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## Job Polarization in Europe

By MAARTEN GOOS, ALAN MANNING, AND 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 toward 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 toward high-skilled occupations, but studies for the United States (Autor, Katz, and Melissa S. Kearney 2006) and the United Kingdom (Goos and Manning 2007) have shown that there is growth in employment in both the highest-skilled (professional and managerial) and lowest-skilled (personal services) occupations, 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 of income going to the rich in the United States and the United Kingdom 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 2009) 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.

### 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 dataset) to map occupational employment changes in 16 European countries<sup>1</sup> over the period 1993–2006. Occupations are classified by the 21 two-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 United Kingdom.

<sup>2</sup>Except for Germany, where hours are not recorded and those working fewer than 15 hours per week are not in the dataset.

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	Percent employment share in 1993	Percentage point change over 1993–2006
<i>Eight 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
Physics, mathematics, 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>Nine 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 trade workers	8.17	–0.52
Machine operators and assemblers	6.71	–2.01
Other craft and related trade workers	3.19	–1.37
<i>Four 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.

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 workers. The larg-

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

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 all 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, 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).

<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 are not available at this level of disaggregation.

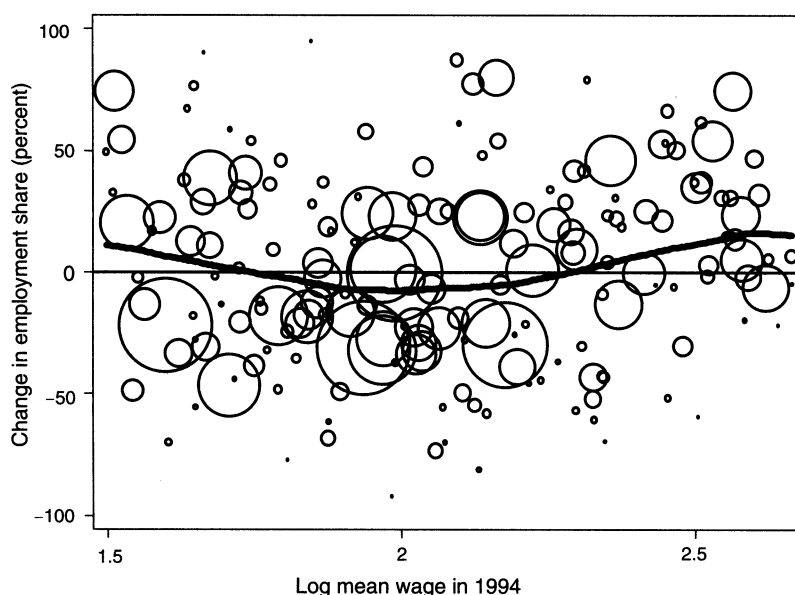


FIGURE 1. PERCENTAGE CHANGES IN EMPLOYMENT SHARES OVER 1993–2006 FOR JOBS RANKED BY THEIR 1994 LOG WAGE

*Note:* Jobs are industry-occupation cells weighted by their 1993 employment shares, pooled across countries, and ranked by their UK 1994 log mean wage.

*Sources:* European Union Labour Force Survey 1993–2006, United Kingdom Labour Force Survey 1994.

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 for changes in the occupational structure of employment. To capture the idea 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 (O\*NET) database to construct three measures of the types of tasks contained in an occupation—abstract tasks, which are intense in nonroutine cognitive skills; service tasks, intense in nonroutine noncognitive skills; and routine tasks, intense in both cognitive and noncognitive routine skills. Goos, Manning, and Salomons (2008) contains more details on the way 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 nonroutine 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 Organisation for Economic Co-operation and Development (OECD) to compute time-varying measures of occupational wages and measures of wage inequality. We might expect

TABLE 2—CHANGES IN SHARES OF HOURS WORKED OVER 1993–2006 FOR HIGH-, MIDDLING, AND LOW-PAYING OCCUPATIONS

	Four lowest paying occupations	Nine middling occupations	Eight 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.

that countries with compressed occupational wage distributions have a relatively small share of employment in low-wage occupations because relative wages affect factor demands, and 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 industry 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 tenth 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 reasons other than overall wage inequality 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.

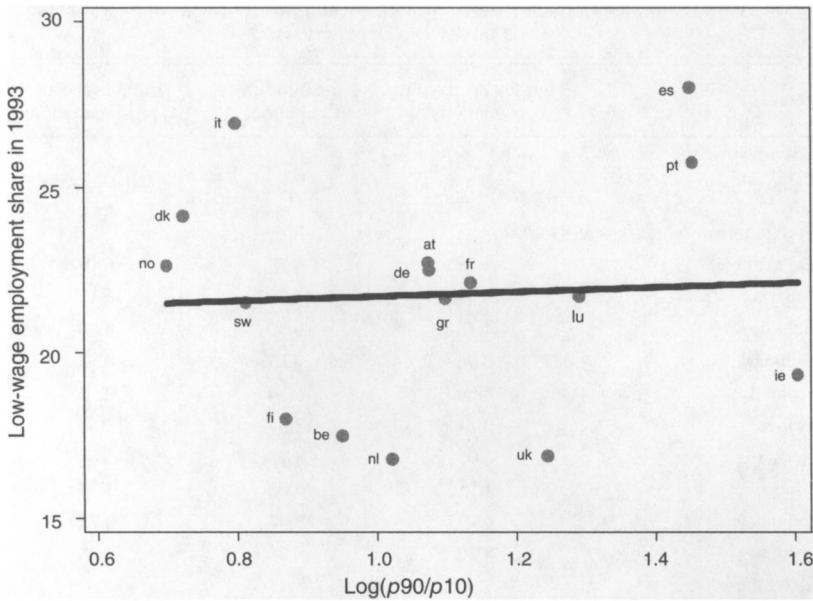


FIGURE 2. OVERALL WAGE INEQUALITY AND THE 1993 LOW-WAGE EMPLOYMENT SHARE IN 16 EUROPEAN COUNTRIES

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.

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 United States and United Kingdom, 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 nonroutine 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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TABLE 3—EXPLAINING JOB POLARIZATION  
Dependent variable:  $\ln(\text{hours worked}/1,000)$

Linear time-trend interacted with:	(1)	(2)
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 zero and standard deviation one.

\*Significant at the 5 percent level or better.

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