6-9	10-20	20 and more
1	**0**	1	0	1	0
2-5	0	**2**	2	3	3
6-9	1	2	**1**	4	6
10-20	0	3	2	**4**	14
20 and more	0	1	7	19	**134**

Table B3: Number of establishments that hired twice

Note: Table gives statistics for establishments that hired twice

Reading: see Table B1

C Complementary results

Generalized Tobit Model	
Termination Costs	Coef. (Std)
Total Terminations * Share of Managers	**562,807.95** (84,201.48)
Total Terminations * Share of Clerks-Technicians	−77,253.61 (109,292.31)
Total Terminations * Share of Blue-Collar Workers	**69,831.66** (12,849.24)
Total Terminations * Share of Managers (squared)	−536.49 (615.24)
Total Terminations * Share of Clerks-Technicians (squared)	2,212.92 (1,884.83)
Total Terminations * Share of Blue-Collar Workers (squared)	**−28.52** (10.62)
Correlation	**0.15** (0.057)
Number of Observations	1,127
Log-likelihood	−7,299.11

Table C1: The Costs of Termination by Skill-Levels : maximum likelihood estimates

Generalized Tobit Model	
Retirement Costs	Coef. (Std)
Total Retirement * Share of Managers	−127,568.70 (187,924.17)
Total Retirement * Share of Clerks	−28,108.11 (104,443.76)
Total Retirement * Share of Blue-Collar Workers	74,095.08 (48,962.79)
Total Retirement * Share of Managers (squared)	**13,506.55** (5,505.20)
Total Retirement * Share of Clerks (squared)	588.01 (1,343.27)
Total Retirement * Share of Blue-Collar Workers (squared)	731.52 (673.26)
Correlation	0.040 (0.051)
Number of Observations	1,134
Log-likelihood	−4,443.305

Table C2: The Costs of Retirement by Skill-Levels : maximum likelihood estimates

Generalized Tobit Model	
Hiring Costs	Coef. (Std)
Intercept	**315.34** (88.70)
Total Hiring * Share of Managers	**1,033.52** (410.04)
Total Hiring * Share of Clerks	36.24 (178.17)
Total Hiring * Share of Blue-Collar Workers	71.36 (71.83)
Total Hiring * Share of Managers (squared)	**−3.49** (2.03)
Total Hiring * Share of Clerks (squared)	−0.07 (0.17)
Total Hiring * Share of Blue-Collar Workers (squared)	−0.05 (0.04)
Correlation	−0.208 (0.182)
Number of Observations	628
Log-likelihood	−1,944.893

Table C3: The Costs of Hiring by Skill-Levels : maximum likelihood estimates