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The shape of hiring and separation costs in France ☆

Francis Kramarz [a,*], Marie-Laure Michaud [b]

[a] CREST-INSEE, CEPR, and IZA, France
[b] Consultant in the Paris Office of the Boston Consulting Group, France

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ABSTRACT

In this article, we estimate the structure of costs of hiring, terminating, and retiring employees in France. We use a representative panel data set of French establishments that contains direct measures of these various costs as well as measures of entries and exits for the years 1992 and 1996.
First, we show that our panel data source is able to reproduce results obtained by Abowd and Kramarz (2003) when we use the cross-section dimension. Our estimates show that collective terminations are much more expensive than individual terminations: legislation, namely the requirement to set up a "social plan" in case of collective terminations, magnifies firing costs. Collective terminations entail very large fixed costs. Termination costs are essentially linear in the number of terminated workers, with collective terminations being much more expensive. The costs of retirement are concave in the number of retired workers with a fixed cost component which is smaller than the one estimated for terminations, and quite smaller than that obtained by Abowd and Kramarz (2003). Finally, we find that hiring costs are small and seem only present when hiring on CDI; costs of hiring on short-term contracts are almost zero. Finally, the fixed (firm-specific) component of hiring costs is very small.

1. Introduction

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

Whereas all the above papers, and a flurry of others, study the consequences of various measures of employment protection on labor market performances, only a few try to precisely relate firing costs and labor market flows (see in particular Kugler with co-authors in Kugler and Saint-Paul, 2004 or Kugler, 2002). And even fewer attempt to measure the directs costs associated to employment protection legislation. Hamermesh (1989) examines the costs firms face in adjusting labor demand to exogenous shocks. He shows, using monthly plant-level US data, that adjustment proceeds in jumps and that smooth adjustments used in the macro-economic literature results from aggregation. Hamermesh (1993) summarizes various estimates of the magnitude and the structure of adjustment costs from international data, in particular the asymmetry in these costs. Even though the structure of adjustment costs appear to vary across specifications, skills, or countries, symmetry seems rejected by most studies using micro-economic data sources. For instance, in the United States separation costs are much smaller than hiring costs (but see Caballero et al., 1997). Recent papers give a different picture of the European situation. Goux et al., 2000 estimate the costs of firing and hiring, using a dynamic model of labor demand for France. Among other results, they show separations are more costly than hiring, in particular when workers are employment under long-term contracts.

In contrast with the rest of the literature, who examine adjustment costs by indirect methods, we directly measure the costs of hiring and separation. Our study follows that of Abowd and Kramarz (2003) who estimated the costs of hiring, separation, and retirement of employees for a representative cross-section of French establishments in the year 1992 matched with a representative sample of their employees, in that same year.[1] They showed that both retirement and termination costs were increasing and mildly concave in the number of retired and terminated workers. Moreover, the fixed costs that they estimated

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* Corresponding author.
E-mail addresses: kramarz@ensae.fr (F. Kramarz), mlmichaud@gmail.com (M.-L. Michaud).

[1] See also Pfann (2006) who uses direct measures of firing costs for a Dutch firm to study the selection of workers for a massive layoff plan.

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

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

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

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

To summarize the main differences between AK's approach and ours, two points must be stressed. First, in AK, the fixed cost of firing or hiring was unique and equal for all firms.[2] Here, the fixed cost of firing or hiring is firm-specific, and therefore is allowed to vary by firm. Second, what is gained in the longitudinal dimension however is potentially lost in the cross-section: our new data source comprises a smaller number of establishments or firms. More precisely, each cross-section, 1992 and 1996, is a representative sample of the population of French establishments. For each year, the sampling frame is stratified by size with known weights (inverse of the sample rates). To keep representativeness in the panel dimension, all our estimates are weighted by the product of these two weights.

To summarize our results, we first show that, when estimating a firing equation similar to that estimated by AK in the cross-section dimension, the fixed cost of firing is huge. Hence, even though our data set is smaller, it retains essentially the same properties as the one used by AK.

Moreover, *in line with these authors*, our panel data 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 more expensive than individual terminations,
- Costs are often concave and induce firms to group their hiring and separations.

But in stark contrast with AK's estimates, we find that

- Hiring entails no firm-specific fixed cost,
- Individual terminations entail a small (and heterogeneous) firm-specific fixed cost,
- Collective terminations entail a very large (and heterogeneous) firm-specific fixed cost.

Indeed, the measured costs are much larger than the "theoretical" costs based on the formulas contained in collective agreements because French labor market regulations significantly increase the termination costs.

The paper is organized as follows. In the next section we present information on French policies and institutions that affect the costs of adjusting employment. Section 3 contains a description of our data sets. Our econometric specification is presented in Section 1. The results of the empirical analysis are given in Section 2. Finally, Section 5 concludes.

2. Hiring and separations: the French labor laws

French labor laws[3] allow firms to hire workers on two types of regular employment contracts: indefinite-term contracts (*Contrats à Dur ée Indéterminée*, CDI) and fixed-duration contracts (*Contrats à Durée Déterminée*, CDD). 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% severance payment by law (10% since January 2002).[4] 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 et al., 1999a).

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",[5] 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.

Theoretical 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 h if the worker is paid

[2] Even though, as pointed out by the editor, AK could have estimated fixed costs by industry, or age of the firm. But given the cross-sectional nature of the data, firm-specific fixed costs were not identifiable in AK.

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

[4] Hence, at the end of a one-year CDD, a worker received in the years under study 72% of her monthly wage or 6% of her annual wage.

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

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. However, the real costs are rarely determined by these rules. Indeed, there are multiple reasons for this. First, note 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. So, severance payments are much larger than the costs induced by the above formulas. Second, because the potential costs of implementing termination for economic reasons are very large — the worker or the unions can sue the firm before the labor courts — firms have often tried to come up with agreements (such as firing for "personal reasons") with the worker or her representatives.[6] And, in general, firms are willing to pay large sums of money to their workers to avoid problems and lawsuits. These sums, including those payments made after a labor court decision, should be declared by the firm and therefore recorded in our measure of severance payments since they all pertain to costs incurred by the firm and paid directly to their workers rather than, say, to lawyers. To summarize, termination costs, though much larger than the formulas described just above,[7] have an unknown shape but their magnitude should be relatively well-captured by our surveys described below. Of course, crucially and unfortunately, we do not know the components of these costs since we just observe a sum that cannot be individualized or related to, say, existence of a social plan or a labor court decision.

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 this *contribution* was to promote employment of older workers.[8] Because the costs of early retirement interact with this contribution, we decided to leave the question of its cost for future research.

3. Data description and basic facts

3.1. Creation of the matched data file

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

3.1.1. The Wage Structure Survey

We use the 1992 and 1996 waves of the Wage Structure Survey (Enquête sur la Structure des Salaires, ESS), a scientific sample of all establishments (manufacturing) or firms (construction and services) with at least ten employees. The details of the sampling procedure and other characteristics are presented in the Data Appendix. In this analysis, we use the following establishment-level variables, available in 1992 and 1996, unless stated:

- total employment: the average full-time monthly employment;
- 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;[9]
- 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 of a CDI.[10] In particular, all payments bargained between the firms and their workers in case of social plans, collective dismissals, economic termination, termination for cause are included. For instance, in the last case, all payments made to avoid any legal action (before labor courts) or all payments made after a judgment of the labor courts as long as they are directly paid to the workers should be reported. To reiterate the limitations mentioned above, the components of these costs cannot be individualized or related to, say, existence of a social plan or a labor court decision.
- hiring costs: reported employer expenses on job advertising, search firm fees;
- training costs, including training hours, direct training costs and trainees' compensation.

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

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

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

3.1.2. The Workforce Movement Questionnaire

Our second data source is the Monthly Worker Movement Report (Déclaration Mensuelle de Mouvement de Main-d'Oeuvre, DMMO), is

[6] On labor courts in France and their prevalence, see Fraisse et al. (2009).

[7] Typically, AK estimated for year 1992 that average termination costs per terminated employee were close to the annual labor costs paid for an average employee, the exact magnitude depending on the individual or collective nature of the termination. Numbers for 1996 are very similar.

[8] See Behaghel et al. (forthcoming) who show the unintended and adverse effects of this law.

[9] This number of terminations (for economic reasons or other reasons) does not include the end of CDD.

[10] Costs involved at the end of a CDD are not included.

an administrative record of all worker movements at all establishments with at least 50 employees, that is aggregated at the level of the establishment.[11] The variables used in our analysis are:

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

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

3.1.3. The matched data file

We matched our two sources by establishment code (SIRET code) separately in 1992 and in 1996. Then, the two years were matched by SIRET to constitute our panel data set. In the first matched file (by year), we required the establishment to be in the Wage Structure Survey. Given the sampling procedure, large establishments are over-represented in the resulting data source. In the final matched file, we required the establishment to be present both in 1992 and in 1996 in order to measure the costs for all establishments. Notice that we kept all establishments present in both years in the Wage Structure Survey, even those that declare no hiring or no separation. However, because the sampling frame in 1992 and 1996 includes all establishments with 200 employees or more but a sample of those establishments with less than 200 employees, the match yields are relatively small final data set comprising 1328 establishments.[12] These establishments constitute our analysis file. In this analysis panel, some variables have missing values (not all establishments report retired workers, terminated or hired employees). We explain now our methods for imputing missing data, when required for the statistical analysis.

For those establishments with no data on total employment from the ESS, we used the available information from the DMMO. An equivalent procedure was adopted for the following variables: total hires, total separations for economic reasons and for cause, regular and early retirement. Finally, we used data on entry by type of contract only for those establishments with non-missing data.

The number of observations used in the different regressions is shown in our results section (Section 2). We present some preliminary evidence in the next subsection.

3.2. Summary statistics

Table A1 reports summary statistics for our sample of establishments. Of the 1328 establishments included in our sample, only 1004 give their industrial affiliation; however most responding establishments belong to manufacturing industries. More than half of our establishments have more than 50 employees.[13] The two basic components of our estimation strategy, hiring and separation flows and hiring and separation costs are described in turn.

Employment flows: Table A1 reports numbers of terminations, retirements, and hirings for the establishments included in the sample separately for 1992 and 1996. We present these figures using three types of weights: full weights (product of the sampling weights in 1992 and 1996, since the sampling frames are independent), 1992 weights to compare with AK (who used no weights), and no weights. Because the matching process eliminates mostly smaller establishments, it is important to use such weights. More workers are terminated in 1992, a sharp trough in the French business cycle, whereas more workers are hired in 1996.

Hiring and separation costs: Table A1 also reports termination costs, retirement costs, as well as hiring costs in 1992 and 1996. The termination costs reported in the ESS include all severance payments paid for economic reasons and for cause (other than very serious misconduct). However, the DMMO and the ESS report the number of workers terminated for cause and for economic reasons, and the number of workers for cause reported in the two surveys includes both workers who were terminated for serious reasons (with severance payment) and workers who were terminated for very serious misconduct (without severance payment). Hence, we compute two measures of the costs for termination. The first is the ratio of termination costs to the total number of workers terminated either for economic reasons or for cause; the second is the ratio of the termination costs to the number of workers terminated only for economic reasons. The second number gives an upper bound on the termination costs whereas the first one gives a lower bound since the total number of terminated workers may include terminations for "very serious misconducts", which are exempted from severance payments. Termination costs show no clear pattern over the period; firing costs seem to increase but they decrease when one restricts attention to firing for economic reasons. Retirement costs per head apparently decrease. By contrast, hiring costs per hire are clearly smaller than firing or retirement costs and seem to increase, a fact consistent with a better economic environment.

The numbers presented in this descriptive analysis do not account for potential selection biases and composition effects since hiring and firing are the outcome of complex decision procedures. Hence, we present in the next section our econometric specification that tries to take into account some of the complexity of adjustment decisions. We also present econometric estimates for the cost functions.

4. The shape of hiring and separation costs

4.1. Statistical models

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

The econometric specification: Our establishment-level econometric specification is inspired from simple models of hiring and separation decisions, given fixed costs of adjusting the workforce (such as Bentolila and Saint-Paul, 1994). In this paper, we are solely interested in estimating those costs. Our modelling decisions are fully driven by information that our data sources contain. Indeed, our measures of costs and flows at entry and exit in both 1992 and 1996 are unique. Unfortunately, and even though some useful information needed to understand and model the exact decisions is present in 1992, there is no measure of the economic environment of the establishment in 1996. Furthermore, since the information on costs and flows is only available at the establishment level, there is no other data source in the French statistical system that could help us because all accounting measures are collected at the firm level and never at the establishment level.

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

[11] For more details on the survey, see the Data Appendix.

[12] 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.

[13] 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.

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

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

where $X_{2j;t}$ are observable characteristics of the firm that potentially affect the costs, most notably the number of entries, and α_{2j} the fixed cost of adjustment. This hiring cost is only observed when the firm decides to hire. The modeling hypothesis on the firm-specific fixed cost allows us to write the hiring cost in difference:

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

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

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

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

where $(y^*_{1j}, \Delta y^*_{2j})$ are latent variables; y^*_{1j} models the decision to hire in both years in firm j (*i.e.* if the firm hired twice then $y^*_{1j} > 0$ rather than once, in 1992 or in 1996; or neither in 1992 or 1996 implying $y^*_{1j} \leq 0$) and Δy_{2j} is the cost difference paid by firm j, a variable directly observed in the data when the firm hired twice, and where X_{1j} comprises economic variables likely to affect firm j hiring decisions at the exclusion of the cost of hiring. This system is essentially of the generalized Tobit type.

Choice of covariates for the decision: We only observe the following variable y_{1j}:[14]

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

For hiring, the Tobit selection equation is based on observable characteristics of the establishment. Indeed, as explained previously, we are forced to rely solely on those variables contained in the 1992 ESS to model the hiring decisions in the two years. Obviously, our selection equation is reduced form. These variables are the share of managers, clerks and blue-collar workers in total employment in 1992 (the excluded category being the fraction of technicians and foremen), business conditions in 1992 ("facing bad business conditions"), expected increase in employment in 1992. These variables are excluded from the continuous part of the system and, therefore, help us in the identification of the parameters. Notice though that the structure by skill-level certainly plays a role, for instance because the training costs for managers are quite different from those for blue-collar workers. In addition, because collective bargaining agreements in France tie compensation and skill-levels, returns to seniority often translate into (skill) promotion. Hence, introduction of the skill structure plays the additional role of capturing some (admittedly, not all) elements of seniority of the workforce. However, results are not sensitive to the inclusion of the skill structure in the cost difference equation.

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

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

with,

$$\Delta y^*_{2j} = \Delta X_{2j}\beta_2 + \Delta\varepsilon_{2j} \tag{1}$$

and:

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

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

Finally, our estimated equations are the following:

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

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

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

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

The fixed cost: After estimating the structure of hiring costs in first-difference, we are now able to compute an estimate of the fixed cost of hiring. Using the estimated $\hat{\beta}_2$ from Eq. (1), we can write:

$$\alpha_{2j;92} = y^*_{2j;92} - \hat{\beta}_2 X_{2j;92} - \varepsilon_{2j;92}$$
$$\alpha_{2j;92} = y^*_{2j;96} - \hat{\beta}_2 X_{2j;96} - \varepsilon_{2j;96}$$

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 et al. (1999b), 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.[15]

4.2. Estimation results

4.2.1. Can we trust our new sample?

For the reader, it clearly appears that our new data source is simultaneously richer and poorer than that used by AK. Richer for the obvious reason that we follow establishments or firms over a period of

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

[15] We do not correct for the fact that the fixed cost is estimated since it is used as a left handside variable. We assume that the induced measurement error is classical.

Table 1a
Termination costs, cross-section results.

Generalized Tobit model (weighted)			
	Full sample	Large establishments (50+)	Small establishments (49−)
Probit (selection)	Coef (Std)	Coef (Std)	Coef (Std)
Intercept	0.13 (0.21)	**−0.71 (0.20)**	0.29 (0.64)
Share of manager	**−0.97 (0.37)**	**2.01 (0.41)**	**−2.21 (1.08)**
Share of clerks	**−1.39 (0.23)**	**0.82 (0.27)**	**−2.21 (0.66)**
Share of blue-collar workers	**−0.73 (0.24)**	**0.92 (0.26)**	*−1.38 (0.73)*
Situation in 1992 (good = 1)	0.10 (0.09)	**0.50 (0.10)**	−0.19 (0.44)
Growth in 1992 (positive = 1)	0.03 (0.08)	0.03 (0.10)	−0.12 (0.18)
Year = 1996	*0.15 (0.08)*	*0.17 (0.09)*	0.19 (0.20)
Termination costs	Coef (Std)	Coef (Std)	Coef (Std)
Total terminations	**115,854 (27,099)**	**118,071 (28,756)**	*6914 (4707)*
Total terminations (squared)	**−33.1 (13.1)**	**−35.4 (13.6)**	**−108.4 (51.4)**
Intercept	**1,720,634 (819,084)**	*776,929 (487,822)*	272,538 (383,431)
Correlation	**−0.28 (0.10)**	−0.09 (0.10)	−0.62 (1.09)
Number of observations	2111	1642	439
Log-likelihood	−45,610.92	−29,644.10	−11,028.43

Sources: Wage Structure Survey, DMMO, 1992, 1996. Weights: inverse of sampling probability.
Bold: significant at the 5% level, Italics: at the 10% level.

5 years. Poorer for the equally obvious reason that the sample size decreases quite strongly because of the matching process involved in using (at least) two data sources that are not exhaustive and sample smaller firms at a lower rate than larger firms. Hence, we start our investigation by checking that results found in AK (cross-section estimates) still hold when using our new (longitudinal) sample. First, we know the exact weighting scheme for each of the samples (see the Data Appendix). Hence, as already explained, we compute weights for the two cross-sections as well as weights for the full analysis. These weights will be used throughout our analysis with the longitudinal sample to make our estimates representative of the entire economy. Second, we present an analysis of terminations using the sampling weights in order to directly compare terminations costs as obtained from AK with termination costs in the cross-section obtained from our new sample. The exact same variables as those of AK are used for this Tobit analysis of terminations.

Table 1a (Terminations, cross-section) presents the resulting estimates. We use *both* cross-sections, 1992 and 1996, using the appropriate weighting scheme. We show estimates for all establishments; for those with at least 50 employees; and for those with less than 50 employees. Hence, we are able to compare with AK results on one side and the longitudinal estimates presented in Table 1b. As explained above, the decision to terminate is modelled using similar variables, all measured in 1992, for both periods because we lack equivalent variables for 1996. We just add a 1996 indicator in this decision to contrast 1996 and 1992 observations. The cost function is exactly similar to that estimated in AK.[16] Using all establishments, the *cross-sectional* cost of terminating N workers has the following form:

$$\underset{}{\text{Cost}(N)} = \underset{(27,099)}{115,854} \times N - \underset{(13.1)}{33.1} \times N^2 + \underset{(819,084)}{1,720,364}$$

where N denotes the number of terminated workers. If we directly compare with AK (their Table 4a), our vector of estimates are 118,071; −35.4; and 776,929 for the establishments with at least 50 employees, when those in AK (column 2) were 56,299; −15.6; and 1,113,117 for establishments of the same size. For these establishments, results have the same flavor: a large fixed cost and a concave variable component of similar orders of magnitude. For the smaller establishments (less than 50 employees), our results share important features with those found in AK (column 4 of Table 4a): the fixed cost is smaller and badly estimated, the marginal cost is much smaller and more concave. We learn two things from this exercise. First and most importantly, we believe that our new data source constructed to follow firms over this period of time shares features with that used by AK, in its cross-section dimension at least. The introduction of weights allows us to capture the heterogeneity of situations across establishments. Because we focus on establishments present in both 1992 and 1996, we are faced with a data set that includes a relatively small number of small establishments (in contrast with AK). That these weights do indeed help us capture heterogeneity is apparent when one compares all firms with the samples of large and small establishments: heterogeneity and therefore the fixed cost is maximal in the full sample. Second, these cross-sectional estimates are huge and not credible if applied to $N = 1$, for instance since they imply that costs are equal to 10 years of labor costs of an average employee. Now, we turn to our new results using the panel dimension of our data source.

Table 1b
Termination costs, panel data results.

Generalized Tobit model (weighted)		
	Large establishments (50+)	Small establishments (49−)
Probit (selection)	Coef (Std)	Coef (Std)
Intercept	**−2.04 (0.39)**	0.30 (0.71)
Share of manager	**3.48 (0.84)**	*−2.18 (1.40)*
Share of clerks	**1.47 (0.48)**	**−2.65 (0.73)**
Share of blue-collar workers	**1.67 (0.47)**	**−2.09 (0.70)**
Situation in 1992 (good = 1)	**0.52 (0.21)**	−0.78 (0.58)
Growth in 1992 (positive = 1)	−0.02 (0.18)	−0.07 (0.41)
Termination costs	Coef (Std)	Coef (Std)
Total terminations	**97,727 (20,236)**	*9796 (5937)*
Total terminations (squared)	−16.1 (21.0)	*−214.4 (112.8)*
Intercept	28,605 (815,937)	7,276 (75,583)
Correlation	0.06 (0.21)	0.47 (0.65)
Number of observations	857	184
Log-likelihood	−26,668.93	−29,818.76

Sources: Wage Structure Survey, DMMO, 1992, 1996. Weights: inverse of sampling probability cost equation in first difference (1996–1992).
Bold: significant at the 5% level, Italics: at the 10% level.

4.2.2. Terminations

Terminations in Small and Large Establishments: As explained above, our estimation strategy relies on two types of establishments: those that have positive costs and positive terminations in both years

[16] Introduction of a 1996 indicator in the cost function did not prove to be significantly different from the general constant, and was therefore not used in the presented specification.

Table 2
Termination costs, individual vs collective.

Generalized Tobit model	
Termination costs	Coef (Std)
Individual terminations	**27,389 (9992)**
Collective terminations	**81,850 (15,883)**
Indicator = 1 if Collective termination	−299,819 (711,768)
Intercept	90,720 (129,551)
Correlation	0.01 (0.06)
Number of observations	857
Log-likelihood	−38,692.79

Sources: Wage Structure Survey, DMMO, 1992, 1996. Weights: inverse of sampling probability Cost Equation in First Difference (1996–1992). The linear cost equation is based on establishments that had collective terminations in both years or had individual terminations in both years.
Bold: significant at the 5% level, Italics: at the 10% level.

Table 3
Fixed establishment-specific termination costs.

	Terminated twice		Terminated once	
Collective Terminations	Cost	Number	Cost	Number
Mean	1,741,752	93	34,936	17.6
Std	9,692,656	184	3,179,631	19.3
No. obs	129	129	32	32
Individual terminations				
Mean	188,661	5.1	104,531	2.6
Std	1,063,028	3.7	812,663	1.8
No. obs	259	259	152	152

Sources: Wage Structure Survey, DMMO, 1992, 1996. Weights: inverse of sampling probability.
This table excludes establishments that terminate collectively in one year and individually in another as well as those that never terminate any worker.

and those that have not fired in at least one of the two years. As in AK, we contrast establishments with 50 or more employees with those with less than 50 employees. Results are presented in Table 1b. They report the termination costs as estimated from Eq. (2) for the termination decision. The first columns of Table 1b presents generalized Tobit estimates for the largest establishments whereas the second columns presents results for smaller establishments. All coefficients are expressed in French Francs.[17] These numbers can also be directly compared with those presented in Table 1a (cross-section results). Again, the marginal components are quite comparable. We discuss at the end of this subsection the difference in the estimated fixed cost.

For the largest establishments, termination costs appear linear in the number of terminated workers ($97{,}727 \times N$). In addition, the intercept — a measure of the temporal trend between the two years — is not significantly different from zero. In smaller establishments, both the linear and the quadratic terms are (marginally) significant. There, terminations costs are clearly cheaper. The marginal cost of terminating 1 worker in a large firm represents 10 months of the cost paid by the employer for a minimum wage's worker or 14 months at the median wage (not the cost).

Notice also that, in both equations, the correlation between the decision (to fire twice) and the cost equations is never significantly different from zero.[18] This result can be viewed as a (admittedly weak) test of our approach. Indeed, the idea underlying this test, and the general strategy is the following. Assume that all firms face a fixed cost of firing (on top of a proportional cost). Assume again, as stated in the theory that it is heterogeneous across firms. First, in the cross-section as estimated above, the residual would reflect the heterogeneity across firms in this fixed cost. Hence, a small fixed cost (negative residual) should be associated with a large tendency to fire. Conversely, a large establishment-specific cost should be associated with a low tendency to fire. The cross-section correlation should be negative. Exactly as estimated in Table 1a. Now, as soon as the establishment-specific fixed cost is differenced out, there is no potential for correlation between the decision to fire (at both dates) and the costs equation expressed in first difference. Or, put differently, the decision to terminate being taken knowing the costs, most of them stemming from the stringency of labor laws and translated into a firm- or an establishment-specific fixed cost, there is no reason for the two decisions to be related, once the costs, and in particular the fixed part, are observed and conditioned on.[19]

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

Results distinguishing individual and collective terminations are given in Table 2. Models are estimated by maximum likelihood using all observations of establishments with 50 or more employees, the critical size threshold above which firms have to implement a "social plan" for collective terminations. Given the data, in any one year, an establishment faces either collective or individual terminations. In the panel dimension, some establishments terminated workers collectively in both years, when others terminated workers individually in both years, or collectively in one and individually in the other, and, finally, some did not terminate workers in at least one of our two years, 1992 and 1996. To estimate the costs, we assume that fixed costs differ for collective and for individual terminations, even within establishments. Hence, we only keep in the cost part of our system, those establishments that either terminated workers collectively in both years or terminated workers individually, again in both years. This ensures that the fixed cost component specific to the establishment gets differenced out. Results show that, in the costs equation, most coefficients are significantly different from zero. The collective termination procedure[20] is much more expensive than the individual termination procedure. Indeed, the marginal cost of individual terminations is 27,389 whereas the marginal cost of collective terminations is 81,850. As mentioned in Section 2, French labor law requires that firms with 50 or more employees formulate a "social plan" before implementing a collective termination: it undoubtedly increases the proportional component of the separation costs.

Because of collective terminations, "social plans", potential settlements between workers and firms, the threats of legal action (labor courts), the payments after legal action, the proportional component of the costs of terminating workers for economic reasons or cause are quite different from — and much larger than — the legal formulas that were described in our Section on French institutions.

4.2.2.2. The fixed cost of termination. Using the estimated structure of termination costs, we are able to compute an estimate of the fixed cost component of termination costs, separately for collective and for individual terminations. For each type of termination, results are given in Table 3 for establishments that have terminated workers twice (both in 1992 and 1996) and for establishments that have terminated workers once (either in 1992 or in 1996).[21]

[17] All numbers are expressed in nominal French Francs of the year (1992 Francs for the costs in 1992 and 1996 Francs for the costs in 1996). All equations are estimated using the inverse of the sampling probabilities as weights.

[18] In contrast to the cross-section estimation that has, as in AK, a negative and significant correlation between the level of the cost and the decision equation.

[19] Indeed, the decisions equations (for terminations, retirement, or hiring) most often include significant variables even though these variables are measured at the beginning of our analysis period.

[20] So the termination cost for one worker when the total number of terminations is greater or equal to 10.

[21] Notice that some establishments may appear twice since some have fired workers collectively in one year and individually in the other.

Table 4
Explaining the fixed cost of terminations.

Variable	Coef. (Std)	Coef. (Std)
Fixed cost	Collective terminations	Individual terminations
Gross earning per worker	−273.3 (870.0)	−1.0 (4.9)
Share of blue-collar workers	**−1,655.3 (256.4)**	**787.0 (255.3)**
Share of clerks	−1,201.5 (1,041.9)	**−1,124.2 (566.6)**
Share of manager	**16,380 (1,325)**	**6,834.8 (586.7)**
Manufacturing industries	**1,024,227 (449,575)**	−52,417 (046)
Constant	**−686,415 (326,694)**	−6,843.4 (59,091)
Number of observations	343	576
R^2	0.3480	0.2351

Sources: Wage Structure Survey, DMMO, 1992, 1996. Weights: inverse of sampling probability. Bold: significant at the 5% level, Italics: at the 10% level.

Fixed costs of collective terminations are very large, in average 1,741,752 FF for establishments that terminated workers collectively both in 1992 and in 1996, corresponding to the annual labor costs of 10 average employees. They are much smaller, 34,936 FF for those establishments that terminated workers collectively only once. Even though the mean cost differs between those that had two or one collective terminations, both estimates are extremely heterogeneous across firms. In addition, the mere existence of such costs should induce firms to group their terminations, a feature that is clearly present in columns 2 and 4 of Table 3. Given the respective magnitudes of the two components of collective terminations, the largest fraction of these costs come from the number of terminated workers.[22]

Fixed costs of individual terminations are smaller and do not differ across establishments that had individual terminations in one or in both years. Again, these costs are heterogeneous across establishments.

To better understand the source and nature of these fixed costs, we decompose them using observable characteristics of the establishments. Results are presented in Table 4, separately for collective and individual terminations. They show, unsurprisingly, that the more skilled the labor force, as measured by the share of managers, engineers and other professionals, the higher the fixed cost for both collective and individual terminations (remember that severance payments and notice periods depend upon wages and skill-levels at the moment of termination).[23] Except for such professionals (and even for them), the structure of skills within the establishment appears to have a relatively minor impact on the fixed component of termination costs. This result stands in stark contrast with the fixed costs component of collective terminations in manufacturing plants. Indeed, most of the collective terminations that involved "social plans" in France took place in the manufacturing industries.

4.2.3. Retirement

4.2.3.1. The marginal cost of retirement. Table 5 reports our results for the determinants of the retirement costs based on Eq. (2) applied to the retirement decision. Table 5 has the same structure as Tables 1a,b or 2.[24] Coefficients are expressed in Francs.[25]

The retirement costs appear to be mildly concave. The intercept — a measure of the temporal trend between the two years — is not significantly different from zero and imprecisely estimated; the institutional changes that took place between 1992 and 1996 did not translate into obvious costs increases. Therefore, the shape of the retirement costs differs from those estimated for terminations; the former are concave whereas the latter are linear. Again, the two equations behave independently: the decision to retire workers and the entailed costs, measured again in difference, appear to be independent. This independence may have multiple origins. Again, the most likely being that the legislation (collective agreements as well as labor laws) constrains retirement costs on one side and, on the other, retirement is clearly strongly related to age of the workforce and the decision to retire is also very constrained by the legislation. Furthermore, our estimation strategy relies on a retirement cost equation in first difference, in which the establishment-specific fixed cost is not present any more (see our above discussion on terminations).

The marginal cost of retiring N workers is equal to 60,767–388N. Thus, the marginal cost of terminating 1 worker represents 5 months of the cost paid by employer for a minimum wage's worker, or 6.5 months at the median wage (not cost). For comparison, Abowd and Kramarz (2003) estimated this marginal cost (in 1992) to be equal to 27,435–176N with a fixed cost of 579,549 FF.

Table 5
Retirement costs, panel data results.

Generalized Tobit model	
Probit (selection)	Coef (Std)
Intercept	−0.52 (0.52)
Share of manager	0.40 (0.94)
Share of clerks	−0.34 (0.56)
Share of blue-collar workers	−0.14 (0.56)
Manufacturing establishment (yes = 1)	**1.10 (0.24)**
Situation in 1992 (good = 1)	−0.13 (0.22)
Growth in 1992 (positive = 1)	−0.22 (0.21)
Retirement costs	Coef (Std)
Total retirement	**60,767 (16,575)**
Total retirement (squared)	**−194.2 (69.1)**
Intercept	139,570 (426,603)
Correlation	−0.17 (0.53)
Number of observations	1002
Log-likelihood	−242,243.5

Sources: Wage Structure Survey, DMMO, 1992, 1996. Weights: inverse of sampling probability.
Cost equation in first difference (1996–1992).
Bold: significant at the 5% level, Italics: at the 10% level.

Table 6
Fixed establishment-specific retirement costs.

	Terminated twice		Terminated once	
	Cost	Number	Cost	Number
Mean	20,655	11	32,428	2.7
Std	1,030,806	20	370,521	8.5
No. Obs	326	326	221	221

Sources: Wage Structure Survey, DMMO, 1992, 1996. Weights: inverse of sampling probability.

Table 7
Explaining the fixed cost of retirement.

Variable	Coef. (Std)
Fixed cost	
Gross earning per worker	−0.04 (2.04)
Share of blue-collar workers	−35,342 (34,527)
Share of clerks	−41,070 (35,286)
Share of managers	−4196 (51,658)
Manufacturing industries	1085 (26,259)
Intercept	32,900 (31,591)
Number of observations	1133
R^2	0.0022

Sources: Wage Structure Survey, DMMO, 1992, 1996. Weights: inverse of sampling probability. Bold: significant at the 5% level, Italics: at the 10% level.

[22] It must be noted though that, comparing with AK as well as those given in Table 1a, the fixed costs or the proportional costs are not very different across specifications.
[23] Collective bargaining agreements imply that more senior workers also tend to be more skilled. To increase wages within French pay scales, workers sometimes change skills without changing jobs. Hence, controlling for skills is a way of controlling for (unobserved in our data source) seniority, in an imperfect way, admittedly.
[24] Just note that the decision equation includes an indicator for manufacturing establishments, all estimated costs are essentially identical with or without this indicator.
[25] 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). All equations are estimated using the inverse of the sampling probabilities as weights.

Table 8
Hiring costs.

Generalized Tobit model	
Probit (selection)	Coef (Std)
Intercept	**−1.63 (0.31)**
Share of manager	*−1.08 (0.62)*
Share of clerks	**−0.71 (0.36)**
Share of blue-collar workers	*−0.51 (0.32)*
Situation in 1992 (good = 1)	−0.17 (0.18)
Growth in 1992 (positive = 1)	0.04 (0.17)
Hiring costs	Coef (Std)
Total hiring	*910.8 (535.2)*
Total hiring (squared)	*−0.40 (0.25)*
Intercept	135,497 (215,826)
Correlation	−0.09 (0.34)
Number of Observations	534
Log-likelihood	−9800.76

Sources: Wage Structure Survey, DMMO, 1992, 1996. Weights: inverse of sampling probability Cost Equation in First Difference (1996–1992).
Bold: significant at the 5% level, Italics: at the 10% level.

4.2.3.2. The fixed cost of retirement. As before, we compute an estimate of the fixed cost of retirement. Results are given in Table 6 for establishments that have retired workers twice (both in 1992 and 1996) and for establishments that have retired workers once (either in 1992 or in 1996). Fixed costs of retirement are three times smaller than the fixed costs of termination for those firms that retired workers twice, in comparison with those firms that fired workers in both years. For the less active firms, the fixed cost of retiring workers is approximately twice smaller than that estimated for firms that fired workers only once. Notice that, in all cases, they are much smaller than those presented in AK but very heterogeneous. Their existence should induce at least some firms to group their retirements (see again Table 6, columns 2 and 4).

Our least squares analysis of the fixed cost of retirement is given in Table 7. Nothing appears to explain these costs.

4.2.4. Hiring

4.2.4.1. The marginal cost of hiring. Table 8 presents our results for the costs of hiring based on Eq. (2) for the hiring decision. Our numbers, again expressed in Francs, provide estimates of the direct hiring costs, without taking into account training costs and other adjustment costs (such as production lost). Unfortunately, firms are not asked in the ESS to report the training costs that they incur for their new hires. This is unfortunate since they probably constitute a large fraction of adjustment costs in case of a hire.

In Table 8, most coefficients are significantly different from zero (at a level of 10%), except the intercept — again, a measure of the temporal trend between the two years.[26] The marginal cost of hiring N workers is estimated as 910–0.8N. For comparison AK estimated this cost for the year 1992 as 2015–2.84N with a fixed cost of 385,364FF.

Table 9
Hiring costs, long-term vs short-term.

Generalized Tobit model	
Probit (selection)	Coef (Std)
Intercept	**−1.64 (0.31)**
Share of manager	*1.08 (0.60)*
Share of clerks	**−0.71 (0.36)**
Share of blue-collar workers	*−0.51 (0.32)*
Situation in 1992 (good = 1)	0.18 (0.18)
Growth in 1992 (positive = 1)	0.05 (0.17)
Hiring costs	Coef (Std)
Total hiring (CDI, Long-term)	**3164 (1230)**
Total hiring (CDI, squared)	**−8.9 (4.2)**
Total hiring (CDD, Short-term)	622 (569)
Total hiring (CDD, squared)	−0.35 (0.29)
Intercept	159,326 (183,606)
Correlation	−0.12 (0.29)
Number of observations	534
Log-likelihood	−15,440.30

Sources: Wage Structure Survey, DMMO, 1992, 1996. Weights: inverse of sampling probability Cost Equation in First Difference (1996–1992).
Bold: significant at the 5% level, Italics: at the 10% level.

4.2.4.2. Fixed-term contracts and permanent contracts. Table 9 reports costs of hiring by contract type. As mentioned above, French labor laws distinguish between two types of contracts, short-term contracts (up to 18 months, CDD) and indefinite duration contracts (CDI). Results are interesting as they show that hiring on long-term contracts (CDI) is clearly more expensive than hiring on short-term contracts, which appears to have no significant cost. Remember though that separations are much more expensive than any type of hiring. Moreover, the costs of hiring on long-term contracts are (mildly) concave when the costs of hiring on short-term contracts are not: establishments should optimally group their hiring on CDIs and adjust gradually their workforce with CDDs (in line with Abowd et al., 1999a). Finally, because we do not measure entries by skill-level (see data section), we cannot compare our results with those of AK.

Table 10
Fixed establishment-specific hiring costs.

	Hired twice			Hired once		
	Cost	Number CDI	Number CDD	Cost	Number CDI	Number CDD
Mean	1,920	33	88	−25,602	25	54
Std	120,965	45	180	45,697	28	55
No. Obs	210	210	210	54	54	54

Sources: Wage Structure Survey, DMMO, 1992, 1996. Weights: inverse of sampling probability.

Table 11
Explaining the fixed cost of hiring.

Variable	Coef. (Std)
Fixed cost	
Gross earning per worker	−0.35 (0.40)
Share of blue-collar workers	3278 (4814)
Share of clerks	6943 (4893)
Share of managers	5642 (7029)
Manufacturing industries	7221 (5338)
Intercept	−6777 (4429)
Number of observations	627
R^2	0.0085

Sources: Wage Structure Survey, DMMO, 1992, 1996. Weights: inverse of sampling probability. Bold: significant at the 5% level, Italics: at the 10% level.

4.2.4.3. The fixed cost of hiring. We present now our estimates of the fixed cost of hiring. Results are given in Table 10 for establishments that have hired workers twice (in 1992 and 1996) and for establishments that have hired workers once (either in 1992 or in 1996). Fixed costs of hiring are small, much smaller than those incurred for separations, but also extremely heterogeneous. Table 11 presents an analysis of these fixed costs, using as above, firm-level variables to explain the source of such costs. No coefficient is significantly different from zero.

[26] 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). All equations are estimated using the inverse of the sampling probabilities as weights.

5. Conclusion

In this paper, we examine the structure of costs that firms face when adjusting their employment, using panel data on individual establishments for which we directly measure adjustment costs. Our estimation strategy heavily relies on those firms that terminated, retired, or hired workers both in 1992 and in 1996. By doing so, we are able to difference out the establishment-specific fixed cost of adjusting employment. This fixed cost should be related to the tendency of the establishments to adapt their employment stock; its absence in the differenced equation appears to help us estimate adjustment cost equations, diminishing (legitimate) concerns for endogeneity of the adjustment decision.

First, we show that our panel data source is able to reproduce results obtained by Abowd and Kramarz (2003) when we use the cross-section dimension: fixed costs of terminations appear to be very large. However, as soon as one uses the panel dimension of the data, in particular our measures of the termination costs, the number of separations in both 1992 and 1996, together with the longitudinal sample weights, estimated fixed costs are extremely heterogeneous across firms, even conditioning on the collective or the individual nature of the separations.[27] To summarize, collective terminations are much more expensive than individual terminations: legislation, namely the requirement to set up a "social plan" in case of collective terminations, magnifies firing costs. The two components of collective terminations are much larger than those for individual terminations. The former type of separations entail very large fixed costs when the latter induce much smaller costs. In addition, termination costs are essentially linear in the number of terminated workers, with collective terminations being much more expensive. These results are not necessarily surprising since the law strictly limits the use of individual terminations. Finally, the costs of retirement are concave in the number of retired workers with a fixed cost component which is smaller than the one estimated for terminations, and quite smaller than that obtained by Abowd and Kramarz (2003).

Finally, we find that hiring costs are small and seem only present when hiring on CDI; costs of hiring on short-term contracts are almost zero, confirming the finding that fixed-term contracts represent the bulk of hires in France (see Abowd et al., 1999a). 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 addition, we are able to estimate a firm-specific fixed cost of terminating, retiring, and hiring workers for each establishment in our data source. This is the first paper to do so. Our results show that, in France, adjustment costs display at least two sources of lumpiness — the concave shape of these costs and an heterogeneous fixed cost of separation — which may explain why firms tend to prefer large adjustments over small ones. Legislation has a central role in the structure and magnitude of the costs. First, because procedures for individual terminations and collective terminations largely differ (in particular when firms must implement a "social plan"), the distinction has a strong and clear impact on the level and structure of termination costs. Furthermore, because the economic rationale behind the termination of workers for economic reasons is often disputed,[28] the threat of legal action before labor courts is a serious issue for firms. Hence, firms are often willing to pay costs for terminating workers that are quite different from — and much larger than — the legal formulas that are in force in France. Indeed, these formulas provide little information in most cases and econometric analysis based on real data is the only serious way of measuring these costs. However, when we try to analyze the origin of the fixed costs, they appear to be unrelated to simple measures of firm heterogeneity. Indeed, even though the details and magnitudes of our findings are French-specific, their flavor is very similar to the facts contained in Caballero et al. (1997) who emphasized the non-convexities in the adjustment technology of American manufacturing establishments.

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

Appendix A. Data appendix

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).[29] 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.

Our second data source is the Monthly Worker Movement Report (Dé claration 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.[30] Although this administrative report was created in 1975 as a part of the government's monitoring of employees terminations, it was fully computerized in

[27] As AK estimated a unique fixed cost for the entire economy.

[28] When they fire for economic reasons, firms are allowed to maintain their competitiveness but not to increase it.

[29] For more details on the survey, see Guigon, 1996.

[30] For more details on the survey, see Chazal et al., 1992.

1987 for all of France. Each establishment with at least 50 employees must report for each employment movement:

- The nature of the transaction (hire, transfer, quit, retirement and termination);
- The skill level of the job involved;
- Age and seniority of the employee involved.
- All these variables are aggregated at the level of the establishment on a yearly basis.

Table A1
Descriptive statistics.

	Obs	%
Manufacturing industries	659	50.4
Service industries	345	26
No response	324	32.6
10–50 employees	213	16
50–100 employees	134	10.1
100–200 employees	152	11.5
More than 200 employees	829	62.4
	Mean	StDev
Employment in 1992	637.9	1,209.50
Employment in 1992 (full weights)	38.5	194.7
Employment in 1992 (1992 weights)	182.3	645.9
Employment in 1996	550.3	1062.9
Employment in 1996 (full weights)	35	168.5
Employment in 1996 (1992 weights)	166.2	565.8
Hiring in 1992 (full weights)	12.4	49.3
Hiring in 1996 (full weights)	18.4	56.2
Firing in 1992 (full weights)	1.1	9.7
Firing in 1996 (full weights)	1	4.3
Firing in 1992 (full weights, excluding zeroes)	8.4	25.2
Firing in 1996 (full weights, excluding zeroes)	5.9	9.1
Firing cost per person (full weights, 1992)	24,963	95,617
Firing cost per person (full weights, 1996)	34,983	282,502
Firing cost per person (full weights, 1992, for economic reasons)	149,802	451,521
Firing cost per person (full weights, 1996, for economic reasons)	87,589	625,870
Retirement cost per person (full weights, 1992)	72,263	197,574
Retirement cost per person (full weights, 1996)	32,439	135,406
Hiring cost per person (full weights, 1992)	388	4003
Hiring cost per person (full weights, 1996)	647	7678

Sources: Wage Structure Survey, DMMO, 1992, 1996. Full weights: product of 1992 and 1996 weights.

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