

## JOB POLARIZATION IN EUROPE

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### **SESSION TITLE**

The Skill Content of Jobs and the Evolution of the Wage Structure

### **SESSION CHAIR**

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## JOB POLARIZATION IN EUROPE

Maarten Goos, Alan Manning, Anna Salomons\*

The structure of employment is always changing and economists are always trying to understand those changes. In the 1990s the idea of skill-biased technological change (SBTC) was used to understand the shift in employment towards more-educated workers (see David H. Autor and Lawrence F. Katz, 1999, for a survey). However, in recent years, it has become apparent that a more nuanced approach is needed. The idea of SBTC might lead one to predict a uniform shift in employment away from low-skilled and towards high-skilled occupations but studies for the US (Autor, Katz and Melissa S. Kearney, 2006) and the UK (Goos and Manning, 2007) have shown that there is growth in employment in both the highest-skilled (professional and managerial) and lowest-skilled occupations (personal services), with declining employment in the middle of the distribution (manufacturing and routine office jobs). This is what Goos and Manning (2007) term job polarization – although see the introduction to Goos and Manning (2007) for antecedents of these ideas.

There are several hypotheses about the reasons for job polarization. First, the ‘routinization’ hypothesis (first put forward by Autor, Frank Levy and Richard Murnane, 2003) suggests that the effect of technological progress is to replace ‘routine’ labor which tends to be clerical and craft jobs in the middle of the wage distribution. Second, there is the view that globalization in general and offshoring in particular is an important source of change in the job structure in the richest countries (see, for example, Alan S. Blinder, 2007). Third, there may be a link between job polarization and wage inequality. The rise in the share

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of income going to the rich in the US and the UK may have led to an increase in demand for low-skill workers whose employment increasingly consists of providing services to the rich (Manning, 2004; Francesca Mazzolari and Giuseppe Ragusa, 2007).

One thing that is not clear from the existing literature is how pervasive is the phenomenon of job polarization. Is it confined to Anglo-Saxon economies which have had very large rises in wage inequality at the top of the wage distribution? Two recent studies for West-Germany (Alexandra Spitz-Oener, 2006; Christian Dustmann, Johannes Ludsteck and Uta Schönberg, 2008) suggest job polarization is also occurring there. Yet we have no evidence for other European countries. These countries are particularly interesting because they will undoubtedly have been subject to the same technological shocks but have not generally had the same changes in wage inequality.

The plan of the paper is as follows. The next section presents some evidence on the pervasiveness of job polarization in Europe. The second section then tries to test several hypotheses about its cause.

## **I. Recent Changes in the European Job Structure**

We use the harmonized European Union Labour Force Survey (ELFS), supplemented with German data from social security records (the so-called IABS-regional dataset) to map occupational employment changes in 16 European countries<sup>1</sup> over the period 1993-2006. Occupations are classified by the 21 2-digit International Standard Classification of Occupations (ISCO) listed in Table 1. Throughout this paper, employment is measured as usual weekly hours worked<sup>2</sup> but the same results obtain when using the alternative definition of persons employed.

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<sup>1</sup> Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Ireland, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden and the UK.

<sup>2</sup> Except for Germany, where only the full-time part-time distinction can be made, and workers working less than 15 hours a week are not in the dataset.

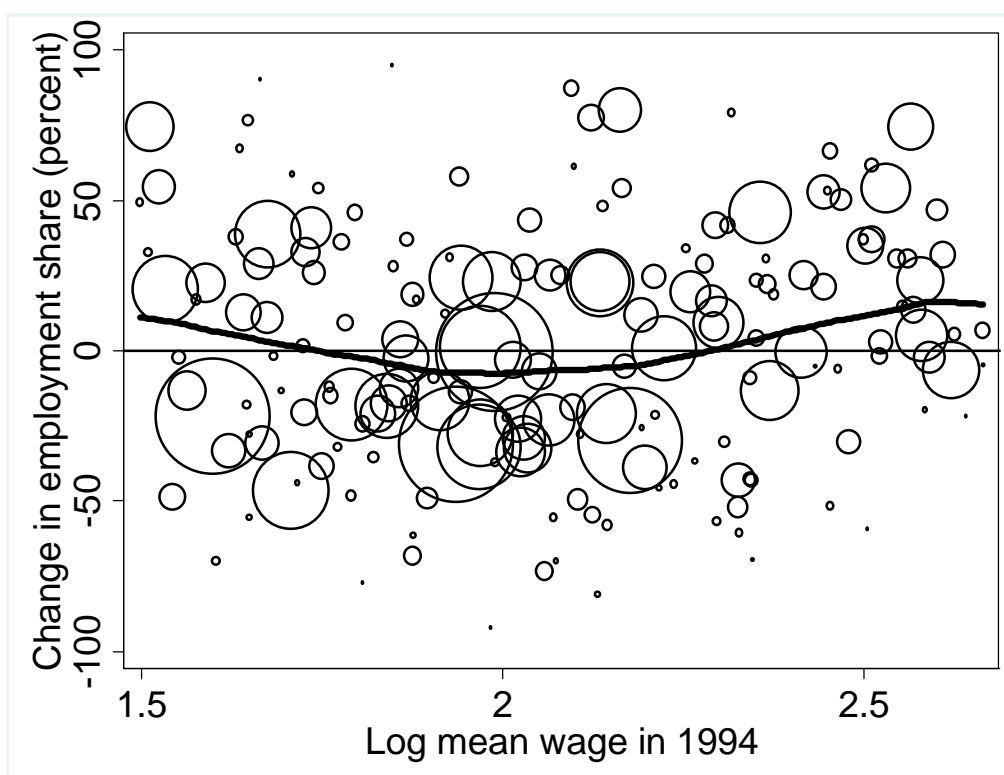


FIGURE 1. PERCENTAGE CHANGES IN EMPLOYMENT SHARES OVER 1993-2006  
FOR JOBS RANKED BY THEIR 1994 LOG WAGE

Source: European Union Labour Force Survey 1993-2006, United Kingdom Labour Force Survey 1994

Pooling employment in occupation-industry cells across the 16 European countries, Figure 1 shows a distinct pattern of polarization, with high- and low-paying occupations expanding their employment shares relative to the occupations paying close to the mean wage.<sup>3</sup> To see which occupations are growing in importance and which are declining, Table 1 ranks occupations from highest-paid to lowest-paid and reports the percentage-point change in the employment share between 1993 and 2006 for each occupation. Among the fastest growing occupations we find many high-paid jobs such as professionals and managers but also several of the lowest-paid occupations such as personal service, transport and sales

<sup>3</sup> The wage ranking in Figure 1 is based on the UK mean occupation-industry specific mean wage in 1994 since European-wide wage data is not available at this level of disaggregation.

workers. The largest relative declines are observed for craft workers, machine operators and office clerks.

**Table 1.** Changes in Shares of Hours Worked over 1993-2006 for Occupations Ranked by Their Mean 1993 European Wage

ISCO occupations ordered by 1993 mean European wage rank	Employment share in 1993	Percentage point change over 1993-2006
<i>8 highest paying occupations</i>		
Corporate managers	4.54%	1.25
Physical, mathematical, engineering professionals	2.92%	1.02
Life science and health professionals	1.86%	-0.14
Other professionals	2.82%	0.70
Managers of small enterprises	3.60%	1.28
Phy., math., engineering associate professionals	3.99%	0.91
Other associate professionals	6.77%	2.07
Life science and health associate professionals	2.28%	0.66
<i>9 middling occupations</i>		
Drivers and mobile plant operators	5.48%	-0.17
Stationary plant and related operators	1.75%	-0.39
Metal, machinery and related trade workers	8.33%	-2.33
Precision, handicraft, and related trade workers	1.31%	-0.40
Office clerks	12.04%	-1.98
Customer service clerks	2.00%	0.19
Extraction and building trades workers	8.17%	-0.52
Machine operators and assemblers	6.71%	-2.01
Other craft and related trade workers	3.19%	-1.37
<i>4 lowest paying occupations</i>		
Personal and protective service workers	6.94%	1.15
Laborers in construction, manufacturing, transport	4.11%	0.48
Models, salespersons, demonstrators	6.73%	-1.42
Sales and service elementary occupations	4.47%	1.02

Notes: Years 1993-2006. All 16 countries, pooled. Employment shares in 1993 and 2006 imputed on the basis of average annual growth rates for countries with shorter data spans. Occupations are ordered by their mean wage rank in 1993 across the 16 European countries.

Figure 1 and Table 1 tell us about job polarization at the level of Europe as a whole but what about individual country experiences? Table 2 puts occupations into three groups according to their wage and shows that employment is polarizing in almost each of the 16 European countries in our sample. The employment share of the lowest-paying occupations increases relative to the employment share of the middling occupations in all countries except Italy, while the employment share of the highest-paying occupations increases relative to the employment share of the middling occupations in all countries except Portugal. On average, the low- and high-paying occupations increase their employment shares by 6 and 2 percentage-points (or 9 and 22 percent), respectively, whereas the middling occupations decrease their employment share by 8 percentage-points (or 17 percent).

**Table 2.** Changes in Shares of Hours Worked over 1993-2006 for High-, Middling and Low-Paying Occupations

	4 lowest paying occupations	9 middling occupations	8 highest paying occupations
<i>Employment share in 1993 (std dev)</i>			
EU average	22% (3.5)	46% (5.2)	32% (7.1)
<i>Percentage point change 1993-2006</i>			
EU average	1.58	-7.77	6.19
Austria	-0.59	-14.58	15.17
Belgium	1.48	-9.50	8.03
Denmark	-0.96	-7.16	8.13
Finland	6.66	-6.54	-0.12
France	-0.74	-12.07	12.81
Germany	3.05	-8.71	5.67
Greece	1.75	-6.08	4.34
Ireland	6.19	-5.47	-0.72
Italy	-8.20	-9.08	17.28
Luxembourg	-1.66	-8.45	10.10
Netherlands	2.27	-4.68	2.41
Norway	4.96	-6.52	1.57
Portugal	2.39	-1.13	-1.26
Spain	0.96	-7.04	6.07
Sweden	1.90	-6.93	5.03
UK	5.77	-10.32	4.55

Notes: Years 1993-2006. Employment shares in 1993 and 2006 imputed on the basis of average annual growth rates for countries with shorter data spans. Occupational employment pooled within each country. Low-, middling and high-paying occupations are as listed in Table 1.

This shows that job polarization is quite pervasive but what are the reasons for it? The next section provides some evidence.

## **II. Changes in the Demand for Tasks and Offshoring**

The introduction discussed skill-biased technical change, routinization, offshoring and wage inequality as potential explanations of changes in the occupational structure of employment. To capture the ideas behind skill-biased technical change we use the average level of education in an occupation. To capture the ‘routinization’ hypothesis we use 96 variables from the US Occupational Information Network (ONET) database to construct three measures of the types of tasks contained in an occupation - Abstract tasks, which are intense in non-routine cognitive skills; Service tasks, intense in non-routine non-cognitive skills; and Routine tasks, intense in both cognitive and non-cognitive routine skills. Goos, Manning and Salomons (2008) contains more details on the way in which these variables are constructed. Abstract tasks are concentrated in high-paid service jobs, Routine tasks in middling jobs and Service tasks in low-paid service jobs so that our measures do seem to capture the essence of the routinization hypothesis.

To capture to what extent the tasks done in different occupations are offshorable, we use counts of news reports about offshoring of European jobs from the European Restructuring Monitor (again, see Goos, Manning and Salomons, 2008, for more details). Routine jobs (e.g. machine operators, office clerks) are offshored most often, although some non-routine occupations (e.g. engineering professionals, customer service clerks) are still much more offshorable than others (e.g. drivers, personal service workers, health professionals).



Finally, we use wage data for each of the countries from the European Community Household Panel (ECHP), the European Union Survey on Income and Living Conditions (EU-SILC) and the OECD to compute time-varying measures of occupational wages and measures of wage inequality. We might expect that countries with compressed occupational wage distributions have a relatively small share of employment in low-wage occupations because relative wages affect factor prices but also because inequality in general has a positive effect on the demand for low-skill workers through the demand for personal services of the rich. It is a common belief that wage compression in many European countries is associated both with low general levels of employment and with a distinctive structure of employment (see, for example, Richard Rogerson, 2008, who considers the industrial dimension). However, the evidence in Figure 2 does not suggest a strong cross-sectional link between wage inequality and the structure of employment. Overall wage inequality ( $\log(p90/p10)$ , the log ratio of the ninetieth to the fiftieth percentile of the wage distribution) is not significantly positively correlated with the share of employment in the four lowest-paying occupations. This result is insensitive to using different measures of wage inequality ( $\log(p50/p10)$  or  $\log(p90/p50)$ ); to the period over which wage inequality is measured; to using the share of low-wage employment in a year different from 1993; and to excluding outliers. Of course, even finding a positive relationship would not necessarily prove causality runs from wage inequality to low-wage employment – if a country for some reason has a high share of employment in low-wage occupations then this may tend to raise wage inequality.

Yet there may be other reasons why countries differ in their share of low-wage employment. An alternative approach to investigating this is to see whether there is a relationship between changes in wage inequality and changes in the structure of employment - and our regressions investigate this.

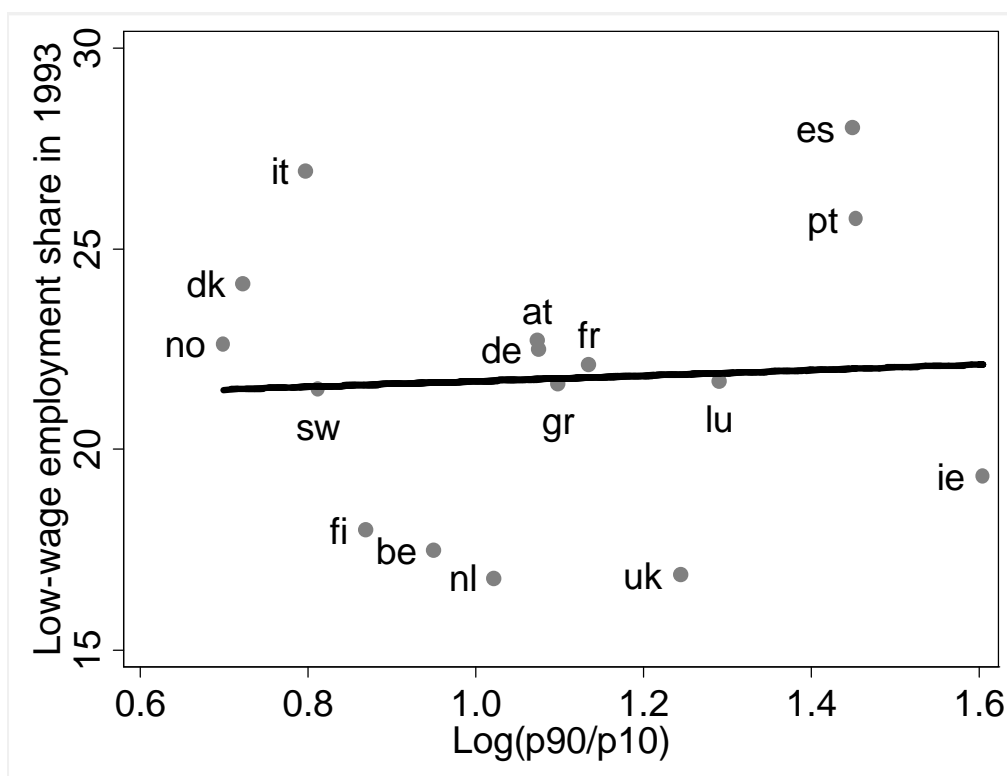


FIGURE 2. OVERALL WAGE INEQUALITY AND THE 1993

LOW-WAGE EMPLOYMENT SHARE IN 16 EUROPEAN COUNTRIES

Sources: European Union Labour Force Survey; European Community Household Panel; the European Union Survey on Income and Living Conditions; and the OECD.

To test the different hypotheses about the causes of job polarization, the first column of Table 3 includes variables related to all of the factors considered above. These are, with the exception of the wage variable, interacted with a time trend to model the idea of a process. The evidence is strongest for the routinization hypothesis although the signs of all variables except 'education' are in line with predictions (education has the sign predicted by SBTC if one excludes the task-content variables). The second column retains only those variables found to be significant.

**Table 3.** Explaining Job Polarization  
Dependent variable:  $\ln(\text{hours worked}/1000)$

	(1)	(2)
Linear time-trend		
interacted with:		
ABSTRACT task importance	1.02* (0.46)	0.96* (0.24)
ROUTINE task importance	-0.67* (0.30)	-0.85* (0.20)
SERVICE task importance	0.24 (0.32)	-
Offshorability	-0.22 (0.19)	-
Education level	-0.19 (0.48)	-
Log wage	-0.32 (0.29)	-

Notes: Years 1993-2006; all countries; 3,950 observations for each regression. Standard errors clustered by occupation-country. All point estimates and standard errors, except for those on the log wage, have been multiplied by 100. The log wage is country-occupation-year specific. Each regression includes dummies for occupation-country cells and country-year cells. Task importances, offshorability and the education level have been rescaled to mean 0 and standard deviation 1. \*Significantly different from 0 at the 5-percent level or better.

The specifications of Table 3 assume that the effects of technological change are the same for all countries. To test whether the time trends estimated in Table 3 are pervasive across countries, we interact the variables in Table 3 with country dummies and test for their joint significance (not reported here). The F-test for country heterogeneity in Abstract employment growth has a p-value of 0.24; in Routine employment growth a p-value of 0.97; and in Service employment growth a p-value of 0.59. Given the pervasiveness of job polarization shown in Table 2, this is in line with the routinization hypothesis. To the

contrary, the decrease in employment growth for offshorable occupations does seem to be less pervasive and hence more country specific with a p-value of 0.11.

### **III. Conclusions**

Since the early 1990s Europe, like the US and UK, has experienced job polarization, that is, a disproportionate increase in high-paid and low-paid employment. Pervasive job polarization is in line with the evidence that in advanced countries, technologies are becoming more intense in the use of non-routine tasks concentrated in high-paid and low-paid service jobs at the expense of routine tasks concentrated in manufacturing and clerical work. The evidence for alternative explanations – offshoring and inequality – is much weaker.

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