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In 2004 all publications will carry a motif taken from the €100 banknote.

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CONTENTS

Abstract

We examine job flows in the 1990s for a sample of 13 European countries. By using a dataset of continuing firms that covers all sectors, we find firm characteristics to be important determinants of job flows, with smaller and younger firms within services typically having a larger degree of job turnover. Once controlled for firm and sectoral effects, the role of institutions in the dynamics of job creation and destruction is examined. As expected, employment protection is found to reduce job flows. Similarly, countries with higher unemployment benefits and more coordinated wage bargaining systems are characterised by lower job flows.

Keywords: Gross Job Flows, labour market institutions.
JEL-Codes: J23, J60

Non-technical summary

Recent literature has stressed the importance of job flows when firms and workers are heterogeneous and the matching process between vacancies and workers is costly. When a shock hits the economy, the desired allocation of jobs among firms and sectors changes, leading to simultaneous job creation and destruction. Because of heterogeneity and other labour market frictions, new vacancies and unemployed workers do not match instantaneously, implying spells of unemployment and vacant positions in the economy. Studies estimating job creation and destruction from plant or firm level data show that a high number of jobs are simultaneously created and destroyed in the economy even when the employment growth is close to zero. This provides evidence on the complexity of the dynamics underlying the adjustment process in the labour market.

An important limitation of the existing empirical studies on job flows is the lack of internationally comparable job flows statistics. A number of problems arise when using establishment/firm level data, which became of particular concern when doing international comparisons. Differences in definitions, sampling intervals, sectoral coverage and sampling frame may lead to misleading interpretations of the cross-country differences in estimated job flows. Cross-country comparisons of job flows provide the basis for a formal investigation on the link between job turnover and labour market institutions and policies. The focus on the institutional determinants of gross job flows allows testing theoretical predictions, which otherwise have ambiguous effects on net employment changes. A typical example is employment protection legislation. Barriers to the layoff of workers are expected to hinder both job creation and destruction, having ambiguous effects on the average level of labour demand.

We examine time series and cross-sectional patterns of job flows for 13 European countries in the 1990s using a unique homogeneous firm data set that covers all productive sectors. We provide comparable estimates of job flows of continuing firms, i.e. excluding start-ups and shutdowns, and examine cross-country differences and regularities.

The multivariate analysis indicates a number of cross-country regularities in the relationship between job flows and firm characteristics. These can be summarised as follows: i) a negative relationship between both job reallocation and job creation and the age of the firms; ii) a higher job reallocation and job creation rates in construction and service sectors than in industry, but a higher job destruction in the later; iii) a negative relationship between the size of the firm and job reallocation; v) a positive association between job reallocation and the net employment change. Moreover, differences across countries in gross job flows are statistically significant even after controlling for a full set of firm characteristics.

Focusing on cross-country differences, the role of a number of institutional factors in the determination of job turnover is examined. As expected, the strictness of employment protection legislation has a negative and statistically significant impact on job reallocation. It responds to a reduction of both job creation and job destruction in countries with more stringent employment protection legislation, although in general only the effects on job

destruction are statistically significant. The duration of unemployment benefits and the degree of wage-setting co-ordination have similar effects, reducing job reallocation by dampening job creation and job destruction. Regarding the tax wedge, countries with higher tax burdens experience lower job creation and job reallocation. Finally, temporary contracts and employment subsidies present opposite effects on job destruction, the former increasing and the latter obstructing the destruction of jobs. We find that these results are robust to a variety of specifications. Moreover, sensitivity analysis indicates that the main results do not hinge on a particular set of countries, but instead are quite robust to the set of countries included in the analysis.

1 Introduction

Recent theoretical and empirical literature has stressed the importance of job reallocation in a world where agents (firms and workers) are heterogeneous and the matching process between vacancies and workers is costly. When a shock hits the economy, the desired allocation of jobs among firms and sectors changes, leading to job destruction on the one hand and the creation of new vacancies on the other. Because of heterogeneity and other labour market frictions, new vacancies and unemployed workers do not match instantaneously, implying spells of unemployment and vacant positions in the economy (Pissarides, 2000).

Gross job flows may be considered a proxy for labour market flexibility to the extent that they provide a measure of the responsiveness of the labour market to changes in economic conditions. In recent years, several studies have estimated job creation and destruction from longitudinal data at plant or firm level. Studies on gross job flows have shown that a high number of jobs are simultaneously created and destroyed in the economy even when the employment growth is close to zero.[1] This provides evidence on the complexity of the dynamics underlying the adjustment process in the labour market and the heterogeneity in the behaviour of both workers and firms.

The main limitation of the existing studies on job flows is the lack of internationally comparable job flows statistics (OECD 1994). A number of problems arise when using establishment/firm level data, which became of particular concern when doing international comparisons. Differences in definitions, sampling intervals, sectoral coverage and sampling frame may lead to misleading interpretations of the cross-country differences in estimated job flows.

[1] For a thorough discussion of the results in this literature, see the excellent survey of Davis and Haltiwanger (1999).

We examine time series and cross-sectional patterns of job flows for 13 European countries using a unique homogeneous firm dataset that covers the whole spectrum of productive sectors. We provide comparable estimates of job flows of continuing firms, i.e. excluding start-ups and shutdowns, and examine cross-country differences and regularities.

Job flow measures in relation to firm characteristics are reported in order to identify the patterns of job reallocation among different groups of firms within and between the countries studied. We find important regularities across countries, where smaller and younger firms concentrated in services exhibit the larger job turnover.

After controlling for firm characteristics, we find persistent cross-country differences in job flows that can be partially explained by institutional features. As expected, we find a negative effect of policies aiming to protect jobs on the dynamics of job reallocation. Similarly, generous unemployment benefits and institutions that increase co-ordination in the wage bargaining process reduce job turnover.

The remainder of the paper is organised as follows. In section 2, we present the theoretical motivations of our study and the most relevant empirical evidence. Section 3 describes the data used in the analysis and defines concepts and measures of gross job flows. In section 4, we describe gross job flows for different firm characteristics and extend the analysis to the multivariate framework in order to uncover the main driving factors of labour dynamics. Section 5 assesses the role of institutional features in explaining persistent cross-country differences in gross job flow patterns. In Section 6 a number of robustness checks is carried out and Section 7 concludes.

2 Theoretical motivations and empirical evidence

2.1 Job flows: international comparisons

There is a large literature aiming to explain the magnitude and cyclical behaviour of job reallocation and its components. Empirical studies on job flows include Davis and Haltiwanger (1992), Davis et al. (1996) and Haltiwanger and Schuh (1999) for the US manufacturing industry, Blanchflower and Burgess (1996) for the UK, Broersma and Gautier (1997) for the Netherlands, Albaek and Sorensen (1998) for Denmark, Lagarde et al. (1994) for France, Dolado and Gomez (1995) for Spain, Contini et al. (1991) for Italy, Stiglbauer et al. (2002) for Austria, Faggio and Konings (2001) for 5 accession countries and Contini et al. (1995) for countries of the European Union. In addition OECD (1994) and OECD (1996) report results on job flows for 10 OECD countries between the late 1980s and early 1990s.

The main findings of this literature can be summarised as follows:

1. A high number of jobs are simultaneously created and destroyed in all countries and sectors regardless of the cycle phase;
2. Job creation and destruction are negatively correlated but not perfectly. This implies that, although job creation is clearly pro-cyclical and job destruction is counter-cyclical, the volatility of the two flows over the business cycle may differ. Estimates for the US, Canada and the UK show that the increase in job destruction during economic downturns tends to be stronger than the increase in job creation during upturns, resulting in counter-cyclical movements in job reallocation. The cyclical behaviour of job reallocation is less clear for countries in Europe, where job reallocation tends to be a-cyclical or slightly pro-cyclical;
3. Job reallocation is inversely correlated with capital intensity, more jobs being created and destroyed in services than in manufacturing;
4. The intensity of job reallocation depends on some firm-specific characteristics, in

particular job creation tends to be negatively associated with firms' age and size;

5. Job reallocation is a persistent phenomenon. This implies that the observed job flows can not be accounted for by temporary layoff and recall policies.

2.2 Job flows and labour market institutions: theory and empirical evidence

Cross-country comparisons of job flows provide the basis for a formal investigation of the link between job turnover and labour market institutions and policies. The focus on gross job flows instead of net employment changes allows testing sharper theoretical predictions of the effects of some institutions. A typical example is employment protection legislation (EPL). Barriers to the layoff of workers are expected to hinder both job creation and destruction, having ambiguous effects on the average level of labour demand (Bertola, 1990).

Pissarides (2000) studies the effects of unemployment benefits, employment taxes and job subsidies in a fairly general search-equilibrium framework. Both unemployment benefits and employment taxes decrease job creation and increase job destruction through an increase in labour costs. Job subsidies reduce the cost of matching inducing higher job creation. But job destruction increases as well because of the increase in market tightness that improves the worker's options in the labour market. In contrast, Leonard and Audenrode (1993) argue that subsidies to declining firms must be supported by taxes on growing firms, which overall reduce job creation and destruction and therefore job reallocation.

The role of wage setting institutions on employment dynamics has been emphasised in a number of studies. It has been argued that union may influence worker exit behaviour through keeping wages above the market clearing level and through other "non wage" aspects (Farber, 1986; Freeman, 1980). In both cases the presence of unions contributes to improve the employee-employer relationship, making job

separation more costly and consequently reducing job turnover. Salvanes (1997) points out that more co-ordinated wage negotiations combined with wage drift policies might impose an additional restriction to plants when negotiating wages, reducing job creation and therefore gross job flows. However, more co-ordinated wage bargaining systems will result in higher job reallocation if they compress the wage structure (Bertola and Rogerson, 1997).[2]

It has been emphasised in the literature that labour market institutions can have an impact on the employment adjustment along the business cycle. Garibaldi (1998) focuses on the effect of dismissal costs on the cyclical behaviour of job creation and destruction. Introducing firing restrictions in a quite standard matching framework with endogenous job destruction, he argues that when costs associated with dismissals are negligible, job destruction is instantaneous while job creation takes time. As a consequence job destruction varies more than job creation and job reallocation should move counter-cyclically. This prediction is supported by the counter-cyclical pattern of job reallocation observed in US manufacturing (Davis and Haltiwanger, 1992). However, when firing is costly and time consuming the asymmetry in the job flows' cyclical behaviour disappears or might even be reversed for stringent enough dismissal restrictions. Thus, taking into account the stringency of firing laws in Continental Europe this could provide a rationale for the a-cyclical pattern in job reallocation found in Austria (Stiglbauer et al., 2002) and Germany (Boeri and Cramer, 1992) and pro-cyclical pattern found in France (Lagarde et al., 1994) and Sweden (OECD, 1994).

From an empirical point of view, a preliminary attempt to relate facts with theory within a cross-country framework is due to Garibaldi et al. (1997). By pooling summary job turnover measures from previous studies, they present cross-country

[2] Bertola and Rogerson (1997) show how wage compression induced by either a centralised bargaining system or by the presence of wage floors, may be conducive to higher job turnover through an increase in job creation by the more productive firms and job destruction by the less productive ones.

bivariate relationships with some labour market institutions and policies and find a negative correlation between job reallocation and the strictness of EPL and the duration of unemployment benefits. On the contrary, similar correlations in OECD (1999) show a very weak negative association between different indicators of the strictness of EPL and job turnover rates.

Regarding wage setting institutions, Lucifora (1998) for Italy and Blanchflower and Burgess (1996) for the UK find a lower rate of job turnover in unionised sectors, while Heyman (2001) finds a positive association between job reallocation and the degree of wage compression on a panel of Swedish manufacturing establishments, supporting Bertola and Rogerson's (1997) hypothesis.

To the best of our knowledge, Salvanes (1997) is the only study that presents multivariate analysis on the effect of labour market institutions on cross-country labour market dynamics. Pooling cross-sectional sectoral data from previous studies for 7 OECD countries, he assesses the role of EPL, wage bargaining centralisation and industrial subsidies on job flows. He finds that stricter dismissal costs have a negative impact on job creation and destruction rates. Interestingly, the degree of centralisation also has a negative effect on labour market dynamics by reducing job creation. With regards to industrial subsidies, the positive impact on job reallocation reported in this paper contrasts with the negative effect found by Leonard and Van Audenrode (1993) when comparing the US and Belgium labour markets.

Therefore, despite the growing number of studies on this area, there is still little consensus on the effects of institutions on job flows and no clear pattern emerges by looking at the cross-country job flow developments. The difficulties in international comparisons partly reflect the lack of homogeneous data, which may have affected the empirical results presented so far.

3 Data and measurement issues

3.1 Data source

Annual firm-level observations over the period 1992-2001 are available from *Amadeus* produced by Bureau van Dijk (BvD). Amadeus contains comparable firm-level data for European countries and covers all sectors with the exception of the financial sector. BvD local providers collect balance sheet information, sector of operation and number of employees from the national Chambers of Commerce, and uniform formats are applied to the data allowing accurate cross-country comparisons and analysis. Thus, apart from employment data, the dataset includes a wide range of financial and descriptive information (industry and activity codes, incorporation year of the firm to the register, etc.). There are several versions of Amadeus, depending on the number of firms included in the dataset. The version of Amadeus used for our study is the top 1 million companies. In order to be included in Amadeus, a firm must satisfy at least one of the following criteria: operating revenues equal to at least 1.5 (1) million euro, total assets equal to at least 3 (2) million euro, number of employees equal to at least 15 (10) for the UK, Germany, France and Italy (for all the other European countries).

The data has several advantages, which make it especially well suited for international comparisons. First, the data collection method is reasonably homogeneous across countries. This overcomes the problem of previous studies where available country data differed on the sources (administrative vs. survey) and unit of study (firm vs. establishment). Second, information is provided on narrowly defined sectors (2-digit NACE classification) and data on both manufacturing and non-manufacturing sectors are reasonably representative. The availability of services data is an important advantage with respect to previous studies, where cross-country comparisons relied on

information obtained from the whole economy in some countries and the manufacturing sector in others.

There are, however, some limitations in the data. First, it is not possible to distinguish between newly created firms and firms that simply enter the sample at a given period t but were already operating in the period before. Similarly, it is not possible to identify firms' closures from firms that exit the sample for other reasons. Therefore, we restrict our analysis to continuing firms, e.g. firms that are in the sample for at least two consecutive periods. Although this is quite standard in the literature, it introduces a downward bias in the estimates of job flows. Moreover, differences across countries in job turnover rates implied by entry and exit have been found to be quantitatively relevant (Bartelsman et al., 2003) and this may further hamper the cross-country comparability of estimated job flows. However, the exclusion of entry and exit should be less of a problem because it is precisely job turnover of continuing firms the component that is more likely to be affected by some of the labour market institutions considered in this paper (OECD, 1999).

Second, the data are available at the firm rather than the establishment level. Measuring job flows at firm level understates the actual magnitude of total gross flows among plants[3] and may lead to longitudinal linkage problems if ownership and organisational changes (i.e. mergers, acquisitions, etc) are not accounted for.[4] This may be less of a problem with plant-level data, plant being defined in terms of physical location of production. However, cross-country comparisons of establishment data pose serious difficulties since there is important heterogeneity in the definition of

[3] Job creation and job destruction resulting from movement between establishments within the same firm offset each other at the firm level. As a result, higher job reallocation rates are expected at the establishment level. Schuh and Triest (2000) estimate for the United States that job flows between firms represent less than 60% of the total job flows between establishments owned by these firms.

[4] See Davis et al. (1996) for a detailed discussion on problems arising from the measurement of employment changes at the establishment/firm level.

establishment across datasets (OECD, 1994). This is less of a problem with firm data. Similarly, estimates of job creation and job destruction based on year-to-year employment changes will also understate the actual flows since short term jobs (i.e. seasonal jobs) are likely not to be accounted for. As shown by Blanchard and Portugal (2000), the frequency of the data can be quite relevant for cross-country comparisons of job turnover.

Finally, the inclusion criteria in Amadeus introduces a bias against very small firms.

We assess how representative the data is in Section 3.3. Although the results yield clear positive signs, these characteristics of the data should be kept in mind when comparing our results with previous studies.

3.2 Measuring job flows

The conventions of Davis et al. (1996) are followed in defining job flows statistics. Denote the level of employment at firm f in period t with n_{ft} and let Δn_{ft} be the change in employment between period t and t-1. Let S^{+} be the set of firms in sector S with $\Delta n_{ft}>0$ and S^{-} be the set of firms in sector S with $\Delta n_{ft}<0$. We calculate job creation by summing employment changes in S^{+}. Correspondingly, job destruction is calculated by summing all the (absolute) changes in S^{-}. Rates of job creation and job destruction are obtained by dividing by the size of sector. Firm size at time t is calculated as the average employment between period t and t-1, i.e. $x_{ft}=0.5(n_{ft} + n_{ft-1})$. Accordingly, the sector size is defined as $X_{st} = \sum_{f \in S} x_{ft}$.

Job flow rates can equivalently be expressed as the size-weighted average over firms' growth rates as follows

$$JC_{st} = \sum_{f \in S_t^{+}} g_{ft} \frac{x_{ft}}{X_{st}} \qquad \text{Job Creation Rate}$$

$$JD_{st} = \sum_{f \in S_t^-} |g_{ft}| \frac{x_{ft}}{X_{st}} \qquad \text{Job Destruction Rate}$$

where $g_{ft} = \Delta n_{ft} / x_{ft}$ is the growth rate of employment in firm f and period t.[5] The sum of the job creation rate and job destruction rate is the job reallocation rate (JR). It gives the total number of employment positions reallocated in the economy.

The difference between job creation and job destruction is the net employment growth (NET). Finally, minimum worker reallocation (minWR) is defined as the maximum between JC and JD and represents the lower bound of the fraction of workers who change jobs or employment status (worker reallocation) in response to firm-level employment changes.

3.3 Sample description

In order to judge how representative our dataset is, we present comparisons with respect to official sources. Using information provided by Eurostat and the OECD, we compare the employment coverage and yearly net employment changes in our sample with labour force survey data. Similarly, we assess how representative is the coverage in our sample as regards the distribution of employment by sector and firm size.

Figure 1 compares the evolution of employment growth from our sample with the growth in the number of employees measured by OECD statistics.[6] Although there are some minor inconsistencies, the employment figures in our sample follow quite closely

[5] The growth measure defined above is monotonically correlated with the conventional measure defined as the change in employment divided by the lagged employment, and the two measures are approximately the same for small growth rates. Moreover, unlike the conventional measure, which ranges from -1 and $+\infty$, this measure of growth rate is symmetric around zero, being bounded in the interval [-2,2], allowing employment expansions and contractions to be treated symmetrically.

[6] The final sample covers the EU countries with the exception of Luxembourg and Greece. Greece and Luxembourg are excluded from the analysis due to lack of institutional data.

the official statistics. The most significant exception is Italy, which consistently overstates employment growth. This inconsistency is not related to specific outliers, since tabulations show that Italian employment growth in Amadeus is always above the mean values of the rest of the sample for all breakdowns of firm characteristics.[7]

[INSERT FIGURE 1 ABOUT HERE]

Table 1 shows the final sample composition and the sample period for each country, after filtering the observations from outliers.[8] The period of observation varies across countries but information is available in most cases at least during 1995-2000. The number of average valid observations per year ranges from almost 90,000 firms in Germany to some 500 firms in Ireland. This implies an annual average employment coverage of 25 per cent when compared to figures in the Labour Force Survey (LFS).

[INSERT TABLE 1 ABOUT HERE]

Table 2 shows the distribution of firms and employment by sector and country and compares the distribution of sectoral employment in our sample with the distribution calculated using information from the LFS. Although there is a bias towards employment in manufacturing, the sample is well representative of both manufacturing and non-manufacturing sectors. Moreover the sectoral coverage is rather homogeneous across countries and stable over time.

[INSERT TABLE 2 ABOUT HERE]

Regarding the distribution of firms by size classes, our sample is expected to be biased against small firms due to the eligibility criteria applied in Amadeus. Our next table shows that the sample is still well balanced across different size classes. Table 3 compares the distribution of employment by firm size in our sample and OECD (1994)

[7] In the text, we report results including Italy. We have repeated the analyses in sections 4 and 5 excluding Italy from the sample (available upon request). The main findings of the paper are largely unaffected by the exclusion of Italy, although results are somewhat more robust when Italy is excluded from the institutional analysis.

estimates based on the report Enterprises in Europe produced by Eurostat in 1992 and 1994. It shows that, overall, although there is a bias towards larger firms in our sample, smaller firms are well represented.

[INSERT TABLE 3 ABOUT HERE]

4 Job Turnover, Firm Characteristics and the Cycle

4.1 An Overview

In this Section, we present an overview of recent developments in the job flows in European countries. Figure 2 presents the distribution of employment growth rates for the whole sample of EU countries over the 1992-2000 period. It shows that the employment change for 30% of the observations falls in the [–5%, 5%] range. This percentage increases to about 50% when the range of growth considered is [–10%, 10%]. It is clear, however, that there is a high dispersion of growth rates. Moreover, this figure also points to a higher concentration of observations in positive growth rates, which reflects the fact that the period of study is overall expansionary.

[INSERT FIGURE 2 ABOUT HERE]

Table 4 reports the aggregate rates of job creation (JC), job destruction (JD), job reallocation (JR), minimum worker reallocation (minWR) and net employment change (NET) in each country, averaged within the sample period. First note the large flows, both regarding job creation and destruction, observable in all countries. Although all of the countries registered a net increase of employment within the period of study, the coexistence of significant job creation and destruction flows is a broadly based finding. Job creation rates range between 4.4% in Germany and 8.6% in Spain, and job

[8] Discussion of the data selection and cleaning can be found in the Appendix.

destruction rates from 3.0% in Finland and 4.4% in the UK. These developments led to job reallocation rates of around 10% on average in the EU, Austria and Germany being the country with the lowest job reallocation (7.9% and 8.1% respectively) and Spain and Italy those with the highest (12.1% and 12.3%). This means that, on average, one tenth of jobs are either created or destroyed per year. The minimum amount of workers that have to move to accommodate the change in job positions or employment status (minimum worker reallocation) varied between 4.6% on average in Austria and 8.6% in Spain.

[INSERT TABLE 4 ABOUT HERE]

The rest of Table 4 presents summary statistics of flow rates by sector and firm's size, age and capital intensity pooling the information across countries and years. According to the sector,[9] service industries exhibit, on average, larger job flows. Business services is the sector with larger job flows in Europe during the period of study, a pattern mainly driven by the strong employment creation in this sector, while manufacturing and energy present the lowest JR rates. As regards size classes, the concept used in the analysis refers to the average size of the firm in two consecutive periods. The average size is used instead of the current size as it is expected to give a better indication of the intended scale of operations. We divide the sample in eight categories: 1-19 employees; 20-49; 50-99; 100-249; 250-499; 500-999; 1,000-2,499; and 2,500 and over. The process of job reallocation is clearly stronger among smaller firms. In fact, there is an inverse relationship between the size of the firm and the intensity of job reallocation. Moreover, this inverted relationship is mainly due to the pattern of job creation, which shows a higher variation among firm size than the pattern of job destruction. Concerning the age of the firm, four groups are considered: 1 year old; 2-5 years; 6-10 years; and more than 10 years. Job flows are significant in all age groups

[9] Sectors are defined according to the 1-digit NACE classification (NACE code, rev 1).

but higher in the youngest firms than in the oldest. This fact is again related with a higher variation in job creation than in destruction.

Capital intensity is defined as the capital (measured as value added minus the wage bill) share in value added. We distinguish four categories: below 20%; 20-30%; 30-40%; and more than 40%. According to the estimates in Table 4, there seems to be an U–shaped relationship between capital intensity and JR, with firms with either low or high capital intensity exhibiting larger turnover rates.

To better understand firm-level job dynamics, it is also useful to measure how persistent are the decisions of creating or destroying jobs. Job reallocation may not be a persistent phenomenon if it is related to temporary layoffs and recalls. On the other hand, to the extent that job flows are persistent, they must be associated with long-term joblessness or worker reallocation across firms. Following Davis et al. (1996), we define the *N-period* persistence of job creation as the fraction of newly created jobs at time t that survives through the period $t+N$. Analogously, the *N-period* persistence of job destruction is defined as the fraction jobs destroyed at time t that do not reappear through the period $t+N$.

Table 5 summarises the persistence rates of job creation and job destruction over a one and two-year horizon. Between 81% and 92% of newly created jobs and 64% and 86% of recent destroyed jobs persist at least one year in our sample of European countries. After two years the persistence rates in job creation fall up to a minimum of 71% in Belgium and a maximum of 86% in Austria, while the persistence in destruction rate vary between 52% in Italy and 79% in Austria. These results indicate that firm-level job decisions are highly persistent, while job creation appears as a more persistent phenomenon than job destruction. As indicated at the bottom of the table, the differences between persistence rates of job creation and job destruction both over one and two year periods are statistically significant for the whole sample of countries. However, this can be partly explained by activity developments, as our results refer to

a period of overall expansion and persistency rates tend to show a pro-cyclical pattern (Davis et al. 1996).

[INSERT TABLE 5 ABOUT HERE]

Some of these results, including the negative relationship between job reallocation and firm size and age and the fact that job creation and job destruction largely reflect persistent changes, are similar to those reported in Davis et al. (1996) for the US. They are not totally comparable, however, as their study refers to the manufacturing sector only and includes, apart form continuing firms, start-ups and shutdowns.

As a final exercise, the job flows for the euro area as a whole are estimated and confronted with those of the UK, whose labour market is considered to be more flexible than that of the euro area on average, and those of the Nordic countries,[10] which lie under a more "corporatist" model. The average job reallocation rate in the UK is 11%, compared with 9.3% in the euro area (see Table 4). In addition, even if the net employment growth is slightly higher in the UK than in the euro area, not only job creation is higher in the former compared to the latter but also job destruction. Job flows in Nordic countries lie between these two. Table 6 presents detailed comparisons that confirm the difference in average job reallocation among the three areas. All breakdowns by firm size, age and capital intensity reflect higher flows in the UK than in the euro area. The same pattern emerges by sectors, only with the exception of agriculture. These patterns are confirmed by differences in persistence rates across these three areas, which point to more persistent decisions in the euro area than in the UK and Nordic countries. Whether or not labour market institutions are responsible for these differences is something that will be investigated in section 5.

[INSERT TABLE 6 ABOUT HERE]

[10] Including only Denmark, Finland and Sweden.

4.2 The impact of firm characteristics on job flows

Next, we study the joint impact of the different firm characteristics considered in the descriptive analysis on the dynamics of job flows. Some of the firm characteristics presented above are highly correlated among each other (e.g. firm's age and size), suggesting the need of moving to a multivariate framework in order to disentangle the main determinants of labour market flows. For this purpose, we calculate JC, JD and JR rates for narrow sectors defined as the crossing of 4 age groups, 7 sectors of activity, 4 size groups, 13 countries, 10 years (between 1992 and 2001) and 4 capital intensity groups. Then, we regress the sectoral flows on dummy variables defined for each of these groups and the aggregate employment growth rate in each country-year to control for the business cycle.

We consider two different specifications, depending on whether we include or not capital intensity in the definition of the cells. The reason is that *Amadeus* has very limited information on value added for firms in Austria, Germany and the Netherlands. Thus, considering capital intensity classes might affect significantly the estimates of these countries. When capital intensity crossings are excluded, the potential number of cells is 13,440, ascending to 53,760 if capital is included in the analysis. In the first case, we have about 8,000 valid observations, and almost 21,000 when capital intensity is considered.[11] Reported standard errors are robust to heteroskedasticity and country clustering.[12]

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[11] The main reason for missing observations is the different sample periods available for each country. See Table 1 for a full description of the sample coverage by year and country.

[12] We trimmed out outlier observations following the method of detection of outliers in the multivariate framework developed by Hadi (1992). In order to identify the outliers, we constructed categorical variables by age, size, industrial sector, country and capital intensity (if applicable). This implied the exclusion of 56 (147) cells in the case of JR, 65 (153) in the case of JC and 101 (237) in the case of JD in the sample without (with) capital intensity. The results presented in the paper refer to the regressions without outliers. Results including outliers, available upon request, do not differ importantly with respect to those presented in

Table 7 summarises the results of the OLS regressions for JR, JC and JD on the class dummies. Columns (A) to (C) do not include capital intensity groups, which are reported in columns (D) to (F). According to the goodness of fit in the regressions, the proposed models do a much better job in explaining the patterns of JR and JC than in explaining the sources of JD, suggesting a more important role to idiosyncratic factors in the determination of the latter. The results tend to be in line with the descriptive analysis discussed in the previous section. Thus, there is a negative relationship between JR and JC and the age of the firms, especially when firms are more than 5 years old. According to columns (A) and (B), JR and JC are 4 percentage points lower in firms above 10 years old than in those which have been operating for less than a year. Interestingly, there is some indication of a reversed pattern in JD, with older firms significantly destroying more jobs than younger ones. The sectoral dummies confirm a higher job reallocation and creation in construction and service than in manufacturing, while the latter presents higher job destruction. For instance, job reallocation and creation rates in Business services are more than 5 percentage points higher than in industry, while the difference in job destruction is not significant.

[INSERT TABLE 7 ABOUT HERE]

Similarly, the negative relationship between the size of the firm and job reallocation is confirmed by the multivariate analysis. Indeed, both job creation and destruction rates are lower the larger the firm is, although differences are higher in job creation than in job destruction. As a result, a firm of more than 1,000 employees presents a job reallocation rate around 7 percentage points lower than a firm with less than 50 workers, which is explained by 6.2 percentage points less in job creation and 1.3 percentage point less in job destruction.

Differences across countries in job flow statistics are statistically significant even after controlling for a wide range of firm characteristics. According to the estimates of the text.

JR, only Spain and Italy show a higher rate than the UK, while all the other countries show significantly lower rates. The highest difference compared with the UK is observed in Austria, which has a 5 percentage points lower JR rate.[13]

When ranges of capital intensity are taken into account, all previous results remain broadly unchanged (see Columns D to F in Table 7). In addition, we do not find a systematic role of capital intensity in the determination of job flows.

Finally, we focus on the effects of the business cycle on job turnover. Previous country estimates suggest clear pro-cyclical patterns of JR in the US (Davis and Haltiwanger, 1999) but either a-cyclical or slightly pro-cyclical movements in European countries. Our estimates suggest a pro-cyclical character of JR in Europe, although the effect is only statistically significant when capital intensity classes are considered.

5 Job Flows and Institutions

The aim of our next set of regressions is to uncover the determinants of country idiosyncratic factors in the patterns of job turnover. According to our previous discussion, we concentrate on several institutional and regulatory aspects of the labour market:

- Tax and benefits systems: including an index of the duration of unemployment benefits and the tax wedge between the real (monetary) labour cost faced by the firms and the consumption wage received by the employees. The latter is normalized by GDP, while the former ranges from 0 (if benefit provision stops before 1 year) to 1 (for a constant benefit after 5 years).

[13] Interestingly, the UK presented relatively low job flow patterns when compared to many Continental European countries in previous international comparisons (e.g. OECD, 1994; Garibaldi et al, 1997 and OECD, 1999). This apparently puzzling result, reversed in our study, might be due to the lack of homogeneous data in previous analyses.

- Wage-setting institutions: including an index of co-ordination in the wage bargaining process which ranges from 1 to 3 according to the increasing degree of co-ordination.[14] Within our sample, this indicator is time-invariant.

- Restrictions to hiring and firing: we consider an updated version of the time-varying index of EPL reported in Nickell et al. (2001) and a time-invariant index as described by OECD (1999). Both increase with the relative stringency of EPL.

- Sectoral employment subsidies: we include an indicator of the share of sectoral and ad hoc state aid as a percentage of GDP.[15]

Additionally, we include in the regressions the share of workers holding temporary contracts in the total number of employees.[16]

The results presented above suggest that failing to control for differences across countries in the size, age and sectoral distribution of firms might blur cross-country comparisons. Hence, we repeat the cell regressions presented in Columns (A) to (C) of Table 7 including the institutional indicators.

First we present pooled OLS regressions where the country dummies are substituted by the institutional variables. A second set of regressions includes country fixed effects. The main advantage of this specification is that it allows controlling for unobserved time-invariant country heterogeneity. However, together with the limitation of not allowing for the inclusion of time-invariant covariates (one of the indicators of EPL and wage-setting co-ordination) the fixed effect specification disregards the cross-country information in the data. The latter might severely affect the efficiency of the estimates of institutional variables given the slow moving nature of institutions and the short

[14] Wage-setting co-ordination, unemployment benefits duration, and the tax wedge are taken from an updated series from Nickell et al. (2001). The information is annual till 1998. When necessary, we extrapolated the variables for the period 1999-2001.

[15] Source: NewCronos Database.

sample period (see Table 1) of our panel. Thus, as Heckman and Pages (2000) point out, the reduced time-series variation in the institutional data may result in imprecise estimates (high standard errors) when country-specific fixed effects are included in the regressions. A final set of regressions treats country unobserved heterogeneity as random. Differently from the fixed effect methodology, the random effect methodology allows to exploit both the cross-country and time-series variation of the data, implying more precise estimates. The advantage of this approach in terms of efficiency comes with the cost of imposing the assumption of orthogonality between the individual effects and the covariates.

The effects of institutions on JR, JC and JD are reported on Table 8. As expected, the strictness of EPL has a negative and statistically significant impact on JR. This result is similar for both indicators of EPL and robust to the inclusion of fixed or random effects in the regression, thought not significant at the conventional levels in the pooled OLS specification. It responds to a reduction of both JC and JD in countries with more stringent EPL, although only the coefficients on JC are statistically significant.

The duration of unemployment benefits and the degree of wage-setting co-ordination have similar effects, reducing JR by dampening JC and JD. All these effects are statistically significant across the different specifications, with the exception of the role of benefits on JD when fixed or random effects are present (Columns L and M). Results for wage-setting co-ordination are in line with those of Salvanes (1997), while the reduction of JC in countries with more generous unemployment benefits supports the predictions of matching models discussed by Pissarides (2000).

[INSERT TABLE 8 ABOUT HERE]

Regarding the tax wedge, countries with higher tax burdens experience lower JC and JR. According to the estimates in Columns (A) to (D), a 10 percentage points increase

[16] Source: Labour Force Survey.

of the tax wedge reduces JR by 0.5 percentage point. However, the tax wedge becomes non-significant although correctly signed when fixed effects are included. These results support the predictions of matching models discussed by Pissarides (2000), although we do not find statistically significant effects of the tax wedge on JD.

Employment subsidies have a negative and significant effect on JD, in line with the results in Leonard and Van Audennrode (1993), suggesting that these policies are successful in alleviating job losses. The effect on JC is positive but statistically significant only when country unobserved heterogeneity is taken into account.

Finally, the evidence suggests a non-significant impact of the use of temporary contracts in the determination of job flows.

The evidence presented is relatively robust to different specifications. When country-specific fixed effects are included in the regressions, most of the effects of institutions remain statistically significant at standard confidence levels. Moreover, the fact that our findings are robust to the use of alternative estimators that do not rely exclusively on the time-series variation of institutions is reassuring.

6 Sensitivity Analysis

The purpose of this section is to investigate the robustness of the regression results presented in the previous section.

Table 9 presents the results of the institutional regressions when the sample is restricted to those years for which we have reliable institutional data. Since some noise might be introduced in the extrapolation of the data on institutions for the period 1999-2001, we repeat the analysis restricting the sample to the years when information on labour market institutions is available. The results are qualitatively and quantitatively similar to those previously presented.

[INSERT TABLE 9 ABOUT HERE]

Aggregate cross-country studies are often criticised on grounds of lack of robustness with respect to the set of countries included in the analysis. Hence, the last set of regressions presented performs sensitivity analysis following the approach proposed by Sala-i-Martin (1997) in the context of growth regressions, but focusing on the number of countries included in the regression. Very briefly, we look at the distribution of the estimates of the institutional variables across the full set of regressions that result from dropping any combinations of three countries in the OLS, FE and RE specifications. Taking into account that the full sample of countries is 13, the resulting number of regressions is 1365 for each institutional variable (910 for union co-ordination, since this variable is not included in the fixed effect specifications). For each institutional variable, we take averages of the estimated coefficients and their standard deviations across the different regressions. Under the assumption of normality, these two statistics are sufficient to calculate the cumulative distributive function (cdf) of the estimates and apply standard confidence levels. However, even if the estimates in every regression follow a t-Student distribution, it might be the case that the distribution of the estimates is not normal. Following Sala-i-Martin (1997), in this case we can still compute their cdf as the average of the individual cumulative distributive functions.

Table 10 presents the results of the sensitivity analysis with respect to the number of countries. According to the normality criterion (Column C), the results in Table 8 do not depend on the set of countries included in the analysis in the cases of EPL, wage-setting co-ordination, employment subsidies and the duration of unemployment benefits. These institutions retain their significance at the 95% level in those cases in which they were found significant with the full sample. The significance is somewhat weaker in most cases when non-normality is assumed (Column D), but results remain largely consistent with those of Column C. The most remarkable change with respect to Table 8 regards the tax wedge, which becomes non-significantly correlated with JR and JC when the set of countries in the sample varies.

[INSERT TABLE 10 ABOUT HERE]

7 Conclusions

This paper presents an analysis of job flows for a panel of 13 European countries in the 1990s using a dataset of continuing firms that covers the whole spectrum of productive sectors and, given homogeneity in the definitions and sectoral coverage, permits cross-country comparisons.

We estimate the joint effect of different firm characteristics on job flow rates. We find that both the size and age of the firm have a negative impact on job reallocation. Similarly, firms located in services typically exhibit stronger patterns of job flows than firms operating in manufacturing.

Even after controlling for a number of firm characteristics we find significant cross-country differences in labour market dynamics. Thus, we investigate the role of institutional aspects of labour markets in the determination of job turnover. Once controlled for sectoral and firm characteristics, we find that the strictness of employment protection legislation has a negative effect on job creation and therefore on job reallocation. Similarly, the extent of wage bargaining co-ordination and the generosity of unemployment benefits reduce both job creation and job destruction. All these results are robust to different specifications and different sets of countries included in the regressions. The role of other institutions such as the tax wedge, the use of temporary contracts and employment subsidies on job dynamics are less clear-cut, suggesting the need of further empirical and theoretical work.

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Figure 1

Growth in the Number of Employees.

Comparing Amadeus (NET) with Official Statistics (OECD)

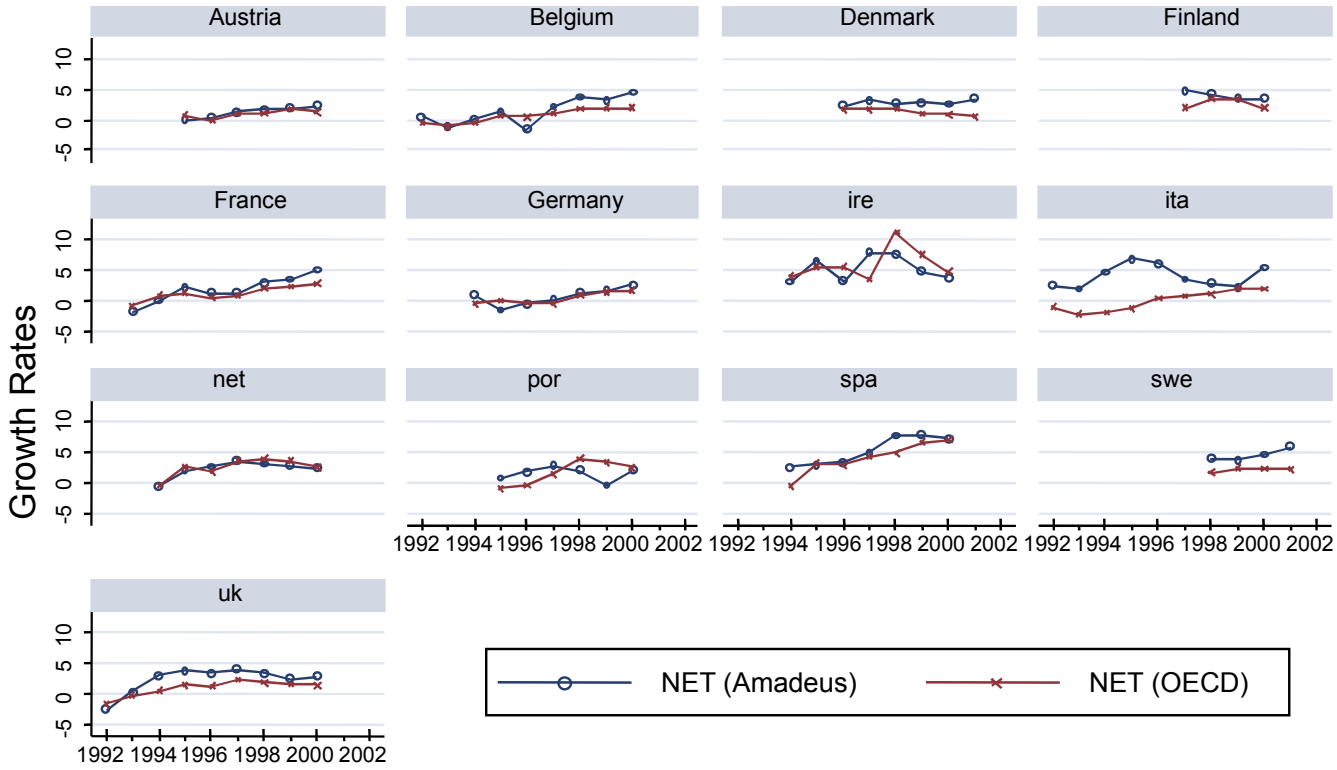
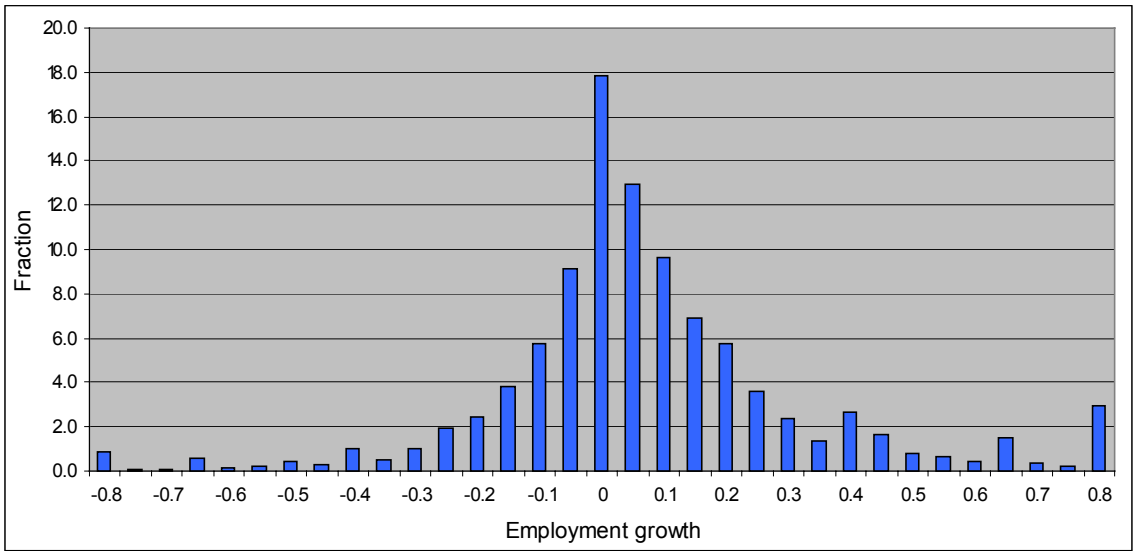


Figure 2

Distribution of continuing firms according to employment growth rates



Note: Distributions of firms by employment growth rate (annual observations) for the panel of European countries in the period 1992-2000. The growth rates are defined as the change in employment divided by the average employment between two consecutive periods. Firms for which employment remains unchanged are not included.

Table 1

Final Sample Composition

Panel A: Number of observations per year

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
Austria				4208	7558	9609	11465	12490	11588		56918
Belgium	21106	24047	25797	27407	26851	28655	29855	30440	30506		244664
Denmark					10973	13529	14502	15990	17098	6404	78496
Finland						4353	6976	8916	9640		29885
France		23898	27321	38098	51311	55049	61593	71556	74673		403499
Germany			14898	49416	93081	103647	114387	124816	125967		626212
Ireland			289	454	539	593	661	605	248		3389
Italy	15273	17883	22352	27200	33273	66222	71524	71278	63836		388841
Netherlands			23864	26382	28734	15703	5268	4949	2789		107689
Portugal				1157	1680	1705	1909	646	476		7573
Spain			9850	23538	38479	47415	54055	66354	69630		309321
Sweden							33350	36411	38194	9380	117335
UK	14474	20909	24254	28946	32936	36393	39090	42231	42758		281991
Total	50853	86737	148625	226806	325415	382873	444635	486682	487403	15784	2655813

Panel B: Average number of observation and sample coverage

	Sample period	Average number of observations per year	Employment coverage (%)
Austria	1995-2000	9486	18.9
Belgium	1992-2000	27185	48.6
Denmark	1996-2001	13083	29.9
Finland	1997-2000	7471	27.5
France	1993-2000	50437	23.4
Germany	1994-2000	89459	36.2
Ireland	1994-2000	484	5.9
Italy	1992-2000	43205	23.6
Netherlands	1994-2000	15384	9.8
Portugal	1995-2000	1262	5.3
Spain	1994-2000	44189	24.2
Sweden	1998-2001	29334	33.2
UK	1992-2000	31332	27.2

Table 2

Distribution of firms and employment by sector (NACE code, rev. 1)

			Sectors								
		Source	01-05	10-14	15-37	40-41	45	50-55	60-64	70-74	75-99
Austria	% empl	Ams	0.002	0.004	0.300	0.014	0.149	0.321	0.066	0.096	0.047
		LFS	0.081	0.004	0.276	0.012	0.108	0.283	0.087	0.087	0.061
	% firms	Ams	0.003	0.007	0.216	0.002	0.182	0.418	0.071	0.084	0.017
Belgium	% empl	Ams	0.004	0.004	0.394	0.021	0.083	0.205	0.142	0.125	0.023
		LFS	0.034	0.004	0.294	0.012	0.099	0.271	0.115	0.110	0.061
	% firms	Ams	0.011	0.003	0.228	0.002	0.122	0.381	0.080	0.141	0.032
Denmark	% empl	Ams	0.011	0.002	0.372	0.002	0.078	0.238	0.115	0.159	0.023
		LFS	0.054	0.000	0.284	0.010	0.101	0.249	0.105	0.126	0.072
	% firms	Ams	0.022	0.002	0.254	0.001	0.137	0.306	0.060	0.189	0.029
Finland	% empl	Ams	0.004	0.004	0.433	0.019	0.066	0.209	0.113	0.123	0.028
		LFS	0.093	0.003	0.287	0.016	0.084	0.207	0.106	0.128	0.076
	% firms	Ams	0.008	0.003	0.281	0.016	0.103	0.329	0.071	0.158	0.031
France	% empl	Ams	0.005	0.006	0.408	0.020	0.073	0.204	0.098	0.151	0.036
		LFS	0.062	0.003	0.271	0.013	0.096	0.240	0.094	0.129	0.093
	% firms	Ams	0.010	0.006	0.270	0.002	0.103	0.354	0.060	0.154	0.041
Germany	% empl	Ams	0.038	0.007	0.331	0.012	0.123	0.240	0.076	0.098	0.075
		LFS	0.004	0.007	0.395	0.019	0.068	0.194	0.111	0.153	0.050
	% firms	Ams	0.011	0.005	0.281	0.005	0.136	0.336	0.052	0.140	0.035
Ireland	% empl	Ams	0.004	0.009	0.445	-	0.040	0.216	0.149	0.109	0.029
		LFS	0.109	0.005	0.244	0.011	0.118	0.267	0.074	0.101	0.072
	% firms	Ams	0.007	0.021	0.416	-	0.049	0.301	0.072	0.107	0.027
Italy	% empl	Ams	0.006	0.002	0.592	0.013	0.052	0.157	0.084	0.066	0.029
		LFS	0.031	0.008	0.471	0.022	0.119	0.107	0.108	0.071	0.062
	% firms	Ams	0.011	0.004	0.483	0.004	0.063	0.316	0.045	0.054	0.020
Netherlands	% empl	Ams	0.013	0.006	0.310	0.009	0.142	0.244	0.080	0.153	0.042
		LFS	0.050	0.002	0.229	0.009	0.092	0.294	0.091	0.166	0.067
	% firms	Ams	0.022	0.002	0.192	0.001	0.138	0.294	0.064	0.261	0.026
Portugal	% empl	Ams	0.003	0.006	0.402	0.009	0.140	0.189	0.170	0.063	0.016
		LFS	0.120	0.005	0.293	0.010	0.134	0.252	0.051	0.057	0.080
	% firms	Ams	0.006	0.003	0.382	0.005	0.119	0.391	0.030	0.053	0.011
Spain	% empl	Ams	0.012	0.011	0.364	0.014	0.093	0.248	0.092	0.119	0.047
		LFS	0.095	0.006	0.240	0.008	0.129	0.284	0.075	0.082	0.081
	% firms	Ams	0.015	0.007	0.307	0.004	0.118	0.366	0.053	0.100	0.031
Sweden	% empl	Ams	0.007	0.004	0.366	0.013	0.070	0.206	0.109	0.179	0.046
		LFS	0.041	0.004	0.288	0.012	0.084	0.231	0.102	0.161	0.078
	% firms	Ams	0.014	0.003	0.207	0.007	0.095	0.378	0.072	0.185	0.039
U.K	% empl	Ams	0.011	0.009	0.341	0.008	0.045	0.274	0.068	0.157	0.087
		LFS	0.023	0.006	0.258	0.010	0.101	0.280	0.094	0.146	0.081
	% firms	Ams	0.011	0.005	0.287	0.002	0.072	0.252	0.053	0.193	0.124

Note: LFS is the EU Labour Force Survey. Ams is the final sample from Amadeus. 01-05 Agriculture, forestry and fishing; 10-14 Mining and quarrying; 15-37 Manufacturing; 40-41 Energy and water supply; 45 Construction; 50-55 Trade, Restaurants and Hotels; 60-64 Transportation and communication; 70-74 Business services; 75-99 Community, social and personal services.

Table 3

Distribution of firms and employment by size

			Firm size (number of employees)		
		Data source	Small 1-99	Medium 100-499	Large 500+
Austria	%empl	Amadeus	0.404	0.279	0.317
		OECD	-	-	-
	%firms	Amadeus	0.906	0.082	0.013
Belgium	%empl	Amadeus	0.381	0.224	0.395
		OECD	0.460	0.191	0.349
	%firms	Amadeus	0.939	0.051	0.010
Denmark	%empl	Amadeus	0.410	0.247	0.343
		OECD	0.614	0.176	0.210
	%firms	Amadeus	0.926	0.063	0.011
Finland	%empl	Amadeus	0.313	0.269	0.418
		OECD	0.443	0.171	0.386
	%firms	Amadeus	0.897	0.084	0.019
France	%empl	Amadeus	0.301	0.246	0.452
		OECD	0.501	0.162	0.337
	%firms	Amadeus	0.887	0.094	0.019
Germany	%empl	Amadeus	0.211	0.215	0.574
		OECD	0.446	0.182	0.372
	%firms	Amadeus	0.849	0.124	0.027
Ireland	%empl	Amadeus	0.266	0.452	0.282
		OECD	-	-	-
	%firms	Amadeus	0.683	0.286	0.032
Italy	%empl	Amadeus	0.345	0.268	0.387
		OECD	0.714	0.099	0.187
	%firms	Amadeus	0.896	0.091	0.013
Netherlands	%empl	Amadeus	0.570	0.250	0.180
		OECD	-	-	-
	%firms	Amadeus	0.945	0.050	0.005
Portugal	%empl	Amadeus	0.217	0.343	0.440
		OECD	0.595	0.195	0.210
	%firms	Amadeus	0.770	0.195	0.036
Spain	%empl	Amadeus	0.406	0.236	0.358
		OECD	0.654	0.145	0.200
	%firms	Amadeus	0.935	0.055	0.010
Sweden	%empl	Amadeus	0.391	0.195	0.414
		OECD	-	-	-
	%firms	Amadeus	0.952	0.039	0.009
UK	%empl	Amadeus	0.154	0.254	0.592
		OECD	0.491	0.172	0.338
	%firms	Amadeus	0.728	0.219	0.053

Note: The figures in the table are average values over the sample period. Data for the OECD are from the OECD Economic Outlook (based on Enterprises in Europe, 1994).

Table 4

Average job flow rates

	JC	JD	JR	NET	MinWR
By country					
Austria	4.6	3.4	7.9	1.2	4.6
Belgium	5.2	3.8	9.0	1.3	5.5
Denmark	6.2	3.3	9.5	2.8	6.2
Finland	7.0	3.0	9.9	4.0	7.0
France	5.1	3.2	8.3	1.8	5.3
Germany	4.4	3.7	8.1	0.7	4.7
Ireland	8.5	3.1	11.5	5.4	8.5
Italy	8.2	4.1	12.3	4.1	8.2
Netherlands	6.5	4.3	10.8	2.2	6.6
Portugal	4.9	3.5	8.4	1.5	5.0
Spain	8.6	3.4	12.1	5.2	8.6
Sweden	8.1	3.6	11.7	4.5	8.1
UK	6.6	4.4	11.0	2.3	6.9
Euro area	5.6	3.7	9.3	1.9	6.3
Nordic countries	7.3	3.4	10.7	2.9	7.1
By Sector of Operation					
Agriculture	5.8	4.3	10.1	1.6	6.7
Mining	3.3	5.8	9.1	-2.7	6.2
Manufacturing	4.6	3.9	8.5	0.7	5.3
Energy	2.3	4.1	6.4	-1.3	4.8
Construction	6.8	4.7	11.5	1.7	7.3
Trade, restaurants and hotels	6.8	3.0	9.8	3.4	6.8
Transport and communication	5.0	4.0	9.0	0.7	6.3
Business services	8.3	4.3	12.6	4.4	8.7
Community, social and personal serv.	7.6	3.0	10.6	4.2	7.5
By size					
1-19 employees	10.7	3.5	14.2	6.9	10.7
20-49 employees	7.8	3.8	11.6	3.8	7.9
50-99 employees	7.4	3.8	11.2	3.3	7.4
100-249 employees	7.0	4.0	11.0	2.9	7.1
250-499 employees	5.8	3.4	9.2	2.2	6.0
500-999 employees	5.7	3.6	9.4	2.0	5.9
1000-2499 employees	4.8	3.7	8.5	2.2	5.3
2500 and more employees	3.7	3.8	7.5	-0.4	4.7
By age					
1 year old	8.9	3.7	12.6	5.2	9.0
2-5 years old	8.4	4.1	12.5	4.3	8.4
6-10 years old	7.6	4.0	11.6	2.6	8.0
More than 10	5.2	3.6	8.8	1.6	5.4
By capital intensity					
20% or less	6.5	4.0	10.5	2.5	7.3
20-30%	5.7	3.7	9.4	2.0	6.5
30-40%	5.9	3.2	9.1	2.7	6.4
More than 40%	6.1	3.8	9.9	2.3	6.6

Note: Average values over the sample period.

Table 5

Average persistence rates

	Job Creation		Job Destruction	
	One year	Two years	One year	Two years
Austria	0.92	0.86	0.86	0.79
Belgium	0.80	0.71	0.75	0.63
Denmark	0.81	0.72	0.68	0.54
Finland	0.86	0.80	0.70	0.62
France	0.82	0.74	0.70	0.56
Germany	0.91	0.85	0.87	0.77
Ireland	0.87	0.83	0.67	0.53
Italy	0.85	0.78	0.64	0.52
Netherlands	0.80	0.72	0.68	0.56
Portugal	0.81	0.73	0.69	0.57
Spain	0.85	0.78	0.64	0.55
Sweden	0.86	0.79	0.71	0.56
UK	0.83	0.75	0.71	0.57
Sample mean	0.85	0.77	0.72	0.60
Euro area	0.85	0.78	0.72	0.61
Nordic countries	0.84	0.77	0.70	0.57

Mean comparison test (whole sample)

	Differences between JC and JD persistence rates:
One year	0.13 (13.43)
Two years	0.18 (13.28)

t-values in parenthesis: H_0: mean (diff) = 0 vs. H_1: mean (diff) >0

Note: the figures in the table are average values over the sample period.

Table 6

Average job reallocation rates for the euro area, the UK and Nordic countries

	Euro area	UK	Nordic countries
By NACE			
Agriculture	11.0	6.4	11.9
Mining	9.0	10.1	8.5
Manufacturing	7.9	10.1	9.1
Energy	6.1	7.8	11.7
Construction	10.9	14.7	12.4
Trade, restaurants and hotels	9.6	10.4	10.4
Transport and communication	8.9	10.1	8.9
Business services	12.4	13.5	15.3
Community, social and personal services	9.6	11.7	12.1
By size			
1-19 employees	13.9	17.0	13.5
20-49 employees	10.8	14.2	12.7
50-99 employees	10.5	12.6	12.7
100-249 employees	10.3	12.9	12.2
250-499 employees	8.4	11.6	10.2
500-999 employees	8.7	11.4	9.5
1000-2499 employees	7.8	10.8	8.9
2500 and more employees	7.2	8.8	5.4
By age			
1 year old	13.9	15.8	18.3
2-5 years old	12.5	13.7	12.1
6-10 years old	10.6	13.0	10.4
More than 10	7.7	10.3	9.5
By capital intensity			
20% or less	10.5	11.2	11.0
20-30%	9.3	10.5	10.2
30-40%	9.1	9.7	9.8
More than 40%	10.0	10.3	10.4

Note: The figures in the table are average values over the sample period.

Table 7

Firm characteristics and Labour Market Flows. OLS Estimates

Model	(A)	(B)	(C)	(D)	(E)	(F)
Depvar:	JR	JC	JD	JR	JC	JD
Intercept	16.699	10.858	5.782	15.896	10.942	4.978
	(22.46)	(20.19)	(12.27)	(20.01)	(13.20)	(14.81)
Cycle indicator	0.001	0.005	-0.003	0.228	0.527	-0.286
	(1.47)	(5.13)	(4.68)	(2.52)	(5.25)	(5.87)
Age: 2-5 years	0.431	0.507	0.128	0.076	-0.088	0.240
	(1.17)	(1.64)	(1.16)	(0.30)	(0.41)	(2.17)
6-10 years	-1.518	-1.347	0.204	-1.491	-1.623	0.304
	(5.21)	(4.69)	(2.07)	(8.42)	(8.39)	(3.51)
More than 10 years	-4.127	-4.041	0.501	-4.254	-4.424	0.697
	(9.91)	(9.28)	(4.87)	(10.34)	(10.48)	(9.48)
Sector: Agriculture	0.265	-0.161	-0.648	0.333	0.234	-0.540
	(0.33)	(0.22)	(3.39)	(0.61)	(0.54)	(2.48)
Construction	2.235	1.549	0.446	3.894	2.714	0.636
	(2.89)	(2.59)	(1.36)	(4.93)	(4.37)	(1.50)
Trade	1.381	1.825	-0.607	1.672	2.095	-0.554
	(3.52)	(4.64)	(4.41)	(6.23)	(6.63)	(4.18)
Transport	2.451	2.933	-0.807	2.434	2.920	-0.710
	(6.51)	(7.32)	(6.32)	(5.08)	(6.90)	(7.52)
Business services	5.484	5.149	0.117	4.891	4.775	-0.191
	(8.59)	(8.82)	(0.99)	(8.99)	(9.71)	(1.73)
Other services	1.800	2.469	-0.924	1.993	2.687	-1.073
	(4.16)	(5.98)	(6.10)	(4.29)	(6.36)	(6.89)
Size: 50-249	-1.476	-1.644	-0.045	-1.791	-1.610	-0.333
	(4.35)	(5.53)	(0.30)	(7.23)	(7.68)	(3.15)
250-999	-4.989	-4.276	-1.224	-4.523	-3.746	-0.994
	(8.78)	(9.69)	(4.80)	(10.25)	(11.62)	(4.46)
1,000 and over	-6.941	-6.232	-1.302	-5.523	-4.822	-1.034
	(12.55)	(15.71)	(5.25)	(13.36)	(11.31)	(4.73)
K-intensity: 20-30%				-0.377	-0.008	-0.425
				(1.90)	(0.03)	(5.55)
30-40%				-0.367	0.085	-0.619
				(1.51)	(0.28)	(6.39)
More than 40%				0.557	0.364	-0.030
				(3.17)	(1.32)	(0.21)
Country: France	-3.505	-2.169	-1.297	-3.264	-2.295	-0.932
	(38.56)	(31.46)	(18.21)	(32.00)	(36.23)	(13.99)
Sweden	-1.004	-1.411	-0.289	-1.988	-1.964	-0.248
	(3.56)	(6.78)	(3.44)	(8.12)	(10.88)	(2.44)
Italy	0.964	0.370	0.177	1.167	0.368	0.320
	(5.52)	(2.20)	(1.58)	(7.95)	(2.31)	(3.91)
Spain	0.718	0.484	-0.008	0.475	-0.087	0.355
	(3.22)	(1.93)	(0.04)	(2.46)	(0.40)	(2.15)
Portugal	-3.116	-1.382	-1.939	-2.746	-1.999	-1.505
	(12.36)	(5.62)	(13.31)	(8.68)	(6.95)	(12.07)
Netherlands	-1.511	-1.853	-0.417	-4.135	-3.354	-1.636
	(11.22)	(20.58)	(4.80)	(23.90)	(21.62)	(25.41)
Ireland	-1.668	-1.078	-1.347	-2.384	-1.693	-1.551
	(5.92)	(3.77)	(6.64)	(8.53)	(4.19)	(8.49)
Germany	-3.939	-2.474	-1.404	-3.822	-4.311	-0.231
	(15.47)	(11.12)	(9.40)	(13.92)	(15.47)	(2.07)
Finland	-3.588	-2.573	-1.178	-3.389	-2.955	-0.793
	(22.21)	(26.90)	(14.48)	(16.88)	(19.01)	(7.96)
Denmark	-4.728	-3.688	-1.176	-5.817	-4.552	-1.453
	(17.82)	(17.73)	(14.86)	(20.23)	(18.38)	(15.52)
Belgium	-2.297	-1.195	-1.203	-2.731	-2.172	-0.726
	(22.13)	(11.30)	(15.71)	(25.82)	(19.07)	(13.81)
Austria	-5.363	-3.990	-1.825	-5.371	-4.832	-1.003
	(20.33)	(15.74)	(12.07)	(19.78)	(15.43)	(10.66)
Time dummies	yes	Yes	yes	yes	yes	yes
Observations	7943	7931	7887	20755	20760	20658
R-squared	0.32	0.33	0.14	0.22	0.22	0.08

Base case: Age (<1); Sector (Manufacturing); Size (1-49); Country (UK); Capital intensity (<20%). Calculated standard errors are robust to country clustering. t-statistics in parenthesis

Table 8

Institutional Determinants of Job Flows.

OLS, Fixed- and Random-effects estimates (t-statistics in parenthesis)

Model :	(A) OLS[1]	(B) OLS[1]	(C) Random effects[2]	(D) Random effects[2]	(E) Fixed-effects[1]	(F) OLS[1]	(G) OLS[1]	(H) Random effects[2]	(I) Fixed-effects[1]	(J) OLS[1]	(K) OLS[1]	(L) Random effects[2]	(M) Fixed-effects[1]
Dependent Variable:	JR	JR	JR	JR	JR	JC	JC	JC	JC	JD	JD	JD	JD
Intercept	22.844	23.108	23.539	23.116	27.645	15.665	15.816	16.059	14.023	6.737	6.862	5.663	8.651
	(17.06)	(17.37)	(11.30)	(11.31)	(7.31)	(12.53)	(12.68)	(9.37)	(9.38)	(8.37)	(8.62)	(2.05)	(5.07)
Cycle indicator	0.004	0.004	0.002	0.002	0.002	0.007	0.007	0.005	0.006	-0.003	-0.003	-0.003	-0.003
	(5.61)	(4.97)	(2.79)	(2.55)	(1.43)	(7.75)	(7.51)	(9.95)	(8.83)	(4.27)	(4.23)	(12.19)	(4.56)
Union Co-ordination	-0.947	-0.901	-0.713	-0.689		-0.854	-0.829	-1.020		-0.327	-0.302	0.529	
	(2.08)	(2.00)	(1.20)	(1.21)		(2.43)	(2.39)	(2.04)		(1.71)	(1.55)	(0.41)	
Benefit Duration	-5.472	-5.816	-6.005	-5.917	-3.855	-3.780	-3.969	-4.773	-4.865	-1.250	-1.435	-0.628	0.007
	(3.87)	(3.81)	(6.21)	(6.04)	(2.71)	(2.84)	(2.89)	(5.72)	(4.52)	(3.55)	(3.23)	(0.79)	(0.28)
Tax Wedge	-0.054	-0.052	-0.052	-0.053	-0.147	-0.061	-0.060	-0.028	0.011	0.008	0.009	-0.024	-0.166
	(1.84)	(1.84)	(1.77)	(1.86)	(0.73)	(2.51)	(2.52)	(1.02)	(0.40)	(0.56)	(0.72)	(1.24)	(0.28)
Temporary Contracts	-0.005	0.002	-0.004	-0.001	-0.100	-0.020	-0.016	0.006	-0.001	0.019	0.022	0.006	-0.024
	(0.14)	(0.06)	(0.10)	(0.02)	(1.85)	(0.83)	(0.65)	(0.18)	(0.04)	(1.19)	(1.31)	(0.30)	(0.39)
Subsidies	-0.302	0.207	0.652	0.173	1.119	0.733	0.777	1.044	1.397	-0.841	-0.757	-0.556	-0.493
	(0.38)	(0.26)	(1.17)	(0.33)	(1.78)	(0.99)	(1.06)	(2.08)	(3.97)	(4.17)	(4.36)	(2.29)	(1.41)
(EPL) – time variant	-0.493		-1.194		-2.117	-0.307		-0.853	-0.921	-0.122		-0.091	-0.276
	(1.14)		(3.18)		(2.66)	(0.93)		(2.68)	(3.10)	(0.61)		(0.49)	(0.74)
(EPL) – time invariant		-0.678		-0.887			-0.409				-0.224		
		(1.29)		(2.01)			(1.10)				(1.00)		
Observations :	7943	7943	7943	7943	7943	7931	7931	7931	7931	7887	7887	7887	7887
R squared	0.30	0.30	-	-	0.23	0.32	0.32	-	0.30	0.12	0.12	-	0.08

Note: The regressions include age, sector, year and firm size dummies as defined in Columns A to C of Table 7. Range values: Co-ordination(1-3); Unemployment Benefit Duration(0-1); Tax Wedge(18.61-53.33); Share of Temporary Contracts (4.33-34.99); Employment Subsidies(0.23-1.93); EPL time invariant (0.50-3.70); EPL time variant (0.5-3.88). The indicator for the cycle is the aggregate net employment change.
[1]Calculated standard errors are robust to country clustering.
[2]Maximum likelihood estimation.

Table 9

Robustness Check.

Institutional Determinants of Job Flows. Restricted period 1992-1998

OLS, Fixed- and Random-effects estimates (t-statistics in parenthesis)

Model :	(A) OLS[1]	(B) OLS[1]	(C) Random effects[2]	(D) Random effects[2]	(E) Fixed-effects[1]	(F) OLS[1]	(G) OLS[1]	(H) Random effects[2]	(I) Fixed-effects[1]	(J) OLS[1]	(K) OLS[1]	(L) Random effects[2]	(M) Fixed-effects[1]
Dependent Variable:	JR	JR	JR	JR	JR	JC	JC	JC	JC	JD	JD	JD	JD
Intercept	22.871	23.603	24.354	23.952	21.002	16.216	16.687	17.265	17.990	6.479	6.767	6.017	7.273
	(17.01)	(18.65)	(11.30)	(11.58)	(7.55)	(11.11)	(11.89)	(10.75)	(3.35)	(8.45)	(8.81)	(6.23)	(2.51)
Cycle indicator	0.004	0.003	0.002	0.002	0.002	0.007	0.006	0.006	0.006	-0.003	-0.003	-0.003	-0.003
	(5.97)	(5.25)	(2.49)	(2.46)	(1.56)	(7.81)	(7.81)	(8.91)	(6.74)	(4.99)	(4.92)	(9.87)	(3.29)
Union Co-ordination	-0.755	-0.668	-0.462	-0.483		-0.745	-0.685	-0.789		-0.251	-0.216	0.058	
	(1.60)	(1.53)	(0.88)	(0.97)		(2.03)	(2.04)	(2.04)		(1.41)	(1.24)	(0.20)	
Benefit Duration	-5.861	-6.802	-6.269	-5.923	-1.765	-3.679	-4.317	-4.229	-2.220	-1.730	-2.112	-1.269	0.089
	(3.89)	(4.38)	(5.18)	(4.87)	(0.92)	(2.57)	(3.08)	(4.41)	(0.84)	(3.32)	(3.34)	(2.39)	(0.05)
Tax Wedge	-0.063	-0.057	-0.083	-0.085	-0.038	-0.079	-0.075	-0.080	0.010	0.013	0.016	-0.001	-0.005
	(1.93)	(1.97)	(2.48)	(2.66)	(0.65)	(2.85)	(2.95)	(3.10)	(0.21)	(0.89)	(1.24)	(0.04)	(0.13)
Temporary Contracts	-0.001	0.007	0.012	0.012	-0.123	-0.015	-0.009	-0.009	-0.085	0.017	0.021	0.028	0.016
	(0.04)	(0.25)	(0.29)	(0.32)	(1.00)	(0.62)	(0.41)	(0.29)	(0.74)	(1.26)	(1.55)	(1.60)	(0.38)
Subsidies	-0.144	0.177	-0.276	-0.684	0.562	0.770	1.005	0.644	1.285	-0.765	-0.627	-0.802	-0.611
	(0.18)	(0.21)	(0.43)	(1.15)	(0.81)	(1.24)	(1.34)	(1.16)	(4.29)	(4.03)	(3.13)	(2.86)	(1.43)
(EPL) – time variant	-0.549		-0.898		-3.083	-0.285		-0.484	-1.539	-0.184		-0.157	-0.426
	(1.41)		(2.13)		(4.01)	(0.74)		(1.46)	(2.05)	(0.95)		(0.89)	(0.82)
(EPL) – time invariant		-0.973		-0.620			-0.574				-0.358		
		(1.94)		(1.42)			(1.40)				(1.53)		
Observations :	5470	5470	5470	5470	5470	5465	5465	5465	5465	5433	5433	5433	5433
R squared	0.30	0.30	-	-	0.31	0.31	0.31	-	0.32	0.14	0.14	-	0.15

Note: The regressions include age, sector, year and firm size dummies as defined in Columns A to C of Table 7. Range values: Co-ordination(1-3); Unemployment Benefit Duration(0-1); Tax Wedge(18.61-53.33); Share of Temporary Contracts (4.33-34.99); Employment Subsidies(0.23-1.93); EPL time invariant (0.50-3.70); EPL time variant (0.5-3.88). The indicator for the cycle is the aggregate net employment change.
[1]Calculated standard errors are robust to country clustering.
[2]Maximum likelihood estimation.

Table 10

Sensitivity Analysis

	(A) Coeff.	(B) SD	(C) CDF_N	(D) CDF_{NN}
Dependent Variable: Job reallocation (JR)				
EPL-time variant	-1.286	0.549	0.990	0.953
Union co-ordination	-0.915	0.618	0.930	0.905
Benefit duration	-4.924	1.440	0.999	0.974
Tax wedge	-0.046	0.039	0.881	0.837
Temporary Contracts	-0.042	0.051	0.796	0.782
Subsidies	0.502	0.703	0.762	0.815
Dependent Variable: Job creation (JC)				
EPL-time variant	-0.684	0.384	0.962	0.913
Union co-ordination	-0.967	0.471	0.980	0.952
Benefit duration	-4.490	1.158	0.999	0.996
Tax wedge	-0.032	0.031	0.851	0.824
Temporary Contracts	-0.005	0.035	0.561	0.714
Subsidies	0.992	0.579	0.957	0.919
Dependent Variable: Job destruction (JD)				
EPL-time variant	-0.156	0.257	0.728	0.756
Union co-ordination	0.291	0.430	0.751	0.872
Benefit duration	-0.387	0.569	0.752	0.830
Tax wedge	-0.011	0.017	0.749	0.818
Temporary Contracts	-0.002	0.025	0.526	0.792
Subsidies	-0.584	0.299	0.974	0.919

Note: Pooled results of the RE, FE and OLS regressions presented in Table 8 for all the combinations that result from dropping up to three countries from the sample. Total number of regressions: 1365 (910 in the case of union co-ordination). CDF_N: cumulative distributive function under normality assumption. CDF_{NN}: cumulative distributive function under non-normality assumption.

Appendix. Data Cleaning

The following observations are dropped from the initial sample in Amadeus:

- Firms for which only consolidated accounts are available. In order to avoid double counting, only unconsolidated accounts are included in the analysis.
- Observations for which employment growth rate is missing value. In this case, the observations and not the entire firm are dropped from the sample.
- Observations where the growth rate of compensation per employee is less than –50% or more than 50% within two consecutive years. The aim of this filter is to clean for possible outliers. We experimented with different cut-off values always obtaining similar results. Most of the observations dropped are well above or below these figures.

As regards the latter, we believe that the information on wages is useful, combined with that of employment, to detect the presence of outliers in our data. A disadvantage of this filter is that additional noise might be introduced using the wage information. We checked the consistency of the filter constructing an analogous one using the information on added value. Both the coverage of the dataset and the results reported in Tables 2 to 4 are not significantly affected by the use of the alternative filter. The percentage of observations considered outliers by either the wage or value added filters is below 5 percent of the initial sample.

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