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The Shape of Hiring and Separation Costs*

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Abstract

In this article, we estimate the structure of costs of hiring, terminating, and retiring employees in France using a representative sample of French establishments. The estimates are estimated using a panel data set for two years (1992 and 1996) that matches 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, the termination and hiring costs are concave and induce firms to group their hirings (into Permanent Contracts) and separations. Retirement costs are linear. Finally, legislation appears to be a major component of these costs.

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

Résumé

Dans cet article, nous estimons la structure des coûts d'embauche, de licenciement et de mise en retraite en France sur un échantillon représentatif d'établissements français. Les estimations sont obtenues à partir de données de panel sur deux années (1992 et 1996) appariant deux enquêtes sources : l'Enquête sur la Structure des Salaires (ESS) et les Déclarations Mensuelles de Mouvements de Main-d'Oeuvre (DMMO).

Nous montrons que les coûts de licenciement sont en France bien plus conséquents que les coûts de recrutement. Le coût d'embauche en CDI est plus élevé que le coût d'embauche en CDD ; les licenciements collectifs (licenciement d'au moins dix travailleurs sur 30 jours pour une même cause économique) sont plus coûteux que les licenciements individuels.

On retrouve toutefois dans nos estimations une caractéristique commune aux coûts d'embauche et de licenciement : ni l'un ni l'autre ne comporte de coût fixe spécifique à la firme. De plus, coûts de licenciement et coûts d'embauche en CDI sont concaves : les établissements français sont donc incités à grouper les embauches permanentes d'une part et les licenciements d'autre part. Les coûts de mise en retraite sont linéaires. Finalement, la législation française semble peser considérablement sur les coûts d'ajustement des établissements français.

Mots Clés : Coûts d'ajustement, Comportement des entreprises

1 Introduction

Employment protection legislation is often pointed out as one of the most important source of rigidity in 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 1998), (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. While all these papers study the consequences of employment protection on labor market performances, only a few try to measure the directs costs associated to employment protection legislation (for a survey on adjustment costs and labor demand, see (Hamermesh and Pfann 1996)). (Hamermesh 1989) examines the costs firms face in adjusting labor demand to exogenous shocks. He shows, from monthly plant-level US data, that adjustment proceeds in jumps and that results in the large literature that assumes smooth adjustment are due to aggregation. (Hamermesh 1993) summarizes various estimates of the magnitude and the structure of adjustment costs from US data and of the asymmetry in these costs. Results on asymmetry and structure are far from clear, but symmetry appears rejected in adjustment parameters according to several studies that use microeconomic data. On the structure of adjustment costs, there is nothing wrong, according to the author, with assuming quadratic adjustment costs, any more than with making linear approximations to general functions in the absence of better information. On magnitude, it appears that in the United States, separation costs are much smaller than hiring costs. The situation is really different in France. Indeed, in a recent paper, (Goux, Maurin, and Pauchet 2001) estimate the costs of firing and hiring, using a model of dynamic labor demand, and a French dataset. 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 employment of workers employed under fixed-term contracts than to adjust employment of workers employed under permanent contracts. In contrast with (Goux, Maurin, and Pauchet 2001) who indirectly estimate the costs, the purpose of the present paper is to **directly** estimate the exact structure of the costs of hiring and separations.

Our study follows that of (Abowd and Kramarz 2001), who estimate 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. 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 a insight on firms' cost structure, we use a newly available version of the survey used by these 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.

The data 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 the

establishment identifier. The first source is the Wage Structure Survey (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 where this last piece of information is missing, we use 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 a simple modeling hypothesis: the costs of adjustments comprise a fixed cost component, assumed to be firm-specific. In line with (Abowd and Kramarz 2001), 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 2001)' estimates, we find that hiring and separations entail no firm-specific fixed cost. Furthermore, these costs are concave and induce firms to group their hiring (in Permanent Contracts) 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-Term 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 1999)).

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,

[1] For more details about French Labor Laws, see (Abowd and Kramarz 2001) for an executive summary in english, and (Lamy 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".

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, Corbel, and Kramarz 1999)).

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, 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 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 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:
  - 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 SIRET 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

establishment to be both in the 1992 file and in the 1996 file; this operation gives a dataset with $1,328$ establishments.[3] These establishments constitute our analysis file. 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 for 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 i.i.d. 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 chooses 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.

[3] Notice that 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.

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

$$\begin{cases} y^*_{1j;t} = X_{1j;t}\beta_1 + \alpha_{1j} + \varepsilon_{1j;t} \\ y^*_{2j;t} = X_{2j;t}\beta_2 + \alpha_{2j} + \varepsilon_{2j;t} \end{cases} \tag{7}$$

where $\left(y^*_{1j}; y^*_{2j}\right)$ are two latent variables; y^*_{1j} is the selection criterion for hiring in firm j (i.e. $y_{1j} = 1(\ y^*_{1j} \geq 0)$)[4], 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 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 assumes 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 that its effect was similar for all firms. It is important here to stress that there was no change between 1992 and 1996 in the hiring and firing legislation.[5] This allows us to write $y^*_{2j,t}$ in equation (7) and then to rewrite a panel data version of the generalized tobit model. Notice that in our estimated model, we include an intercept to test the existence of a temporal trend between the two years. We expect this intercept to be zero, because the law did not change.

This model, a panel data version of the generalized tobit model ((Heckman and Willis 1977), (Heckman 1977)), could be estimated by maximum likelihood methods (see (Gourieroux and Monfort 1995)). However, as mentioned in the data description section, we do **not** have the establishment-level variables $X_{1j;t}$ for the year $t = 1996$ that would allow us to model the firms hiring and separation decisions in that year. Such variables are only available in 1992. In addition, notice that we are solely interested in estimating the parameters of the cost function. Therefore, 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

[4] Unfortunately, $X_{1j;t} = X_{1j;1992}$ because information is unavailable for 1996. So $y^*_{1j;t}$ cannot be fully modelled.

[5] except for retirement, but it concerns more employees than employers.

role in the decision of hire, insofar as training costs for managers are quite different from training costs for blue-collar workers. As previously mentioned, information on the firms' situations was not asked in the 1996 survey. In addition, we use establishment-level data and most other alternative data sources in France are firm-level. We are therefore forced to rely solely on those variables contained in the 1992 ESS to model the separation (retirement or hiring) decision. Obviously, our selection equation must be a reduced form of the structural decision of the firm[6], and by construction the number of hires is excluded from the equation. The selection equation includes these variables while the costs equation excludes them, for no indisputable reason.

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

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

with,

$$\Delta y_{2j}^* = \Delta X_{2j}\beta_2 + \Delta\varepsilon_{2j} \tag{8}$$

and :

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

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.

Finally, our estimated equations are the following:

$$\begin{cases} \widetilde{y}_{1j} = \begin{cases} 1 \text{ if } Z_{1j}\beta_1 + \widetilde{\varepsilon}_{1j} > 0 : \text{ hiring both in 1992 and in 1996} \\ 0 \text{ if } Z_{1j}\beta_1 + \widetilde{\varepsilon}_{1j} = 0 : \qquad\qquad \text{otherwise} \end{cases} \\ \Delta y_{2j} = \begin{cases} \Delta X_{2j}\beta_2 + \Delta\varepsilon_{2j} \text{ if } \widetilde{y}_{1j} = 1 \\ 0 \qquad\qquad\qquad \text{if } \widetilde{y}_{1j} = 0 \end{cases} \end{cases} \tag{9}$$

After estimating the structure of hiring costs in first-difference, we are now able to provide an estimate of the fixed cost of hiring. Using the estimated $\widehat{\beta}_2$ from equation 8, 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 1999), 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.[7]

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 might matter will be captured by this functional form. Our retirement model is a quadratic function of the number of retirements plus an intercept. Remember that the law on retirements was changed in July 1993 with first application in 1995. The intercept should capture this change.

[6] Insofar as important variables are unavailable in 1996 (so as environmental exogenous variables), we are constrained on the selection model.

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

5 Estimation Results

5.1 Summary statistics of the Matched Data File

Table 1 reports the summary statistics for our sample of establishments. Of the 1,328 establishments, only 1,004 give their industrial affiliation; however, almost the majority of responding establishments belong to manufacturing industries. More than half of the establishments have more than 50 employees[8]. The 1992 retirement costs per retired worker, as reported by these establishments, were 70,607FF and the 1996 ones were 68,844FF.[9]

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 130,500FF and in 1996 it is equal to 305,538FF. 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 385,042FF and in 1996 it is equal to 728,820FF. 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. Between 1992 and 1996, the number of terminations was halved. This increase in costs may come from various reasons such as composition effects or cycle effects (1996 was a good year in business cycle). Similarly, the average retirement costs per worker were stable around 70,000FF while the number of retirements went from 5 to 7.

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

In 1992 there were 62 hires (70% on short-term contracts, on line with (Abowd, Corbel, and Kramarz 1999)), 14 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 larger (above 75%) than in 1992. This explains the drop in costs between the two dates since short-term contracts should be cheaper to hire.

Table 3 gives some basic statistics on establishments that retired twice, both in 1992 and in 1996. The industrial description of those 326 establishments with positive retirements and positive retirement costs both in 1992 and 1996 shows that 68% of them belong to manufacturing industries. More than 95% of establishments have 50 or more employees. Since we use available information from the DMMO[10] 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 14 in 1996. The retirement costs per retiree were almost 100,000FF in 1992 and 1996. Of Course, these costs are greater than those for all establishments: in Table 5.1, we compute estimates for establishments with zero retirement and zero retirement costs, consequently the average are downward biased.

Table 5 presents some basic statistics on establishments that 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 252 establishments with positive hiring and positive hiring costs both in 1992 and 1996 shows that two thirds of them belong to manufacturing industries. All of those establishments have 50 or more

[8] 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.

[9] 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). We do not correct for the inflation rate between the two years: inflation rate in France during the 90's was very small.

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

employees. In establishments with positive entries, 90 workers (more than 70% on short-term contracts) were hired in 1992 and 94 (more than 75% on short-term contracts) in 1996. The hiring costs per hire were 8,910FF in 1992 and 9,500FF in 1996.

Table 7 gives some basic statistics of establishments that fired twice, both in 1992 and 1996: Establishments with no termination 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 531 establishments with positive terminations and positive costs both in 1992 and 1996 shows 73% of them belong to manufacturing industries. Large establishments are over-represented with a share of 98%. In establishments with positive terminations for economic reasons, the average size of the group of workers fired for economic reasons was 17 in 1992 and 7 in 1996, whereas in establishments with positive terminations (for economic reasons and for cause) the average size was 28 and 15. The termination costs per terminated worker (economic reasons) were 496,520FF in 1992 and 753,590FF in 1996, whereas the termination costs per terminated worker (all reasons) were 158,270FF and 353,170FF.

The distinction between collective and individual terminations is an important element of 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 8 gives some basic statistics for establishments that used the individual termination procedure or the collective termination procedure twice, in 1992 and 1996. The industrial description of those 222 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 24 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 an individual termination procedure during our sample period. Moreover, establishments using the collective termination procedure are very large; their average size is five times larger than that of establishments that have used the individual termination procedure (see "total employment" in Table 8).

Estimates for the costs of individual terminations for the establishments that have fired twice are given now. The average number of workers terminated for economic reasons and for cause was 4.15 in 1992 and 3.74 in 1996, whereas the average number of workers terminated for economic reasons was 0.75 in 1992 and 0.43 in 1996. Termination costs per terminated worker (economic reasons) were 365,340FF in 1992 and 897,111FF in 1996, whereas the termination costs per terminated worker (all reasons) were 189,630FF and 405,052FF. The 1996 termination costs per terminated worker (economic reasons) is twice that of 1992. Note that the average number of terminated workers (all reasons) was stable between the two years whereas the average total termination costs increased, going from 686,647FF to 1,060,880FF.

Estimates of the costs of collective terminations for the establishments that have used this procedure twice are given now. The average size of workers terminated[11] was 147 in 1992 and 65 in 1996. The termination costs per terminated worker increased from 181,000FF to 196,000FF whereas the average total termination costs decreased (19,600,000FF in 1992 and 10,400,000FF 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, increase in termination costs per terminated worker seem to come from the increase in individual termination costs.

Of course, this statistical analysis does not account for potential selection biases and composition effects since hiring and firing are the outcome of complex decision procedures. Hence, we now present our econometric results based on estimated versions of equation (9).

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

5.2 Generalized Tobit Estimation

5.2.1 Terminations

Tables 9 and 10 report our results for the determinants of the termination costs based on equation (9) for termination decision. Table 9 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 10 gives the maximum likelihood estimates of the generalized tobit model using all observations with either positive costs and positive terminations or zero cost and zero termination[12]. Column (1) gives estimates for all establishments; column (2) gives estimates for those with 50 or more employees. All coefficients are expressed in Francs[13]. In estimates presented in Tables 9, all 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[14]. Apart from the intercept, the least squares and tobit estimates are quite similar: the linear part is huge and the costs are strongly concave. Hence, the structure of termination costs does not depend on the establishment involved in termination procedure, but on French legislation. The marginal cost of terminating N workers, for all establishments whatever their size, is estimated as $115,006 - 28.44N$. 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 cost). For comparison (Abowd and Kramarz 2001) estimated this cost for the year 1992 as $56,299 - 31.2N$ with a fixed cost of $1,138,117$FF. By comparing estimates for all establishments and for establishments with at least 50 employees, we see that the cost of termination does not depend on the establishment size. However, the concavity of the cost of termination means that French firms should optimally group their terminations. Notice also that the correlation between the decision and the cost equations is always very small and never significantly different from zero. These two decisions appear only weakly related.

Results distinguishing individual and collective terminations are given in Table 11. Models are estimated by maximum likelihood using all observations. Column (1) gives estimates for all establishments. All coefficients in the probit equation are significantly different from zero. In the tobit equation, coefficients for the individual termination procedure are not significantly different from zero, whereas coefficients for collective terminations are. The collective termination procedure is much more expensive than the 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 : a social plan undoubtedly increases the separation costs. Note also the structure of the cost of collective termination appears to be convex. Although French firms should group their terminations (given our estimates), they have to be pay attention to the legislative limit laid down by the French labor law. As soon as the number of workers involved in the termination is greater than 10, firms should optimally space their collective terminations (also given our estimates).

The estimates of the costs of termination are modified when the structure of skills in the establishment is introduced (by interacting terminations with the share of managers, clerks and blue-collar workers in 1992). We report these results in Table 12. 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. Although we do not have measures of entries and exits flows by skill-levels, 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. One result is important to note here. Indeed, the correlation between the decision and the cost equations is positive and significantly different from zero. When we take into account the structure of the workforce in the estimates,

[12] Note that establishments with positive terminations and zero cost are deleted from the termination analysis file. The size of this file is then $1,127$.

[13] 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).

[14] The fact that the intercept is significantly different from zero in the OLS estimates is in line with the summary statistics of the terminations costs. Indeed, we note in the previous section that the terminations costs were twice upper in 1996 than in 1992.

the two decisions are related.

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 13 for establishments which have terminated workers twice (both in 1992 and 1996)[15] and for establishments which have terminated workers once (either in 1992 or in 1996)[16]. Fixed costs of termination are small, in average $5,700$FF for all establishments. There are fewer establishments that fired once than establishments that fired twice. This result is of interest insofar as it apparently contradicts the fact that, since the marginal cost of firing N workers is high, establishments should group their separations instead of adjusting gradually their workforce. However, in average, the fixed cost appears to be higher when the firm fired once. This result is in line 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 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. A way to confirm this result is to look at the distribution of separations for our establishments present in the two years. The distribution is presented in Table 6. We directly see that many firms terminate in both years 5 or less workers, another evidence that the fixed cost of separating is small. But, at the same time, many firms fire in both years very large numbers of their workers, also indirect evidence of the concavity of the costs. Finally, even though the limit for collective terminations is 10 workers and more, unreported results display no evidence of an accumulation in the distribution of terminations at 9 workers exactly.

Our least squares estimates decomposing the fixed cost of termination are given in Table 14[17]. 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 consistent with the 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 is larger in manufacturing industries, whereas the fixed cost does not differ by size of the establishment (we do not report the coefficient of the size variable in the Table, it was not significantly different from zero).

5.2.2 Retirement

Tables 15 to 18 report our results for the determinants of the retirement costs based on equation (9) for retirement decision. Table 15 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 16 presents maximum likelihood estimates (generalized tobit) using all observations with either positive costs and positive retirement or zero costs and zero retirements[18]. Column (1) gives estimates for all establishments ; column (2) gives estimates for those with 50 or more employees. Coefficients are expressed in Francs[19]. In the estimates presented in Tables 15 and 16, the linear component of the cost is the only coefficient that is significantly different from zero. Estimates presented in Tables 17 and 18 confirm this result. The intercept – a measure of the temporal trend between the two years – is not significantly different from zero; 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

[15] Columns (1) and (2)

[16] Columns (3) and (4)

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

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

[19] 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 and tobit estimates are quite similar: the decision to retire and the entailed costs are apparently independent. This independence has multiple sources but one could be that legislation constrains retirement costs: once the decision to retire is taken, the costs ensue. The cost of retiring N workers, for all establishments whatever their size, is estimated as $53,026N$ (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 months and a half of median wage (not cost). For comparison, (Abowd and Kramarz 2001) estimated this marginal cost for the year 1992 as $27,435 - 176N$ with a fixed cost of 579,549FF. By comparing estimates for all establishments and for establishments with at least 50 employees, we see that the cost of retirement does not depend on the establishment size.

Table 19 reports 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 blue-collar workers in 1992).[20] The estimates of the costs of retirement are modified. 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. Once again, the two decisions appear only weakly related, since the correlation between the decision and the cost equations is not significantly different from zero. Estimates show that retiring a manager is three times more expensive than retiring a blue-collar worker. As mentioned in section 2, French labor laws require the severance payment to be proportional to the wage of the worker involved in the separation. Our results are in agreement with French legislation. These results allow us to draw another conclusion. Insofar as severance payments are calculated similarly for all types of separations (either termination or retirement), estimates show that the sunk costs are far more important in the case of terminations, especially for high-skill workers.

After inferring the structure of retirement costs in difference, we are now able to compute an approximate estimate of the fixed cost of retirement. Results of this exercise are given in Table 20 for establishments that have retired workers twice (both in 1992 and 1996)[21] and for establishments that have retired workers once (either in 1992 or in 1996)[22]. Fixed costs of retirement are three times bigger than the fixed costs of termination. Our least squares estimates explaining the fixed cost of retirement are given in Table 21. Most coefficients are significantly different from zero. Conclusions are similar to those given before for terminations.

5.2.3 Hiring

Tables 22 through 25 report our results for the determinants of the costs of hiring based on equation (9) 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 do not 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. Tables 22 and 24 give estimates using least squares; models rely on establishments with strictly positive costs and strictly positive hiring. We do not distinguish by establishment size since only large establishments hire in both years, 1992 and 1996 (see section 5.1 and Table 5). Tables 23 and 25 give maximum likelihood estimates (generalized tobit) using all observations with either positive costs and positive hiring or zero costs and zero hiring[23]. Coefficients, for both methods, are expressed in Francs[24]. In estimates presented in Tables 22 through 25, most coefficients are significantly different from zero, including the intercept – a measure of the temporal trend between the two years. Tables 22 and 23 report costs of hiring without a distinction for the contract type. The least squares and tobit estimates are quite similar: the linear part is small and the hiring costs are roughly linear. Once again, this cost does not depend on the size of the establishment involved in the recruitment

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

[21] Columns (1) and (2)

[22] Columns (3) and (4)

[23] Note that establishments with positive hiring and zero cost are deleted from the recruitment analysis file. The size of this file is then 628.

[24] 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).

procedure. The marginal cost of hiring N workers is estimated as $1,926 - 0.9N$ whatever their size. For comparison (Abowd and Kramarz 2001) estimated this cost for the year 1992 as $2,015 - 2.84N$ with a fixed cost of 385,364FF. Tables 24 and 25 report costs of hiring by contract type. Results are interesting as they show that hiring on long-term contracts (CDI) is expensive, in particular hiring on such contracts is much more expensive than hiring on short-term contracts (CDD). Moreover, the costs of hiring on long-term contracts are more concave than the costs of hiring on short-term contracts: Establishments should optimally group their hiring on CDIs and adjust gradually their workforce with CDDs (see also (Abowd, Corbel, and Kramarz 1999)). 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.

Table 26 reports 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 blue-collar workersin 1992). As was observed for terminations and retirements, 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. Once again, the two decisions appear only weakly related, since the correlation between the decision and the cost equations is not significantly different from zero. Estimated costs show that hiring a manager is three times more expensive than hiring a blue-collar worker.

From the estimates of the structure of hiring costs, we provide an estimate of the fixed cost of hiring. Results are given in Table 27 for establishments that have hired workers twice (in 1992 and 1996)[25] and for establishments that have hired workers once (either in 1992 or in 1996)[26]. Fixed costs of hiring are very small (negative on average). Table 4 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 do not have to pay training costs insofar as CDD may act as a training period. Therefore, it seems that firms with high fixed costs are those that hired the most on long-term contracts. The decomposition of our estimated fixed component of the cost of hiring are given in Table 28. Most of coefficients are significantly different from zero. The wage policy of the firm does affect the fixed part of the cost of hiring. The structure by skill-levels of the establishment as well as the training costs are also directly related to this fixed cost.

6 Conclusion

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

First, we study termination costs. We show that termination costs are increasing and mildly concave in the number of terminated workers, and that terminations costs are independent of the firm's size. It also appears that collective terminations are much more expensive than individual terminations: Legislation, namely the requirement to formulate a social plan in case of collective termination, magnifies 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 conclude that the major component of termination costs comes from the number of terminated workers.

Then, we study retirement costs. The costs of retirement are linear and do not depend on the size of the firm. Apparently, as observed for the termination costs, the equation modelling the decision to retire and the cost equation are not related. A possible interpretation is that French firms retire their workers independently of the costs of retirement. After estimating the structure of termination costs, we estimate the firm-specific fixed component of the termination cost function. This cost is larger than the one estimated for terminations, but way smaller than the

[25] Columns (1) and (2)
[26] Columns (3) and (4)

estimate obtained by (Abowd and Kramarz 2001). When controlling for unobserved heterogeneity, it appears that major component of retirement costs come from the number of retired workers.

Finally, we examine hiring costs. Hiring costs are small, increasing and slightly concave, but the hiring costs on CDI contracts are more concave than those estimated for CDD contracts: Firms have incentive to group their hiring on long-term contracts 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 explain the finding that fixed-term contracts represent the bulk of hires in France. 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 cost 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 plays an important role in the level of costs paid by the firms.

Because we have two waves of the Cost Structure Survey, our analysis yields insights that were not available to (Abowd and Kramarz 2001). In particular, our estimates of the fixed cost component of adjustment costs is much smaller than those obtained by these authors. By contrast, (Abowd and Kramarz 2001) had access to matched employer-employee data that allowed them to contrast costs as perceived by the firm with costs as received in form of severance payments by the workers.

(Abowd, Corbel, and Kramarz 1999) 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 large French firms. In particular, our estimates explain why these firms hire primarily on short term contracts, why they reduce entries in bad times without increasing separations, a feature common to many countries. Interestingly, our estimates also show that firms can also fire workers quite easily, i.e. without paying a large fixed cost. Even though they are costly, small adjustments appear to be possible in France.

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A Statistical Description of The Matched Data File

Industrial Sector	Number of Obs.	%				
Manufacturing industries	659	50.38				
Service Industries	345	25.98				
No response	324	23.64				
Size	**Obs.**	**%**				
less than 50	213	16.04				
more than 50	1,115	83.96				
Variable	**Obs. 92**	**Mean 92**	**Std**	**Obs 96**	**Mean 96**	**Std 96**
Total Employment	1,328	637.88	1,209.51	1,328	550.26	1,062.93
Total Hiring	1,328	62.29	120.59	1,328	63.54	132.30
Total Hiring (CDI)	1,328	16.99	38.45	1,328	14.64	32.17
Total Hiring (CDD)	1,328	45.29	100.88	1,328	48.89	117.83
Total Terminations[1]	1,328	14.51	60.77	1,328	7.80	22.01
Total Terminations[2]	1,328	8.18	51.79	1,328	3.59	18.51
Total Retirement	1,328	5.17	17.28	1,328	7.68	34.63
Hiring Costs	1,328	97,100.14	813,117.78	1,328	86,753.49	410,631.34
Termination Costs (All Reasons)	1,328	1,551,576.62	6,747,887.64	1,328	1,401,296.42	4,926,202.67
Retirement Costs	1,328	334,305.40	1,439,961.77	1,328	523,856.91	2,240,560.12
Termination Costs per Termination[1]	835	130,499.53	413,100.39	873	303,538.44	1,100,121.62
Termination Costs per Termination[2]	350	385,042.64	1,275,426.37	297	728,820.35	2,155,734.94
Retirement Costs per Retiree	643	70,607.19	271,694.70	761	68,844.21	248,990.22
Hiring Costs per Hire	953	2,824.80	21,208.11	1012	2,456.37	16,827.05

Table 1: Summary Statistics for the Establishment-Level Variables

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996.
Total Terminations[1] means Total Terminations, All Reasons
Total Terminations[2] means Total Terminations, Economic Reasons

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 2: Number of establishments that retired twice

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Table gives statistics for establishments that retired twice.

Industrial Sector	Obs.	%				
Manufacturing industries	222	68.10				
Service Industries	104	31.90				
Size	**Obs.**	**%**				
less than 50	1	0.31				
more than 50	325	99.69				
Variable	**Obs. 92**	**Mean 92**	**Std**	**Obs 96**	**Mean 96**	**Std 96**
Total Employment	326	1,000.76	1,771.03	326	851.16	1,526.05
Total Retirement	326	11.03	18.21	326	14.45	21.34
Retirement Costs	326	850,999.94	2,534,238.02	326	1,059,351.61	3,305,514.96
Retirement Costs per Retiree	326	101,452.17	352,545.73	326	96,522.00	227,836.16

Table 3: Summary Statistics for the Establishments that Retired Twice

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

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 4: Number of establishments that hired twice

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Table gives statistics for establishments that hired twice.

Industrial Sector	Obs.	%				
Manufacturing industries	166	65.87				
Service Industries	86	34.13				
Size	**Obs.**	**%**				
less than 50	0	0				
more than 50	252	100				
Variable	**Obs. 92**	**Mean 92**	**Std**	**Obs 96**	**Mean 96**	**Std 96**
Total Employment	252	802.52	1047.69	252	710.09	904.92
Total Hiring	252	90.05	138.71	252	93.79	194.58
Total Hiring (CDI)	252	25.55	33.09	252	21.66	30.92
Total Hiring (CDD)	252	64.50	125.01	252	72.14	184.18
Hiring Costs	252	379,361.19	841,433.66	252	356,745.86	843,316.28
Hiring Costs per Hire	252	8,909.96	41,926.26	252	9,534.18	38,516.74

Table 5: Summary Statistics for the Establishments that Hired Twice

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

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 6: Number of establishments that fired twice

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Table gives statistics for establishments that fired twice.

Industrial Sector	Obs.	%
Manufacturing industries	387	72.88
Service Industries	144	27.12
Size	**Obs.**	**%**
less than 50	8	1.51
more than 50	523	98.49

Variable	Obs. 92	Mean 92	Std	Obs 96	Mean 96	Std 96
Total Employment	531	931.94	1,623.86	531	801.02	1,396.54
Total Terminations[1]	531	28.38	90.66	531	14.79	31.10
Termination Costs[1]	531	3,218,197.14	10,118,285.98	531	2,596,711.92	6,591,521.61
Termination Costs per Termination[1]	531	158,269.54	396,256.20	531	353,173.42	1,201,482.42
Total Terminations[2]	531	17.28	79.45	531	6.87	27.06
Termination Costs[2]	216	4,902,317.26	13,082,094.53	172	4,119,031.39	9,348,805.24
Termination Costs per Termination[2]	216	496,518.95	1,570,102.71	172	753,589.83	2,013,594.33

Table 7: Summary Statistics for the Establishments that Fired Twice

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996.
[1] means All Reasons
[2] means Economic Reasons

Individual Terminations						
Industrial Sector	Obs.	%				
Manufacturing industries	150	67.57				
Service Industries	72	32.43				
Size	Obs.	%				
less than 50	5	2.25				
more than 50	217	97.75				
Variable	Obs. 92	Mean 92	Std 92	Obs 96	Mean 96	Std 96
Total Employment	222	526.08	550.70	222	463.26	438.51
Total Terminations[1]	222	4.15	2.38	222	3.74	2.32
Total Terminations[2]	222	0.75	1.64	222	0.43	1.07
Termination Costs	222	686647.28	1,925,808.35	222	1,060,880.32	2,721,091.53
Termination Costs per Terminations[1]	222	189,630.48	536,422.18	222	405,052.17	1,021,864.18
Termination Costs per Terminations[2]	59	365,339.71	966,380.87	46	897,111.87	1,989,789.70
Collective Terminations						
Industrial Sector	Obs.	%				
Manufacturing industries	22	91.67				
Service Industries	2	8.33				
Size	Obs.	%				
less than 50	0	0				
more than 50	24	100				
Variable	Obs. 92	Mean 92	Std 92	Obs 96	Mean 96	Std 96
Total Employment	24	2,801.71	3,977.83	24	2,272.93	3,292.71
Total Terminations[2]	24	147.20	274.44	24	65.00	82.17
Termination Costs	24	19,630,612.88	33,823,583.60	24	10,400,425.63	16,586,404.64
Termination Costs per Terminations[2]	24	180,987.19	237,654.96	24	195,868.20	192,068.76

Table 8: Summary Statistics : distinguishing collective and individual terminations

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996.
[1] means All Reasons
[2] means Economic Reasons

B The Costs of Termination between 1992 and 1996

Variable	Coef. (1)	Std	Coef. (2)	Std
Termination Costs	dep.	dep.	dep.	dep.
Total Termination (All)	**114,987.66**	940.45	**115,309.19**	948.61
Total Termination (squared)	**−28.43**	7.59	**−28.67**	7.65
Intercept	**7,192.64**	2,868.91	**7,190.99**	2,911.09
Number of Observations	531		523	
R^2	0.488		0.489	

Table 9: 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	**−0.650**	0.175	**−1.106**	0.194
Share of Manager	**0.943**	0.352	**2.026**	0.410
Share of Clerks	−0.170	0.215	**0.850**	0.252
Share of Blue-Collar Workers	**0.643**	0.209	**1.388**	0.235
Situation in 1992	**0.455**	0.082	**0.496**	0.092
Growth in 1992	**0.129**	0.077	0.126	0.086
Tobit (costs)				
Total Terminations	**115,006.67**	938.29	**115,373.35**	946.43
Total Terminations (squared)	**−28.44**	7.57	**−28.72**	7.63
Intercept	7,818.42	10,452.36	5,179.59	8,903.89
Correlation	−0.012	0.196	0.048	0.204
Number of Observations	1,127		922	
Log-likelihood	−7,319.44		−7,073.19	

Table 10: 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
Probit (selection)		
Intercept	**−0.651**	0.175
Share of Manager	**0.944**	0.352
Share of Clerks	−0.169	0.214
Share of Blue-Collar Workers	**0.645**	0.208
Situation in 1992	**0.455**	0.082
Growth in 1992	**0.128**	0.077
Tobit (costs)		
Individual Terminations	43,693.58	151,147.57
Individual Terminations (squared)	10,659.74	30,594.41
Collective Terminations	**105,085.39**	10,421.29
Collective Terminations (squared)	**28.13**	11.85
Correlation	0.018	0.057
Number of Observations	531	
Log-likelihood	−7,332.71	

Table 11: The Costs of Termination : distinguishing collective and individual terminations: maximum likelihood estimates

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	**−0.651**	0.175
Share of Managers	**0.944**	0.352
Share of Clerks	−0.169	0.214
Share of Blue-Collar Workers	**0.644**	0.267
Situation in 1992	**0.454**	0.081
Growth in 1992	**0.129**	0.77
Tobit (costs)		
Total Terminations * Share of Managers	**531,499.32**	79,415.43
Total Terminations * Share of Clerks	49,488.27	33,385.80
Total Terminations * Share of Blue-Collar Workers	**61,686.71**	15,128.68
Total Terminations (squared)	**−17.41**	7.45
Correlation	**0.15**	0.056
Number of Observations	1127	
Log-likelihood	−7302.292	

Table 12: The Costs of Termination by Skill-Levels : maximum likelihood estimates

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

Number of observations	531	531	203	203
Mean	5,700.22	−13.59	7,445.23	−0.3
Std	58,804.42	73.70	37,372.89	21.28

Table 13: Fixed Costs of Termination

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

Variable	Coef.	Std
Fixed Cost	dep.	dep.
Gross Earning per Worker	−5.619	6.767
Share of Blue-Collar Workers	**−18.29388**	2.379
Share of Clerks	−12.344	10.366
Share of Managers	**127.105**	11.033
Manufacturing Industries	**7518.493**	3035.015
Long-Term Contracts	**−131.146**	76.342
Number of Observations	531	
R^2	0.27	

Table 14: Fixed Cost of Termination : least squares estimates

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

C The Costs of Retirement between 1992 and 1996

Variable	Coef. (1)	Std	Coef. (2)	Std
Retirement Costs	dep.	dep.	dep.	dep.
Total Retirement	**53,030.92**	23,821.99	**53,028.64**	23,859.37
Total Retirement (squared)	136.88	2,111.88	136.89	2,115.16
Intercept	−1,521.51	201,123.94	−1,342.27	2,017.49
Number of Observations	326		325	
R^2	0.091		0.091	

Table 15: 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	**−0.203**	0.178	**−0.348**	0.189
Share of Manager	−0.489	0.370	−0.069	0.399
Share of Clerks	**−0.954**	0.223	**−0.402**	0.247
Share of Blue-Collar Workers	**−0.442**	0.214	−0.114	0.233
Situation in 1992	0.111	0.086	0.074	0.093
Growth in 1992	**0.147**	0.081	**0.151**	0.086
Tobit (costs)				
Intercept	52,698.93	1,295,722.5	23,382.76	1,531,807.2
Total Retirement	**53,026.02**	23,712.39	**53,015.91**	23,761.85
Total Retirement (squared)	136.73	210.24	137.01	210.66
Correlation	−0.013	0.313	−0.006	0.411
Number of Observations	1,134		926	
Log-likelihood	−4,456.14		−4,374.18	

Table 16: The Costs of 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	−0.203	0.178
Share of Manager	−0.488	0.369
Share of Clerks	**−0.954**	0.223
Share of Blue-Collar Workers	**−0.443**	0.213
Situation in 1992	0.111	0.085
Growth in 1992	**0.147**	0.08
Tobit (costs)		
Total Retirement	**53,057.18**	23,699.86
Total Retirement (squared)	136.74	210.25
Correlation	−0.0063	0.048
Number of Observations	1134	
Log-likelihood	−4,456.038	

Table 17: The Costs of Retirement : maximum likelihood estimates

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	−0.203	0.179
Share of Manager	−0.488	0.369
Share of Clerks	**−0.954**	0.223
Share of Blue-Collar Workers	**−0.443**	0.213
Situation in 1992	0.111	0.085
Growth in 1992	**0.147**	0.081
Tobit (costs)		
Total Retirement	**66,390.39**	11,895.22
Correlation	−0.004	0.048
Number of Observations	1134	
Log-likelihood	−4,456.523	

Table 18: The Costs of Retirement : maximum likelihood estimates

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		
Share of Managers	−0.486	0.369
Share of Clerks	**−0.954**	0.223
Share of Blue-Collar Workers	**−0.443**	0.213
Situation in 1992	0.112	0.085
Growth in 1992	**0.147**	0.081
Tobit (costs)		
Total Retirement * Share of Managers	**285,674.68**	98,192.01
Total Retirement * Share of Clerks	−26,968.8	35,760.54
Total Retirement * Share of Blue-Collar Workers	**95,612.22**	25,695.08
Correlation	0.013	0.049
Number of Observations	1134	
Log-likelihood	−4,452.62	

Table 19: The Costs of Retirement by Skill-Levels : maximum likelihood estimates

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

Number of observations	326	326	221	221
Mean	15547.01	3.41	6437.75	6.55
Std	27593.08	16.34	12990.18	27.35

Table 20: Fixed Costs of Retirement

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Column (1) and (2) gives computation for establishments that retired twice. Column (3) and (4) gives computation for establishments that retired once. Column (1) and (3) gives computation for the fixed cost of retirement. Column (2) and (4) gives computation for the number of workers involved in retirements.

Variable	Coef.	Std
Fixed Cost	dep.	dep.
Gross Earning per Worker	−0.008	0.160
Share of Blue-Collar Workers	1,707.257	4,399.679
Share of Clerks	**−6,614.083**	4,265.925
Share of Managers	**20,782**	7,548.718
Manufacturing Industries	−384.866	2,966.257
Number of Observations	326	
R^2	0.0305	

Table 21: Fixed Cost of Retirement : least squares estimates

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

D The Costs of Hiring between 1992 and 1996

Variable	Coef. (1)	Std
Hiring Costs	dep.	dep.
Total Hiring	**1910.57**	437
Total Hiring (squared)	**−0.89**	0.23
Intercept	**214.65**	29.64
Number of Observations	212	
R^2	0.25	

Table 22: 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.

Variable	Coef. (1)	Std
Probit (selection)		
Intercept	**−0.877**	0.225
Share of Manager	**1.253**	0.442
Share of Clerks	−0.402	0.284
Share of Blue-Collar Workers	**0.459**	0.270
Situation in 1992	**0.221**	0.113
Growth in 1992	**0.204**	0.107
Tobit (costs)		
Total Hiring (All)	**1,926.96**	436.32
Total Hiring (squared)	**−0.91**	0.23
Intercept	**330.57**	85.12
Correlation	−0.249	0.165
Number of Observations	628	
Log-likelihood	−1,945.909	

Table 23: 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.

Variable	Coef. (1)	Std
Hiring Costs	dep.	dep.
Total Hiring (CDI)	**3642.45**	1731.73
Total Hiring (CDI, squared)	**−10.11**	6.69
Total Hiring (CDD)	**1711.41**	507.77
Total Hiring (CDD, squared)	**−0.95**	0.28
Intercept	**220.59**	30.07
Number of Observations	212	
R^2	0.25	

Table 24: 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.

Variable	Coef. (1)	Std
Probit (selection)		
Intercept	**−0.877**	0.225
Share of Manager	**1.254**	0.442
Share of Clerks	−0.400	0.284
Share of Blue-Collar Workers	**0.456**	0.270
Situation in 1992	**0.221**	0.113
Growth in 1992	**0.204**	0.107
Tobit (costs)		
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 25: 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.

Variable	Coef. (1)	Std
Probit (selection)		
Intercept		
Share of Managers	**1.23**	0.441
Share of Clerks	−0.406	0.284
Share of Blue-Collar Workers	**0.451**	0.270
Situation in 1992	**0.222**	0.113
Growth in 1992	**0.204**	0.107
Tobit (costs)		
Total Hiring (squared)	**−0.78**	0.27
Total Hiring * Share of Managers	**6,168.71**	2506.25
Total Hiring * Share of Clerks	416.44	1029.17
Total Hiring * Share of Blue-Collar Workers	**1,866.54**	624.94
Correlation	−0.23	0.17
Number of Observations	628	
Log-likelihood	−1,945.947	

Table 26: The Costs of Hiring by Skill-Levels : maximum likelihood estimates

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

Number of observations	212	212	54	54
Mean	−219.18	9.15	−185.49	−6.37
Std	254.88	169.61	190.96	220.69

Table 27: Fixed Costs of Hiring

Sources : ESS 1992, ESS 1996, DMMO 1992, DMMO 1996. Column (1) and (2) gives computation for establishments that hired twice. Column (3) and (4) gives computation for establishments that hired once. Column (1) and (3) gives estimates for the fixed cost of hiring. Column (2) and (4) gives estimates for the number of workers involved in terminations.

Variable	Coef.	Std
Fixed Cost	dep.	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 28: Fixed Cost of Hiring : least squares estimates

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