



## Gross job flows and institutions in Europe

Ramón Gómez-Salvador<sup>a</sup>, Julián Messina<sup>b,\*</sup>, Giovanna Vallanti<sup>c</sup>

<sup>a</sup>*DG-Economics, European Central Bank, Germany*

<sup>b</sup>*DG-Research, European Central Bank and IZA, Kaiserstrasse 29, D-60311 Frankfurt am Main, Germany*

<sup>c</sup>*Centre for Economic Performance, London School of Economics, UK*

Received 1 June 2003; received in revised form 1 November 2003; accepted 1 February 2004

Available online 27 April 2004

---

### 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 co-ordinated wage bargaining systems are characterised by lower job flows.

© 2004 Elsevier B.V. All rights reserved.

*JEL classification:* J23; J60

*Keywords:* Gross job flows; Labour market institutions

---

### 1. Introduction

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 (Pissarides, 2000). Studies estimating job creation and destruction from plant

---

\* Corresponding author. Tel.: +49-691-3448826; fax: +49-691-3446000.

*E-mail address:* [julian.messina@ecb.int](mailto:julian.messina@ecb.int) (J. Messina).

or firm-level data show that a high number of jobs are simultaneously created and destroyed 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.

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 firm-level data, which become of particular concern when doing international comparisons. Differences in definitions, sampling intervals and sectoral coverage may lead to misleading interpretations of the cross-country differences in estimated job flows.

We examine time series and cross-sectional patterns of job flows for 13 European countries in the 1990s using a homogeneous firm dataset that covers all 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.

We find important regularities across countries, where smaller and younger firms in the service sectors exhibit higher 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 wage bargaining reduce job turnover.

The remainder of the paper is organized 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. Section 4 analyses the effects of firm characteristics and Section 5 assesses the role of institutional features in explaining gross job flows. Section 6 concludes.

## 2. Theoretical motivations and empirical evidence

### 2.1. Job flows: some stylized facts

There is a large literature studying job reallocation and its components.<sup>1</sup> The key findings 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 pro-cyclical and job destruction is counter-cyclical, the volatility of the two flows over the business cycle may differ.

---

<sup>1</sup> For a thorough discussion of the results in this literature, see the excellent survey of Davis and Haltiwanger (1999).

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 various firm-specific characteristics, with job creation being negatively associated with firms' age and size.
5. Job reallocation is a persistent phenomenon. This implies that the observed job flows cannot 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 Van 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.

Regarding wage-setting institutions, Salvanes (1997) argues that more co-ordinated wage negotiations combined with wage drift policies might impose an additional restriction to plants when negotiating wages, reducing job creation. However, more co-ordinated wage bargaining systems will result in higher job reallocation if they compress the wage structure (Bertola and Rogerson, 1997).

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 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 lower turnover rates in unionised sectors, while Heyman (2001) finds a positive association between job reallocation and the degree of wage compression in a panel of Swedish manufacturing establishments.

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 seven

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 regard 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 Belgian 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 flows 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. 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 (two-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 level rather than the establishment level. Measuring job flows at firm level understates the actual magnitude of total gross flows among plants and may lead to longitudinal linkage problems if ownership and organizational changes (i.e., mergers, acquisitions, etc.) are not accounted for. 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 as there is important heterogeneity in the definition of establishment across datasets (OECD, 1994). This is less of a problem with firm data. 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 and Haltiwanger (1999) are followed in defining job flows statistics.

Denote the level of employment at firm level in period  $t$  with  $n_{ft}$  and the change in employment between period  $t$  and  $t - 1$  with  $\Delta n_{ft}$ . Let  $S^+$  be the set of firms in sector  $S$  with  $\Delta n_{ft} > 0$  and  $S^-$  the set of firms in sector  $S$  with  $\Delta n_{ft} < 0$ . We calculate job creation (JC) by summing employment changes in  $S^+$  and job destruction (JD) by summing (absolute) changes in  $S^-$ . 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 be expressed as the size-weighted average over firms' growth rates as follows

$$JC_{st} = \sum_{f \in S^+} g_{ft} \frac{x_{ft}}{X_{st}} \tag{1}$$

$$JD_{st} = \sum_{f \in S^-} |g_{ft}| \frac{x_{ft}}{X_{st}} \tag{2}$$

where  $g_{ft} = \Delta n_{ft}/x_{ft}$  is the growth rate of employment in sector  $f$  and period  $t$ . The sum of the JC and JD rates is the job reallocation rate (JR). This gives the total number of employment positions reallocated in the economy. The difference between JC and JD is the net employment growth (NET).

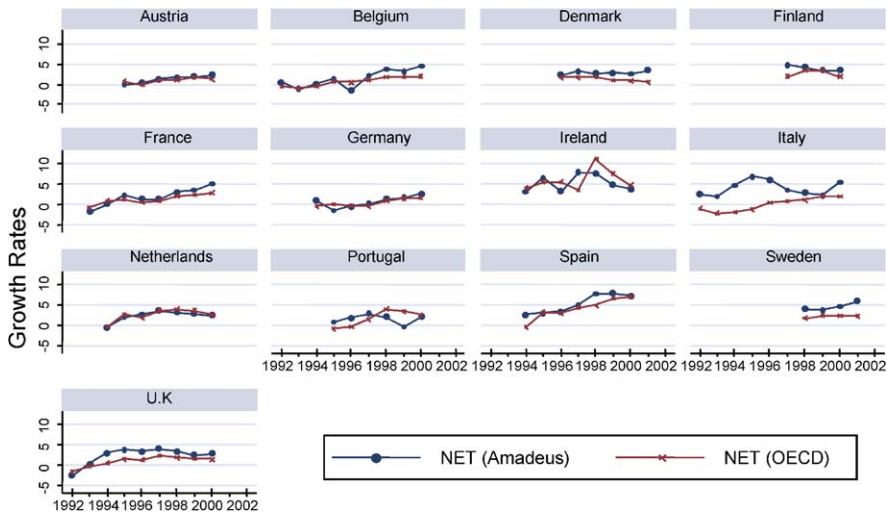


Fig. 1. Growth in the number of employees. Comparing Amadeus with OECD statistics.

### 3.3. Sample description

Fig. 1 compares the evolution of employment growth from our sample with the growth in the number of employees measured by OECD statistics.<sup>2</sup> Although there are some minor inconsistencies, the employment figures in our sample follow quite closely the official statistics (the average correlation excluding Italy is 0.8). The most significant exception is Italy, which consistently overstates employment growth. This inconsistency is not related to specific outliers, as 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.<sup>3</sup>

Table 1 shows the final sample composition and the sample period for each country, after filtering the observations from outliers.<sup>4</sup> 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% when compared to figures in the Labour Force Survey (LFS). Comparing the sectoral coverage with the LFS shows a small bias towards employment in manufacturing, but the sample is well representative of both manufacturing and non-

<sup>2</sup> 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.

<sup>3</sup> 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.

<sup>4</sup> A detailed discussion of the data selection and cleaning can be found in Gómez-Salvador et al. (2004).

Table 1  
Sample composition

	Sample period	Average number of firm observations per year	Coverage <sup>a</sup> (%)
Austria	1995–2000	9,486	18.9
Belgium	1992–2000	27,185	48.6
Denmark	1996–2001	13,083	29.9
Finland	1997–2000	7,471	27.5
France	1993–2000	50,437	23.4
Germany	1994–2000	89,459	36.2
Italy	1992–2000	484	5.9
Ireland	1994–2000	43,205	23.6
Netherlands	1994–2000	15,384	9.8
Portugal	1995–2000	1,262	5.3
Spain	1994–2000	44,189	24.2
Sweden	1998–2001	29,334	33.2
UK	1992–2000	31,332	27.2

<sup>a</sup> Coverage: number of employees covered in the sample as a percentage of total number of employees in the Labour Force Survey.

manufacturing sectors. Moreover, the sectoral coverage is rather homogeneous across countries and stable over time.

#### 4. Job turnover and firm characteristics

Table 2 reports summary statistics of JC, JD and JR in each country, averaged within the sample period. JC rates range between 4.4% in Germany and 8.6% in Spain, and JD rates from 3.0% in Finland to 4.4% in the UK. These developments lead to an average JR rate close to 10%, Austria and Germany being the countries with the lowest rate—7.9% and 8.1%, respectively—and Spain and Italy those with the highest—12.1% and 12.3%, respectively.

The rest of Table 2 presents summary statistics of flow rates by sector and firm's size, age and capital intensity pooling the information across countries and years. On average, service industries exhibit larger job flows, with business services being the sector with largest job flows in the sample. Similarly, JR is clearly stronger among smaller and younger firms.

Some of the firm characteristics considered 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 job flows. For this purpose, we calculate JC, JD and JR rates for narrower sectors, defined as the crossing of 4 age groups, 7 sectors of activity, 4 size groups, 12 countries, 10 years (between 1992 and 2001) and 4 capital intensity groups. Then, we regress the resulting 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 will 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,

Table 2  
Average job flow rates

	JC	JD	JR
<i>By country</i>			
Austria	4.6	3.4	7.9
Belgium	5.2	3.8	9.0
Denmark	6.2	3.3	9.5
Finland	7.0	3.0	9.9
France	5.1	3.2	8.3
Germany	4.4	3.7	8.1
Ireland	8.5	3.1	11.5
Italy	8.2	4.1	12.3
Netherlands	6.5	4.3	10.8
Portugal	4.9	3.5	8.4
Spain	8.6	3.4	12.1
Sweden	8.1	3.6	11.7
UK	6.6	4.4	11.0
Euro area	5.6	3.7	9.3
Nordic countries	7.3	3.4	10.7
<i>By sector of operation</i>			
Agriculture	5.8	4.3	10.1
Mining	3.3	5.8	9.1
Manufacturing	4.6	3.9	8.5
Energy	2.3	4.1	6.4
Construction	6.8	4.7	11.5
Trade, restaurants and hotels	6.8	3.0	9.8
Transport and communication	5.0	4.0	9.0
Business services	8.3	4.3	12.6
Community, social and personal services	7.6	3.0	10.6
<i>By size</i>			
1–19 employees	10.7	3.5	14.2
20–49 employees	7.8	3.8	11.6
50–99 employees	7.4	3.8	11.2
100–249 employees	7.0	4.0	11.0
250–499 employees	5.8	3.4	9.2
500–999 employees	5.7	3.6	9.4
1000–2499 employees	4.8	3.7	8.5
2500 and more employees	3.7	3.8	7.5
<i>By age</i>			
1 year old	8.9	3.7	12.6
2–5 years old	8.4	4.1	12.5
6–10 years old	7.6	4.0	11.6
More than 10	5.2	3.6	8.8
<i>By capital intensity</i>			
20% or less	6.5	4.0	10.5
20–30%	5.7	3.7	9.4
30–40%	5.9	3.2	9.1
More than 40%	6.1	3.8	9.9

Average values over the sample period.



considering capital intensity classes might affect significantly the estimates of these countries.

Table 3 summarises the results of the OLS regressions for JR, JC and JD on the class dummies. Columns (A)–(C) exclude capital intensity groups, which are reported in columns (D)–(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 of idiosyncratic factors in the determination of the latter. 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 higher JR and JC rates in construction and services than in industry, while the latter presents higher JD. For instance, JR and JC rates in business services are more than 5 percentage points higher than in manufacturing, while the difference in JD is non-significant.

The negative relationship between the size of the firm and JR is confirmed by the multivariate analysis. Indeed, both JC and JD rates are lower the larger the firm is. As a result, a firm with more than 1000 employees presents a JR rate around 7 percentage points lower than a firm with less than 50 workers.

Differences across countries in job flows figures are statistically significant even after controlling for a wide range of firm characteristics. According to the estimates of 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 5 percentage points lower JR rate.<sup>5</sup>

When ranges of capital intensity are taken into account, all previous results remain broadly unchanged (see columns (D)–(F) in Table 3). 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 acyclical 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

---

<sup>5</sup> 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.

Table 3  
Job flows and firm characteristics (OLS)

Model	(A)	(B)	(C)	(D)	(E)	(F)
Dependent variable	JR	JC	JD	JR	JC	JD
Intercept	16.699 (22.46)	10.858 (20.19)	5.782 (12.27)	15.896 (20.01)	10.942 (13.20)	4.978 (14.81)
Cycle indicator	0.001 (1.47)	0.005 (5.13)	−0.003 (4.68)	0.228 (2.52)	0.527 (5.25)	−0.286 (5.87)
<i>Age</i>						
2–5 years	0.431 (1.17)	0.507 (1.64)	0.128 (1.16)	0.076 (0.30)	−0.088 (0.41)	0.240 (2.17)
6–10 years	−1.518 (5.21)	−1.347 (4.69)	0.204 (2.07)	−1.491 (8.42)	−1.623 (8.39)	0.304 (3.51)
More than 10 years	−4.127 (9.91)	−4.041 (9.28)	0.501 (4.87)	−4.254 (10.34)	−4.424 (10.48)	0.697 (9.48)
<i>Sector</i>						
Agriculture	0.265 (0.33)	−0.161 (0.22)	−0.648 (3.39)	0.333 (0.61)	0.234 (0.54)	−0.540 (2.48)
Construction	2.235 (2.89)	1.549 (2.59)	0.446 (1.36)	3.894 (4.93)	2.714 (4.37)	0.636 (1.50)
Trade	1.381 (3.52)	1.825 (4.64)	−0.607 (4.41)	1.672 (6.23)	2.095 (6.63)	−0.554 (4.18)
Transport	2.451 (6.51)	2.933 (7.32)	−0.807 (6.32)	2.434 (5.08)	2.920 (6.90)	−0.710 (7.52)
Business services	5.484 (8.59)	5.149 (8.82)	0.117 (0.99)	4.891 (8.99)	4.775 (9.71)	−0.191 (1.73)
Other services	1.800 (4.16)	2.469 (5.98)	−0.924 (6.10)	1.993 (4.29)	2.687 (6.36)	−1.073 (6.89)
<i>Size</i>						
50–249	−1.476 (4.35)	−1.644 (5.53)	−0.045 (0.30)	−1.791 (7.23)	−1.610 (7.68)	−0.333 (3.15)
250–999	−4.989 (8.78)	−4.276 (9.69)	−1.224 (4.80)	−4.523 (10.25)	−3.746 (11.62)	−0.994 (4.46)
1000 and over	−6.941 (12.55)	−6.232 (15.71)	−1.302 (5.25)	−5.523 (13.36)	−4.822 (11.31)	−1.034 (4.73)

<i>K-intensity</i>						
20–30%				– 0.377 (1.90)	– 0.008 (0.03)	– 0.425 (5.55)
30–40%				– 0.367 (1.51)	0.085 (0.28)	– 0.619 (6.39)
More than 40%				0.557 (3.17)	0.364 (1.32)	– 0.030 (0.21)
<i>Country</i>						
France	– 3.505 (38.56)	– 2.169 (31.46)	– 1.297 (18.21)	– 3.264 (32.00)	– 2.295 (36.23)	– 0.932 (13.99)
Sweden	– 1.004 (3.56)	– 1.411 (6.78)	– 0.289 (3.44)	– 1.988 (8.12)	– 1.964 (10.88)	– 0.248 (2.44)
Italy	0.964 (5.52)	0.370 (2.20)	0.177 (1.58)	1.167 (7.95)	0.368 (2.31)	0.320 (3.91)
Spain	0.718 (3.22)	0.484 (1.93)	– 0.008 (0.04)	0.475 (2.46)	– 0.087 (0.40)	0.355 (2.15)
Portugal	– 3.116 (12.36)	– 1.382 (5.62)	– 1.939 (13.31)	– 2.746 (8.68)	– 1.999 (6.95)	– 1.505 (12.07)
Netherlands	– 1.511 (11.22)	– 1.853 (20.58)	– 0.417 (4.80)	– 4.135 (23.90)	– 3.354 (21.62)	– 1.636 (25.41)
Ireland	– 1.668 (5.92)	– 1.078 (3.77)	– 1.347 (6.64)	– 2.384 (8.53)	– 1.693 (4.19)	– 1.551 (8.49)
Germany	– 3.939 (15.47)	– 2.474 (11.12)	– 1.404 (9.40)	– 3.822 (13.92)	– 4.311 (15.47)	– 0.231 (2.07)
Finland	– 3.588 (22.21)	– 2.573 (26.90)	– 1.178 (14.48)	– 3.389 (16.88)	– 2.955 (19.01)	– 0.793 (7.96)
Denmark	– 4.728 (17.82)	– 3.688 (17.73)	– 1.176 (14.86)	– 5.817 (20.23)	– 4.552 (18.38)	– 1.453 (15.52)
Belgium	– 2.297 (22.13)	– 1.195 (11.30)	– 1.203 (15.71)	– 2.731 (25.82)	– 2.172 (19.07)	– 0.726 (13.81)
Austria	– 5.363 (20.33)	– 3.990 (15.74)	– 1.825 (12.07)	– 5.371 (19.78)	– 4.832 (15.43)	– 1.003 (10.66)
Time dummies	yes	yes	yes	yes	yes	yes
Observations	7,943	7,931	7,887	20,755	20,760	20,658
$R^2$	0.32	0.33	0.14	0.22	0.22	0.08

Base case: Age (<1 year); sector (manufacturing); Size (1–49); country (UK); capital intensity (<20%). Calculated standard errors are robust to country clustering.  $t$ -Statistics in parenthesis.

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).
- 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.<sup>6</sup> 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.<sup>7</sup>

Additionally, we include in the regressions the share of workers holding temporary contracts in the total number of employees.<sup>8</sup>

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)–(C) of Table 3 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 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.

---

<sup>6</sup> 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.

<sup>7</sup> Source: NewCronos Database.

<sup>8</sup> Source: Labour Force Survey.

The effects of institutions on JR, JC and JD are reported in [Table 4](#). 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, though 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 \(2000\)](#).

Regarding the tax wedge, countries with higher tax burdens experience lower JC and JR. According to the estimates in columns (A)–(D), a 10 percentage points increase 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 Audenrode \(1993\)](#), 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.

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 1,365 for each institutional variable (910 for union co-ordination, as 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.

Table 4  
Institutional determinants of job flows OLS, fixed- and random-effects estimates (*t*-statistics in parenthesis)

Model	(A) OLS <sup>a</sup>	(B) OLS <sup>a</sup>	(C) Random effects <sup>b</sup>	(D) Random effects <sup>b</sup>	(E) Fixed- effects <sup>a</sup>	(F) OLS <sup>a</sup>	(G) OLS <sup>a</sup>	(H) Random effects <sup>b</sup>	(I) Fixed- effects <sup>a</sup>	(J) OLS <sup>a</sup>	(K) OLS <sup>a</sup>	(L) Random effects <sup>b</sup>	(M) Fixed- effects <sup>a</sup>
Dependent variable	JR	JR	JR	JR	JR	JC	JC	JC	JC	JD	JD	JD	JD
Intercept	22.844 (17.06)	23.108 (17.37)	23.539 (11.30)	23.116 (11.31)	27.645 (7.31)	15.665 (12.53)	15.816 (12.68)	16.059 (9.37)	14.023 (9.38)	6.737 (8.37)	6.862 (8.62)	5.663 (2.05)	8.651 (5.07)
Cycle indicator	0.004 (5.61)	0.004 (4.97)	0.002 (2.79)	0.002 (2.55)	0.002 (1.43)	0.007 (7.75)	0.007 (7.51)	0.005 (9.95)	0.006 (8.83)	−0.003 (4.27)	−0.003 (4.23)	−0.003 (12.19)	−0.003 (4.56)
Union co-ordination	−0.947 (2.08)	−0.901 (2.00)	−0.713 (1.20)	−0.689 (1.21)		−0.854 (2.43)	−0.829 (2.39)	−1.020 (2.04)		−0.327 (1.71)	−0.302 (1.55)	0.529 (0.41)	
Benefit duration	−5.472 (3.87)	−5.816 (3.81)	−6.005 (6.21)	−5.917 (6.04)	−3.855 (2.71)	−3.780 (2.84)	−3.969 (2.89)	−4.773 (5.72)	−4.865 (4.52)	−1.250 (3.55)	−1.435 (3.23)	−0.628 (0.79)	0.007 (0.28)
Tax wedge	−0.054 (1.84)	−0.052 (1.84)	−0.052 (1.77)	−0.053 (1.86)	−0.147 (0.73)	−0.061 (2.51)	−0.060 (2.52)	−0.028 (1.02)	0.011 (0.40)	0.008 (0.56)	0.009 (0.72)	−0.024 (1.24)	−0.166 (0.28)
Temporary contracts	−0.005 (0.14)	0.002 (0.06)	−0.004 (0.10)	−0.001 (0.02)	−0.100 (1.85)	−0.020 (0.83)	−0.016 (0.65)	0.006 (0.18)	−0.001 (0.04)	0.019 (1.19)	0.022 (1.31)	0.006 (0.30)	−0.024 (0.39)
Subsidies	−0.302 (0.38)	0.207 (0.26)	0.652 (1.17)	0.173 (0.33)	1.119 (1.78)	0.733 (0.99)	0.777 (1.06)	1.044 (2.08)	1.397 (3.97)	−0.841 (4.17)	−0.757 (4.36)	−0.556 (2.29)	−0.493 (1.41)
EPL time variant	−0.493 (1.14)		−1.194 (3.18)		−2.117 (2.66)	−0.307 (0.93)		−0.853 (2.68)	−0.921 (3.10)	−0.122 (0.61)		−0.091 (0.49)	−0.276 (0.74)
EPL time invariant		−0.678 (1.29)		−0.887 (2.01)			−0.409 (1.10)				−0.224 (1.00)		
Observations:	7,943	7,943	7,943	7,943	7,943	7,931	7,931	7,931	7,931	7,887	7,887	7,887	7,887
R <sup>2</sup>	0.30	0.30	—	—	0.23	0.32	0.32	—	0.30	0.12	0.12	—	0.08

The regressions include age, sector, year and firm size dummies as defined in columns (A)–(C) of Table 3. 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.

<sup>a</sup> Calculated standard errors are robust to country clustering.

<sup>b</sup> Maximum likelihood estimation.

Table 5  
Sensitivity analysis

	(A) Coefficient	(B) SD	(C) CDF <sub>N</sub>	(D) CDF <sub>NN</sub>
<i>Dependent variable: job reallocation (JR)</i>				
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
<i>Dependent variable: job creation (JC)</i>				
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
<i>Dependent variable: job destruction (JD)</i>				
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

Pooled results of the RE, FE and OLS regressions presented in Table 4 for all the combinations that result from dropping up to three countries from the sample. Total number of regressions: 1,365 (910 in the case of union co-ordination). CDF<sub>N</sub>: cumulative distributive function under normality assumption; CDF<sub>NN</sub>: cumulative distributive function under non-normality assumption.

Following Sala-i-Martin (1997) in this case, we can still compute their cdf as the average of the individual cumulative distributive functions.

Table 5 presents the results of the sensitivity analysis. According to the normality criterion (column C), the results in Table 4 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 4 regards the tax wedge, which becomes non-significantly correlated with JR and JC when the set of countries in the sample varies.

## 6. 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.

## **Acknowledgements**

We are grateful to Neale Kennedy, Giovanni Notaro, Luca Onorante, Barbara Petrongolo, Christopher Pissarides, Anna Sanz de Galdeano, Alfred Stiglzbauer, Jarkko Turunen and two anonymous referees for their valuable comments and suggestions. We also thank seminar participants at EALE meetings, ECB, Federal Reserve Bank of Boston, LACEA meetings, LSE and WIFO. The views presented in this paper are those of the authors and do not necessarily reflect the views of the European Central Bank. All the errors are our own.

## **References**

- Bartelsman, E., Scarpetta, S., Schivardi, F., 2003. Comparative analysis of firm demographics and survival: micro-level evidence for the OECD countries. OECD Economics Department WP NO. 348.
- Bertola, G., 1990. Job security, employment and wages. *European Economic Review* 34, 851–886.
- Bertola, G., Rogerson, R., 1997. Institutions and labour reallocation. *European Economic Review* 41, 1147–1171.
- Blanchflower, D., Burgess, S., 1996. Job creation and job destruction in Great Britain in the 1980s. Discussion Paper, CEP.
- Davis, S.J., Haltiwanger, J., 1999. Gross job flows. In: Ashenfelter, O., Card, D. (Eds.), *Handbook of Labour Economics*, vol. 3. North-Holland, Amsterdam, pp. 2711–2797.
- Garibaldi, P., Konings, J., Pissarides, C.A., 1997. Gross job reallocation and labour market policy. In: Snower, D.J., la Dehesa, G. (Eds.), *Unemployment Policy: Government Options for the Labour Market*. Cambridge Univ. Press, Cambridge, pp. 467–489.
- Gomez-Salvador, R., Messina, J., Vallanti, G., 2004. Gross Job Flows in Europe. ECB working paper series, 318.
- Heckman, J.J., Pages, C., 2000. The Cost of Job Security Regulation: Evidence from Latin American Labour Markets. NBER Working Paper, 7773.



- Heyman, F., 2001. Wage dispersion and job turnover: evidence from Sweden. Working paper, Trade Union Institute for Economic Research.
- Leonard, J., Van Audenrode, M., 1993. Corporatism run amok: job stability and industrial policy in Belgium and the United States. *Economic Policy* 17, 355–389.
- Lucifora, C., 1998. The impact of unions on labour turnover in Italy: evidence from establishment level data. *International Journal of Industrial Organization* 16, 353–376.
- Nickell, S., Nunziata, L., Ochel, W., Quintini, G., 2001. The Beveridge curve, unemployment and wages in the OECD from the 1960s to the 1990s. Working Paper, Centre for Economic Performance.
- OECD, 1994. *Employment Outlook*. Chap. 3, OECD, Paris.
- OECD, 1999. *Employment Outlook*. Chap. 2, OECD, Paris.
- Pissarides, C.A., 2000. *Equilibrium Unemployment Theory*. MIT Press, Cambridge, Massachusetts.
- Sala-i-Martin, X., 1997. I just run two million regressions. *American Economic Review* 87, 178–183.
- Salvanes, K.G., 1997. Market rigidities and labour market flexibility: an international comparison. *Scandinavian Journal of Economics* 99, 315–333.