The Entry and Exit of Workers and the Growth of Employment:

An Analysis of French Establishments

by

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Abstract

Using data that permit a distinction between flows of workers, directly measured, and job creation and destruction, again, directly measured, we develop employment and job flow statistics for a representative sample of French establishments for 1987 to 1990. Annual job creation can be characterized as hiring three persons and separating two for each job created in a given year. Annual job destruction can be characterized as hiring one person and separating two for each job destroyed in a given year. When an establishment is changing employment, the adjustment is made primarily by reducing entry and not by changing the separation rates. There is considerable simultaneous hiring and separation, even controlling for skill group. Two-thirds of all hiring is on short term contracts and more than half of all separations are due to the end of these short term contracts.

JEL Classifications: J23, J60, D24

1. Introduction

In this paper we stand at the junction of three diverse strains of the economics literature. One strain considers the macroeconomic consequences of the creation and destruction of jobs on the behavior of aggregate employment and unemployment. The second strain models the employment adjustments of firms as a response to changes in the economic conditions they face and the internal structure of their labor force and costs. The final strain models the creation of firm-specific human capital associated with the selection and training of employees who are optimally matched to the firm. Each of these literatures begins with a detailed model of the behavior of firms when faced with heterogeneous potential employees and/or heterogeneous market conditions. The modeling of this heterogeneity is normally constrained by the absence of detailed data on the firm's actions and the employee's characteristics.

Since the publication of the U.S. gross job creation and destruction statistics calculated by Leonard (1987), Dunne, Roberts and Samuelson (1989), and Davis and Haltiwanger (1990, 1992), several such analyses have appeared for other countries (OECD 1994). More recently, better access to detailed microeconomic data in a variety of countries has allowed researchers to study in greater detail the various statistical and economic relations among job and worker flows. Beginning with an extensive collection of eight U.S. state unemployment system records, which contained individual data on ten to fifteen percent of the state work forces, Anderson and Meyer (1994) computed both job creation/destruction rates and worker total accession and separation rates.[1] They find, among many other reported results, that the quarterly total accession rate is three times the size of the job creation rate and that the comparable total separation rate is also three times the job destruction rate (1978 to 1984). Burgess, Lane and Stevens (1994) use similar Maryland administrative data to find that hires plus separations occur at a rate of 24 percent per

quarter whereas job reallocations occur at a rate of thirteen percent (in manufacturing) and slightly higher numbers in nonmanufacturing (1985 to 1993). Using Danish administrative data that matches workers to their firms, Albæk and Sørensen (1997) report an average hiring rate of 28 percent, approximately twice the job creation rate, and a separation rate, essentially identical to the accession rate, and also twice the job destruction rate (manufacturing, 1980 to 1991). Using annual firm-level Dutch data, Hamermesh, Hassink and van Ours (1996) showed that worker turnover (hiring plus separation) is about three times the magnitude of job reallocations, creations plus destructions, (all industries 1988 and 1990). They also reported statistics on (1) simultaneous hiring and terminations within the same year and (2) internal mobility. Finally, Lagarde, Maurin and Torellli (1995) using some of the same French data sources, in their annual versions, that we employ in this study find that total entries and exits of employees are about four times greater than job reallocations (all industries, 1987 to 1992). These latter statistics may not be directly compared to Davis-Haltiwanger style computations because their total entries and exits include activity that occurs entirely within one year.

At the heart of the empirical and theoretical discussion of employment and job flows is the emerging view, championed in the work of Davis and Haltiwanger but clearly visible in the other studies cited above, that between-firm heterogeneity, even within the same detailed industry, is enormous. This heterogeneity is manifested in the simultaneous creation and destruction of jobs by establishments in the same industry (Davis and Haltiwanger 1990). A related phenomenon, between-worker heterogeneity, is well-documented in an enormous number of studies (see Willis 1986, for example) and is further reflected in the employment flows literature in the simultaneous hiring and separation of workers at the same establishment (Anderson and Meyer 1994). Allocative shocks provide the main theoretical motivation for explaining the simultaneous

destruction and creation of jobs. Imperfect information, either in the form of an information asymmetry (Gibbons and Katz, 1991), or in the form of match heterogeneity (Jovanovic 1979, 1984 and Topel and Ward, 1992), is the theoretical engine for explaining the simultaneous hiring and separation of workers. A critical missing component of the literature, and one that we can directly address, is the ability to measure job and worker flows at the establishment level in conjunction with enough detailed information about the employee to control for both observable skill differences among employees and observable employment contractual arrangements at hire and at separation. Such an analysis provides the essential set of empirical regularities that permit us to disentangle the relative importance of these theoretical models.

Although we cannot resolve all of the theoretical and measurement issues surrounding the differences between job creation/destruction models and accession/separation models, by using a carefully constructed sample of French establishments, for which we can measure monthly hiring, transfers, quits, terminations, seniority at exit, and stocks of employees for five skill groups and two types of employment contracts from 1987 to 1990, we provide direct evidence on the relative importance of each of these flows in the employment adjustments of the establishments. Specifically, we address the extent of entry and exit of workers associated with job creation and destruction, the role of skill in the simultaneous hiring and separation rates, the relative importance of short and long term employment contracts in the adjustment process, and the cyclical sensitivity of the employment flows as compared to the job creations and destructions.

Measures of employment transactions at the establishment level, detailed information about the employment transactions and the direct measurement of contract type are distinct advantages of the French data. We use the type of employment contract--short versus long term--as a proxy for match-specific investments. Hence, in comparison to the earlier studies cited

above, we are able (1) to use a sampling frame representative of establishments to construct the analysis files, (2) to use multiple data sources to identify and correct errors; (3) to analyze data at the monthly level; (4) to study movements and stocks for several worker skill levels; (5) to make use of contract type at entry and separation type at exit; and (6) to measure worker seniority at exit. The disadvantages of our analyses include: (1) a relatively short time period, (2) relatively little individual data (no wage information, for example) all of which we aggregated to the monthly establishment level; (3) a limitation to establishments with 50 or more employees.

Excluding within year entry and exit, we show that annual job creation activity can be characterized as hiring three persons and separating two for each job created in a given year. Job destruction can be characterized as hiring one person and separating two for each job destroyed in a given year. If we also include in our measures the within-year entry and exit of workers, the total entry and exit rates approximately double. Establishments with stable annual employment have entry rates (excluding within year activity) that are half the entry rates of growing firms and exit rates that are three-fourths the exit rates of shrinking firms. Two-thirds of all hiring occurs into short term contracts and more than half of all separations are due to the end of these short term contracts. When an establishment is shrinking the adjustment is made by reducing entry (short and long contracts, and transfers) and not by increasing separations. Match-specific investments and search are apparently important components of these flows. For the highest skill groups ten percent of months with firm-initiated exits also have new hiring in the same skill group. For the lowest skill groups 25% of the months with firm-initiated separations also have new hiring in the same skill group. Approximately one-third of all short term employment contracts are converted to long-term contracts at their termination. We find that most worker flows are procyclical (often with a one year lag). We also find that employment adjustment occurs primarily

through changes in the entry rates (often of short-term contract workers) and not through the exit rates (except for quits). The rate of internal promotion into higher skilled positions is about three times the size of net employment changes inside the job category.

The next section describes the data sources and our methods for sampling, matching, and verifying the various elements of the flows. Section 3 presents the variable definitions and the statistical models we estimated. Section 4 shows our results. Section 5 reconsiders some of the theoretical motivations for employment flow research, providing an interpretation of our key findings. Section 6 concludes.

2. Data Description

We use data from four different ongoing surveys conducted by the Institut National de la Statistique et des Etudes Economiques (INSEE, the French national statistical agency). The first of these surveys is the 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. Our second source is the Enquête sur la Structure des Emplois (ESE), which is an annual administrative data base of the occupational structure for all establishments with more than 20 employees. The third source is the Echantillon d'Entreprises (EE), which is a probability sample of the annual financial and employment data for firms with at least 20 employees. The EE data are drawn from two administrative reports: the Bénéfices Industriels et Commerciaux (BIC) and the Enquête Annuelle d'Entreprise (EAE). The final source is the registry of all establishments in France (SIRENE), which shows the birth and death dates of all registered business establishments. We describe below the methods we used for sampling and extracting variables from each of these surveys as well as the matching process we used.

DMMO: Although this administrative report was created in the 1970s as a part of the government's monitoring of employee terminations, it was first computerized in 1987 for all of France. Each establishment with at least 50 employees makes a monthly declaration of beginning of the month employment, end of the month employment, total entries within the month, and total exits within the month.

For each employment movement a respondent establishment reports the nature of the transaction as:

(a) Hire-long term contract (contrat à durée indéterminée, CDI)

(b) Hire-short term contract (contrat à durée déterminée, CDD)

(c) Trial hire (période d'essai)

(d) Transfer in (entrée par transfert)

(e) Transfer out

(f) Quit (démission)

(g) Exit for military service (départ au service national)

(h) Exit for sickness or death

(i) End of short term contract (fin de CDD)

(j) End of trial hire (fin de période d'essai)

(k) Retirement and early retirement (retraite et préretraite)

(l) Termination for economic reasons (licenciement économique)

(m) Other terminations, including for cause (autre licenciement);

For each employment transaction, the skill level of the job involved (two-digit occupational code, CS), the age, and seniority of the employee involved are also reported. We created categories of movements by grouping the following transactions into the same category: long term contract

hires (a); short term contract hires (b and c); transfers in (d); transfers out (e); quits (f, g, and h); end of short term contract (i and j); retirements (k); and terminations (l and m). We also grouped skill levels into five categories: engineers, professionals, and managers; supervisors and technicians; clerical workers; skilled blue collar workers; and unskilled blue collar workers. We calculated the average age and seniority for each category of movement.

ESE: We used the 1987 to 1991 ESE files aggregated to the enterprise level. Each survey refers to the preceding calendar year; thus, we have information for end of year variables from 1986 to 1990. From these files we extracted: (1) December 31 total employment at the firm; (2) the number of establishments reflected in the ESE aggregations; (3) official number of establishments according to the SIRENE; (4) December 31 employment in each of the five skill groups described in the DMMO using the same CS codes and aggregates.

EE (BIC/EAE): The EE, a probability sample of French firms, provides the sampling frame for the present study. Firms (synonymous with enterprises for our purposes) with more than 500 employees were sampled with probability 1; firms with 50 to 499 employees were sampled with probabilities ranging from 1/4 to 1/2 depending upon the industry, smaller firms were sampled with probability 1/30 but are excluded from this study because the DMMO is based on establishments with at least 50 employees (therefore enterprises with at least 50 employees, *a fortiori*). The EE is dynamically representative of French enterprises in all sectors except the public sector.[2] From this source we use the weight (non time varying) and average employment during the year for the years 1987 to 1991.

SIRENE: The registry includes an event history for all French establishments and their associated enterprises (firms). We used the number of establishments per firm, the establishment creation date (birth date), the establishment destruction date (death date), the dates of passage

above and below the 50 employee threshold, and a record of the transfer of business operations between establishments within and across enterprises. We used the date information to verify the validity of establishment entry and exit within the DMMO; that is, we verified the establishment sample composition with respect to the universe of eligible establishments for each month of the sample. Hence, all births and deaths of establishments and firms have been verified. Establishments or firms that appear for the first time in the sample, but are not true births, get initial employment data from the SIRENE and are not treated as births. Similarly, establishments or firms that disappear from the sample, but do not die, get terminal employment information from the SIRENE and are not treated as deaths. To eliminate holes in our data resulting from passage above and below the 50 employee threshold, we used reported information from smaller (< 50 employees) establishments if it was available. We used the transfer information to eliminate false creations and destructions of establishments when the original establishment and the new establishment were, according to the SIRENE, destroyed and created sequentially within the same enterprise at the same location.

Creation of the matched data file: The basic DMMO file contains information for 47,903 establishments (1987-1990) from 31,336 enterprises (private and semi-public) with a total of 152,526 establishment-year observations. The basic ESE file contains information for 106,147 enterprises with 218,755 enterprise-year observations for the 1986-1990 period when we retain only those enterprise-year combinations present for at least two consecutive years. These two files were matched on the basis of the firm identifier (Siren number) with no side constraints. The resulting file contains 44,302 establishments from 28,154 enterprises, for which we therefore have beginning and end of year enterprise employment (source: ESE). From this file we computed the following measures of data availability:

(a) the first and last month of data availability for each establishment in the DMMO.

(b) for each establishment at a given firm, the number of months of DMMO responses and the number of continuously available months.

(c) the first and last year of data availability for the firm in the ESE.

The DMMO-ESE matched file was matched with the EE for all firms in the EE present for at least one year from 1987 to 1991. The resulting file (now a probability sample of firms) contains information for 7,631 firms and 18,278 establishments with 168,437 establishment-month observations.

At this point in the data processing we searched for the best method of creating life histories for the establishments in the DMMO by comparing the implied size of the firm given by each method with the measured sizes from the ESE and EE data. There were two reasons for loss of data due to this control process: (1) we could not do the necessary computer and manual checks for firms with more than 25 establishments, which were, therefore, eliminated at this point;[3] (2) the implied best history of DMMO establishment data was incompatible with the sampled ESE history.[4] The retained history of employment flows within establishments had the best fit with the independently measured annual employment data at the firm level (source: ESE and BIC/EAE). The resulting file contained 5,229 enterprises with 13,177 establishments.

Next, we dealt with the problem of incomplete DMMO information. We eliminated firms and their establishments with any one of the following problems:

(a) the number of monthly establishment records was less than 50% of the number of at risk months; that is, if the establishment was alive for all 48 months, it had to have at least 24 months of data, whereas if it was alive for only 3 months, given the SIRENE information, it had to have data for at least 2.

(b) if an index of excess variability in the changes from year to year in the structure of employment by occupation (source: ESE occupation aggregates shown above) was too large.[5]

(c) if an index of disagreement between the annual firm-level employment obtained from aggregating the monthly DMMO establishments and the directly measured annual employment (sources: ESE and BIC/EAE) was too large. The resulting file contained 3,022 enterprises with 5,997 establishments. We computed *ex post* weights for the enterprises in this file using the procedure described below.[6]

Finally, we addressed the problem of internal consistency in the monthly DMMO reports. At this point we formalize our decision rule: we consciously chose to favor accuracy in the reported movements over *ex post* representativity of the sample. We dealt with the sample selection problems by constructing *ex post* weights. We retain all establishments that have essentially complete and internally consistent monthly histories. The definition of an essentially complete history is that the establishment had at most one missing month in the middle of the sequence of months that should have appeared according to the SIRENE establishment information. The definition of internally consistent was that the difference between the reported end of month employment for month t and the reported beginning of month employment for month $t+1$ was no greater than three in absolute value for any month. The resulting file contains 1,669 enterprises with 2,009 establishments and 84,720 establishment-month observations.

Appendix Table A.1 shows the representativeness of the 1,669 enterprise samples by industry. Certain industries are underrepresented in this analysis sample as compared to the EE sample of firms. Most of the nonrepresentativeness of the 1,669 firm sample is due to problems with smaller firms (20 to 99 employees). The most seriously under-represented industries are "Hotels, Restaurants and Cafés," "Transportation Services," "Business Services," and "Household

Services." The most seriously over-represented industries are "Nonferrous Metal Manufacturing," "Glass Manufacturing" and "Textiles and Apparel." We cannot improve the representativeness of the 1,669 firm sample without introducing other serious data difficulties; however, We provide evidence below that the smaller analysis sample gives substantially the same statistical results as the larger 3,022 firm sample.

Computation of the ex post weight: We began with the master BIC file, which includes a record for every enterprise with 20 or more employees in the for-profit private and semi-private sectors. For 1991, we computed a table of the number of enterprises by size of enterprise and 2-digit industry (NAP 40) in this BIC master file. Then, we calculated the same table for our 3,022 and 1,669 enterprise samples, respectively. The *ex post* weight is the inverse of the ratio of the cell count for our sample over the cell count for the BIC master file.

Imputation of missing data: Missing data arise because some of the individual transactions are not reported whereas the included establishments have complete reports of total movements at the establishment-month level. The case of excess individual transactions never occurs. For the establishment-months in which the individual transactions are completely missing, we compute the structure of the movements for the other months in the year and impute the missing month(s) as the product of the reported entries and exits times the average structure of movements in the observed months of the same year. For the establishment-months in which the individual transaction reports are incomplete, we impute the missing transactions as the product of total excess entries and exits (reported total minus the sum of reported transactions) times the structure of the observed transactions in the month. An additional 926 establishment-months were eliminated because this imputation procedure detected noncorrectable anomalies in the reports.

Computation of promotion data: Because our analysis file contains consistent movement and stock histories for each establishment-month and consistent stocks by skill level for each enterprise-year, we are able to compute the number of internal annual promotions at the firm level implied by the structure of movements by skill level. To allow consistency with our procedure for selecting establishments with consistent ESE data, we calculated the promotions using only three skill levels: engineers, professional and managers; supervisors and technicians; and all others. We calculated the total employment in the retained establishments for each enterprise (source: DMMO). We multiplied this stock by the percentage of total employment that is in each of the three skill groups (source: ESE). For the highest skill group (1), the annual number of promotions was computed as:

$$P_{1,t} = X_{1,t+1} - X_{1,t} - \sum_{m=1}^{12} E_{1,t,m} + \sum_{m=1}^{12} S_{1,t,m}$$

where $P_{a,t}$ is the number of promotions to skill level *a* during year *t*, $X_{a,t}$ is the stock of skill level *a* at the beginning of year *t*, $E_{a,t,m}$ is the number entries into skill level *a* during month *m* of year *t*, and $S_{a,t,m}$ is the equivalent variable for exits. If the promotion estimate is negative, promotions are set to zero for this year, skill-level, and firm and a variable labeled remainder, $R_{a,t}$, is set to this negative number. For the middle skill group, promotions are computed using the following formula:

$$P_{2,t} = X_{2,t+1} - X_{2,t} - \sum_{m=1}^{12} E_{2,t,m} + \sum_{m=1}^{12} S_{2,t,m} + P_{1,t}$$

Again, if the promotion estimate is negative, it is set to zero and the remainder variable for $a = 2$ is set equal to the this negative number. Finally, we compute the remainder for the lowest skill group as:

$$R_{3,t} = X_{3,t+1} - X_{3,t} - \sum_{m=1}^{12} E_{3,t,m} + \sum_{m=1}^{12} S_{3,t,m} + P_{2,t}$$

Summary: The creation of the data used in this paper was clearly a complex process involving many French data sources. Copies of the computer programs and data file documentation are available from the authors.

3. Statistical Formulas for Job and Worker Flows

For a given establishment (*j* subscript omitted below), we define the following job and employment flows. The year to year job creation rate is:

$$C_t = \max\left(0, \left(\frac{2\left(X_{t+1} - X_t\right)}{X_{t+1} + X_t}\right)\right)$$

where X_t is the stock of employees at the beginning of year *t* (aggregated over all skill groups). This formula is exactly analogous to the Davis and Haltiwanger definition. We use calendar year employment accounting to maximize comparability with their statistics. The year-aggregated monthly job creation rate is:

$$C_{t,\bullet} = \sum_{m=1}^{12} \max\left(0, \left(\frac{2\left(X_{t,m+1} - X_{t,m}\right)}{X_{t,m+1} + X_{t,m}}\right)\right)$$

where $X_{t,m}$ is the stock of employees at year *t* at the beginning of month *m* (aggregated over all skill groups). This measure is not strictly comparable to the Davis and Haltiwanger measure; however, it permits us to look at the within-year job creation activity of all firms. The year-to-year job destruction rate and the year-aggregated monthly job destruction rate are, respectively:

$$D_t = \max\left(0, \left(\frac{2\left(X_t - X_{t+1}\right)}{X_{t+1} + X_t}\right)\right)$$

$$D_{t,\bullet} = \sum_{m=1}^{12} \max\left(0, \left(\frac{2\left(X_{t,m} - X_{t,m+1}\right)}{X_{t,m+1} + X_{t,m}}\right)\right).$$

The total entry rate for workers is given by:

$$ER_t = \left(\frac{2\sum_{m=1}^{12} E_{t,m}}{X_{t+1} + X_t}\right)$$

where $E_{t,m}$ is the number of entries during month *m* of year *t*. The entry rate excluding within year entry is given by:

$$ER_t^* = \left(\frac{2\left(\sum_{m=1}^{12} E_{t,m} - S_t^S\right)}{X_{t+1} + X_t}\right)$$

where

$$S_t^S = \sum_{m=1}^{12} S_{t,m} \times \mathrm{I}\left[sen_{t,m} \le m\right]$$

and $sen_{t,m}$ is the average seniority of exiting short term contract workers in month *m* of year *t* and I[.] is the indicator function for the condition [.]. Notice that we only have data concerning the average seniority of these workers and not the individual seniority of the short term contract workers who leave. Nevertheless, this measure effectively excludes entry of workers who were hired and terminated within the same calendar year. The total exit rate is given by:

$$SR_t = \left(\frac{2\sum_{m=1}^{12} S_{t,m}}{X_{t+1} + X_t}\right)$$

where $S_{t,m}$ is the sum of all terminations in month *m* of year *t*. The exit rate excluding within year exit is:

$$SR_t^* = \left(\frac{2S_t^L}{X_{t+1} + X_t} \right)$$

where

$$S_t^L = \sum_{m=1}^{12} S_{t,m} \times \mathrm{I}\left[sen_{t,m} > m \right].$$

Once again, this measure excludes the exits of short term contract workers who were hired and terminated entirely within one calendar year.

4. Results

4.1. The Magnitude of Worker and Job Flows

Table 1 reports summary statistics for the rates of job creation and destruction and for the rates of entry and exit of workers, calculated on an annual basis. (All tables appear at the end of the text.) The table shows these flows for establishments that experienced employment growth, decline and stability between the beginning and the end of each calendar year from 1987 to 1990. For each group of establishments, panel A displays results weighted by the sample *ex post* weights (representative of establishments) whereas panel B reports results weighted by the product of these *ex post* weights and average employment over the year (representative of workers). The measures of central tendency differ hardly at all; however, the dispersion is much greater in panel B.

Consider first the column "Year-to-Year Creation Rate" for those establishments with increasing employment during year *t*. On average, such establishments created 7.556 jobs per 100 workers. In order to compare the job creation rate with employment flow statistics, we use entry

and exit rates that eliminate all within-year entry and exit. Thus the "Entry Rate (no within year entry or exit)" measure in the fourth column, which only counts accessions in a given year for workers who are still in the establishment at the end of the same year, is the appropriate employment flow for our comparisons. Similarly, the exit rate in column 5, "Exit Rate (no within year entry/exit)" counts only those separations within a given year for workers that entered the establishment before the beginning of this same year. These appropriate employment flow rates (columns 4 and 5) are, respectively, three times and two times larger than the year to year job creation rate. Hence, eliminating churning, the annual creation of one job entails three hirings and two separations. The equivalent numbers for the establishments with decreasing employment in year *t* are, respectively, one accession and two separations for each destroyed job in a given year.

For all establishments, we also computed the "Year-Aggregated Monthly Creation and Destruction Rates" (columns 2 and 7, respectively) by aggregating, for a given establishment over a given year, the monthly creation rates when the monthly employment increased and the monthly destruction rates when the monthly employment decreased. For the growing establishments, the average increase of 7.556 jobs per 100 workers during year *t* is associated with a within-year creation of 17.386 jobs per 100 workers and a within-year destruction of 9.944 jobs per 100 workers. These measures should be compared to the total entry and exit rates in a given year (columns 3 and 6, respectively). The total entry rate is approximately twice the year-aggregated monthly creation rate and the total exit rate is three times the year-aggregated monthly destruction rate. These different measures demonstrate the intensity of accessions, separations, and employment movements for those plants that increase employment in a given year. For those establishments at which employment decreases, these ratios are reversed. Surprisingly, those establishments with stable employment in a given year are also very active. For instance, the

monthly creation rate for stable establishments is slightly larger than the one for shrinking establishments and their monthly destruction rate is equal to the one for growing establishment. Finally, their entry and exit rates (with no within year entry/exit) lie between those for the growing and shrinking establishments. However, their total exit rate is smaller. Stable establishments are not inert.

If we compare entry rates (both measures) of growing and shrinking establishments, on the one hand, and exit rates (both measures) of growing and shrinking establishments on the other, the latter are roughly equal for the two groups of establishments and the former are much larger for those establishments with growing employment in a given year. *Hence, establishments shrinking in a given year reduce employment by reducing entry, and not by increasing separations*. This feature will be found repeatedly in our analysis. We note that this feature of the French data is consistent with the findings of Anderson and Meyer (1994), using U.S. UI data, as well as those of Albæk and Sørensen (1997) for Danish Manufacturing (both use matched employee-employer datasets).

Table A.2 in the Appendix shows that our results are essentially unchanged when we use the 3,022 enterprise dataset, which includes many establishments that have incomplete data. Hence, because of the better quality of the smaller dataset, which includes only 1,669 firms, we will restrict our analysis to the latter.

The key finding, that employment adjustments occur through entry adjustment in French establishments, warrants further investigation. Figure 1 shows estimated total entry and total exit rates as a function of the establishment growth rate. The entry and exit rates shown in the figure have been adjusted to remove fixed establishment and year effects. The figure shows that for almost all establishment growth rates (from -17% per annum to more than 20% per annum) the

employment exit rate, adjusted for establishment and year effects, is essentially constant at about 25 exits per 100 employees annually. At the establishments shrinking the most, the employment exit rate rises. On the other hand, the employment entry rate is positively related to the establishment growth rate over the entire range of annual establishment growth rates. The figure thus confirms that the employment entry rate is quantitatively more important factor than the employment exit rate in adjustments of the size of French firms. To further elaborate, note that the sum of the job destructions for all establishments that destroy employment is 219.4. In contrast with the results in Davis and Haltiwanger, the sum of the job destructions for establishments with growth rates less than -20% (greater than 20% in absolute value) is only 60.4, which is substantially less than half of all job destructions.[7] Therefore, while the bulk of job destruction does come from establishments that destroy many jobs, French job destruction rates, in contrast with American ones, are more concentrated around zero. Almost no French establishment shrinks as much as those which shrink in the United States (see Nocke, 1994). For French establishments, it is those with growth rates less than -12% that account for half of all job destruction.

Table 2 shows the same analysis as Table 1 but is based upon monthly data. The month to month creation rate for growing establishments implies that 3.004 jobs are created per 100 workers in each month. Creation of one job corresponds to 1.5 accessions and 0.5 separations for those establishments, approximately. Results for shrinking establishments are roughly comparable. Stable establishments also display non-negligible entry and exit activity. Each month one worker (per 100 workers) enters and one worker (per 100 workers) exits the stable establishments.

Table 3 reports accessions and separations for manufacturing industries on one side and service industries on the other. As expected, employment turnover is larger for the service industries. This is particularly notable when comparing entry rates for increasing and shrinking establishments. The entry rate (excluding within year entry and exit) at growing establishments is 1.4 times larger in the service industries. This rate is twice as large for those establishments in service industries with decreasing employment, again as compared to manufacturing establishments. Within both sectors, the exit rates of the growing and shrinking establishments are very similar. In manufacturing industries, the entry rate (excluding within year entry and exit) of growing establishments is three times that of shrinking establishments. Finally, reflecting the better economic conditions in service industries, the destruction rate is lower than in manufacturing.

Table 4 reports the distribution of three proportions: "no entry and no exit", "entry or exit" (but not both), and "simultaneous entry and exit". Each proportion is computed for each establishment as the ratio of the number of months with no entry and no exit (entry or exit, entry and exit, respectively) to the total number of months the establishment appears in the sample. Establishments have accessions or separations almost every month, as shown by the distribution in the first line. A majority of our 2,009 establishments hire or terminate workers 92 percent of all months (see the median entry). Notice, however, that in comparison with the other lines of the table, the "no entry and no exit" distribution is the most skewed of the three. Thus, employment adjustments are not made in all establishments in a similar fashion. In some, adjustments are continuous and smooth, in others adjustments are more lumpy.

French establishments use the employment entry rate more than the employment exit rate as the main tool for adjusting employment. Most establishments engage in simultaneous entry and

exit of workers, increasing the entry rate when there is job creation and decreasing the entry rate when there is job destruction. For the very largest job destructions, establishments shrinking at the fastest rates, the employment exit rate is increased while the employment entry rate is reduced.

4.2 Worker and Job Flows Analyzed by Skill Level

Table 5 reports the total entry and exit rates for our five skill-levels. These measures are computed as the number of entries (exits) in a given year in one skill-level divided by the average total employment in the same year. Because our measures of the skill-structure are only available at the firm-level and at the beginning of each calendar year (using the ESE), there is no way to track the monthly stock of employees in each skill-level for each establishment. Even though our dataset includes both manufacturing and non-manufacturing establishments, more than a half of the movements come from blue-collar workers (skilled or unskilled). Furthermore, 80 to 90 percent of the movements come from the three lower-skill groups, which represent only 60 percent of the skill structure. For the growing establishments, the ratio of entry to exit is roughly constant across skill-levels with entries equal to 1.3 times exits. On the other hand, the entry-to-exit ratio displays more variability for the shrinking establishments. Entry of engineers, managers and professionals and entry of skilled blue-collar workers are much lower fractions of exits than are entries of other categories of workers. Although exit rates are comparable for growing and shrinking establishments for all skill-groups, entry rates differ significantly. The ratio of entry rates for growing establishments to entry rates for shrinking establishments goes from 1.5 for unskilled blue-collar workers and clerical workers to 2 for skilled blue-collar worker.

Even within skill levels, most of the time there is simultaneous entry and exit. To further investigate this finding, Table 6 reports statistics on simultaneous (i.e. the same month) hiring and separation for the same skill-level conditional on the absence of quits. First, we calculate for each

establishment the empirical probability of having separations but no quits in a given skill-level and month. Next, we compute the probability of having a simultaneous hire in the same month in the same establishment, and in the same skill-level. We allow for quits in this calculation in the following case: when there are n quits in the establishment in a given month and skill-level along with other types of separations, the numerator includes those establishment months where the number of hires is at least n+1. The probability of simultaneous entry and exit is a decreasing function of the employee's skill-level-- 7.6 percent for engineers, professionals, and managers and 23.9 percent for the unskilled blue-collar workers.

The statistics in Tables 5 and 6 demonstrate that matching may be an important issue on the French labor market, in particular for those skill-levels with less education and, therefore, little signal given by schooling. In the lower skill occupations, employment entry and exit rates are very large regardless of whether the establishment is creating jobs, destroying jobs or remaining stable. Indeed, for clerical and unskilled blue collar occupations, the employment exit rate is larger for growing establishments than for shrinking ones. For these same two occupational categories, establishments are hiring and separating employees in the same month about 20% of the time.

Table 7 shows the promotion rates and a statistical decomposition of employment change into entry, exit, promotion and error for each of the three aggregated skill levels in each of the years. These rates were computed as the percentage of total average employment in each year, averaged over our establishment sample, weighted by the ex post weights. The statistics can all be interpreted as in the following example. Consider skilled workers in 1987, the rate of employment change over the year was 0.233 percent, which equals 0.108 percent of excess entries over exits, plus 1.227 percent promotions from unskilled workers less 0.636 percent

promotions to technicians, etc., plus -0.466 percent calculation error. Clearly, the nature of our statistical sources does not permit an exact calculation of the components of employment change. We have the most confidence in the employment rate of change because we were able to verify employment stocks from several sources. We also believe that the entry and exit rates are quite accurate. It is, therefore, interesting to note that our estimated promotion rates are, in general, much larger than the error rates, which suggests that even though we had to impute these rates from matched data sources with multiple measurements, there is reason to believe that we have correct magnitudes. Thus, employment is growing in our highest skill category exclusively because promotions outnumber the loses from excess exits by about ten to one. Employment is growing in our middle skill category because of excess entry but also, and more importantly, because promotions into the category outweigh promotions out of the category by more than two to one. Finally, employment is growing in the last category, where, because the error is larger relative to the other rates, we cannot say with reliability that excess entry outweighs promotions to higher skill categories although in an accounting sense that must be the case. The magnitude of our promotion results are quite similar to those of Hamermesh, Hassink and van Ours (1996) for Dutch firms where the data are directly reported.

4.3 The Role of Contract Types in Employment and Job Flows

We discuss next the employment flows by type of contract. We have already seen that hiring accounts for much of the variability in employment movements for all types of establishments. We now show how the hiring variability is accomplished within French employment practices.

In France, employees may be hired on long-term contracts (contrat à durée indéterminée or indeterminate duration contract, CDI) or on short-term contracts (contrat à durée déterminée

or determinate duration contract, CDD). Since 1982, employment contracts have all been long-term (CDI) unless the employee and job qualify for a fixed duration contract (CDD). Short term employment contracts existed prior to the legal changes in 1982; however, designation of a contract type was less important because the CDI were not the default contracts. As defined in the text of the law (Article L.122), a CDD cannot be used to fill a job that would exist under normal and permanent business conditions for a given firm. Hence, in principle, a CDD can only be signed for a temporary and precise task (replacement in case of absence, temporary or seasonal (positive) demand shock). Such contracts are also used for youth employment programs (see Bonnal, Fougère, Sérandon 1994). Furthermore, selection and testing of future permanent (i.e. CDI) employees is allowed under such contracts. The contract can only be renewed once and its total length cannot exceed 18 months (24 months for youth employment programs). At the termination of the contract, the worker receives a 6 percent severance payment by law.

Table 8 reports total entry and exit rates by type of employment contract and by type of separation. For all groups of establishments, short-term contracts (CDD) are, by far, the most important type of entry into establishments (around 70 percent of all accessions). The share of CDD in total entries is even larger for those establishments with decreasing employment. Accession on a long-term contract is more frequent at those establishments with increasing employment. More than half of total exits come from the end of short-term contracts. A third come from quits. For these two types of separations, the exit rates are larger for growing establishments than for shrinking establishments. Quits are a "good-times" phenomenon as a large portion of CDD hiring (and therefore exits) come from short-term adaptation to positive demand shocks, as we show below. For those shrinking establishments, retirement is important. However, surprisingly, terminations in those establishments do not increase by a large amount

when compared to growing establishments. Finally, for shrinking establishments, almost one worker per 100 is transferred between two establishments of the same firm, even though we do not have many multiple-establishment enterprises in the 1,609 firm sample.

Table 9 reports descriptive statistics for hiring on CDI. The first line reports the mean and standard deviation followed by various quantiles of the share of CDI accessions among all accessions (excluding transfers). Notice that 32.7 percent of accessions result from long-term contract hiring, however, the distribution is highly skewed. The median is 5.3 percent and the third quartile is 66.7 percent. Some establishments never hire employees on CDIs while others hire most of their workers on long-term contracts. The four following lines show the time-variation of this distribution. To establish a frame of reference, we note that the real GDP growth rates over our period of analysis were: 1.9 percent (1985), 2.5, 2.3, 4.2, 3.9, and 2.8 (1990) (INSEE 1991). The year 1987 is a trough in the business cycle while 1988 and 1989 are peaks. Clearly, hires on long-term contract are procyclical but slightly out of phase. The entire 1990 distribution is shifted to the right of the 1987 distribution.

To further investigate the extent to which short-term contracts are used as a sorting or matching device by employers and employees, we computed the proportion of all CDD entries less all CDD exits divided by all CDD entries for each establishment, which is interpreted as a flow-through rate for CDD employees. When this statistic is zero, the CDD is purely short term employment. When it is one, the CDD is purely a port of entry for permanent employment. The mean of this statistic is 36.8 percent and the distribution is reasonably symmetric. We interpret this result to mean that about one-third of all short-term hires result in a longer-term employment match. This calculation was not adjusted for within year entry and exit and is, therefore, a lower bound on the extent to which CDD employment becomes long-term.

4.4 Cyclical Variability in Employment Flows

Although we have only four years of monthly data on our basic employment and job flows, we are able to study some aspects of their cyclical variability. For this purpose, we compute a set of adjusted aggregate monthly flows for establishment growth, total employment entry, total employment exit, involuntary employment exits, quits, and retirements. The aggregate monthly flows are adjusted to remove four fixed year effects, thus eliminating aggregate trends in the data, and fixed establishment effects, thus eliminating between establishment heterogeneity. We use the month-to-month change in the ratio of registered unemployment to the adult population as our monthly cycle measure. Figure 2 plots the monthly entry rate, exit rate, firm growth rate and the change in the monthly unemployment ratio. Figure 3 plots the monthly exit rate and its components. The summary given here is supported by basic time series regression analysis using the month-to-month change in the unemployment ratio as the cycle indicator.

Adjusted establishment growth rates are procyclical (negatively related to changes in the unemployment ratio) with an elasticity of -0.14 (0.02 robust standard error). The employment entry rate is weakly countercyclical with an elasticity of 0.09 (0.04). The employment exit rate is strongly countercyclical with an elasticity of 0.23 (0.06) and the involuntary exit rate displays essentially identical countercyclicality. The employment quit rate is weakly countercyclical with an elasticity of 0.02 (0.004). Finally, the retirement rate is procyclical with an elasticity of -0.22 (0.06). Because of the very short nature of our time series, we are reluctant to draw strong conclusions from these analyses; however, it is worth noting that these results are not obviously contrary to the Davis and Haltiwanger (1990) or the Anderson and Meyer (1994) results on cyclicality. In particular, Davis and Haltiwanger noted that job destructions were strongly countercyclical and we find that employment exits are strongly countercyclical. We note,

however, that this result is not inconsistent with our conclusion that entry is the primary force in employment adjustment, as shown in Figure 1, because the use of entry to adjust employment occurs over a wide range of employment growth rates while the use of exit occurs primarily at the very largest job destruction rates.

5. Job and Worker Flows with Match Heterogeneity

The macroeconomic consequences of our empirical findings can be interpreted by considering a modified version of the original Davis and Haltiwanger economy. The discussion in this section follows closely the modeling of Davis and Haltiwanger (1990, DH hereafter). In particular, their model focused on the macroeconomic consequences of both aggregate demand shocks and reallocation shocks, the latter being the theoretical engine for explaining the simultaneous creation and destruction of jobs in a single sector of the economy. We extend this notion to accommodate an additional process that determines the efficiency of the specific investment that must be made to create a high-productivity work site. Our goal is to focus upon the role of fixed duration contracts as a part of the process of matching workers to jobs. In DH a worker moving into the high-productivity work site had to spend exactly one period to operationalize that site; hence there was a nonstochastic foregone production that represented the specific investment. In our model the length of time this specific investment takes is uncertain. We interpret the failure to produce the high-productivity work site as holding a single period job (CDD) that transitions automatically into another single period (CDD) job with the next period's probability of successfully matching. Our model, therefore, provides a theoretical engine for distinguishing between the forces that create and destroy jobs and the forces that increase or decrease the mobility of workers between those jobs. Furthermore, our model provides an interpretation of the role of this matching process as the primary mechanism for employment adjustment in France.

Like DH we will assume that complete insurance markets exist and that employers can write appropriate compensation contracts so that the market can achieve fully efficient mobility. DH made these assumptions in order to focus on the essential economic distinction between allocative and aggregate shocks. We continue in order to focus on the distinction between allocative shocks and match-specific investments.

At the beginning of *t*

$$\begin{aligned} H_t^M &= \text{workers matched to high productivity sites} \\ H_t^U &= \text{workers not matched to high productivity sites} \\ 1 - H_t^M - H_t^U &= \text{workers matched to low productivity sites.} \end{aligned}$$

A fraction σ_t of matched high-productivity sites reverts to low-productivity sites during period *t*. Low-productivity sites produce Y_L units of the consumption good. Operational high-productivity sites produce Y_H units of the consumption good with $Y_H > Y_L > 0$. To become operational, a high-productivity site requires the input of unmatched workers. A fraction π_t of the unmatched workers are matched to high-productivity sites during *t*. A fraction θ_t of the workers at low-productivity sites become unmatched workers whose labor supply is used to operationalize high-productivity work sites. The equations of motion are

$$H_{t+1}^U = (1-\pi_t)H_t^U + \theta_t(1 - H_t^M - H_t^U + \sigma_t H_t^M)$$

$$H_{t+1}^M = \pi_t H_t^U + (1-\sigma_t)H_t^M$$

A consumer-worker's utility is $A_t\,\mathrm{U}(C_t)$ where A_t is a demand shifter. Aggregate consumption is given by

$$C_t = (1-\sigma_t)H_t^M Y_H + (1-\theta_t)(1 - H_t^M - H_t^U + \sigma_t H_t^M)Y_L$$

The A_t, σ_t and π_t driving processes evolve according to

$$F_A[\tilde{A}|A] = \Pr[A_{t+1} \le \tilde{A}|A_t \le A]$$

$$F_A[\tilde{\sigma}|\sigma] = \Pr[\sigma_{t+1} \le \tilde{\sigma}|\sigma_t \le \sigma]$$

$$F_A[\tilde{\pi}|\pi] = \Pr[\pi_{t+1} \le \tilde{\pi}|\pi_t \le \pi]$$

where

$$\frac{\partial F_Z[\tilde{Z}|Z]}{\partial Z} \le 0, \text{ for } Z = A, \sigma, \pi.$$

The competitive equilibrium solves the following dynamic program

$$V(H_t^M, H_t^U, A_t, \sigma_t, \pi_t) = \max_{\theta \in (0,1)} \left\{ A_t \, U(C_t) + \beta \, E\left[V(H_{t+1}^M, H_{t+1}^U, A_{t+1}, \sigma_{t+1}, \pi_{t+1}) \right] \right\} \qquad (1)$$

where β is the discount factor, $0 < \beta < 1$.[8] The program (1) satisfies the conditions in Theorems 9.6-9.8 and 9.10 in Stokey, Lucas and Prescott (1989) so, like DH, we can conclude:

(a) $V(H_t^M, H_t^U, A_t, \sigma_t, \pi_t)$ exists, is unique, and is concave in H_t^M and H_t^U.

(b) There exists a unique, time-invariant policy function $\theta(H_t^M, H_t^U, A_t, \sigma_t, \pi_t)$ and

(c) At an interior solution, V is continuously differentiable in H_t^M, H_t^U and satisfies

$$\begin{aligned} \frac{\partial V\left(H_t^M, H_t^U, A_t, \sigma_t, \pi_t\right)}{\partial H_t^M} = {} & A_t(1-\sigma_t)Y_H + (1-\theta_t)\sigma_t Y_L \\ & + \beta(1-\sigma_t) E\left[\frac{\partial V\left(H_{t+1}^M, H_{t+1}^U, A_{t+1}, \sigma_{t+1}, \pi_{t+1}\right)}{\partial H_{t+1}^M} \right] \\ & - \beta(1-\sigma_t) E\left[\frac{\partial V\left(H_{t+1}^M, H_{t+1}^U, A_{t+1}, \sigma_{t+1}, \pi_{t+1}\right)}{\partial H_{t+1}^U} \right] \end{aligned}$$

$$\frac{\partial \mathrm{V}\left(H_t^M, H_t^U, A_t, \sigma_t, \pi_t\right)}{\partial H_t^U} = -A_t(1-\sigma_t)Y_L + \beta\pi_t(1-\sigma_t)\,\mathrm{E}\left[\frac{\partial \mathrm{V}\left(H_{t+1}^M, H_{t+1}^U, A_{t+1}, \sigma_{t+1}, \pi_{t+1}\right)}{\partial H_{t+1}^M}\right] + \beta(1-\pi_t-\theta_t)\,\mathrm{E}\left[\frac{\partial \mathrm{V}\left(H_{t+1}^M, H_{t+1}^U, A_{t+1}, \sigma_{t+1}, \pi_{t+1}\right)}{\partial H_{t+1}^U}\right]$$

Existence of the value function implies that the first order condition for the reallocation of workers is

$$A_t Y_L\,\mathrm{U}'(C_t) = \beta\,\mathrm{E}\left[\frac{\partial \mathrm{V}\left(H_{t+1}^M, H_{t+1}^U, A_{t+1}, \sigma_{t+1}, \pi_{t+1}\right)}{\partial H_{t+1}^U}\right] \tag{2}$$

Although there are two state variables, the critical distinction between this model and that of DH is the behavior of H_t^U because the stock of matched workers does not involve the employment reallocation parameter. So, our equation (2) is identical to equation (6) in DH. In contrast to DH, however, our workers spend a random duration interval before they are matched to an operational high-productivity site. There are now three distinct factors to consider in the mobility patterns of jobs (employment sites) and workers. Aggregate factors are still captured by A_t, DH reallocation effects are still captured by σ_t; however, there is a third factor, captured by π_t, that reflects the mobility of workers that is unrelated to either aggregate factors or reallocation.

Our interpretation of the π_t induced mobility is that the specific investment that DH modeled as producing a high-productivity site with certainty after one period is uncertain. We interpret an unsuccessful attempt to produce an operational high-productivity site as a CDD job that terminated after one period and was followed by another CDD job with a potential high-productivity site. In other words, the stock of unmatched workers H_t^U is continuously mobile

from site to site until a successful match occurs. The worker then enters the H_t^M stock and is at risk to have this job destroyed by aggregate or reallocative forces. The length of time that the worker must spend in the lowest productivity site (unmatched workers produce nothing) is controlled by the stochastic process π_t. A positive shock to π_t is equivalent to a transitory increase in workers successfully matched to high-productivity sites and a transitory decrease in unmatched workers. The effect is a transitory increase in consumption and a transitory decrease in the flow of workers into the unmatched stock. A persistent increase in π_t increases the efficiency of the specific investment and thus increases the stock of matched workers and decreases the stock of unmatched workers.

6. Conclusions

Our empirical analyses distinguish between flows of workers, directly measured, and job creation and destruction, again, directly measured. We used a representative sample of all French establishments for 1987 to 1990 (with more than 50 employees). Our most important findings are: (1) annual job creation can be characterized as hiring three persons and separating two for each job created in a given year; (2) annual job destruction can be characterized as hiring one person and separating two for each job destroyed in a given year; (3) when an establishment is changing employment, the adjustment is made primarily by reducing entry and not by changing the separation rates; (4) for the highest skill groups, ten percent of months with firm-initiated exits also have new hiring in the same skill group and, for the lowest skill groups, 25% of the months with firm-initiated separations also have new hiring in that skill group; (5) the rate of internal promotion into higher skilled positions is about three times the size of net employment changes inside the job category; (6) two-thirds of all hiring is on short term contracts and more than half of all separations are due to the end of these short term contracts; (7) approximately one-third of all

short term employment contracts are converted to long-term contracts at their termination; (8) controlling for between-establishment heterogeneity and common trends, entry and exit of workers are both countercyclical.

Worker heterogeneity, particularly the quality of the match between the worker and the employer, is clearly a crucial element of employment dynamics. The very substantial worker flows associated with creating or destroying a job and the pervasive use of simultaneous hiring and separation, even within skill group, provide the main empirical regularities that lead us to focus on the role of matching in the employment flows. The tendency of French firms to rely upon entry flows to adjust the stock of employees also suggests that worker heterogeneity and employment institutions interact to determine the relation between worker and job flows. The French establishment can search continuously for good-quality matches using the CDD. It can also make very substantial employment adjustments by sharply increasing or decreasing hires on CDD as well as by adjusting their lengths without running afoul of French laws limiting the firm's ability to separate workers.

We have considered only the movement of workers and not their compensation. To complement our analysis, one should consider the wage patterns for entering and exiting workers and the production patterns of the employing establishments. The questions arise in classical labor demand models and are the next stage of our research program.

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Endnotes

[1]For all definitions in this literature, see the summary in Davis and Haltiwanger 1995.

[2]Dynamic representativeness means that in the construction of the EE sample each firm was a part of the sampling universe exactly once after its birth. If included, the entire history of the firm from 1978 until its death is available.

[3]This results in the elimination of 15 firms, mostly banks.

[4]We compared the number of establishments in the DMMO and the ESE. The number of DMMO establishments (50 employee sampling threshold) had to be lower than the number of ESE establishments (20 employee sampling threshold).

[5]We computed from the DMMO the change in the number of worker/skill groups annually. We compared this to the same information from the ESE. We computed an index over the skill groups of the percentage difference between the skill structures from the two sources. If this index of disagreement implied aggregated differences that exceed 30% over the whole period we discarded the enterprise.

[6]We aggregated employment over all of the available establishments in the DMMO and compared this total to equivalent number for the ESE and the EAE. From these different sources, we built ratios of the DMMO employment to the ESE and EAE employment that were combined to yield an index of disagreement for each year. An incompatible history was one in which the level of disagreement implies that the different data sources differed by more than 10%.

[7]For comparison, the sum of the job destruction rates for establishments with growth rates less than –17% is 75.7 (respectively, less than –15% is 88.5, less than –10% is 118.9, less than –5% is 174.7).

[8]In our formulation, it makes no sense to consider the variable π as endogenous because the optimal value is always 1. Our interpretation is that the success of the match process is a random feature of the technology.

Figure 1: Entry and Exit Rates by Establishment Growth (Controlling for Establishment and Year Effects)

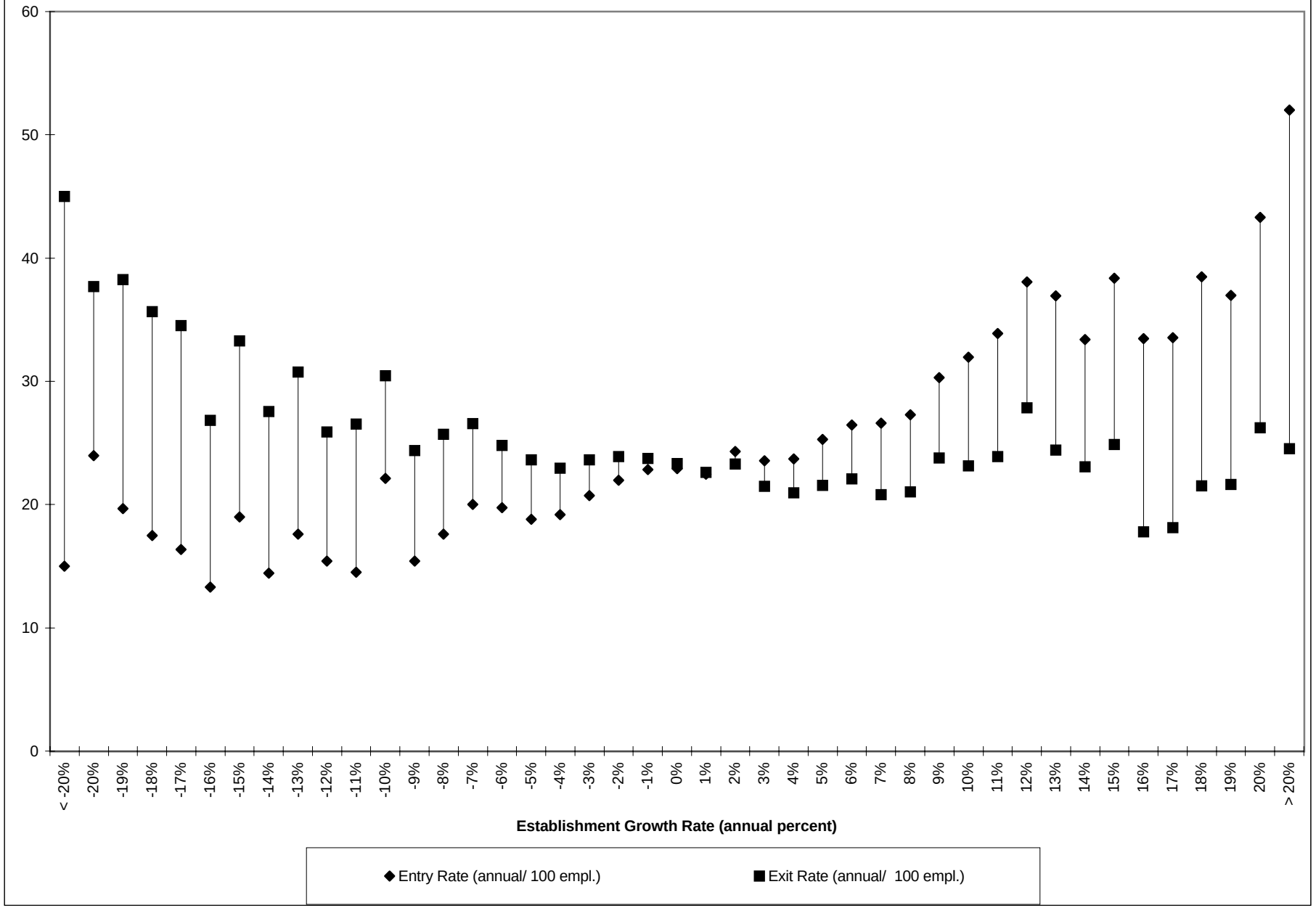

Figure 2: Time Series Plots of Employment Flows and Unemployment

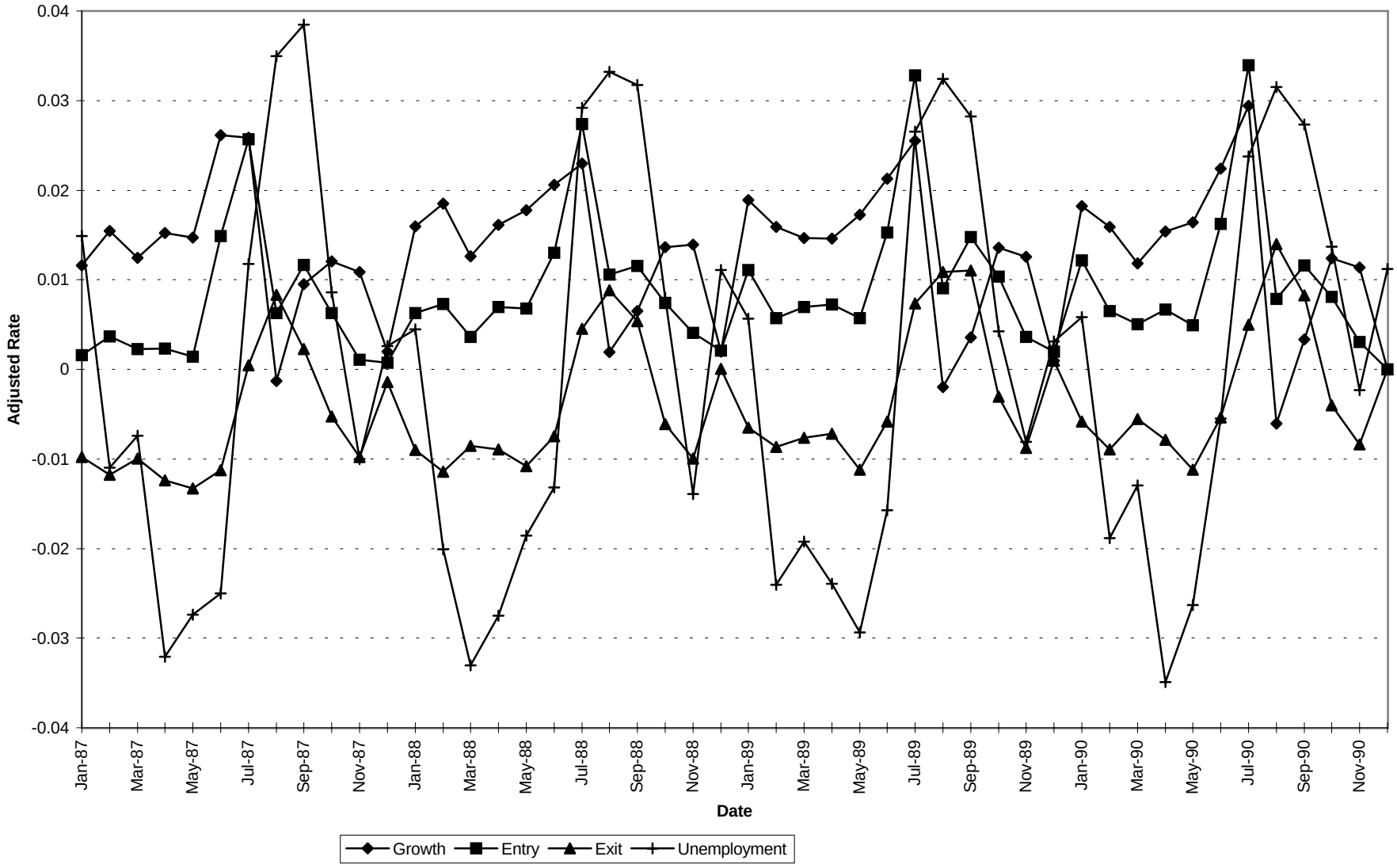

Figure 3: Time Series Plots of Exit and Its Components

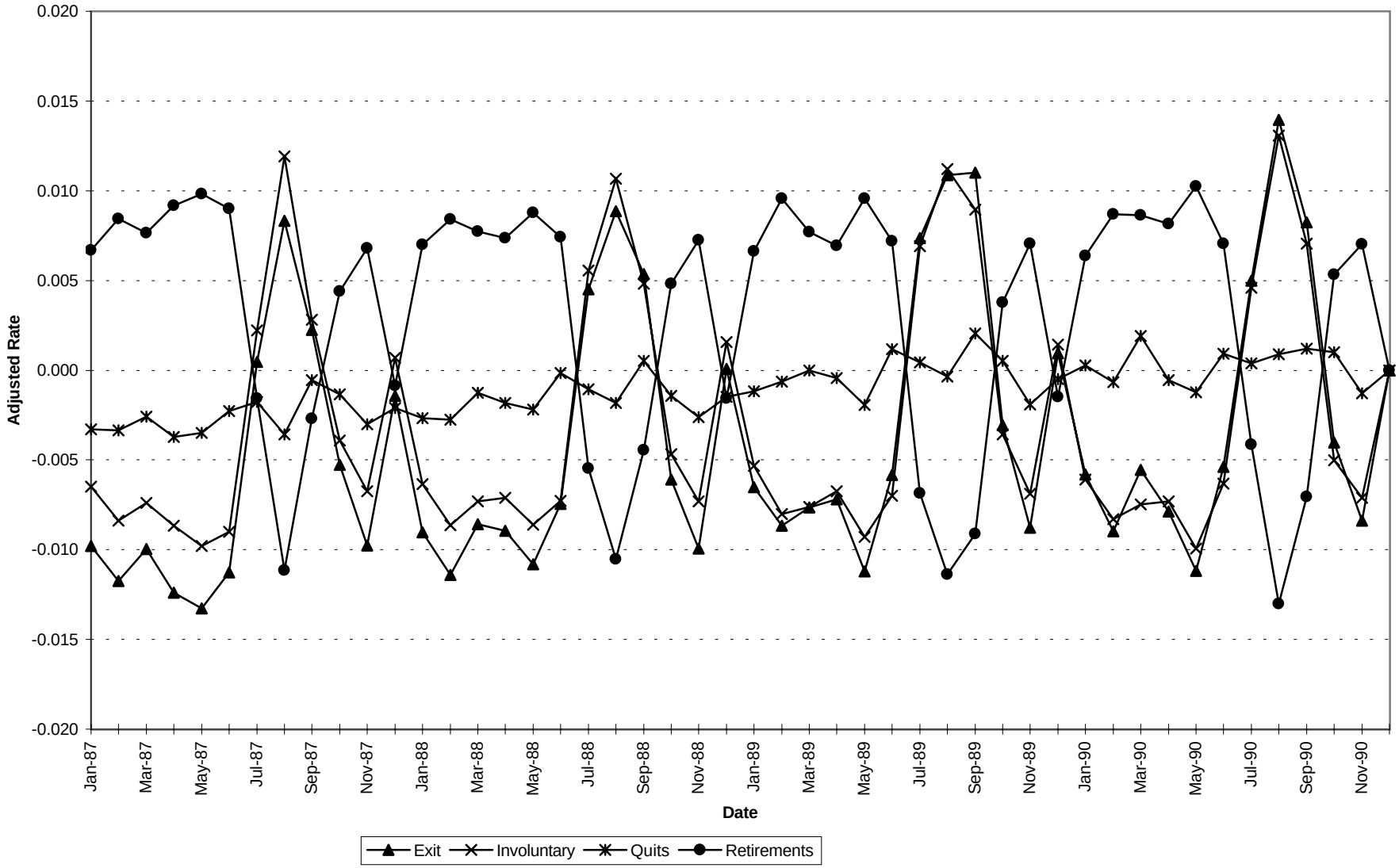

Table 1
Rates of Creation/Destruction of Jobs and Entry/Exit of Workers
by Establishment Employment Growth Categories per 100 Employees

Employment Growth Category		Year to Year Creation Rate	Year-Aggregated Monthly Creation Rate	Total Entry Rate	Entry Rate (no within year entry/exit)	Exit Rate (no within year entry/exit)	Total Exit Rate	Year-Aggregated Monthly Destruction Rate	Year to Year Destruction Rate
Establishments with	A	7.556	17.386	37.226	20.587	13.652	30.291	9.944	-
increasing employment		(48.941)	(78.534)	(201.390)	(102.010)	(79.803)	(187.640)	(61.441)	-
in year t (all years)	B	7.075	16.074	35.490	19.527	12.957	28.921	9.078	-
(N=3,465)		(509.49)	(842.54)	(2187.70)	(1107.20)	(868.26)	(2037.40)	(660.79)	-
Establishments with	A	-	8.051	22.725	8.594	15.675	29.805	14.983	6.902
decreasing employment		-	(52.173)	(170.880)	(71.770)	(83.454)	(178.530)	(80.582)	(53.200)
in year t (all years)	B	-	7.275	21.308	7.880	14.397	27.826	13.641	6.356
(N=3,179)		-	(563.18)	(1821.60)	(767.45)	(891.10)	(1902.90)	(786.84)	(506.350)
Establishments with	A	-	9.866	22.695	11.755	12.126	23.066	10.095	-
stable employment		-	(51.478)	(138.560)	(77.832)	(78.771)	(140.930)	(52.919)	-
in year t (all years)	B	-	9.847	23.462	11.383	11.730	23.810	10.017	-
(N=371)		-	(483.84)	(1368.20)	(730.30)	(723.49)	(1383.90)	(494.67)	-

Sources: DMMO, 1987-1990.

Notes: Subpanel A is weighted by the ex post weights. Subpanel B is weighted by the product of the ex post weight and average employment in year t. Total entry (exit, resp.) includes all entries (exits). A worker who enters and exits within the same year is eliminated from the entry (exit) rate labeled "no within year entry/exit". Year to year creation (destruction) is calculated for the change in employment between the beginning and end of each year. The monthly creation (destruction) rate is aggregated witin each year and establishment to give the year-aggregated monthly creation (destruction) rate.

Table 2
Monthly Rates of Creation/Destruction of Jobs and Entry/Exit of Workers by Establishment Employment Growth Categories

Employment Growth Category	Month to Month Creation Rate	Monthly Entry Rate	Monthly Exit Rate	Month to Month Destruction Rate
Establishments with Increasing employment in month t (all years) (N=30,570)	3.004 (22.500)	4.647 (30.418)	1.713 (16.797)	- -
Establishments with Decreasing employment in month t (all years) (N=32,414)	- -	1.413 (16.135)	4.256 (31.098)	2.844 (23.493)
Establishments with Stable employment in month t (all years) (N=20,810)	- -	0.986 (13.704)	1.006 (13.885)	- -

Sources: DMMO, 1987-1990; weighted by ex post weights.

Table 3
Rates of Creation/Destruction of Jobs and Entry/Exit of Workers by Growth Categories and Industry per 100 Employees

	Manufacturing Industries				Service Industries			
Establishment Growth Category	Year to Year Creation Rate	Entry Rate (no within year entry/exit)	Exit Rate (no within year entry/exit)	Year to Year Destruction Rate	Year to Year Creation Rate	Entry Rate (no within year entry/exit)	Exit Rate (no within year entry/exit)	Year to Year Destruction Rate
Establishments with increasing employment in year t, all years	7.535	17.862	10.725	-	7.574	22.926	16.162	
MI: (N=2,518) SI: (N=947)	(39.348)	(70.765)	(51.107)		(68.197)	(154.020)	(123.040)	
Establishments with decreasing employment in year t, all years	-	5.612	13.033	7.246	-	12.201	18.868	6.485
MI: (N=2,567) SI: (N=612)		(46.604)	(58.520)	(48.450)		(126.650)	(167.020)	(69.529)
Establishments with stable employment in year t, all years	-	9.688	10.172	-	-	13.882	16.135	-
MI: (N=275) SI: (N=96)		(59.229)	(59.171)			(112.070)	(115.110)	

Sources: DMMO, 1987-1990.

Notes: Statistics are weighted by the ex post weights. A worker who enters and exits within the same year is eliminated from the entry (exit) rate labeled "no within year entry/exit". Year to year creation (destruction) is calculated for the change in employment between the beginning and end of each year.

Table 4
Analysis of Simultaneous Entry and Exit as a Proportion of Months in Sample, Distribution across Establishments, All Years

	Mean (Std)	First Quartile	Median	Third Quartile	90th Percentile
Number of months with no entry and no exit	0.152	0.021	0.083	0.250	0.396
Number of months in the sample	(0.175)				
Number of months with entry or exit, but not both	0.310	0.167	0.333	0.438	0.521
Number of months in the sample	(0.174)				
Number of months with entry and exit	0.538	0.292	0.528	0.792	0.938
Number of months in the sample	(0.290)				

Source: DMMO
Notes: Each proportion is computed by establishment. The number of establishments is 2,009 and the number of observations is 83,794.

Table 5
Rates of Entry/Exit of Workers
by Establishment Employment Growth Categories and Skill Level

Employment Growth Category		Engineers, Professionals, and Managers	Technicians and Supervisors	Clerical Workers	Skilled Blue Collar Workers	Unskilled Blue Collar Workers	Total
Establishments with	Entry	1.416	2.606	9.421	6.840	12.637	37.226
Increasing employment		(24.649)	(35.722)	(125.230)	(80.365)	(146.430)	(201.390)
in year t (all years)	Exit	1.115	1.998	7.821	5.310	10.209	30.291
(N=3,465)		(19.552)	(29.379)	(110.490)	(62.952)	(130.220)	(187.640)
Establishments with	Entry	0.823	1.636	6.074	3.416	8.239	22.725
Decreasing employment		(12.662)	(24.023)	(108.220)	(40.814)	(97.503)	(170.880)
in year t (all years)	Exit	1.450	2.332	7.187	5.568	9.864	29.805
(N=3,179)		(19.673)	(28.634)	(114.700)	(58.460)	(104.240)	(178.530)
Establishments with	Entry	0.868	2.482	6.630	4.311	6.189	22.695
Stable employment		(14.538)	(36.141)	(90.266)	(53.397)	(74.669)	(138.560)
in year t (all years)	Exit	0.977	2.615	6.444	4.557	6.151	23.066
(N=371)		(15.931)	(37.891)	(90.216)	(52.656)	(74.880)	(140.830)

Sources: DMMO, 1987-1990; weighted by ex post weights.
Notes: Totals of the five skill groups may differ from the total shown because some movements have missing skill level.

Table 6
Proportion of Simultaneous Entry and Exit in the Skill Level and Month, Average across Establishments

	Months with Simultaneous Entry and Exit	Months at Risk	Proportion of Simultaneous Entry and Exit
Engineers, Managers	0.9	11.8	0.076
Technicians	1.8	18.8	0.096
Clerks	6.8	32.5	0.209
Skilled blue-collar	4.0	31.3	0.128
Unskilled blue-collar	9.0	37.6	0.239

Source: DMMO

Note: All calculations in this table are conditional on months in which there are exits but no quits or exits and more entries than quits, by skill level.

Table 7
Employment Changes Decomposed into Entry, Promotion, Exit and Error Rates
Percent of Average Total Employment, by Skill Levels and Year

Skill Category	Year	Employment Rate of Change		Entry minus Exit	Promotions (Entry)	Promotions (Exit)	Remainder (Measurement Error)
Technicians, Managers, Engineers, Professionals							
	1987 (N=1,440)	0.252	=	-0.111	0.636		-0.273
	1988 (N=1,468)	0.480	=	-0.069	0.910		-0.362
	1989 (N=1,529)	0.187	=	-0.069	0.598		-0.341
	1990 (N=1,615)	0.222	=	-0.126	0.621		-0.272
Skilled Workers							
	1987 (N=1,440)	0.233	=	0.108	1.227	-0.636	-0.466
	1988 (N=1,468)	0.420	=	0.073	1.743	-0.910	-0.486
	1989 (N=1,529)	0.528	=	0.039	1.453	-0.598	-0.366
	1990 (N=1,615)	0.366	=	-0.017	1.398	-0.621	-0.394
Unskilled Workers							
	1987 (N=1,440)	0.044	=	0.225		-1.227	1.046
	1988 (N=1,468)	0.757	=	1.470		-1.743	1.030
	1989 (N=1,529)	1.051	=	1.238		-1.453	1.266
	1990 (N=1,615)	0.575	=	0.759		-1.398	1.215

Source: Authors' calculations based on the DMMO, ESE and BIC.
Notes: Weighted by ex post weights.

Table 8
Rates of Entry/Exit of Workers by Employment Growth Category and Type of Employment Contract or Separation

Employment Growth Category	Hired into Long Term Contract	Hired into Short Term Contract	Transfers in	Total Entry	Quits	End of Short Term Contract	Retirement	Terminations	Transfers out	Total Exits
Establishments with Increasing employment in year t (all years) (N=3,465)	9.829 (83.357)	26.949 (187.610)	0.448 (17.117)	37.226 (201.390)	9.590 (62.151)	17.877 (158.290)	0.599 (6.850)	1.934 (21.422)	0.290 (8.072)	30.291 (187.640)
Establishments with Decreasing employment in year t (all years) (N=3,179)	5.095 (48.086)	17.432 (160.530)	0.198 (5.868)	22.725 (170.880)	8.844 (53.808)	16.227 (153.950)	1.228 (12.735)	2.671 (31.023)	0.835 (26.876)	29.805 (178.530)
Establishments with Stable employment in year t (all years) (N=371)	7.096 (61.918)	15.494 (128.570)	0.106 (5.242)	22.695 (138.560)	8.455 (65.124)	12.054 (114.050)	0.768 (9.594)	1.559 (13.593)	0.230 (7.914)	23.066 (140.930)

Sources: DMMO, 1987-1990; weighted by ex post weights.

Table 9
Long-term Hiring as a Proportion of Long-term and Short-term Contracts, Distribution across Establishments, 1987-1990

	Mean (Std)	First Quartile	Median	Third Quartile	90th Percentile
Monthly analysis, all years (N=55,083)	0.327 (2.691)	0.000	0.053	0.667	1.000
Monthly analysis, 1987 (N=11,918)	0.300 (2.644)	0.000	0.000	0.600	1.000
Monthly analysis, 1988 (N=13,275)	0.301 (2.640)	0.000	0.000	0.556	1.000
Monthly analysis, 1989 (N=14,688)	0.333 (2.671)	0.000	0.059	0.667	1.000
Monthly analysis, 1990 (N=15,202)	0.365 (2.771)	0.000	0.154	0.750	1.000

Source: DMMO
Notes: Weighted by ex post weights.

Table A.1

Representativeness of the Sample of 1,669 Firms as Compared to the Echantillon d'Entreprises

	Size 20 - 99					Size 100-499					Size 500+				
Sector	(A) Unweighted Firm Count (3,022)	(B) Unweighted Firm Count (1,669)	(C) Average Weight per Firm (1,669)	(D) Average Weight per Firm (EE)	(E) (C)/(D)	(A) Unweighted Firm Count (3,022)	(B) Unweighted Firm Count (1,669)	(C) Average Weight per Firm (1,669)	(D) Average Weight per Firm (EE)	(E) (C)/(D)	(A) Unweighted Firm Count (3,022)	(B) Unweighted Firm Count (1,669)	(C) Average Weight per Firm (1,669)	(D) Average Weight per Firm (EE)	(E) (C)/(D)
Meat and Milk Products	44	33	36.2	3.5	10.3	25	15	7.4	1.2	6.0	29	15	4.9	1.2	4.3
Other Food Products	48	32	64.0	4.4	14.5	24	12	11.2	1.1	9.8	38	8	13.2	1.1	11.7
Petroleum and Natural Gas Production						2			1.3		3			1.1	
Electricity and Gas Production	4	3	43.3	5.0	8.7	2	1	14.0	1.4	10.0	6	3	7.0	1.1	6.3
Iron and Steel Primary Manufacturing	8	4	49.3	3.2	15.3	9	5	3.9	1.1	3.4	17	8	5.2	1.1	4.6
Nonferrous Metal Manufacturing	8	5	12.4	2.6	4.7	7	7	3.6	1.0	3.6	15	6	4.3	1.1	4.0
Building Materials Production	25	12	107.8	5.6	19.3	12	7	9.0	1.2	7.7	11	3	18.0	1.1	16.0
Glass Manufacturing	8	6	23.6	3.9	6.0	7	7	2.7	1.1	2.6	12	3	7.0	1.2	6.0
Basic Chemical Production	9	7	26.8	3.1	8.6	13	11	5.6	1.2	4.8	16	2	10.7	1.1	9.3
Pharmaceuticals	25	15	50.5	3.3	15.4	33	15	7.3	1.1	6.6	39	6	19.4	1.1	18.2
Foundries and Intermediate Steel	125	86	54.4	5.4	10.1	50	33	5.5	1.1	4.9	42	20	5.0	1.3	3.8
Heavy Equipment Manufacturing	158	102	36.9	4.2	8.8	62	39	4.9	1.2	4.2	56	21	6.1	1.1	5.8
Electronics and Electrical Equipment	60	40	39.0	4.6	8.5	57	37	10.6	1.2	8.8	59	39	5.8	1.2	4.9
Automobile Manufacturing	30	19	23.7	3.1	7.6	27	19	5.1	1.1	4.4	34	11	8.0	1.3	6.1
Ship and Space Vehicle Manufacturing	7	5	29.0	3.4	8.5	9	6	4.6	1.2	3.8	17	6	5.3	1.4	3.8
Textiles and Apparel	126	92	33.6	3.5	9.5	70	52	4.5	1.1	4.0	43	20	3.2	1.1	2.9
Leather and Shoe Manufacturing	28	13	35.7	3.2	11.1	18	9	8.0	1.1	7.1	7	2	15.0	1.1	14.0
Wood and Furniture Products	87	64	38.9	4.4	8.8	31	26	5.7	1.1	5.4	17	5	5.4	1.1	5.1
Paper and Paper Products	24	13	46.8	3.2	14.8	30	23	4.5	1.1	4.0	22	10	3.4	1.1	3.0
Printing and Publishing	55	33	61.7	5.5	11.1	28	18	6.5	1.1	5.7	12	5	7.8	1.1	7.2
Rubber and Plastics Manufacturing	44	26	52.3	4.0	13.2	23	15	9.0	1.1	8.3	29	8	4.6	1.2	3.9
Construction and Building	82	54	197.9	6.3	31.6	36	19	20.5	1.2	17.6	52	11	11.2	1.1	9.8
Wholesale Food	99	57	47.9	5.5	8.7	24	10	13.0	1.2	10.8	4			1.1	
Wholesale Nonfood	202	109	69.2	6.8	10.1	40	20	16.8	1.3	13.1	11	3	16.8	1.1	15.6
Retail Trade Food	114	76	47.9	6.4	7.5	19	9	12.4	1.5	8.4	13	1	71.0	1.1	64.0
Retail Trade Nonfood	26	17	156.2	13.9	11.2	9	6	15.6	1.9	8.4	10			1.2	
Automobile Repair and Sales	23	14	189.1	5.8	32.5	5	2	13.5	1.6	8.5	4	1	12.0	1.2	10.0
Hotels, Restaurants and Cafés	7	4	583.8	11.6	50.5	4	1	14.0	1.4	9.8	4			1.2	
Transportation Services	26	12	414.0	6.2	66.3	10	9	23.8	1.2	19.2	13	4	35.3	1.1	32.0
Telecommunication and Postal Services	1	1	600.0	17.7	34.0						1			1.5	
Business Services	56	29	323.0	8.2	39.5	21	8	40.5	1.6	24.8	23	5	73.3	1.5	48.0
Household Services	53	25	158.5	4.0	40.0	17	15	27.5	1.2	23.9	9	2	47.5	1.2	41.0
Real Estate	6	3	139.8	3.9	35.5	5	3	28.0	2.0	14.0	2	1	19.0	2.1	9.0

Notes: Column (A) is the number of firms in the size/industry cell in the sample of 3.022 firms. Column (B) is the number of firms in the size/industry cell in the sample of 1,669 fimrs. Column (C) is the average weight per firm in the size/industry cell in the sample of 1,669 firms. Column (D) is the average weight per firm in the size/industry cell in the Echantillon d'Entreprises (control sample).

Table A.2
Rates of Creation/Destruction of Jobs and Entry/Exit of Workers
by Establishment Employment Growth Categories per 100 Employees

Employment Growth Category		Year to Year Creation Rate	Year-Aggregated Monthly Creation Rate	Total Entry Rate	Entry Rate (no within year entry/exit)	Exit Rate (no within year entry/exit)	Total Exit Rate	Year-Aggregated Monthly Destruction Rate	Year to Year Destruction Rate
Establishments with	A	8.086	18.049	39.644	21.963	14.189	31.871	10.277	-
Increasing employment		(33.783)	(53.038)	(139.090)	(71.252)	(56.662)	(129.820)	(41.268)	-
in year t (all years)	B	7.579	16.519	37.589	20.745	13.172	30.016	9.203	-
(N=8,566)		(382.03)	(597.27)	(1544.39)	(787.49)	(608.98)	(1429.80)	(447.08)	-
Establishments with	A	-	8.573	24.805	10.179	16.723	31.349	15.644	7.377
Decreasing employment		-	(35.318)	(121.340)	(58.100)	(61.454)	(124.700)	(48.508)	(34.632)
in year t (all years)	B	-	7.595	23.011	9.276	14.927	28.662	13.976	6.832
(N=8,546)		-	(386.74)	(1315.22)	(618.38)	(661.76)	(1351.22)	(517.36)	(404.810)
Establishments with	A	-	7.294	23.307	11.981	12.140	23.466	7.731	-
Stable employment		-	(32.167)	(92.658)	(48.134)	(48.216)	(94.496)	(37.457)	-
in year t (all years)	B	-	9.823	23.806	11.487	11.540	23.860	10.090	-
(N=1,383)		-	(240.44)	(919.02)	(454.76)	(444.10)	(926.91)	(257.30)	-

Sources: DMMO, 1987-1990, extended to 3,022 enterprises with 5,997 establishments.
Notes: Subpanel A is weighted by the ex post weights. Subpanel B is weighted by the product of the ex post weight and average employment in year t. Total entry (exit, resp.) includes all entries (exits). A worker who enters and exits within the same year is eliminated from the entry (exit) rate labeled "no within year entry/exit". Year to year creation (destruction) is calculated for the change in employment between the beginning and end of each year. The monthly creation (destruction) rate is aggregated witin each year and establishment to give the year-aggregated monthly creation (destruction) rate.