The Shape of Hiring and Separation Costs : Concave but Not Fixed

Francis Kramarz*and Marie-Laure Michaud†

January 2002

Abstract

In this article, we estimate the structure of the costs of hiring, termination, and retirement of employees for a representative sample of French establishments. The estimates are computed using panel data from two years (1992 and 1996) and two sources : the Wage Structure Survey (Enquête sur la Structure des Salaires) and the Workforce Questionnaire (Déclarations des Mouvements de Main-d'Oeuvre).

We 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 and collective termination (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 firm specific fixed cost. Furthermore, these costs are concave and induce firms to group their hirings and separations. Finally, legislation obviously constrains firms behavior.

Keywords : adjustment costs, firm behavior
JEL Classifications : J30, D21

*CREST-INSEE and CEPR (kramarz@ensae.fr)
†EUREQua-Université Paris 1-Panthéon-Sorbonne (mlm@univ-paris1.fr)

1 Introduction

Employment protection legislation is often pointed out as one of the most important source of rigidity in continental European labor markets. Theoretical (Bentolila and Bertola [1990], Bertola [1990], Garibaldi [1998], etc.) and empirical (Garibaldi, Konnings and Pissarides [1997], Lazear [1990]) evidence suggest some implications in that way (see Bertola, Boeri and Cazes [1999]). Theoretical models indicate 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, and may also affect the character of unemployment experience. Empirical work provides mixed results in the evaluation of the influence of labor market regulation on labor market adjustments. While all those papers study the consequences of employment protection on labor market performances, only a few try to measure the cost of employment protection legislation. In a recent paper, Goux, Maurin and Pauchet [2001] estimate the costs of firing and hiring, using a model of dynamic labor demand. They show that it is much more costly to lay off workers under permanent contracts than to hire them and that it is much less costly to adjust the number of fixed-term contracts than to adjust the number of permanent ones. In line with Goux et al. [2001], the purpose of the present paper is also to estimate the structure of the costs of hiring and separation, in order to know if and how the legislation affects those costs.

This study follows a previous article by Abowd and Kramarz [2001], who estimate the costs of hiring, separation, and retirement of employees for a representative sample of French establishments matched with a representative sample of their employees.

They show that both retirement and termination costs are increasing and mildly concave in the number of retired and terminated workers. Moreover, the fixed costs that they estimate are very large, giving the firm an incentive to group exits instead of adjusting them gradually. Termination costs are largest for collective terminations as opposed to individual ones, and they are also largest for highly skilled employees. In Abowd and Kramarz [2001], it appears that hiring costs are concave adjustment costs also with a strong fixed component. However, hiring costs do differ by skill-level. Only hires of managers on long-term contracts have an increasing and concave impact on the costs. For all other skill levels and types of contracts, hiring costs do not depend upon the number of entries. The authors also show that costs of hiring are much less important in France than the costs of separations.

The results of Abowd and Kramarz [2001]'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 any single firm's cost structure. To have better insight on firm's cost structure, we build a panel of a representative sample of French establishments, that allows us to control for unobserved heterogeneity in the cost functions.

The data were collected in 1992 and 1996 and we computed establishments-based measures using French data from two sources that are matched together. The first source is the Wage Structure Survey (ESS), which provides the establishments measures of the hiring and firing costs. For units where this information is missing, we match data from the Workforce Movement Questionnaire (DMMO) which gives, for every establishment with at least 50 employees, the number of new hires and separations. To control for unobserved heterogeneity, we formulate two hypothesis supported by French evidence. First, our model assume that the fixed cost of adjustment comprises a firm specific component. Second, if there was a legislation change between 1992 and 1996, we assume the effect was similar for all firms. Our results show that separations 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 termination (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 firm specific fixed cost. Furthermore, these costs are concave and induce firms to group their hiring and separations. Finally, legislation obviously constrains

firms behavior.

The paper is organized as follows. In the next section we give some information about French policies and institutions that affect the costs of adjusting employment. Section 3 presents our data sets. Theoretical and statistical models that motivate our econometric specification are presented in section 4. The results of the empirical analysis are given in section 5. Finally, section 6 concludes.

2 Hiring and Separations : The French Labor Laws

French labor laws[1] 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. 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 87% 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 CDI. 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 forms : firing for "economic reasons", in which case the firm must prove that it needs to reduce its employment, or for "personal reasons"[2], 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 et 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

[1] For more details about French Labor Laws, see Abowd and Kramarz [2001] for an executive summary in english, and *Lamy Social, Droit Du Travail* [1992] for an explanation of the text of the law.

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

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, if the worker is old enough. On retirement and early-retirement, two laws must be singled out. First, an employer can mandatorily 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 the 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 that *contribution* was to promote early-retirement. Because of these changes, we decided to leave the question of early-retirement to future research.

3 Data Description

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 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) (for more details on the survey, see Guigon [1996]). 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 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 study, 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 n 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 :
  - training hours : the total number of hours of training paid by the firm when trainees were directly compensated by the firm ;
  - direct training costs : employer paid training expenditures exclusive of trainee labor costs and inclusive of payroll costs for instructors as well as all other direct material costs ;
  - trainees' compensation (young) : the direct labor costs for young trainees (stagiaires, apprentis and others).

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.

3.2 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 (for more details on the survey, see Chazal, Thiery and Torelli [1992]). 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 in a long-term contract (CDI),
- hire in a short-term contract (CDD),
- trial hire,
- transfer in,
- transfer out,
- quit,
- exit for military service,
- exit for sickness or death,
- end of short-term contract,
- end of trial hire,
- retirement or early-retirement,
- termination for economic reasons,
- other termination including for cause,

- 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 CDI is the number of long-term contract hires ;
- total hiring on CDD is the number of short-term contract hires ;
- total retirement is the number of regular and early retirements ;
- total terminations (economic reasons) is the number of terminations for economic reasons as defined in section 2 ;
- total terminations (all reasons) is the total number of terminations.

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

3.3 Creation of 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 firm identification number (SIREN code) for the panel data set. In the matched file by year, we required the establishment to be in the Wage Structure Survey. Giving the sampling procedure of the ESS, large establishments are over-represented in the panel. For the year 1992, the match of ESS with DMMO gives a data set of $13,313$ establishments ; for the year 1996, there were $15,619$ establishments in the data set. In the matched panel file, we required the firm to be both in the 1992 file and in the 1996 file ; this operation gives a dataset with $4,042$ establishments. These establishments constitute our analysis file. It is worth noting that when we required the establishment to be both in the 1992 and 1996 file, we obtain a dataset with only $1,328$ establishments. In the analysis panel, many variables have missing values (not all establishments report retired workers, terminated or hired employees). We explain here 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 (CDD or CDI) only for those establishments with non-missing data.

The number of observations used in the different regressions is shown in our results section (section 5). Appendix A gives some basic statistics of the data.

4 Theoretical and Statistical Models

The theoretical model underlying our econometric specification is inspired by 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 profit of the representative firm, which employs homogeneous labor L_t as sole input, is given by :

$$\pi_t = (e_t + m) L_t - \frac{1}{2} b L_t^2 - w L_t - C_f (f_t) - C_h (h_t) \tag{1}$$

with $m, b > 0$, e_t an iid shock, w the real wage, $C_f(.)$ the firing costs function, $C_h(.)$ the hiring costs function, f_t the number of involuntary separations (firing, retirement and early-retirement), h_t the number of hiring. Those latter are given by :

$$f_t = \max [0; \beta L_{t-1} - L_t] \tag{2}$$

$$h_t = \max [0; L_t - \beta L_{t-1}] \tag{3}$$

where $0 \leq \beta \leq 1$ is the workforce retention rate.

The representative firm is risk neutral and choose employment after the current shock realization is observed. She maximizes the present discounted value of expected profit, over an infinite horizon :

$$V(L_{t-1}) = \max_{L_t} \sum_{i=0}^{\infty} \delta^i \mathrm{E}_t \pi_{t+i} = \max_{L_t} [\pi_t + \delta V(L_t)] \text{ subject to } L_t \geq 0 \tag{4}$$

with $0 \leq \delta \leq 1$ the discount factor.

Following Abowd and Kramarz [2001] who built on Bentolila and Saint-Paul [1994], the optimal rule of workforce adjustment is thus given by :

- If

$$e_t + m - b\beta L_{t-1} - w + C_f^{'}(f_t) + \delta V'(\beta L_{t-1}) < 0 \tag{5}$$

  then the firm fires. Equation (5) is the marginal condition for firing.

- If

$$e_t + m - b\beta L_{t-1} - w + C_h^{'}(h_t) + \delta V'(\beta L_{t-1}) > 0 \tag{6}$$

  then the firm hires. Equation (6) is the marginal condition for hiring.

Our establishment-level econometric specification can be stated in terms of the economic model above. From the above equations, we can write thee following model for the hiring decision:

$$\begin{cases} y_{1j;t}^* = X_{1j;t}\beta_1 + \alpha_{1j} + \varepsilon_{1j;t} \\ y_{2j;t}^* = X_{2j;t}\beta_2 + \alpha_{2j} + \varepsilon_{2j;t} \end{cases}$$

where $\left(y_{1j}^*; y_{2j}^*\right)$ are two latent variables; y_{1j}^* is the selection criterion for hiring in firm j (i.e. $y_{1j} = 1(\ y_{1j}^* \geq 0)$), and y_{2j}^* the costs paid by the firm j if and only if she decides to hire, with $t = 1992, 1996$ and $(\varepsilon_{1j;t}; \varepsilon_{2j;t}) \overset{\text{i.i.d.}}{\sim} N(0, \Sigma)$:

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

where ρ is the linear correlation coefficient between the two residuals $\varepsilon_{1j;t}$ and $\varepsilon_{2j;t}$. α_{1j} and α_{2j} are correlated firms fixed effect, but $(\varepsilon_{1j;t}; \varepsilon_{2j;t})$ and $(\alpha_{1j}; \alpha_{2j})$ are independent. $X_{1j;t}$ and $X_{2j;t}$ are observable characteristics of the firm that explain the decision and the costs. Note that our

model assume that the fixed cost of adjustment comprises a firm specific component (α_{2j}). Note also that if there was a change between 1992 and 1996, we assume the effect was similar for all firms.

This model, a panel data version of the generalized tobit model (Heckman and Willis [1977], Heckman [1977]), can be estimated by, say, simulated maximum likelihood methods (see Gourieroux and Monfort [1995]). However, notice that we are solely interested in estimating the parameters of the cost function. Since we have :

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

we can rewrite our system as follows :

$$\begin{cases} \widetilde{y}^*_{1j} = Z_{1j}\beta_1 + \widetilde{\varepsilon}_{1j} \\ \Delta y^*_{2j} = \Delta X_{2j}\beta_2 + \Delta\varepsilon_{2j} \end{cases}$$

In that model, $\widetilde{y}^*_{1j}$ is not observed ; we only observe the result of the decision $\widetilde{y}_{1j}$:

$$\widetilde{y}_{1j} = \begin{cases} 1 \text{ if } \widetilde{y}^*_{1j} > 0 : \text{ hiring both in 1992 and in 1996} \\ 0 \text{ if } \widetilde{y}^*_{1j} = 0 : \qquad\qquad\qquad\qquad \text{otherwise} \end{cases}$$

For hiring, the tobit selection equation is based on (6) with observable characteristics of the establishment replacing the value function. In their theoretical model, Bentolila and Saint-Paul [1994] point out the fact that adjustment costs depend on total employment in the firm, marginal costs (so the number of workers involved in the adjustment process), economic shocks, etc.. Thanks to this model, we are able to choose the relevant variables in the regressions. In the tobit selection equation, the selected variables are the share of managers, clerks and blue-collar workers in total employment, business conditions in 1992 ("facing bad business conditions"), expected increase in employment in 1992. The structure by skill level of employment in the establishment may play a role in the decision of hire, insofar as, training costs for managers are quite different from training costs for blue-collar workers. Obviously, our selection equation is a reduced form of the structural decision of the firm, and by construction the number of hires is excluded from the equation. The selection equation includes those variables while the costs equation excludes them, for no indisputable reason.

The cost of hiring, Δy_{2j} is observed if and only if the firm have made two hires, so :

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

with,

$$\Delta y^*_{2j} = \Delta X_{2j}\beta_2 + \Delta\varepsilon_{2j} \tag{7}$$

and :

$$\begin{aligned} \Delta y^*_{2j} &= C_h\left(h_{j96}\right) - C_h\left(h_{j92}\right) \\ \Delta X_{2j} &= \begin{pmatrix} h_{j96} - h_{j92} \\ h^2_{j96} - h^2_{j92} \\ I_{j;h} \end{pmatrix} \end{aligned}$$

where $I_{j;h}$ represents institutional variables likely to influence the recruitment. Note that thanks to this procedure, the firm specific fixed cost has been differenced out.

After estimating the structure of hiring costs in first difference, we are now able to compute the fixed cost of hiring. We have estimated $\widehat{\beta}_2$ in the equation 7. So 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.[3]

For terminations and retirements, the specification is exactly similar. Note also that for separations, the tobit selection equation is based on (5) with observable characteristics of the establishment replacing the value function.

Our hiring and firing models are quadratic functions of the number of hires and separations. Even though the laws seem to imply linear costs, a number of unobserved individual characteristics of the hired or separated workers that matter will be captured by this functional form. Our retirement model is a quadratic function of the number of retirements plus an intercept. According to the modification of the law in July 1993 with first application in 1995, we have to capture this effect by a temporal component.

5 Estimation Results

5.1 Summary statistics of the Matched Data File

Table 1 reports the summary statistics for our sample of establishments. In the industrial description, only 2,252 establishments of 4,042 answer ; we note that the majority of responding establishments belong to manufacturing industries. More than a half of the establishments have more than 50 employees[4]. The 1992 retirement costs per retired worker, as reported by these establishments, were $59,017$FF and the 1996 ones were $65,942$FF.[5]

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 give two measures of the cost for termination. The first is the ratio of termination costs to the total number of terminated workers (either for economic reasons or for cause) ; in 1992 this ratio is equal to $107,288$FF and in 1996 it is equal to $256,715$FF. The second is the ratio of the termination costs to the number of workers terminated for economic reasons ; in 1992 this ratio is equal to $380,974$FF and in 1996 it is equal to $552,862$FF. 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.

The 1992 hiring costs per hire were $2,825$FF and the 1996 ones were $2,456$FF. Those last figures do not include the training costs.

We also give estimates of the average number of workers entering, retiring from, and terminated from the establishment in 1992 and 1996. In 1992 there were 51 hires (70% on short-term contracts, on line with Abowd et al. [1999b]), 17 terminations (half of them for economic reasons) and 5 retirements. In 1996, the average number of hires was stable, whereas the number of hires on short-term contracts was growing (above 75%) ; the number of terminations was three times lower and the number of retirements went from 5 to 3. The average hiring costs was lower in 1996 than in 1992 whereas the number of hires was stable : it is worth noting that the number of hirings on long-term contracts decreased, decrease exactly compensated by an increase of hires on short-term contracts. This fact can explain the drop in hiring costs. The average total termination costs went from $1,026,000$FF in 1992 to $800,000$FF in 1996, while the number of terminations fell. Insofar

[3] At this stage of the paper, we do not correct for the fact that the fixed cost is estimated.

[4] 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.

[5] All numbers are expressed in nominal French Francs.

as the termination costs per terminated worker went up, we understand the stability of the firing costs. The average retirement costs went from 2,250,000FF in 1992 to 3,030,000FF in 1996.

Table 2 gives some basic statistics on establishments that have retired twice, both in 1992 and in 1996. The industrial description of those 492 establishments with positive retirements and positive retirement costs both in 1992 and 1996 shows that 72% of them belong to manufacturing industries. More than 95% of establishments have 50 or more employees. Since we use available information from the DMMO[6] when information is missing in the ESS, we may lose small establishments when they do not report their workforce movements. In establishments with positive retirements, the average size of the group of retirees is 11 in 1992 and 12 in 1996. The retirement costs per retiree were almost 86,000FF in 1992 and 1996. Of course, these costs are greater than those for all establishments ; in Table 1, we compute estimates for establishments with zero retirement and zero retirement costs, consequently the averages are downward biased. A more detailed study of skill-level shows that the representative establishment has 35% of blue-collar workers, 27% of technicians, 22% of clerks and 15% of managers.

Table 3 gives some basic statistics of establishments that have hired twice, both in 1992 and 1996. Since establishments with no entries are excluded, the estimates give us the average size of the groups entering the firm both in 1992 and 1996. The industrial description of those 361 establishments with positive hirings and positive hiring costs both in 1992 and 1996 shows that 2/3 of them belong to manufacturing industries. Almost 90% of establishments have 50 or more employees. In establishments with positive entries, 106 workers (more than 65% on short-term contracts) were hired in 1992 and 112 (more than 75% on short-term contracts) in 1996. The hiring costs per hire were 8,910FF in 1992 and 9,500FF in 1996. For the same reasons as retirement, note those costs are upper than those of all establishments.

Table 4 gives some basic statistics of establishments which have fired twice, both in 1992 and 1996 : establishments with no terminations are excluded and therefore the estimates give us the average size of the groups leaving the firm both in 1992 and 1996. The industrial description of those 966 establishments with positive terminations and positive costs both in 1992 and 1996 shows 68% of them belong to manufacturing industries. Large establishments are over-represented with a share of 94%. In establishments with positive terminations for economic reasons, the average size of the group of workers fired for economic reasons was 26 in 1992 and 13 in 1996, whereas in establishments with positive terminations (for economic reasons and for cause) the average size was 37 and 15. The termination costs per terminated worker (economic reasons) were 513,833FF in 1992 and 869,177FF in 1996, whereas the termination costs per terminated worker (all reasons) were 135,535FF and 287,660FF.

The distinction between collective and individual terminations is an important element of the French law. 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 or in 1996 uses the collective termination procedure while those that terminate less than 10 workers necessarily use the individual termination procedure. Table 5 gives some basic statistics of establishments which have used the individual termination procedure or the collective termination procedure twice, in 1992 and 1996. The industrial description of those 380 establishments with positive individual terminations and positive costs in 1992 and 1996 shows that 67% of them belong to manufacturing industries. For comparison, there was only 32 establishments with positive collective terminations and positive costs both in 1992 and 1996. The manufacturing industries are over-represented with more than 90% of establishments. Note that only large establishments used the collective termination procedure twice : small establishments only used individual termination procedure during the interest period of time. Moreover, establishments using this collective termination procedure are very large;their average size is five time larger than the average size of establishments that have used individual termination procedures (see "total employment" in table 5).

We now describe our estimates of the different costs paid in case of individual termination procedures. The average number of workers terminated for economic reasons and for cause was 3.98 in 1992 and 3.58 in 1996, whereas the average number of workers terminated for economic reasons

[6] Survey on establishments with 50 or more employees.

was 0.74 in 1992 and 0.52 in 1996. Termination costs per terminated worker (economic reasons) were 385, 454FF in 1992 and 602, 941FF in 1996, whereas the termination costs per terminated worker (all reasons) were 157, 069FF and 312, 278FF. The termination costs per terminated worker (economic reasons) is twice upper in 1996 than in 1992. It is worth noting that the average number of terminated workers (all reasons) was stable between the two years whereas the average total termination costs increased, going from 581, 895FF to 759, 986FF.

Our estimates of the different costs involved in collective termination procedure are the following. The average size of workers terminated[7] was 137 in 1992 and 55 in 1996. The termination costs per terminated worker decreased from 223, 660FF to 190, 140FF and the average total termination costs also decreased (11, 000, 000FF in 1992 and 6, 000, 000FF in 1996). We point out that the drop in the total number of terminations is explained by the drop in collective terminations, probably attributable to the business cycle. Furthermore, it seems that the largest share of the increase in termination costs per terminated worker comes the increase in individual termination costs.

Of course, this statistical analysis misses all selection biases since firms decide to fire or hire. Hence, we now proceed using our econometric strategy.

5.2 Generalized Tobit Estimation

Tables 6 and 7 report our results of the determinants of the costs of termination. Table 6 gives estimates using least squares ; models rely on establishments with strictly positive costs and strictly positive terminations. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees. Table 7 gives the maximum likelihood estimates of the generalized tobit model using all observations with either positive costs and positive terminations or zero costs and zero terminations. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees. All coefficients, for both methods are expressed in francs. Unreported estimates including an intercept – a measure of the temporal trend between the two years – showed that the intercept was not significantly different from zero. We decided to remove it. In estimates presented in tables 6 and 7, all coefficients are significantly different from zero. The least squares and tobit estimates are quite similar : the linear part is huge and the costs are strongly concave. The establishments which indeed terminate workers do not differ from those which do not. The marginal cost of terminating N workers, for all establishments whatever their size, is estimated as $92,412 - 4,124N$. The marginal cost for establishments with at least 50 employees is estimated as $93,337 - 426N$. For comparison Abowd and Kramarz [2001] estimated this cost for the year 1992 as $56,299 - 31.2N$ with a fixed cost of 1, 138, 117FF. By comparing estimates for all establishments and for establishments with at least 50 employees, we are able to conclude that establishments that have more than 50 employees have strongly concave costs : the largest firms should optimally group their terminations. Moreover, costs of termination are mildly correlated with termination's decision : French establishments dismiss their employees whatever the costs of the separation.

Results distinguishing individual and collective terminations are given in table 8. Models are estimated by maximum likelihood using all observations. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees. All coefficients in the probit equation are significantly different from zero. In the tobit equation, coefficients of individual termination procedure are not significantly different from zero, whereas coefficients of collective termination are. Collective termination procedure is much more expansive than 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 : that social plan undoubtedly increases the separation costs.

Table 9 reports estimates for the costs of termination by firm's size. In the probit equation, all coefficients are significantly different from zero, whereas in the tobit equation, coefficients of small firms are not. The linear part of termination costs is larger in large firms than in smaller

[7] Note that collective termination procedure only concerns termination for economic reasons.

ones : small firms have stronger concave costs than bigger ones. However, this coefficient is not significantly different from zero.

Table 10 reports estimates for the costs of termination when taking into account the structure by skill-levels of the establishment (share of managers, clerks and blue-collar workers). Coefficients on share of clerks and share of blue-collar workers are not significantly different from zero. Coefficients on the linear and quadratic part of the costs are similar to those in table 7, column (1). Surprisingly, the coefficient on share of managers is the smallest and coefficient on blue-collar workers is the largest. In fact, we do not have measures of entries and exits flows by skill-levels, only the shares in the firm.

After inferring the structure of termination costs in difference, we are now able to compute the fixed cost component of termination costs. Results are given in table 11 for establishments which have terminated workers twice (both in 1992 and 1996)[8] and for establishments which have terminated workers once (either in 1992 or in 1996)[9]. Fixed costs of termination are small, in average $1,240$FF for all establishments and 621FF for establishments with at least 50 employees. It is worth noting that establishments that fired twice are fewer than those that fired once. Indeed the marginal cost of firing N workers is high, so the establishments should group their separations instead of adjusting gradually their workforce. In average, fixed cost is higher when the firm fired once. This result is in conformity with the theoretical model; firms with large fixed costs should fire less often than those with smaller fixed component in their firing cost function. Comparing to Abowd and Kramarz [2001], the estimates fixed costs are tiny. When controlling for unobserved heterogeneity, we find that major costs when terminating workers are related with the number of terminated workers. We can conclude that there are almost no firm specific fixed costs. Our least squares estimates decomposing the fixed cost of termination are given in table 12[10]. Most coefficients are significantly different from zero. The wage posting policy of the firm does not affect the fixed cost of separation. The structure by skill-levels of the establishment as well as the number of long-term contracts explain the level of this fixed cost. This result is consistent with the French Labor Law, insofar as severance payments and notice periods depend upon skill-levels. Moreover, long-term contracts are subject to employment protection (consequently termination costs) whereas short-term contracts are not. Finally, note that industrial sector of the establishment explains a share of the fixed cost, whereas the size does not (we do not report the coefficient of the size in the table, it was not significantly different from zero).

Tables 13 through 16 report our results for the determinants of the costs of hiring. Table 13 and 15 give estimates using least squares ; models rely on establishments with strictly positive costs and strictly positive hiring. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees. Tables 14 and 16 give maximum likelihood estimates (generalized tobit) using all observations with either positive costs and positive hiring or zero costs and zero hiring. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees. All coefficients, for both methods are expressed in Francs. Our first estimates included an intercept – a measure of the temporal trend between the two years – which was not significantly different from zero. We decided to remove it. In estimates presented in tables 13 through 16, most of the coefficients are significantly different from zero. Tables 13 and 14 report costs of hiring without distinction of contract type. The least squares and tobit estimates are quite similar : the linear part is weak and hiring costs are roughly linear. Hence, the establishments which indeed hire workers do not differ from those which do not. The marginal cost of hiring N workers for all establishments whatever their size is estimated as $2,769 - 2.8N$ and for those with at least 50 employees as $3,091 - 3N$. For comparison Abowd and Kramarz [2001] estimated this cost for the year 1992 as $2,015 - 2.84N$ with a fixed cost of $385,364$. Tables 15 and 16 reports costs of hiring by contract type. Coefficient on total hiring on short-term contract (CDD) is not significantly different from zero. However results are interesting as they show that hiring on long-term contracts (CDI) are quite expensive. Moreover, hiring on long-term contracts

[8] Columns (1) and (2)

[9] Columns (3) and (4)

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

are more concave than hiring on short-term contracts : establishments should optimally group their hiring on CDIs.

It is worth noting that the industries of the establishment influences the hiring costs. We do not report the results in the appendix, but it appears that hiring in services industries are more expensive than in manufacturing industries. (Unreported) results by firm's size are not different from those presented here.

Table 17 reports estimates for the costs of hiring when taking into account the structure by skill-level of the establishment.

After inferring the structure of hiring costs in difference, we are now able to compute the fixed cost of hiring. Results are given in table 18 for establishments which have hired workers twice (both in 1992 and 1996)[11] and for establishments which have hired workers once (either in 1992 or in 1996)[12]. Fixed costs of hiring are very small (less than 150FF) but the larger the firm, the larger the fixed cost. This result may be related to the existence of a personnel department : the larger the establishment is, the larger the personnel department should be. Note that establishments that hired once are fewer than establishments that hired once. This result is consistent with previous observations. Insofar as hiring on short-term contracts are cheaper and about 70% of hiring are on CDDs, establishments are well advised to recruit more often than not. Moreover, fixed costs are very small because of the possibility of hire on short-term contracts. Indeed, when they hire on CDD, establishments do not have to pay training costs insofar as CDD act as a training period. We can conclude that firms with high fixed costs are those that hired the most on long-term contracts. Our least squares estimates of fixed cost of hiring are given in table 19. Most of coefficients are significantly different from zero. The wage policy of the firm does not affect the fixed cost of hiring. The structure by skill-levels of the establishment as well as the training costs are directly related to this fixed cost. Once again, the industry of the establishment explains a part of the fixed cost of hiring, whereas the size does not.

Tables 20 and 21 report our results for the determinants of the costs of retirement. Table 20 gives estimates using least squares ; models rely on establishments with strictly positive costs and strictly positive retirements. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees. Table 21 gives maximum likelihood estimates (generalized tobit) using all observations with either positive costs and positive retirement or zero costs and zero retirements. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees. All coefficient, for both methods are expressed in francs. Our estimates include an intercept – a measure of the temporal trend between the two years – which is significantly different from zero. Indeed, as we said in section 2, there was a major modification of French Law on retirements between 1992 and 1996 : the law of 22 July 1993 with first application in 1995 that undoubtedly weighs on retirement costs. In estimates presented in tables 20 and 21, most of coefficients are significantly different from zero. The least squares and tobit estimates are quite different. In the least squares estimates, the linear part is large, the function strongly concave and the intercept is negative. In the tobit estimates, linear and quadratic parts are similar to least squares estimates but the fixed costs are huge : $5,240,561$FF for all establishments and $4,725,589$FF for establishments with at least 50 employees : establishments that actually retire their workers have lower fixed costs which translate into larger proportional costs. In table 21, we see establishments with at least 50 employees have convex retirement costs, whereas all establishments have concave costs. We can conclude that establishments with less than 50 employees have strongly concave retirement costs. The smallest firms should optimally group their retirements. The marginal cost of retiring N workers, for all establishments whatever their size, is estimated as $38,119 - 225.1N$. The marginal cost for establishments with at least 50 employees is estimated as $7,986 + 385.1N$. For comparison, Abowd and Kramarz [2001] estimated this cost for the year 1992 as $27,435 - 176N$ with a fixed cost of $579,549$FF. We also see that costs of retirement are strongly correlated with the retirement decision. Firms that retired just a few workers had largest costs than firms that retired many workers.

[11] Columns (1) and (2)
[12] Columns (3) and (4)

We do not report estimates of the costs of retirement when taking into account the structure by skill-level of the establishments, since they were similar to those presented.

Table 22 gives estimates of the costs of termination by firms' size. In the probit equation, most of coefficients are significantly different from zero, whereas in the tobit equation, coefficient of small firms are not. Intercept is roughly the same for large and small firms, whereas the linear part is greater in small firms than in large ones. As said before, small firms have stronger concave costs than larger firms.

After inferring the structure of retirement costs in difference, we are now able to compute the fixed cost of retirement. Results are given in table 23 for establishments that have retired workers twice (both in 1992 and 1996)[13] and for establishments that have retired workers once (either in 1992 or in 1996)[14]. To compute the fixed costs, we attributed the temporal component cost to the year 1996, because of the legislation's modification in 1993. Fixed costs of retirement are small, but they are larger when the establishment retired once. Note that, as before, establishments that retired twice are fewer than establishments retired once. As we observed, establishments should group their retirements. Comparing with Abowd and Kramarz [2001], we can conclude that there is no firm specific fixed cost component in retirement. Hence, major costs when retiring workers are related to the number of retired workers. Our least squares estimates explaining the fixed cost of retirement are given in table 24[15]. Most of coefficients are significantly different from zero. Conclusions are once again similar to those given before (even though size matters but not the industry affiliation).

6 Conclusion

In this paper, we examine the costs firms face in adjusting their employment, using panel data on individual establishments.

First, we study termination costs. We show that the firms that actually terminated their workers did not differ from those that did not. Termination costs are increasing and strongly concave in the number of terminated workers, and large firms have incentive to group their terminations. It also appears that collective terminations are much more expensive than individual terminations : we thus infer that legislation, namely the requirement to formulate a social plan in case of collective termination, affects firing costs. After estimating the structure of termination costs, we compute and estimate the firm specific fixed component of the termination cost function. That component is very small, and consequently we observe that major costs when terminating workers are related to the number of terminated workers.

Second, we examine hiring costs. As for termination costs, we show that firms that actually hired workers did not differ from those that did not. Hiring costs are small, increasing and slightly concave, but hiring on CDIs are more concave than hiring on CDDs : firms have incentive to group their recruitment on CDI and adjust gradually their temporary workforce. Our estimates suggest that the cost of hiring permanent workers is much higher than the cost of hiring temporary ones. Moreover, costs of hiring on short-term contracts are almost zero : our estimates confirm the descriptive finding that fixed-term contracts represent the bulk of hires in France. The firm specific hiring cost is very small (less than 150FF in average).

Finally, we study retirement behavior which differs from firing and hiring ones. It is worth noting that there is a temporal component in this adjustment cost. Because of the change in the legislation that took place in 1993, their is a fixed component of the cost, specific to year 1996. Consistent with this finding, firms that indeed retired their workers are different from those that did not. Moreover, we show that firms have incentive to group their retirements instead of adjusting gradually. As for hiring and firing, we find that there is no firm specific retirement costs, but a common component, due to the change in the retirement legislation, that took place between the two surveys.

[13] Columns (1) and (2)

[14] Columns (3) and (4)

[15] The explanatory variable "Firm Size" is a dummy variable equals to 1 for establishments with 50 or more employees and 0 otherwise.

References

Abowd, J.M. and F. Kramarz, "The Costs of Hiring and Separations," *CREST Working Paper nř9543*, 2001.

____ , ____ , and D.N. Margolis, "High Wage Workers and High Wage Firms," *Econometrica*, 1999, pp. 251–333.

____ , P. Corbel, and F. Kramarz, "The Entry and Exit of Workers and the Growth of Employment : An Analysis of French Establishments," *Review of Economics and Statistics*, 1999, pp. 170–187.

Bentolila, S. and G. Bertola, "Firing Costs and Labor Demand : How Bad is Eurosclerosis," *The Review of Economic Studies*, 1990, *57*, 381–403.

____ and G. Saint-Paul, "A Model of Labor Demand with Linear Adjustment Costs," *Labour Economics*, 1994, pp. 303–326.

Bertola, G., "Job Security, Employment and Wages," *European Economic Review*, 1990, *34*, 851–886.

____ , T. Boeri, and S. Cazes, "Employment Protection and Labour Market Adjustment in some OECD Countries : Evolving Institutions and Variable Enforcement.," Technical Report 1999.

Chazal, J., P. Thiery, and C. Torelli, "Les Mouvements de Main-D'oeuvre Dans Les Établissements de 50 Salariés Ou Plus," *INSEE Résultats*, 1992.

Coutrot, T., "Les Facteurs de Recours Aux Contrats Temporaires," *DARES, Premières Synthèses*, 2000, *25.3.*

Garibaldi, P., "Job Flow Dynamics and Firing Restrictions," *European Economic Review*, 1998, *42*, 245–275.

____ , J. Konnings, and C. Pissarides, "Gross Job Reallocation and Labor Market Policy," *Unemployment Policy : Government options for the labor market (Cambridge University Press, Cambridge)*, 1997.

Gourieroux, C. and A. Monfort, *Simulation Based Econometric Methods*, Core Lecture Series - Core Foundation. Université Catholique de Louvain, 1995.

Goux, D., E. Maurin, and M. Pauchet, "Fixed-Term Contracts and the Dynamics of Labour Demand," *European Economic Review*, 2001, *45*, 533–552.

Guigon, C., "Le Coût de la Main-D'oeuvre En 1996 : Résultats de L'enquête sur Le Niveau et la Structure Du Coût de la Main-D'oeuvre En 1996," *INSEE Résultats*, 1996.

Heckman, J. J. and R. J. Willis, "A Beta-Logistic Model for the Analysis of Sequential Labor Force Participation by Married Women," *The Journal of Political Economy*, 1977, pp. 27–58.

Heckman, J.J., "Sample Selection Bias as a Specification Error," *Econometrica*, 1977, pp. 153–162.

Lamy Social, Droit Du Travail, Paris: Lamy S.A. editeur, 1992.

Lazear, E.P., "Job Security Provisions and Employment," *Quaterly Journal of Economics*, 1990, pp. 699–726.

A Statistical Description of The Matched Data File

Industrial Sector	Number of Obs.	%
Manufacturing industries	1300	32.16
Service Industries	952	23.55
No response	1790	44.29

Size	Obs.	%
less than 50	1460	36.12
more than 50	2582	63.88

Variable	Obs. 92	Mean 92	Std	Obs 96	Mean 96	Std 96
Total Employment	4042	429.39	898.23	4042	318.99	682.92
Total Hiring	4042	51.06	114.88	4042	52.25	125.29
Total Hiring (CDI)	4042	13.47	36.97	4042	10.73	31.64
Total Hiring (CDD)	4042	33.05	90.40	4042	36.26	107.03
Total Terminations (All Reasons)	4042	16.74	52.43	4042	5.01	19.33
Total Terminations (Economic Reasons)	2255	8.72	44.95	4042	1.64	13.46
Total Retirement	2255	5.01	14.96	4042	3.20	20.03
Hiring Costs	4042	97,100.14	1,313,117.78	4042	54,491.72	339,490.74
Termination Costs (All Reasons)	4042	1,025,577.3	4,352,697.30	4042	790,669.14	3,327,150.44
Retirement Costs	4042	224,976.27	958,267.21	4042	302,799.74	1,512,409.67
Termination Costs per Termination (All)	1829	107,287.78	320,595.32	2097	256,705.37	1,237,991.27
Termination Costs per Termination (Economic Reasons)	735	380,974.75	1,143,865.49	517	552,862.85	1,536,084.25
Retirement Costs per Retiree	1215	59,017.60	203,375.33	1289	65,942.22	223,449.65
Hiring Costs per Hire	2138	2,824.80	21,208.11	2604	2,456.37	16,827.05

Table 1: Summary Statistics for the Establishment-Level Variables

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996.

Industrial Sector	Obs.	%
Manufacturing industries	357	72.56
Service Industries	135	27.44

Size	Obs.	%
less than 50	6	1.22
more than 50	486	98.78

Variable	Obs. 92	Mean 92	Std	Obs 96	Mean 96	Std 96
Total Employment	492	865.06	1,098.39	492	629.08	1160.60
Total Retirement	492	10.90	17.72	492	12.07	19.01
Retirement Costs	492	727,444.36	2,028,127.3	492	751,104.65	2,588,847.13
Retirement Costs per Retiree	492	87,570.22	290,461.33	492	87,128.71	196,350.98

Table 2: Summary Statistics for the Establishments that Retired Twice

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996.

Industrial Sector	Obs.	%
Manufacturing industries	220	60.94
Service Industries	141	39.06

Size	Obs.	%
less than 50	36	9.97
more than 50	325	90.03

Variable	Obs. 92	Mean 92	Std	Obs 96	Mean 96	Std 96
Total Employment	361	712	802.37	361	571.05	619.39
Total Hiring	361	106.24	128.25	361	112.36	244.23
Total Hiring (CDI)	361	31	48.30	361	25.22	50.84
Total Hiring (CDD)	361	67.71	105.30	361	80.48	216.67
Hiring Costs	361	379,361.19	841,433.66	361	327,469.46	924,008.43
Hiring Costs per Hire	361	8,909.96	41,926.26	361	9,534.18	38,516.74

Table 3: Summary Statistics for the Establishments that Hired Twice

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996.

Industrial Sector	Obs.	%
Manufacturing industries	660	68.25
Service Industries	306	31.75

Size	Obs.	%
less than 50	57	5.9
more than 50	909	94.1

Variable	Obs. 92	Mean 92	Std	Obs 96	Mean 96	Std 96
Total Employment	966	804.43	1,362.16	966	579.62	1,098.72
Total Terminations (All Reasons)	966	25.93	73.44	966	12.88	31.32
Termination Costs (All Reasons)	966	2,718,345.79	7,254,037.12	966	1,863,273.28	4,858,189.10
Termination Costs per Termination (All)	966	135,535.17	342,661.05	966	287,660.79	945,513.26
Total Terminations (Economic Reasons)	200	37.61	114.22	200	15.32	38.63
Termination Costs (Economic Reasons)	200	4,488,758.33	9,573,188.85	200	3,176,222.08	5,787,430.17
Termination Costs per Termination (Economic Reasons)	200	513,633.42	1481899.57	200	869,177.76	2,181,499.88

Table 4: Summary Statistics for the Establishments that Fired Twice

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996.

Individual Terminations						
Industrial Sector	Obs.	%				
Manufacturing industries	254	66.84				
Service Industries	126	33.16				
Size	Obs.	%				
less than 50	34	8.95				
more than 50	346	91.05				
Variable	Obs. 92	Mean 92	Std 92	Obs 96	Mean 96	Std 96
Total Employment	380	458.01	538.49	380	365.10	376.98
Total Terminations (All)	380	3.98	2.29	380	3.58	2.33
Total Terminations (Economic Reasons)	380	0.74	1.55	380	0.52	1.21
Termination Costs	380	581,695.68	1,836,254.62	380	759,986.42	2,098,628.18
Termination Costs per Terminations (All)	380	157,069.26	454,286.93	380	312,277.85	808,921.80
Termination Costs per Terminations (Economic Reasons)	107	385,454.18	886,187.11	91	602,941.83	1,174,946.10
Collective Terminations						
Industrial Sector	Obs.	%				
Manufacturing industries	29	90.6				
Service Industries	3	9.4				
Size	Obs.	%				
less than 50	0	0				
more than 50	32	100				
Variable	Obs. 92	Mean 92	Std 92	Obs 96	Mean 96	Std 96
Total Employment	32	2,561.09	3,601.85	32	1,651.08	2,854.62
Total Terminations (Economic Reasons)	32	137.34	258.77	32	54.78	73.68
Termination Costs	32	11,768,197.06	194,933,444.93	32	6,538,562.34	8,767,445.07
Termination Costs per Terminations (Economic Reasons)	32	223,659.36	445,504.93	32	190,139.89	190,498.21

Table 5: Summary Statistics : distinguishing collective and individual terminations

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996.

B The Costs of Termination between 1992 and 1996

Variable	Coef. (1)	Std	Coef. (2)	Std
Termination Costs	dep.	dep.	dep.	dep.
Total Terminations (All)	90,818.5*	5,076.9	91,180.1*	5,241.4
Total Terminations (squared)	−1,945.4*	505.5	−1,976.1*	521.6
Number of Observations	966		909	
R^2	0.4690		0.4698	

Table 6: The Costs of Termination : least square estimates

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Models rely on establishments with strictly positive costs and strictly positive terminations. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees.

Variable	Coef. (1)	Std	Coef. (2)	Std
Probit (selection)				
Intercept	−1.572*	0.096	−1.407*	0.117
Share of Manager	0.956*	0.182	1.549*	0.237
Share of Clerks	0.318*	0.116	0.979*	0.143
Share of Blue-Collar Workers	1.327*	0.115	1.349*	0.141
Situation in 1992	0.447*	0.051	0.418*	0.061
Growth in 1992	0.249*	0.047	0.165*	0.057
Tobit (costs)				
Total Terminations	92,412*	5,229.1	93,337*	5,417.6
Total Terminations (squared)	−2,062*	513	−2,132.2*	530.26
σ	5593.40	127.20	5761.12	135.07
Corrélation	0.035	0.028	0.057	0.037
Number of Observations	3641		2212	
Log-likelihood	−11575.69		−10519.82	

Table 7: The Costs of Termination : maximum likelihood estimates

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Generalized Tobit model. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees.

Variable	Coef. (1)	Std	Coef. (2)	Std
Probit (selection)				
Intercept	-1.570^*	0.096	-1.401^*	0.116
Share of Manager	0.932^*	0.182	1.499^*	0.237
Share of Clerks	0.319^*	0.116	0.978^*	0.143
Share of Blue-Collar Workers	1.325^*	0.116	1.343^*	0.141
Situation in 1992	0.446^*	0.051	0.416^*	0.061
Growth in 1992	0.254^*	0.047	0.173^*	0.056
Tobit (costs)				
Individual Terminations	57,545	391,575	49,759	416,660
Individual Terminations (squared)	1,959.4	38,827	2,795.8	41,374.7
Collective Terminations	$88{,}049^*$	10,037	$87{,}996^*$	10,349
Collective Terminations (squared)	-24.66^*	8.79	-24.68^*	9.25
σ	6887.18	156.37	7105.09	166.42
Correlation	-0.079	0.028	-0.101	0.037
Number of Observations	3641		2212	
Log-likelihood	-11717.08		-10652.44	

Table 8: The Costs of Termination : distinguishing collective and individual terminations

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Generalized Tobit model. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees.

Variable	Coef. (1)	Std
Probit (selection)		
Intercept	-1.572^*	0.096
Share of Managers	0.956^*	0.182
Share of Clerks	0.318^*	0.116
Share of Blue-Collar Workers	1.327^*	0.116
Situation in 1992	0.447^*	0.051
Growth in 1992	0.249^*	0.047
Tobit (costs)		
Total Terminations (big firms)	$92{,}816^*$	5,243
Total Terminations (big firms, squared)	$-2{,}096^*$	514.2
Total Terminations (small firms)	28,145	154,835
Total Terminations (small firms, squared)	$-34{,}412.8$	402,331.7
σ	5590.18	127.131
Correlation	0.036	0.028
Number of Observations	3641	
Log-likelihood	-11575.06	

Table 9: The Costs of Termination by Firm's Size

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Generalized Tobit model. Column (1) gives estimates for all establishments.

Variable	Coef. (1)	Std
Probit (selection)		
Intercept	-1.567^*	0.097
Share of Managers	0.954^*	0.182
Share of Clerks	0.317^*	0.116
Share of Blue-Collar Workers	1.325^*	0.116
Situation in 1992	0.446^*	0.051
Growth in 1992	0.244^*	0.048
Tobit (costs)		
Total Terminations (All)	$92{,}080.6^*$	5,268.4
Total Terminations (squared)	-2004.4^*	513.3
Share of Managers	-3912.666^*	1631.013
Share of Clerks	-674.647	1082.027
Share of Blue-Collar Workers	-190.161	685.169
σ	5617.09	141.44
Correlation	0.16	0.11
Number of Observations	3641	
Log-likelihood	-11564.69	

Table 10: The Costs of Termination by Skill-Levels

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Column (1) gives estimates for all establishments.

Number of observations	966	909	983	572
Mean	1240.469	620.876	617.23	794.06
Std	7599.079	4116.894	2698.46	2901.71
Quantile				
100% Max	152634.692	33663.765	28955.23	28178.68
99%	22375.658	16249.015	12620.37	12785.04
95%	7553.657	6594.636	3493.36	5922.24
90%	3230.598	3091.132	1356.45	2019.85
75% Q3	803.508	773.479	328.18	426.52
50% Median	−40.517	−50.161	17.08	65.24
25% Q1	−453.386	−514.690	−92.39	−82.72
10%	−1033.615	−1241.672	−279.42	−302.61
5%	−1536.754	−1876.617	−501.59	−601.48
1%	−3082.543	5920.225	−1623.76	−1868.39
0% Min	−7251.344	−48917.342	−4690.55	−48917.342

Table 11: Fixed Costs of Termination

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Column (1) and (2) gives estimates for establishments that terminated twice. Column (3) and (4) gives estimates for establishments that terminated once. Column (1) and (3) gives estimates for all establishments. Column (2) and (4) gives estimates for those with 50 or more employees.

Variable	Coef.	Std
Fixed Cost	dep.	dep.
Gross Earning per Worker	−0.030	0.096
Share of Blue-Collar Workers	−597.204*	295.560
Share of Clerks	−3343.998*	679.930
Share of Managers	3538.361*	1426.864
Manufacturing Industries	987.878*	373.657
Long-Term Contracts	56.085*	6.089
Number of Observations	966	
R^2	0.129	

Table 12: Fixed Cost of Termination : least squares estimates

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996.

C The Costs of Hiring between 1992 and 1996

Variable	Coef. (1)	Std	Coef. (2)	Std
Hiring Costs	dep.	dep.	dep.	dep.
Total Hiring (All)	2,861*	714	3,160*	783
Total Hiring (squared)	−1.4*	0.04	−1.6*	0.4
Number of Observations	360		324	
R^2	0.0435		0.0487	

Table 13: The Costs of Hiring : least square estimates

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Models rely on establishments with strictly positive costs and strictly positive hiring. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees.

Variable	Coef. (1)	Std	Coef. (2)	Std
Probit (selection)				
Intercept	−1.920*	0.127	−1.806*	0.159
Share of Manager	1.009*	0.227	1.916*	0.305
Share of Clerks	−0.026	0.159	0.717*	0.203
Share of Blue-Collar Workers	1.143*	0.152	1.333*	0.194
Situation in 1992	0.417*	0.069	0.280*	0.088
Growth in 1992	0.337*	0.066	0.267*	0.081
Tobit (costs)				
Total Hiring (All)	2,769*	722	3,091*	794
Total Hiring (squared)	−1.4*	0.4	−1.5*	0.4
σ	1147.43	42.747	1202.94	47.248
Correlation	−0.026		−0.022	
Number of Observations	2618		1250	
Log-likelihood	−3964.47		−3403.87	

Table 14: The Costs of Hiring : maximum likelihood estimates

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Generalized Tobit model. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees.

Variable	Coef. (1)	Std	Coef. (2)	Std
Hiring Costs	dep.	dep.	dep.	dep.
Total Hiring (CDI)	9,948*	2,785	11,393*	3,108
Total Hiring (CDI, squared)	−257.9*	112.1	−302.4*	121.6
Total Hiring (CDD)	1,203	963	1,327	1,073
Total Hiring (CDD, squared)	−9.9*	5.2	−10.9*	5.7
Number of Observations	360		324	
R^2	0.056		0.064	

Table 15: The Costs of Hiring by Contract Type : least square estimates

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Models rely on establishments with strictly positive costs and strictly positive hiring. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees.

Variable	Coef. (1)	Std	Coef. (2)	Std
Probit (selection)				
Intercept	-1.918^*	0.127	-1.803^*	0.159
Share of Manager	1.007^*	0.227	1.911^*	0.305
Share of Clerks	-0.028	0.159	0.715^*	0.203
Share of Blue-Collar Workers	1.138^*	0.152	1.326^*	0.194
Situation in 1992	0.418^*	0.069	0.281^*	0.088
Growth in 1992	0.337^*	0.066	0.267^*	0.081
Tobit (costs)				
Total Hiring (CDI)	$9{,}818^*$	2,875	$11{,}392^*$	3,181
Total Hiring (CDI, squared)	-253.8^*	114	-302.4^*	123.2
Total Hiring (CDD)	1,200	957	1,327	1,067
Total Hiring (CDD, squared)	-9.8^*	5.2	-10.9^*	5.7
σ	1140.29	42.49	1193.47	46.88
Correlation	-0.006	0.037	-0.000065	0.048
Number of Observations	2618		1250	
Log-likelihood	-3957.37		-3396.12	

Table 16: The Costs of Hiring by Contract Type : maximum likelihood estimates

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Generalized Tobit model. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees.

Variable	Coef. (1)	Std
Probit (selection)		
Intercept	-1.923^*	0.127
Share of Managers	1.027^*	0.227
Share of Clerks	-0.014	0.159
Share of Blue-Collar Workers	1.154^*	0.152
Situation in 1992	0.402^*	0.07
Growth in 1992	0.332^*	0.066
Tobit (costs)		
Total Hirings (All)	$2{,}835^*$	707
Total Hirings (squared)	-1.3^*	0.4
Share of Managers	241.896	394.836
Share of Clerks	105.488	345.722
Share of Blue-Collar Workers	668.349^*	187.763
σ	1141.11	45.44
Correlation	-0.20	0.097
Number of Observations	2618	
Log-likelihood	-3961.483	

Table 17: The Costs of Hiring by Skill-Levels

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Generalized Tobit model. Column (1) gives estimates for all establishments.

Number of observations	360	324	352	202
Mean	121.22	146.48	68.86	90.85
Std	679.78	694.61	372.55	445.48
Quantile				
100% Max	5406.59	5382.35	2193.19	2162.29
99%	3223.89	3198.37	2157.97	2127.32
95%	1521.46	1563.87	714.20	947.19
90%	653.62	700.02	357.30	385.28
75% Q3	147.37	183.82	92.49	119.91
50% Median	−0.93	5.56	−4.84	−1.97
25% Q1	−177.41	−125.21	−70.69	−85.72
10%	−378.49	−323.28	−215.87	−198.64
5%	−508.60	−514.05	−314.91	−366.59
1%	−869.50	−1053.29	−514.69	−563.39
0% Min	−1254.88	−1453.74	−619.42	−704.65

Table 18: Fixed Costs of Hiring

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Column (1) and (2) gives estimates for establishments that hired twice. Column (3) and (4) gives estimates for establishments that hired once. Column (1) and (3) gives estimates for all establishments. Column (2) and (4) gives estimates for those with 50 or more employees.

Variable	Coef.	Std
Fixed Cost	dep.	dep.
Gross Earning per Worker	−0.003	0.004
Share of Blue-Collar Workers	−69.050*	30.749
Share of Clerks	−118.869	136.745
Share of Managers	520.817*	170.393
Manufacturing Industries	106.783*	51.695
Training Costs	2.718*	0.513
Number of Observations	360	
R^2	0.1629	

Table 19: Fixed Cost of Hiring : least squares estimates

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996.

D The Costs of Retirement between 1992 and 1996

Variable	Coef. (1)	Std	Coef. (2)	Std
Retirement Costs	dep.	dep.	dep.	dep.
Total Retirement	53,748*	28,405	53,826*	28,727
Total Retirement (squared)	−245.8	286.8	−246.3	289.5
Intercept	−706,269*	238,756	−713,423*	241,617
Nombre d'observations	492		485	
R^2	0.0288		0.0289	

Table 20: The Costs of Retirement and Early Retirement : least squares estimates

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Models rely on establishments with strictly positive costs and strictly positive retirements. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees.

Variable	Coef. (1)	Std	Coef. (2)	Std
Probit (selection)				
Intercept	−1.162*	0.065	−0.906*	0.076
Share of Manager	0.096	0.132	0.09	0.162
Share of Clerks	−0.231*	0.076	−0.162*	0.091
Share of Blue-Collar Workers	0.087	0.078	0.04	0.089
Situation in 1992	0.081*	0.032	0.099*	0.036
Growth in 1992	0.044*	0.029	0.009	0.033
Tobit (costs)				
Intercept	5,240,561*	206,140	4,725,589*	211,906
Total Retirement	38,119*	5,823	7,986	8,211
Total Retirement (squared)	−225.1*	64.1	385.1*	105.3
σ	3661.54	132.00	3927.96	151.29
Correlation	−0.987	0.001	−0.983	0.002
Number of Observations	3726		2282	
Log-likelihood	−5704.613		−5444.08	

Table 21: The Costs of Retirement and Early Retirement : maximum likelihood estimates

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Generalized Tobit model. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees.

Variable	Coef. (1)	Std
Probit (selection)		
Intercept	-1.213^*	0.063
Share of Manager	0.142	0.129
Share of Clerks	-0.266^*	0.073
Share of Blue-Collar Workers	0.162^*	0.078
Situation in 1992	0.116^*	0.033
Growth in 1992	0.064^*	0.029
Tobit (costs)		
Intercept (small firms)	$4{,}169{,}855^*$	378,470
Intercept (big firms)	$5{,}048{,}524^*$	198,010
Total Retirement (small firms)	273,051	246,780
Total Retirement (big firms)	$30{,}474^*$	5,980
Total Retirement (small firms, squared)	$-8{,}460.7$	8,214
Total Retirement (big firms, squared)	-63.6^*	71
σ	3515.96	124.94
Correlation	-0.987	0.001
Number of Observations	3726	
Log-likelihood	-5701.074	

Table 22: The Costs of Retirement by Firm's Size

Number of observations	491	485	617	588
Mean	−2213.677	−1893.449	−4408.966	−3354.039
Std	1609.948	1516.639	1357.198	1390.05
Quantile				
100% Max	21907.72	21998.05	11346.08	12385.31
99%	3080.77	2007.51	2455.06	5916.09
95%	−872.82	−532.44	−3502.91	−2316.13
90%	−1577.28	−1174.73	−4076.64	−3003.79
75% Q3	−2289.78	−1876.82	−4512.91	−3454.59
50% Median	−2554.16	−2171.56	−4665.27	−3621.52
25% Q1	−2654.41	−2302.73	−4721.17	−3678.51
10%	−2769.36	−2363.11	−4737.21	−3694.61
5%	−2886.43	−2508.07	−4740.04	−3698.52
1%	−3186.99	−3619.52	−5291.35	−4286.75
0% Min	−3481.84	−5909.79	−13666.59	−12930.61

Table 23: Fixed Costs of Retirement

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Column (1) and (2) gives estimates for establishments that retired twice. Column (3) and (4) gives estimates for establishments that retired once. Column (1) and (3) gives estimates for all establishments. Column (2) and (4) gives estimates for those with 50 or more employees.

Variable	Coef.	Std
Fixed Cost	dep.	dep.
Gross Earning per Worker	0.0017	0.022
Share of Blue-Collar Workers	−1712.605*	638.326
Share of Clerks	−1946.292*	905.051
Share of Managers	2974.416*	1578.766
Manufacturing Industries	636.357	509.028
Firm Size	−3501.593*	708.078
Number of Observations	502	
R^2	0.4976	

Table 24: Fixed Cost of Retirement : least squares estimates

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996.