



Munich Personal RePEc Archive

Upgrading or polarization? Occupational change in Britain, Germany, Spain and Switzerland, 1990-2008

Oesch, Daniel and Rodriguez Menes, Jorge

University of Geneva, University of Pompeu Fabra

29 January 2010

Online at <https://mpra.ub.uni-muenchen.de/21040/>

MPRA Paper No. 21040, posted 04 Mar 2010 03:30 UTC

Upgrading or polarization? Occupational change in Britain, Germany, Spain and Switzerland, 1990-2008

Daniel Oesch¹ (daniel.oesch@unige.ch)

Jorge Rodriguez² (jorge.rodriguez@upf.edu)

¹ University of Geneva, ² University of Pompeu Fabra

Abstract

We analyze the pattern of occupational change over the last two decades in Britain, Germany, Spain and Switzerland: which jobs have been expanding – high-paid jobs, low-paid jobs or both? Based on individual-level data, we examine what hypothesis is most consistent with the observed change: skill-biased technical change, routinization, skill supply evolution or wage-setting institutions? Our analysis reveals massive occupational upgrading that closely matches educational expansion: employment expanded most at the top of the occupational hierarchy, among managers and professionals. In parallel, mid-range occupations (clerks and production workers) declined relative to those at the bottom (interpersonal service workers). This U-shaped pattern of upgrading is consistent with the routinization hypothesis: technology seems a better substitute for average-paid clerical and manufacturing jobs than for low-end service employment. Yet country differences in low-paid service job creation suggest that wage-setting institutions play an important role, channelling technological change into more or less polarized patterns of upgrading.

Keywords: employment, labour market institutions, technological change, inequality, occupations

JEL classification: J21 labour force and employment, size and structure, P52 comparative studies of particular economies

Revised version (29. 1. 2010) of a working paper presented at the Low Pay, Low Skill and Low Income (LOPSI) Workshop in Milano, 27. 6. 2009

1. Introduction

In the late 1990s, a consensus emerged among labour market researchers that affluent countries were witnessing an ongoing process of occupational upgrading. The evidence for Western Europe and the U.S clearly suggested that high-skilled occupations were expanding at the expense of low-skilled ones (e.g. Berman et al., 1998; Gallie et al., 1998). However, this consensus was recently shattered by three influential studies finding increasing polarization of the employment structure in the United States (Wright and Dwyer, 2003; Autor et al., 2008) and Great Britain (Goos and Manning, 2007). Their authors argued that employment growth in both countries has taken place both in high-paid professional and managerial jobs and in low-paid personal service jobs, whereas employment in average-paid production and office jobs has been declining.

Three explanations may account for this puzzling finding of a polarizing employment structure in the U.S. and Britain. The first focuses on labour demand and advances a more nuanced theory of skill-biased technological change where computers complement both high-skilled analytical and low-skilled interpersonal tasks, but substitute for mid-skilled manual and clerical tasks (Autor et al., 2003, 2008; Manning, 2004). A second explanation emphasizes changes in labour supply and highlights – for the United States – a slowdown in skill supply growth due to slower educational expansion (Goldin and Katz, 2007) and increasing Hispanic immigration (Wright and Dwyer, 2003). A third explanation emphasizes the role of institutions. It considers the creation of low-paid jobs and the resulting employment polarization a distinctive feature of Anglo-Saxon countries' flexible wage-setting institutions (Scharpf, 2000; OECD, 2004).

Our paper wishes to contribute to this debate by examining the pattern of occupational change for four Western European countries with different institutions: Britain, Germany, Spain and Switzerland. The central question we address is what kind of jobs have been expanding (or declining) over the last two decades: high-paid jobs, low-paid jobs or both? Is occupational polarization limited to the Anglo-Saxon countries or is it pervasive across post-industrial economies?

So far, findings in the literature do not convey a clear-cut picture. If the quality of jobs is measured in terms of skills, results point towards unambiguous occupational upgrading for Britain (Felstead et al., 2007) and Switzerland (Sheldon, 2005). For Germany, conclusions diverge between occupational upgrading (Tahlin, 2007) and polarized upgrading (Spitz-Oener, 2006), where high-skilled jobs expanded strongly

and low-skilled jobs moderately relative to mid-skilled jobs. Analyses for Spain show that over the last thirty years both professionals and – less so – low-skilled service workers have strongly increased their numbers (Bernardi and Garrido, 2008). If the quality of jobs is measured by occupations' average earnings, studies find a trend towards polarization that is weak in Germany (Dustmann et al., 2009) but relatively strong in Britain (Goos and Manning, 2007). Finally, two recent studies based on the European Labour Force Survey diverge in their results: pervasive polarization (Goos et al., 2009) as opposed to large country differences with an underlying trend towards upgrading (Eurofound, 2008).

We analyze the pattern of occupational change between 1990 and 2008 using large individual-level country surveys. Our comparative approach provides us with insights of two kinds. Firstly, by using the same methodological framework and time periods for four countries, we produce comparable cross-country results. Secondly, by confronting the implications of the different theoretical explanations of occupational change with the data, we examine which is most consistent with the observed pattern of employment change. Typically, technological change is pervasive and should produce similar patterns of occupational upgrading or polarization across Western European countries. In contrast, wage-setting institutions and, to a lesser extent, skill supply evolution vary between countries and should lead to different patterns of employment change.

Our paper is organized as follows. In section 2, we discuss three competing explanations of occupational change: technological change on the demand-side, skill evolution on the supply side and wage-setting institutions as intervening factors. In section 3, we present the data and discuss our analytical strategy. In section 4 we show patterns of occupational change over the last two decades in the four countries. Section 5 examines how these results fit into explanations of technical change. Section 6 controls for supply-side influences by looking at the evolution in educational attainment and immigration. Section 7 focuses on institutional factors and examines whether countries have created jobs in different occupational categories. Section 8 concludes by discussing the implications of our findings.

2. Theoretical accounts of occupational change

Transformations in the occupational structure always result from the interaction of demand and supply-side factors in a given institutional context. This interaction makes the isolation of a single driving force of occupational change difficult and has two implications for our study: Firstly, we are better equipped to provide descriptive evidence of occupational change than to explain its causes. Secondly, we may gain some explanatory leverage by specifying what empirical evidence is consistent or inconsistent with different explanatory accounts. We begin our discussion of explanations of occupational change by schematically dividing them into three accounts: (i) demand-side, (ii) supply-side and (iii) institutional.

(i) Demand-side accounts of occupational change: technical change

In the long run, the main driving force behind changes in the tasks humans do in their jobs is technology (Manning 2004). In comparison, other demand-side factors such as international trade or shifts in product demand may at best play a modest role (OECD, 2005). Until recently, the dominant explanation of employment trends has been skill-biased technical change (SBTC), which expects the spread of computer-based technology to monotonically increase the demand for high-skilled relative to low-skilled workers.

Skill-biased technical change explanations have been challenged by the “routinization” hypothesis (Autor et al., 2003; Manning, 2004). The central argument involves a re-specification of the types of jobs that are most likely to be replaced by technology. While machines cannot easily substitute for non-routine interactive tasks such as restaurant waiting, care giving or cleaning, located at the very bottom of the occupational hierarchy, they readily take over the routine production and clerical tasks typically done in mid-range jobs. Computerized technology is thus seen as complementary to both high-paid analytical and low-paid interactive jobs. Rather than leading to overall occupational upgrading, technical change is then expected to hollow out of the middle and hence to polarize the employment structure (Goos and Manning, 2007; Autor et al., 2008).

Explaining transformations in the occupational structure with technical change is sensible. Yet, as the fundamental explanatory force remains largely unobserved (DiPrete and McManus 1996: 39), its pervasive effects can only be grasped indirectly, by detecting homogeneous trends across countries. Technical accounts diverge in the shape

of these trends: SBTC expects clear cut upgrading, routinization polarized job growth (above all) at the top and (less so) at the bottom at the expense of the middle.

(ii) Supply-side accounts of occupational change: skill composition

Unlike demand-side accounts that expect similar patterns of occupational change across countries, supply-side explanations anticipate cross-national variations. Variations are explained by differences in the evolution and characteristics of labour supply (Nickell and Bell, 1996; Freeman and Schettkat, 2001). Firms determine their production techniques and the jobs they need based on the availability of input factors in each country, especially the supply of skills. While the increase in the demand for skills – largely due to technology – is relatively stable over time, growth in the supply of skills varies depending on the evolution of educational attainment and immigration (Goldin and Katz, 2007). Hence, a slow-down or acceleration in countries' educational expansion and immigration should affect their pattern of occupational change.

Table 1 shows the evolution of skill supply in the four countries under study between 1990 and 2008 (employed individuals only). All four countries underwent a clear process of educational expansion, whereby the share of workers with tertiary schooling strongly increased while the share of workers without upper secondary education decreased. This process of educational upgrading was clear cut in Britain, Germany and, above all, in Spain; in Switzerland the share of workers with medium levels of education declined somewhat faster than that of low-skilled workers.

Table 1: Educational attainment and immigrant share in the labour force, 1990-2008

	(1)			(2)			(3)			(4)		
	% with less than upper secondary education			% with upper secondary education			% with tertiary education			% of immigrants in labour force		
	1990	2008	Δ	1990	2008	Δ	1990	2008	Δ	1990	2008	Δ
Britain ¹	29	20	-8.8	49	44	-4.3	23	36	13	3.4	8.3	4.9
Germany ²	15	8	-6.8	68	67	-1.9	17	25	8.7	6.6	6.1	-0.5
Spain	50	17	-33	38	59	21	12	24	12	0.3	16	15
Switzerland ¹	19	13	-5.7	60	50	-9.4	21	36	15	21	24	2.6

Sources: own computations based on the British Labour Force Survey, German Socio-Economic Panel, Spanish Labour Force Survey, Swiss Labour Force Survey

¹ 1991 and 2008; ² 1990 and 2007

Note: our computation of the workforce only includes individuals aged 18-65 years who work at least 20 hours per week.

In theory, the evolution of countries' educational attainment integrates the contribution of immigration to skill supplies, since their qualifications are also counted.

In practice, however, immigration may have an effect onto labour supply that is not accurately captured by formal skills levels. The reason is that immigrants often downgrade to jobs requiring skill levels below their actual education (Dustmann et al., 2008). Hence, column (4) of table 1 presents the share and evolution of immigrant workers between 1990 and 2008. While the proportion of immigrants in the labour force has remained constant in Germany, it augmented slightly in Switzerland, considerably in Britain and massively in Spain.

Based on these changes in the workforce's skill composition, we expect marked occupational upgrading in all four countries, and a strong expansion of high-skilled workers relative to medium- and low-skilled workers. In Britain, the sizeable increase in immigration has possibly compensated, to some extent, the decline of low-skilled labour supply. Hence, a slightly polarized version of occupational upgrading – with strong growth at the top and slower decline at the bottom than the middle of the employment structure – seems consistent with a supply-based explanation.

(iii) Institutional accounts: wage-setting institutions

A third and last explanation stresses that in labour markets, demand- and supply-side factors are channelled through institutional mechanisms (DiPrete and McManus, 1996; Levy and Temin, 2007). In this view, polarization in employment only occurs if low-paid service jobs are created in substantial numbers. However, creation of such jobs in restaurants and supermarkets, nursing homes and private households depends on relative wages: where wage-setting institutions compress the wage structure and decrease wage flexibility, interpersonal service jobs become too expensive and may simply not be created (Krugman, 1994; Scharpf, 2000). In parallel, relatively high minimum wages – by making the creation of low-skilled jobs less profitable – may also induce firms to invest in workers' productivity and create more medium- and high-skilled jobs (Acemoglu, 2001). Hence, a common shift in labour demand due, for instance, to technical change, may have very different effects on the occupational structure depending on countries' wage-setting institutions.

In table 2, we compare wage-setting institutions in the four countries by looking at measures of collective bargaining, unemployment insurance benefits and wage inequality. In terms of bargaining coverage, Germany and Spain have a somewhat more protected (and hence probably less flexible) wage structure than Switzerland and Britain, thus possibly hampering the creation of low-paid jobs. With respect to

unemployment insurance (and hence the reservation wage), Britain provides by far the lowest benefit level, while Switzerland's insurance is slightly more generous than that of Germany and Spain. Hence, economic incentives for low-skilled workers to accept low-paid jobs are stronger in Britain than in the other countries. Finally, regarding the most consequential indicator – the outcome variable of wage-setting institutions, wage inequality –, we find that Switzerland and Germany had a more compressed wage structure at the beginning of the period under study than Britain and Spain. This result holds for both overall and lower-tail wage inequality.

Based on these indicators, the probability of low-skilled services being priced out by high relative wages seems greater in Germany than in Britain, while Spain and Switzerland occupy an intermediate position. Hence, occupational polarization due to low-wage service job creation seems most likely in Britain and least so in Germany.

Table 2: Bargaining coverage and wage inequality in 1990 and 2000

	Collective bargaining: % of employees covered		Unemployment benefits: average replacement rate		Overall wage inequality: decile 9/ decile 1		Lower-tail wage inequality: decile 5/ decile 1	
	early 1990s	early 2000s	1990	2000	1990	2000	1990	2000
Britain	47	35	0.28	0.37	3.44	3.47	1.87	1.83
Germany	70	60	0.66	0.66	2.76	2.93	1.61	1.59
Spain	70	80	0.69 ⁴	0.66 ⁵	3.37 ¹	3.50 ²	1.76 ²	1.89 ²
Switzerland	50	50	0.77	0.77	2.41 ³	2.56	1.51 ¹	1.49

Sources: collective bargaining: Visser (2007); benefit replacement rate, wage inequality (except Spain): OECD; wage inequality Spain: own computations based on three surveys carried out by Spain's Centre for Sociological research in 1989 and 1990 (averaged to provide a single measure for 1990) and 2006.

¹ 1989/90; ² 2006; ³ 2002; ⁴ 1994; ⁵ 2001.

By comparing these different explanations we can single out their two most controversial predictions. Undisputed is the expectation that the strongest employment growth will take place in the high-skilled occupations. In contrast, expectations diverge with respect to (a) the evolution of low-skilled relative to mid-skilled jobs and (b) the evolution of low-paid service jobs relative to total employment. While *SBTC* expects for all countries a negative change in these two dimensions (less growth in low-skilled than in mid-skilled jobs, slower growth in low-paid services than in total employment), the *routinization hypothesis* expects the opposite. The *skill supply hypothesis* expects faster growth of mid-skilled relative to low-skilled occupations in Germany and Spain, but not necessarily in Britain and Switzerland. Finally, the *institutional hypothesis* predicts

stronger than average growth for low-paid services in Britain and possibly Spain, but not in Germany and possibly Switzerland.

3. Data and strategy of analysis

Our analysis of occupational change over the last two decades in Britain, Germany, Spain and Switzerland is based on individual-level data stemming from the British Labour Force Survey (LFS), the German Socio-Economic Panel (SOEP), the Spanish Active Population Survey (EPA) and the Swiss Labour Force Survey (SAKE). For each country, we select the 1990 (1991 for LFS and SAKE) and the 2008 (2007 for SOEP) waves. While SOEP and SAKE are annual surveys, EPA and – beginning in 1993 – LFS are carried out on a quarterly basis. For these two surveys, we have chosen the spring quarter. Table A.1 in the annexe shows for each survey the number of working individuals and of those reporting earnings.

Our enquiry builds on the analytical strategy developed by Erik Wright and Rachel Dwyer (2003) for the study of occupational change in the United States, subsequently applied also to British (Goos and Manning, 2007) and European data (Eurofound 2008). Our procedure involves three steps.

Distinguishing occupations: We first restrict our samples to 18 to 65 years old individuals who spend at least 20 hours per week in paid employment. We thus exclude workers who, like teenagers, senior workers or employees in small part-time jobs, have a marginal attachment to the labour force. In contrast, we include all non-marginal jobs, regardless of whether they are filled by wage-earners, self-employed workers or employers. We next distinguish occupations using the 4-digit International Standard Classification of Occupations (ISCO-88) for Germany and Switzerland, the 3-digit Standard Occupational Classification (SOC-90 and SOC-2000) for Britain, and the 3-digit 1994 National Classification of Occupations (CNO-94) for Spain.¹ Occupations containing fewer than 10 individuals reporting wages are merged with other occupations to increase the accuracy of our estimates.² Depending on the country, this leaves us with 171 (Britain), 145 (Germany), 120 (Spain) or 161 (Switzerland) different occupations. Unlike Wright and Dwyer (2003), we explicitly integrate the industry-part of an occupation only for a few large occupations,³ and this for two reasons: First, our national classifications code occupations at a level comparable to the ISCO 4-digit level, which already accounts for many industry differences, typically so among managers of large and small firms (ISCO-codes 1220-9 and 1310-9, respectively).

Second, our German and Swiss samples are too small to allow breaking down occupations by industry-sector and obtaining more than 150-200 sizeable subgroups. In any case, previous analyses for Britain suggest that results are very similar regardless of whether a job is defined by occupation alone or a combination of occupation and industry (Goos and Manning 2007: 121).

Determining job quality: In a second step, we determine whether a given job is good or bad, advantageous or undesirable. A large array of job attributes matter to people and hence affect a job's quality: earnings, skill requirements, promotion prospects, job security or work autonomy. While these indicators capture different dimensions of a job, they are closely correlated. Hence, following Wright and Dwyer (2003: 294), we use earnings as the arguably most consequential and most reliably measurable indicator of an occupation's quality. In what follows we thus equate occupational upgrading with an expansion of occupations with comparatively high median earnings at the expense of occupations with low median earnings. Note that we only resort to earnings in order to rank-order occupations: The focus of our analysis lies on the quantity side— employment —, and not the price side — wages — of the labour market. We calculate an occupation's earning as the average of its standardized hourly median earning at the beginning and end of the period under study, weighted by the number of individuals employed in the occupation at a given moment.⁴

Rank-ordering occupations into quintiles: Once we have calculated the median earning of each occupation, we rank-order the 120 to 171 occupations from the lowest-paid to the highest-paid, grouping them into five equally large quintiles containing as close as possible to 20% of total employment at the beginning of the period under study.⁵ The bottom quintile thus holds the 20% of employment in the occupations with the lowest median earnings. In Germany, this quintile 1 includes waiters, personal care workers, sales clerks, hairdressers, sewers and cleaners. Likewise, the highest quintile 5 comprises the 20% of employment in the occupations with the highest median earnings. In Germany, these occupations comprise medical doctors, civil engineers, legal and computer professionals and marketing managers. We determine the pattern of occupational change on the basis of how occupations in these five quintiles evolve in terms of employment from 1990 to 2008.

We need to address two potential concerns about our analytical approach. First, our allocation of occupations into quintiles assumes that occupations' rankings by median earnings change little over time. We test this assumption by calculating Spearman's

correlation between occupations' rankings at the beginning and end of the period in each country. These correlations are very strong, ranging between 0.70 (Spain), 0.87 (Switzerland) and 0.90 (both Britain and Germany). Hence, like prior studies (Goos and Manning 2007: 122), we find considerable stability in the occupational earnings structure.

A second concern relates to the comparability of occupational changes across countries. In effect, some occupations may rank higher in terms of earnings in one country than in another. Yet this does not affect our ability to investigate whether good or bad, high-earning or low-earning jobs are expanding within each country. We are comparing the evolution of 'good' and 'bad' jobs in each country – and not tracing the evolution of the same occupations across countries. Regardless, the occupational hierarchy looks surprisingly similar in our four countries. Everywhere, sales clerks, waiters and agricultural labourers are found in the bottom quintile 1; senior officials, computer professionals and medical doctors in the top quintile 5; bricklayers and truck drivers in quintile 2, and nurses and police officers in quintile 4.

4. Findings for the pattern of occupational change, 1990-2008

Before examining changes in quintiles' sizes, we present in tables 3 and 4 the three occupations that have experienced the largest expansion or decline over the last two decades in each country. To convey a sense of quintiles' occupational composition, the last columns of tables 3 and 4 report the job quality quintile in which each occupation falls.

Strongly *growing* occupations can be divided into two groups: the first comprises highly qualified occupations such as financial managers, legal and computer professionals set in (private) business services; the second includes (public) social service jobs such as health care employees, teachers and social workers. In all four countries, the expansion of computer professionals and (assistant) nursing staff has been particularly strong.

We can distinguish three groups of strongly *declining* occupations. A first group comprises the victims of de-industrialization and includes craft and production workers such as mechanics, maintenance fitters and assemblers. These manufacturing jobs are not particularly low-paid, for they spread across the middle quintiles 2 to 4. The same observation applies to a second group of shrinking occupations – office clerks and secretaries – which represent typical mid-range jobs set in the middle quintile 3. Finally,

the fall in employment has also been strong in a third group of agricultural workers and farmers. Yet unlike jobs in production or the secretariat, these jobs are unequivocally associated with low earnings and thus set in quintile 1.

Table 3: The three occupations with the largest increase of their share in total employment

<i>Country</i>	<i>Occupation</i>	<i>Change in employment share in percentage points</i>	<i>Job quality quintile*</i>
GB, 1991-2008	Care assistants & attendants	1.26	1
	Treasurers & financial managers	1.12	5
	Educational assistants	1.09	1
DE, 1990-2007	Legal professional, not else specified	2.57	5
	Nursing associate professionals	1.01	3
	Social workers	1.01	3
ES, 1990-2008	Cashiers, tellers, etc. with direct client-contact	1.80	3
	Office and hotel cleaners	1.68	1
	Health care attendants in hospitals and rest homes	1.67	4
CH, 1991-2008	Managers in private services except banking	1.92	5
	Computer systems designers & analysts	1.25	5
	Secondary education teachers	1.04	5

* Job quality quintile 1 regroups the 20% of employment set in the occupations with the lowest median earnings, job quality quintile 5 the 20% of employment set in the occupations with the highest median earnings.

Table 4: The three occupations with the largest decline of their share in total employment

<i>Country</i>	<i>Occupation</i>	<i>Change in employment share in percentage points</i>	<i>Job quality quintile</i>
GB, 1991-2008	Other secretarial personnel, not else specified	-1.67	3
	Metal work maintenance fitters	-1.43	4
	Service industry managers	-1.34	3
DE, 1990-2007	Agricultural workers	-1.25	1
	Industrial machine mechanics & fitters	-1.24	4
	Car, taxi, van drivers	-1.20	1
ES, 1990-2008	Unskilled construction workers	-4.27	2
	Self-employed farmers	-2.79	1
	Skilled agricultural workers	-2.25	1
CH, 1991-2008	Office clerks in private services except banking	-2.19	3
	Sales and services elementary occupations	-2.00	1
	Manufacturing labourers	-2.00	1

These findings suggest that the shift away from agricultural, industrial and clerical jobs towards business and welfare services upgraded the occupational system. We check this possibility by computing in figure 1 relative changes in quintiles' sizes in each country. Hence, for Britain, the increase of 0.6 percentage points in quintile 1 means that the least-paid occupations' share of total employment grew from 20 to 20.6% per

cent between 1991 and 2008. Likewise, the decrease of 4.8 percentage points in quintile 3 means that the employment share of mid-range occupations fell from 20 to 15.2 per cent. Four remarks can be made regarding these results.

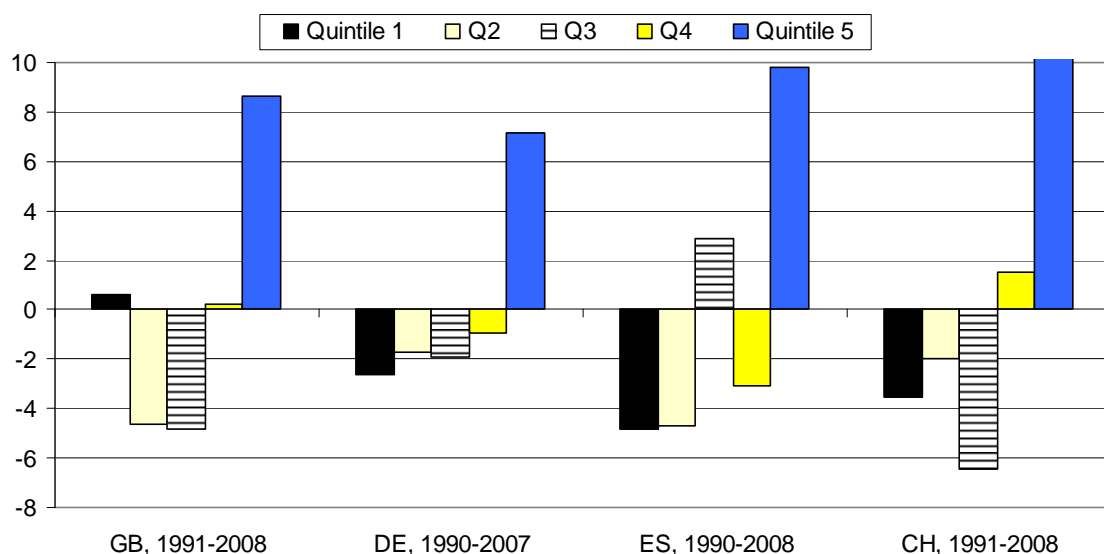
First, job expansion is clearly biased towards high-paid occupations in all four countries. In Germany, net job expansion has been entirely concentrated in the best paid occupations of quintile 5. Similarly, in Britain, Spain and Switzerland, more than 75 per cent of net employment growth took place in occupations of the top quintile.

Second, in Britain and Switzerland employment declined most in the middle quintile 3, whereas in Germany and Spain it did so in the lowest-paid occupations of quintile 1.

Third, we can clearly discard the hypothesis of occupational downgrading for all four countries. We obtain a clear-cut picture of occupational upgrading in Germany and – with the exception of the stronger decline in quintiles 3 and 4 respectively – also in Switzerland and Spain. Results are more contrasted for Britain, suggesting a pattern of ‘polarized upgrading’ with strong employment growth at the top of the occupational hierarchy, substantial losses in the middle, and very slight growth at the bottom.

Fourth, unlike Goos, Manning and Salomons (2009), but consistent with Eurofound (2008), our analysis reveals important country differences: while the best-paid occupations expanded in all four countries, we do not find the patent cross-national similarities predicted by hypotheses based on pervasive technological change.

Figure 1: relative net employment change in job quality quintiles (in percentage points)



By looking at *relative* changes in employment, we might overlook country differences in *absolute* job growth or decline. Although countries' business cycles evolved in parallel – a sharp recession in 1991-93, a slow recovery in 1994-97, sustained booms in 1998-2001 and 2004-2007 with a short dip in 2002-03 –, the extent of job creation varied widely. Hence, while Spain embarked after 1994 on a decade of massive job expansion at an annual rate of 4 per cent, employment increased at a much slower pace in Britain and Switzerland (1% annually) and almost stagnated in Germany (0.6% annually). In order to account for these differences, we show in table 5 occupational change in absolute terms. While the pattern of change is identical to that revealed in figure 1, levels change. Interestingly, the three large countries in our sample created about the same amount of jobs in the high-paid top quintile over the last two decades: 2.5 millions in Germany, 2.8 in Britain and 3.1 in Spain. Of course, given Spain's smaller workforce, this implies a much larger relative increase (+27%) than in Britain (+12%) and Germany (+7%). With the exception of the Spanish 'job miracle', all countries lost jobs in the middle quintiles 2 and 3. The main difference between countries lies in the employment trajectory of the lowest-paid occupations. While Britain and Spain created 720'000 (+3.1%) and 440'000 jobs (+3.8%) in quintile 1, Germany lost 840'000 (-2.5%) and Switzerland 50'000 jobs (-1.8%). Differences in country's job record since 1990 thus seem closely linked to changes at the low-paid end of the labour market (Scharpf 2000; Kenworthy 2003).

Table 5: Absolute net employment change in quintiles – in thousand jobs (and %)

	Quintile 1	Q2	Q3	Q4	Quintile 5	Total
GB 1991-08	717 (3.1)	-645 (-2.8)	-704 (-3.0)	612 (2.6)	2815 (12)	2795 (12)
DE 1990-07	-840 (-2.5)	-545 (-1.6)	-604 (-1.8)	-283 (-0.8)	2483 (7.3)	211 (0.6)
ES 1990-08	443 (3.8)	470 (4.0)	1855 (16)	766 (6.6)	3128 (27)	6663 (57)
CH 1991-08	-53 (-1.8)	-3 (-0.1)	-150 (-5.0)	115 (3.8)	409 (14)	318 (11)

Note: our computation of the workforce only includes individuals aged 18-65 years who work at least 20 hours per week. If small part-time jobs are also included, employment growth is larger.

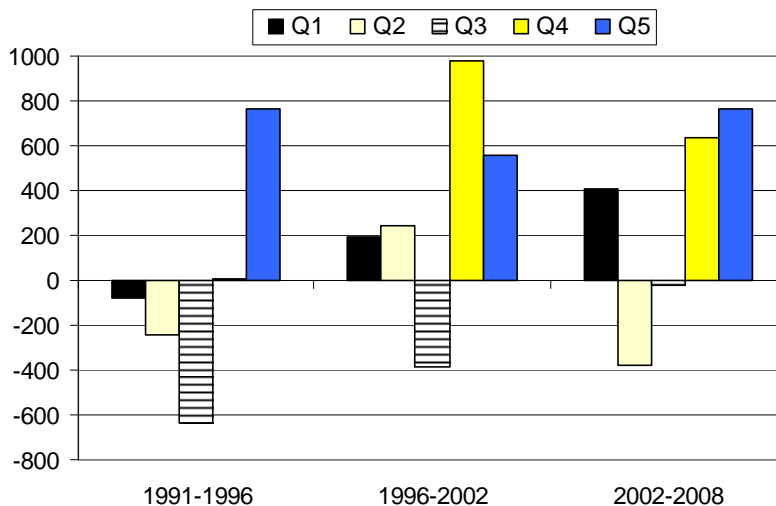
A second issue not addressed by figure 1 concerns timing - the possibility that the gradual shift in employment from upgrading to polarization generated by technological change may have occurred at different times and speeds in each country. An analysis based on only two time points may blur this transition. Accordingly, figure 2 decomposes occupational change over three six-year subperiods. Moreover, in order to account for differences in business cycle across subperiods, we compute occupational

change in absolute terms. Our results suggest that a shift from clear cut occupational upgrading to more polarized change took place in all four countries. The first 1990-96 subperiod coincides everywhere with strong employment gains at the top and losses in the middle and bottom of the occupational hierarchy. Trends towards occupational upgrading thus seem particularly strong in recessionary periods, as the burden of economic restructuring, downsizing and unemployment is disproportionately shouldered by low-paid workers. Upgrading may thus come at a cost for a sizeable proportion of the labour force.

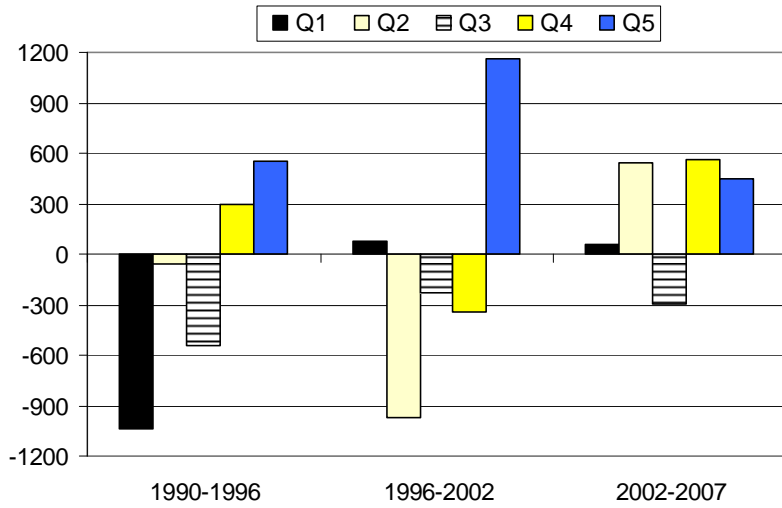
While the upgrading pattern holds for the two subsequent subperiods of 1996-02 and 2002-08 – the top quintile expanding strongly –, there is also job growth in the lowest-paid occupations of quintile 1 in all four countries. In Britain, Germany and Switzerland, this expansion at the bottom coincides with declining employment in the middle quintile 3. Hence, after 1996, we observe for these three countries a substantial fall in mid-range jobs, which contrasts with strong job growth at the top and modest job growth at the bottom. Spain is an exception as employment expanded substantially after 1996 in all five quintiles. Still, Spanish job creation in the last subperiod 2002-08 somewhat resembles Britain’s pattern of polarized upgrading, with the strongest growth taking place at the top and bottom of the employment structure.

Figure 2: absolute net employment change in quintiles over subperiods (in thousand jobs)

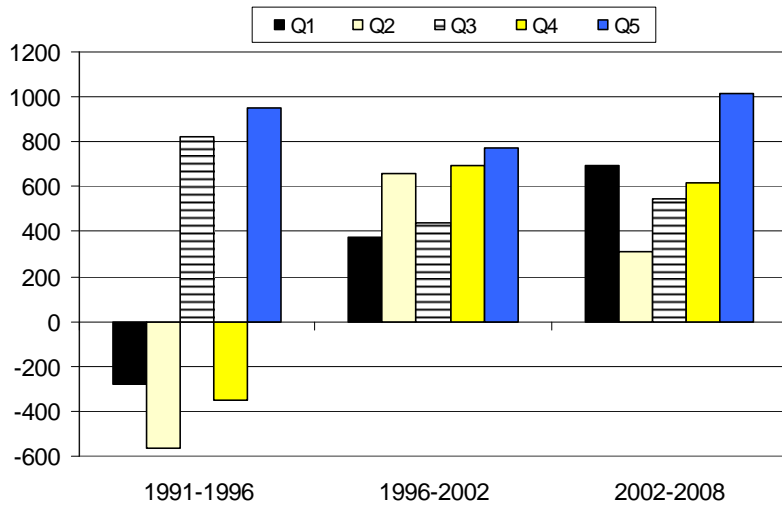
Britain, 1991-2008



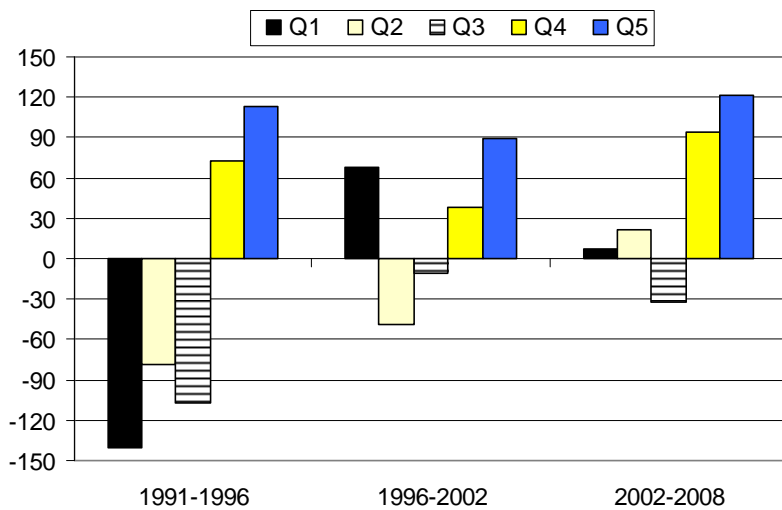
Germany, 1990-2007



Spain, 1990-2008



Switzerland, 1991-2008



5. The impact of labour demand: technical change

The gradual shift from occupational upgrading to polarization, shown in figure 2, seems consistent with the argument that skill-biased technical change was dominant in the 1980s, but has given way to routinization in the 1990s (Autor et al. 2008). In this section we contrast the ability of the two technical accounts to explain overall employment change by analyzing whether this change best matches the evolution of occupations' (a) skills levels, or (b) dominant tasks. SBTC predicts a positive and monotonous link between skill levels and employment growth. Technological change should lead to stronger growth in high- than mid-skilled, and in mid- than low-skilled occupations. In contrast, routinization expects employment to primarily expand in occupations dominated by non-routine tasks. These occupations may either consist of high-paid non-routine analytical and interactive tasks, or of low-paid non-routine service and manual tasks.

We divide occupations into three *skill* levels: *low-skilled* occupations where more than 30 per cent of workers have no upper secondary education; *high-skilled* occupations where more than 30 per cent have tertiary education, and the residual category of *mid-skilled* occupations. Similarly, we draw on Spitz-Oener's work (2006: 243) to classify occupations according to their dominant *tasks* into three groups performing: *non-routine service and manual* tasks (caring, serving; renovating, driving), *routine cognitive and manual* tasks (typewriting, calculating; operating and controlling machines), and *non-routine analytical and interactive* tasks (researching, planning; coordinating, teaching).⁶ Occupations are allocated into a skill and task category according to their values at the beginning of the period analyzed.

Has employment in these skill and task groups grown or declined over the last two decades? The upper half of table 6 shows for all four countries very strong growth in high-skilled jobs, i.e. in occupations which in 1990/91 contained more than 30 per cent of workers with tertiary education. With the exception of Spain where also mid-skilled occupations expanded, net employment growth was limited to high-skilled jobs. More ambiguous is the evolution of mid- and low-skilled occupations. While low-skilled jobs decreased everywhere more than mid-skilled jobs, both skill categories declined (except mid-skilled workers in Spain) – and to a similar extent in Britain. Moreover, since mid-skilled occupations constitute the largest skill category in Britain, Germany and Switzerland, job losses in their ranks exceeded those of low-skilled occupations in absolute numbers.

The lower half of table 6 presents the evolution of employment in occupations grouped according to their dominant task. We observe in all four countries a stark contrast between the strong expansion in non-routine analytical and interactive jobs (professionals, managers, etc.) and the marked decline in routine cognitive and manual jobs (clerks, production workers, etc.). The evolution of non-routine service and manual occupations – in all four countries the task group with the lowest median earnings – is between the two extremes: slightly declining in Germany and Switzerland, slightly increasing in Britain and, above all, Spain. The stronger decline in occupations dominated by *routine cognitive or manual* tasks than in occupations consisting of *non-routine service and manual* tasks is consistent with the routinization hypothesis. At the same time, expansion in top-end *and* low-end non-routine occupations took place only in Britain and Spain: contrary to the polarization argument, Germany and Switzerland witnessed a decrease in low-end non-routine occupations' employment share.

Table 6: employment change 1990-2008 in occupations according to their skill level or dominant task in 1990

	GB, 91-08	DE, 90-07	ES, 90-08	CH, 90-07
Change by skills:				
Low-skilled occupations	-16%	-23%	-8%	-26%
Mid-skilled occupations	-15%	-11%	41%	-14%
High-skilled occupations	41%	53%	44%	63%
Change by tasks				
Non-routine service & manual occupations	12%	-7%	31%	-2%
Routine cognitive & manual occupations	-33%	-29%	-41%	-32%
Non-routine analytical & interactive occupations	27%	36%	41%	41%

Note: employment change is 1991-2008 for GB and CH, 1990-2007 for DE.

These computations suggest that the evolution in Britain (and possibly Spain) may be better resumed by routinization, whereas occupational change in Germany (and possibly Switzerland) seems more consistent with SBTC. However, our skill and task groups are not mutually exclusive: an important part of low-skilled occupations are dominated by routine cognitive and manual tasks; likewise, a sizeable proportion of non-routine service and manual occupations are mid-skilled. Accordingly, we combine the three skill- with the three task-groups and thus create 9 skill-task categories. For one

of these categories – low-skilled non-routine service and manual occupations – SBTC and routinization formulate opposed expectations: SBTC predicts decline, routinization expects expansion. These occupations, which accounted for between 5 (Germany) and 15 (Britain) per cent of all jobs in 1990, increased their share of employment by 9 per cent in Britain and 31 per cent in Spain, but decreased it by 2 per cent in Germany and 29 per cent in Switzerland. Hence, routinization correctly predicts the massive loss in mid-skilled routine cognitive and manual occupations' employment share: -31% in Britain, -30% Germany, -38% in Spain and -35% Switzerland. Yet its expectation of an expanding lower-end service employment is not met in Germany and Switzerland.

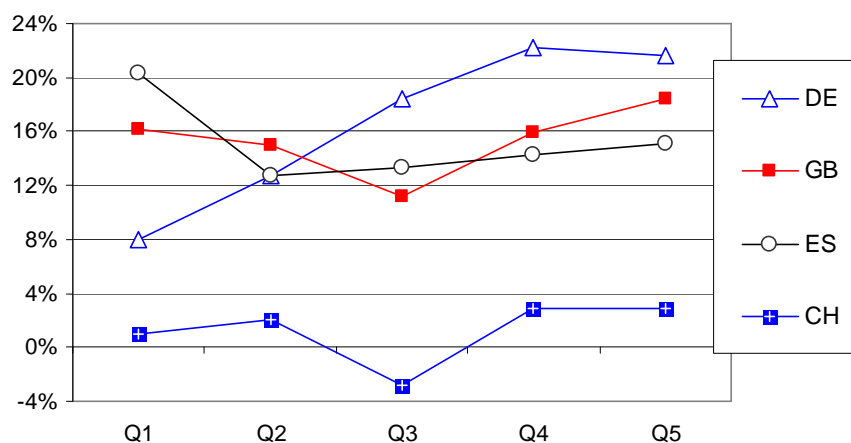
In a next step, we examine the impact of demand factors on employment change by looking at the evolution of earnings. If job growth at the bottom of the occupational structure is caused by a shift in labour demand, we should see a parallel rise in earnings. Hence, if occupational change is demand-induced, changes in earnings (prices) and employment (quantity) should co-vary positively (Autor et al., 2008: 319). We examine this argument by computing real change in quintiles' median earnings over the period for each country.

The results, shown in figure 3, point to a strong covariance between changes in employment (comparing with figure 1 above) and in earnings in Switzerland and, above all, in Britain. In both countries, employment *and* earnings expanded most strongly in the top quintile 5 and least so in the mid-range occupations of quintile 3. In Britain (but not in Switzerland), wages also increased markedly in the bottom quintile, producing the U-shaped pattern of wage evolution that parallels the one predicted by routinization for employment. Pearson's correlation coefficients tentatively suggest that changes in wages and employment covary positively in Switzerland (0.73) and, above all, Britain (0.85). Albeit weaker, a positive correlation is also evident for Germany (0.57) where growth in employment *and* wages was strongest at the top, and weakest at the bottom of the occupational hierarchy. For these three countries, shifts in labour demand thus seem to play a central role in explaining the observed pattern of occupational change. In Spain, earnings also rose – like in Britain – more at the fringes than in the mid-range quintiles, but unlike in Britain evolution in earnings did not match change in employment in the two bottom quintiles, which declined. Accordingly, the correlation between wage and employment change is weak and negative in Spain (-0.23).

Two caveats must be expressed. Our samples for Britain, Spain and Switzerland are the best available datasets to investigate change in *employment*, but this is not true for

earnings; especially in Spain, the samples are small (see endnote 4), and thus reduce the precision of our estimates. Moreover, other factors besides demand-induced shifts may affect the evolution of earnings, notably institutional changes such as the introduction (1999) and subsequent increase of the minimum wage in Britain.

Figure 3: real change in quintiles median wage between early 1990s and end of 2000s



Note: as wage data are only available in British LFS starting from 1993, wage change in Britain refers to 1993-2008. For Spain, wage change refers to the period 1989/90-2006. Nominal wage evolution has been adjusted for inflation with the GDP deflator series contained in the OECD economic outlooks.

Our analyses of demand-side factors suggest that Britain’s employment polarization is most consistent with the routinization argument. Shifts in demand have favoured low-paid workers performing non-routine service and manual tasks and, above all, high-paid workers doing analytical and interactive tasks, increasing their share of employment and wages. In contrast, they were biased against mid-paid workers doing routine cognitive and manual tasks. At the other extreme, we observe in Germany a demand shift of the kind predicted by SBTC: a monotonic change in employment and earnings favouring high-skilled and high-paid occupations. More ambiguous is our evidence for Spain and Switzerland. Spain experienced the pattern of task polarization and wage gains at the fringes expected by routinization, yet without the marked job expansion in the bottom quintile. In Switzerland, skill upgrading of the type predicted by SBTC coexisted with marked losses in real wages in the middle.

6. The impact of labour supply: educational expansion and immigration

We examine whether shifts in the workforce’s skill composition contribute to the explanation of occupational change by resorting to an exercise in counterfactuals: What

would the pattern of occupational change have looked like if quintiles' relative employment had evolved in perfect symmetry with changes in skill supply?

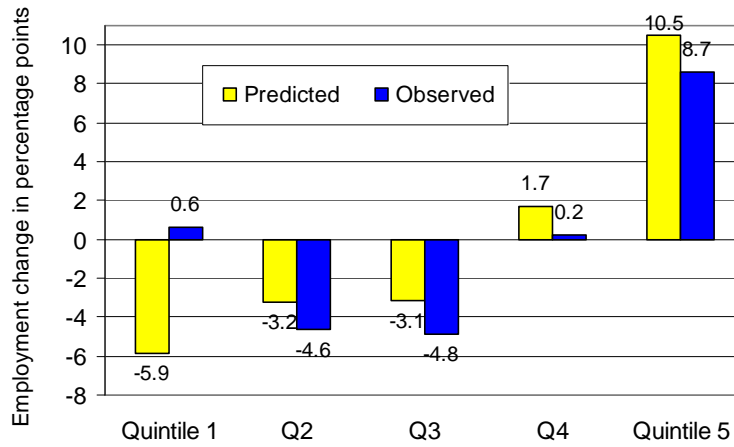
We use decomposition analysis to answer this question: first, we define skills as a combination of educational attainment (distinguishing six levels)⁷ and experience (distinguishing four age groups)⁸. These distinctions are used to decompose the workforce into 24 education-age groups and determine each group's contribution to each quintile of employment in 1990. We then simulate the type of occupational structure that would have unfolded if the distribution of education-age groups within each quintile had remained stable between 1990 and 2008 and the sole source of variation were changes in the size of the 24 education-age groups. If predicted and observed change in skills differ strongly, we must assume that occupational change occurred independently from the evolution in skill supply.

Between 1990 and 2008, the workforce in all four countries became, overall, better educated and older. Accordingly, our decomposition analysis shown in figure 4 predicts clear-cut and massive occupational upgrading. In all countries, the pattern of occupational change predicted on the basis of skill supply evolution mirrors closely the observed one. The correspondence between changing skill supplies and changes in employment is strongest in Germany and Switzerland, where vocational training dominates, and weakest in Spain, where educational expansion over the last two decades was particularly strong and outpaced occupational upgrading. Nonetheless, figure 4 suggests that educational advance and occupational upgrading have gone hand in hand in all four countries. The strong increase in skill supply – notably the expansion of tertiary education – is clearly an important explanatory piece of the occupational puzzle. There are, however, two important exceptions where we would expect a different pattern of occupational change based on skill supply evolution.

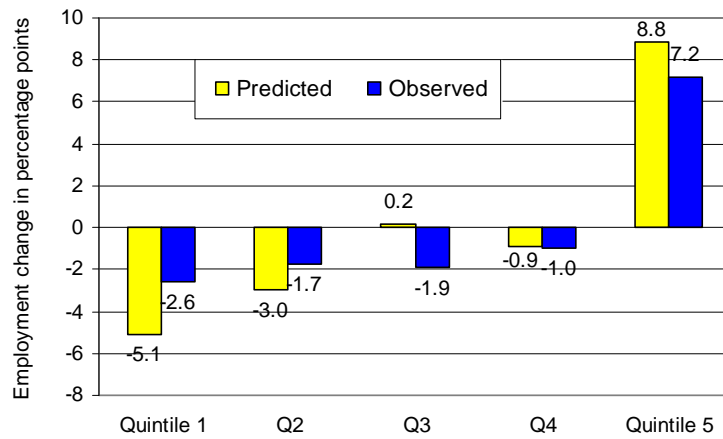
First, the observed employment loss in quintile 3 is much larger than what our decomposition analysis predicts for Britain, Germany and Switzerland: relative employment fell by 1.7 (Britain), 2.1 (Germany) and even 3.2 (Switzerland) percentage points more than predicted by skill groups' evolution (Spain is an exception insofar as the employment share of quintile 3 expanded until 1996). Second, we observe everywhere a smaller decline in the employment share of the lowest-paid quintile 1 than expected by the evolution of skill groups. This is particularly true for Britain, where skill groups' changing size should have led to a fall of 5.9 percentage points in quintile 1. Instead, we observe an increase of 0.6 points in relative employment.

Figure 4: predicted and observed change in relative employment in quintiles (predicted on the basis of skill supply evolution)

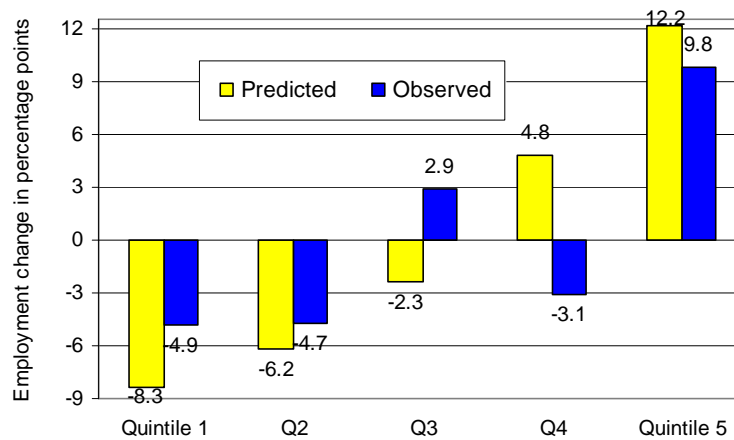
Britain, 1991-2008



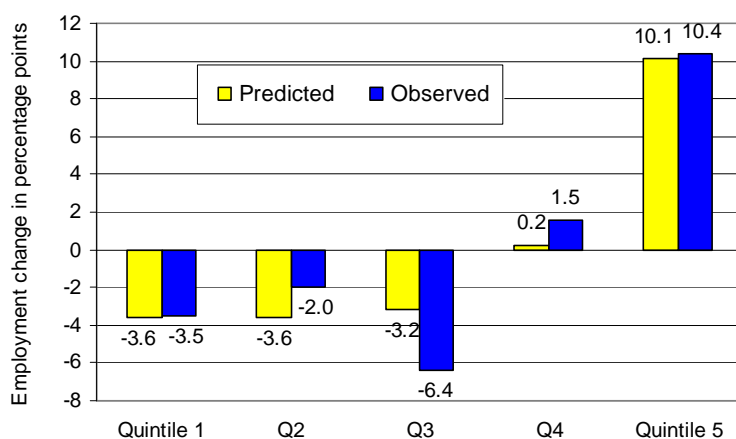
Germany, 1990-2007



Spain, 1990-2008



Switzerland, 1991-2008



Note: changes in quintiles' relative employment are predicted based on actual changes in the size of 24 education-age groups between 1990 and 2008 (all the while assuming an unchanged distribution of education-age groups within each quintile).

Hence, while skill supply and occupational structure have evolved in a surprisingly similar manner, both substantial loss of mid-range jobs and relative stability of low-paid jobs run contrary to predictions based on skill supplies. Above all Britain and Spain's skill evolution would lead us to expect a much larger decline in low-paid occupations – unless the recent rise in immigration had an impact on low-paid labour supply that is not adequately captured by formal educational attainment figures. This is likely to be the case, as new immigrants are often unable to put their human capital into immediate use because of language barriers, information deficiencies and discrimination. As Dustmann and colleagues (2008) show for Britain, immigrants tend to downgrade upon arrival and compete with native workers at lower occupational levels than expected by their educational attainment. Hence, strong surges in immigration as those experienced in Britain and Spain since the end of the 1990s may have created the labour supply necessary to fill the low-paid jobs of quintile 1. We test this argument by disaggregating relative change in employment for four different nationality-gender groups: national men, national women, foreign men and foreign women (see table A.2 in the annexe). The goal is to determine each group's net contribution to the observed pattern of occupational change. Three findings are noteworthy.

Firstly, in both Britain and Spain, expansion in the low-paid jobs of quintile 1 is exclusively due to job growth among foreign workers. In Britain, the increasing employment share of quintile 1 by 0.6 percentage point is the result of falling employment among national men and women (-1.1 percentage points), overcompensated by an increase in employment among foreign men and women (+1.8

percentage points). In Spain too, foreign workers have strongly expanded in the two bottom quintiles (by 4.1 percentage points in Q1 and 3.9 in Q2). Without Spain's large immigration boom, we would have observed a much stronger trend towards occupational upgrading. In fact, Spanish men's employment share in the two bottom quintiles fell dramatically since 1990 (combined by 12.6 percentage points). Spanish women's employment share in the same two quintiles declined as well, but less markedly (-5 percentage points). Unlike in Britain and Spain, shifts in employment were very similar for nationals and foreigners in Switzerland, whereas immigrants' impact on occupational change in Germany was negligible.

Secondly, occupational upgrading in all countries was strongly driven by *national women*. While their share in the lowest-paid jobs of quintile 1 declined strongly, it increased massively in the highest-paid jobs of quintile 5. To give the example of Germany: between 1990 and 2007 the employment share of quintile 5 increased from 20 to 27.2 per cent of total employment. To this job growth of 7.2 percentage points, German women contributed 4.2 percentage points, compared to men's 2.7 point contribution (and foreign men's 0.2 points). Similar results are found for British, Spanish and Swiss women. Hence, women's catch-up process in educational attainment seems to have translated into higher occupational achievement in all four countries.

Thirdly, the fall in the mid-range quintiles was strongly determined by national men's declining employment in average-paid jobs. Between 1990 and 2008, national men's employment share in quintiles 2 to 4 shrank by 16 percentage points in Spain, 9.3 in Britain, 7.2 in Switzerland and 5.1 in Germany. In all four countries, national men increased their employment share only in the highest-paid occupations of quintile 5. In Switzerland, the slight tendency towards polarization – driven by the fall in the middle quintile 3 – was exclusively due to national men's job trajectory. In contrast, in Britain, all four nationality-gender groups underwent a polarizing pattern of change where job growth was stronger at the bottom and the top than in the middle. Although immigration contributed to the polarization of Britain's employment structure, it was not the decisive factor.

7. The impact of institutions: differences in service job creation

The analyses shown so far leave a central question unanswered: why has the employment share of low-paid jobs in the bottom quintile expanded in some countries and periods, but not in others (see figures 1 and 2)? A possible explanation focuses on

how country's wage-setting institutions affect job creation in quintile 1: job creation should be the easier, the lower the median wage in quintile 1 relative to the entire workforce's median wage. Table 7 suggests that this relationship holds for our four countries: in Britain and Spain, where the bottom quintile's median wage in 1990 was low relative to the entire workforce's median wage, employment in quintile 1 expanded much more markedly than in Switzerland and, above all, Germany, where relative wages in quintile 1 were significantly higher.

Table 7: Relative wages and employment creation in the bottom-end quintile 1

	Median wage of quintile 1 as % of entire workforce's median wage in 1990/91	Absolute employment growth in occupations of quintile 1, 1990-2008
GB, 1991-2008	65% ¹	+3.1%
DE, 1990-2007	78%	-2.5%
ES, 1990-2008	68% ²	+3.8%
CH, 1991-2008	73%	-1.8%

¹ 1993 ² 1989/90

A finding based on only four cases can only be tentative. We try to get a better grip on institutions' influence by disaggregating change in the employment structure according to five occupational categories: (i) (associate) managers and administrators; (ii) (semi-) professionals; (iii) office clerks; (iv) craft and production workers; (v) interpersonal service and sales workers.⁹ We expect jobs in this last category to be particularly sensitive to wage-setting institutions, as prices and hence consumption of interpersonal services are – unlike jobs in production and the back office – primarily determined by wage costs (rather than by capital costs and technology use, which are limited). The results of this disaggregation, shown in figure 5, point towards three similarities and one strong contrast in countries' employment trajectories.

The first and clearest cross-national resemblance concerns managers and professionals' strong growth in the two top quintiles. Occupational upgrading was driven in all four countries by professionals and, above all, managers' massive expansion. A second similarity refers to production workers' strong decline in all four countries. In Britain and Germany, production workers' relative job losses were distributed quite equally across quintiles 1 to 4, whereas in Spain and Switzerland they were concentrated in the bottom quintile. A third similarity concerns the falling share of office clerks in Britain, Germany and Switzerland. This fall hollowed out the employment structure, for clerical jobs primarily disappeared from quintile 3. The decline in clerical employment was particularly substantial in Britain and Switzerland,

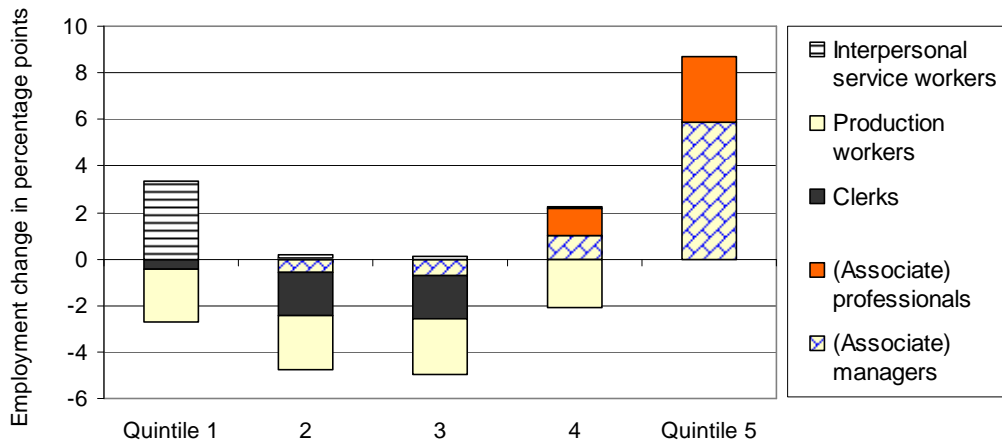
where clerks' share in the workforce dropped by 4.1 and 7.7 percentage points respectively. Contrary to the other three countries, clerks' employment share remained stable in Spain. This stability in back office jobs may reflect a slower rate of computerization and possibly lagged economic development.

The trajectory of interpersonal service jobs stands in stark contrast to these three broad similarities. While their employment share remained unchanged in Germany and Switzerland, Britain and Spain witnessed a substantial increase. These cross-country differences cannot be explained by different starting levels: in 1990, Germany and Spain had, respectively, the lowest and highest proportions of interpersonal service jobs. In Spain, these jobs expanded mostly in the lowest-paid quintile 1 and, to a lesser degree, in quintiles 2 and 4. In Britain, growth of interpersonal service jobs was almost exclusively concentrated in the bottom quintile 1. Consequently, variation in interpersonal service jobs goes a long way in explaining Britain's different pattern of occupational change. Relative employment at the bottom of the British labour market only expanded because of growth in interpersonal service jobs. If these low-paid service jobs had not expanded relative to total employment, Britain would have experienced a similar-sized decline in quintile 1 of about three percentage points as Germany and Switzerland.

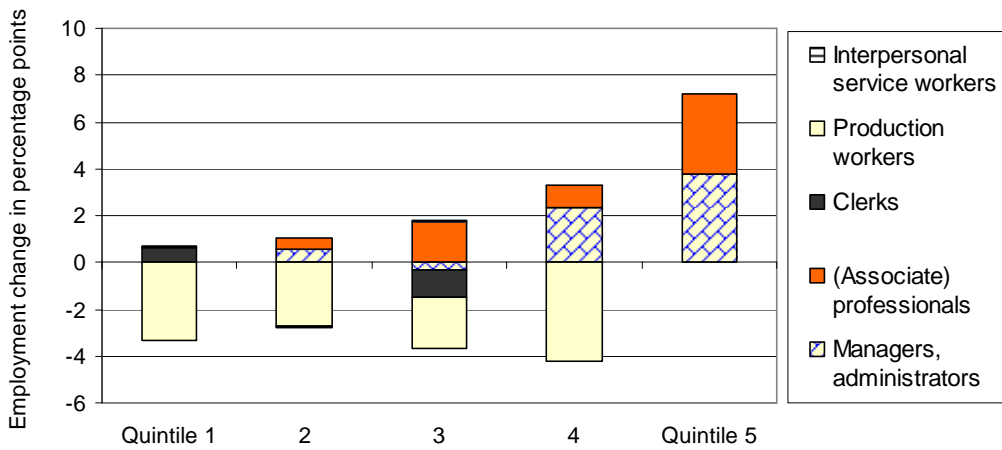
These results for different occupational groups explain why we see a more or less marked tendency towards polarization in the four countries. While the fall in clerical employment led to comparatively stronger job growth at the bottom than the middle of the occupational structure in Britain, Germany and Switzerland, low-paid job expansion was conditional on growth in interpersonal services – a condition only met in Britain and, to a lesser extent, Spain.

Figure 5: the pattern of net employment change by occupational categories

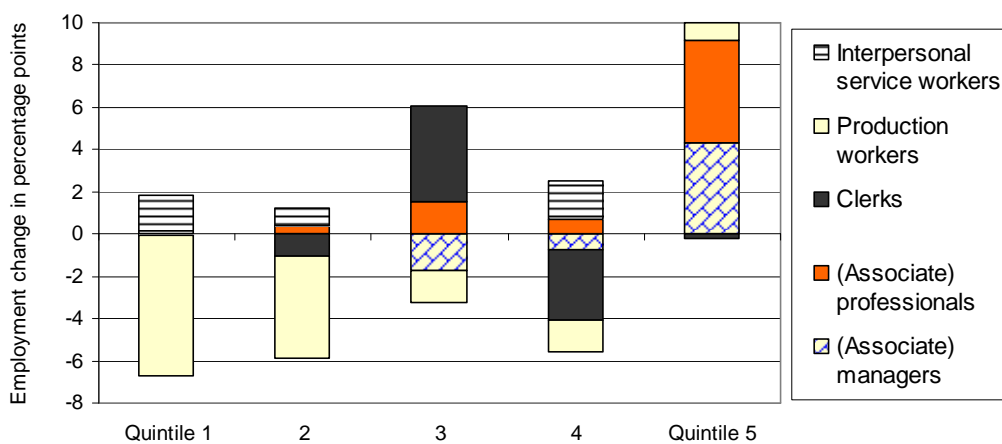
Britain, 1991-2008



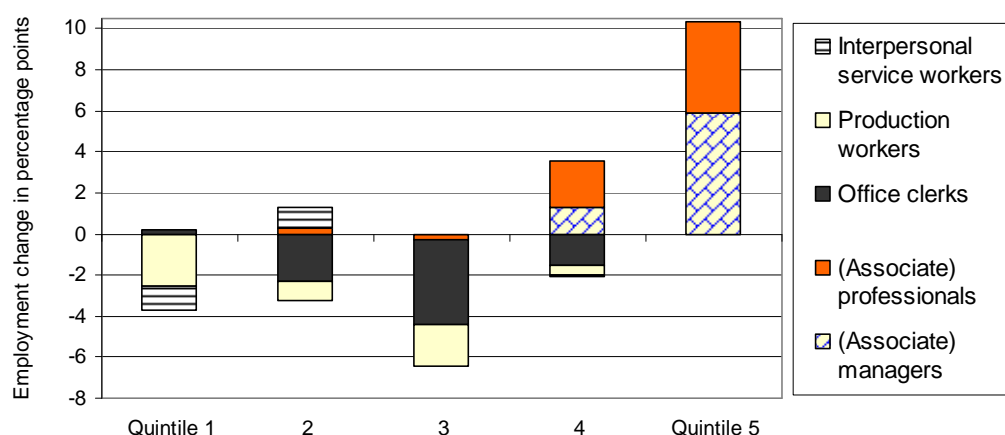
Germany, 1990-2007



Spain, 1990-2008



Switzerland, 1991-2008



We now summarize our findings and revisit our initial hypotheses. To begin with, both skill-biased technical change (SBTC) and skill supply evolution predict a similar pattern of clear-cut occupational upgrading across countries. Hence, they grasp the big picture in all four countries, most clearly so in Germany. At the same time, while SBTC and skill supply evolution describe the general tendency, they fail to account for the strong employment loss in the middling occupations. To explain this trough in the middle, we need the refined theory of technological change provided by the routinization hypothesis: technology has been more successful in substituting for (routine) clerical and production jobs than for (non-routine) interpersonal service occupations. While the former – especially clerical jobs – cluster in the middle range of the occupational hierarchy in pay, the latter are set at the very bottom. Hence, we observe stronger job decline in the middle than the bottom of the employment structure, leading to the slightly polarized pattern of upgrading predicted by routinization.

There is an important caveat to this explanation: the routinization hypothesis has been tailored to explaining job changes in the United States (Autor et al., 2003, Autor et al., 2008) and Britain (Goos and Manning, 2007) – two countries with among the most flexible wage-setting institutions in the OECD. It is an open question to what extent the observed job growth at the occupational lower-end can be extrapolated to countries where the wage structure is more sheltered. Our results show that employment in the lowest paid quintile has only expanded in Britain – and there exclusively among interpersonal service jobs –, and in Spain after 1996, but not in Germany or Switzerland. Hence, while we observe everywhere a collapse of middling jobs in quintiles 2 and 3 (Spain being an exception), growth in quintile 1 only took place in

countries where the low-wage sector is relatively unsheltered from market pressure. Different country institutions may thus channel technological change into a more or less polarized pattern of occupational upgrading.

7. Conclusions

Our objective has been to analyze the pattern of occupational change in four Western European countries and examine which theoretical account is most consistent with: skill-biased technical change, routinization, skill supply evolution or wage-setting institutions? Our findings reveal two similarities across these countries.

Firstly, we obtain everywhere a picture of massive occupational upgrading. In all four countries, by far the strongest employment growth occurred at the top of the occupational hierarchy, among managers and professionals. Over the last two decades, educational expansion and occupational upgrading seem to have gone hand in hand. While this is most clearly the case in Germany and Switzerland, educational advance may have slightly outpaced occupational upgrading in Britain and, above all, Spain. Secondly, employment declined more strongly in average-paid jobs (among clerks and production workers) than in low-paid jobs (where interpersonal service workers cluster) in Switzerland and, especially, Britain. The same polarizing trend becomes also visible for Germany after 1996 and for Spain after 2002.

Hence, we find a general thrust towards occupational upgrading – particularly marked in Germany – that is both consistent with the evolution of skills on the supply side and a skill-biased version of technological change (SBTC) on the demand side. Yet without turning to the routinization hypothesis we cannot explain the hollowing out in the middle of the employment structure. Solely based on changes in the supply of skills, we would have expected a smaller decline in average-paid jobs and a larger fall in low-paid jobs. The polarized pattern of occupational upgrading observed for Britain and Switzerland (and for Germany after 1996 and Spain after 2002) is consistent with the idea that technology is a better substitute for the routine tasks typical of mid-range production and office jobs than for the non-routine tasks characteristic of low-paid interpersonal service jobs.

At the same time, we find sizeable cross-country differences in the employment evolution at the bottom of the occupational hierarchy that run contrary to accounts of uniform technical change. Low-paid interpersonal service jobs have expanded significantly in Spain and, above all, Britain, but stagnated in Germany and

Switzerland. We have argued that wage-setting institutions filter the pattern of occupational change: countries only seem to experience a trend towards polarization if wage-setting institutions facilitate the creation of low-paid interpersonal service jobs. Our evidence suggests that this may be more the case in Britain and Spain than Germany and Switzerland.

What are the implications of our findings? On the one hand, they prompt optimism: the number of ‘lovely’ jobs has clearly grown much faster than that of ‘lousy’ jobs and we can unambiguously discard the hypothesis of occupational downgrading after 1990. On the other hand, the fall in the middle of the occupational structure may be cause for pessimism. Wright and Dwyer’s (2003: 322) concern about low-paid workers’ declining opportunities for upward mobility in the American labour market might also apply to Western Europe.

References

- Acemoglu, D. (2001) ‘Good jobs versus bad jobs’, *Journal of Labor Economics* 19 (1), 1-21.
- Autor, D., Katz, L. and Kearney, M. (2008) ‘Trends in U.S. wage inequality: revising the revisionists’, *The Review of Economics and Statistics* 90 (2), 300-323.
- Autor, D. H., Levy, F. and Murnane, R. J. (2003) ‘The Skill Content of Recent Technological Change: An Empirical Exploration’, *Quarterly Journal of Economics*, 118 (4), 1279-1333.
- Berman, E., Bound, J. and Machin, S. (1998) ‘Implications of Skill-Biased Technological Change: International Evidence’, *Quarterly Journal of Economics*, 113 (4), 1245-79
- Bernardi, F. and Garrido, L. (2008) ‘Is there a new service proletariat? Post-industrial employment growth and social inequality in Spain’, *European Sociological Review* 24 (3), 299–313.
- DiPrete, T. and McManus, P. (1996) ‘Institutions, technical change, and diverging life changes: earnings mobility in the United States and Germany’, *American Journal of Sociology* 102 (July), 34-79.
- Dustmann, C., Frattini, T. and Preston, I. (2008) ‘The Effect of Immigration along the Distribution of Wages’, Centre for Research and Analysis of Migration, Discussion Paper No 03/08.
- Dustmann C., Ludsteck J. and Schönberg U. (2009) ‘Revisiting the German wage structure’, *Quarterly Journal of Economics* 124 (2): 843-881.
- Eurofound (2008) ‘More and better jobs: patterns of employment expansion in Europe’, European Foundation for the Improvement of Living and Working Conditions, Dublin.
- Felstead, A., Gallie, D., Green, F. and Zhou, Y. (2007) ‘Skills at work, 1986-2006’, Working paper, ESCR Centre on Skills, Knowledge and Organisational Performance, Universities of Oxford and Cardiff.
- Freeman, R. and Schettkat, R. (2001) ‘Skill Compression, Wage Differentials and Employment: Germany vs. the US’, *Oxford Economic Papers* 53 (3), 582–603.
- Gallie, D., White, M., Cheng, Y. and Tomlinson, M. (1998) *Restructuring the Employment Relationship*, Oxford: Clarendon Press.

- Goldin, C. and Katz, L. (2007) 'The race between education and technology: the evolution of U.S. educational wage differentials 1890 to 2005', *NBER Working Paper* 12984.
- Goos, M. and Manning, A. (2007) 'Lousy and lovely jobs: the rising polarisation of work in Britain', *Review of Economics and Statistics* 89 (1), 118-133.
- Goos, M., Manning, A. and Salomons, A. (2009) 'Job polarization in Europe', *American Economic Review: Papers & Proceedings* 99 (2), 58-63.
- Kenworthy, L. (2003) 'Do affluent countries face an incomes-jobs trade off?', *Comparative Political Studies* 36 (10), 1180-1209.
- Krugman, P. (1994) 'Past and prospective causes of high unemployment', *Economic Review*, Federal Reserve Bank of Kansas City, issue Q IV, 23-43.
- Levy, F. and Temin, P. (2007) 'Inequality and Institutions in 20th Century America', MIT Department of Economics Working Paper No. 07-17.
- Manning, A. (2004) 'We can work it out: the impact of technological change on the demand for low-skill workers', *Scottish Journal of Political Economy* 51 (5), 581-608.
- Nickell, S. and Bell, B. (1996) 'The distribution of wages and unemployment. Changes in the distribution of wages and unemployment in OECD countries', *American Economic Association Papers and Proceedings* 86, 302-308.
- OECD (2004) 'Wage-setting institutions and outcomes', *OECD Employment Outlook*, 127-171.
- OECD (2005) 'Trade-adjustment costs in OECD labour markets: a mountain or a molehill?', *OECD Employment Outlook*, 23-72.
- Scharpf, F. (2000) 'Economic Changes, Vulnerabilities, and Institutional Capabilities', in Scharpf, F. and Schmidt, V. (eds.), *Welfare and Work in the Open Economy*. Vol. I. *From Vulnerability to Competitiveness*, pp. 21-124, Oxford: Oxford University Press.
- Sheldon, G. (2005) *Der berufsstrukturelle Wandel der Beschäftigung in der Schweiz 1970-2000: Ausmass, Ursachen und Folgen*, Bundesamt für Statistik, Neuchâtel, pp. 1-68.
- Spitz-Oener, A. (2006) 'Technical Change, Job Tasks, and Rising Educational Demands: Looking Outside the Wage Structure', *Journal of Labor Economics*, 24 (2), 235-270.
- Tahlin, M. (2007) 'Skills and Wages in European Labour Markets: Structure and Change', in: Gallie, D. (ed.) *Employment Regimes and the Quality of Work*, Oxford: Oxford University Press.
- Visser, J. (2007) 'Wage bargaining institutions in Europe. A happy marriage or preparing for divorce?', in: Acocella, N. and Leoni, R. (eds.) *Social pacts, employment and growth*, Heidelberg: Physica-Verlag.
- Wright, E. O. and Dwyer, R. (2003) 'The patterns of job expansions in the USA: a comparison of the 1960s and 1990s', *Socio-Economic Review* 1, 289-325.

Annexe

Table A.1: the number of observations in the subsamples in the different surveys

		1990		1996		2002		2008	
		N Work- force	N w/ work income	N Work- force	N w/ work income	N Work- force	N w/ work income	N Work- force	N w/ work income
GB	LFS	54760 ¹	8436 ²	51200	6891	47551	12346	41402	9946
DE	SOEP	7977	7746	6451	6418	11287	11185	9400 ³	9269 ³
ES	EPA	58582	9280 ⁴	57359	-	59379	-	62697	3854 ⁵
CH	SAKE	8490 ¹	6470 ¹	7993	6807	20430	17218	23351	19901

¹ 1991; ² 1993; ³ 2007; ⁴ 1989 and 1990; ⁵ 2006.

Notes: Our subsample is defined as individuals aged 18-65 who work at least 20 hours per week. In the British LFS, information on earnings was only asked to respondents of one out of six waves between 1992 and 1996. From 1997 onwards, earnings data is available for two out of six waves.

Table A.2: contribution by nationality-gender groups to the pattern of occupational change

		Net employment change (in percentage points)					
		Q1	Q2	Q3	Q4	Q5	All quintiles
Britain 1991-2008	National men	-1.0	-3.4	-3.2	-2.8	3.2	-7.2
	National women	-0.1	-1.8	-2.1	2.3	4.0	2.9
	Foreign men	1.0	0.4	0.3	0.3	1.0	2.3
	Foreign women	0.8	0.1	0.1	0.4	0.6	1.9
	Entire labour force	0.6	-4.6	-4.9	0.2	8.7	0
Germany 1990-2007	National men	-0.4	-1.9	-1.0	-2.3	2.7	-2.8
	National women	-2.4	0.4	-0.5	1.5	4.2	3.3
	Foreign men	-0.2	-0.3	-0.4	-0.2	0.2	-0.8
	Foreign women	0.3	0.0	-0.1	0.0	0.0	0.3
	Entire labour force	-2.6	-1.7	-1.9	-1.0	7.2	0
Spain 1990-2008	National men	-5.3	-7.3	-3.7	-5.1	3.7	-17.6
	National women	-3.7	-1.3	3.3	-0.2	4.4	2.4
	Foreign men	1.1	2.4	2.7	1.5	1.1	8.9
	Foreign women	3.0	1.5	0.6	0.7	0.5	6.3
	Entire labour force	-4.9	-4.7	2.9	-3.1	9.8	0
Switzerland 1991-2008	National men	-0.9	-2.3	-3.9	-1.0	3.3	-4.8
	National women	-1.7	-0.4	-1.6	1.7	4.2	2.1
	Foreign men	-0.6	0.1	-0.7	0.4	1.9	1.0
	Foreign women	-0.3	0.6	-0.2	0.5	1.0	1.6
	Entire labour force	-3.5	-2.0	-6.4	1.5	10.4	0

Endnotes

¹ In the British Labour Force Survey (LFS), occupations are coded according to SOC90 between 1991 and 2000, and according to SOC2000 after 2001. We have transformed SOC2000 codes into SOC90 codes on the basis of three dual-coded (SOC90 and SOC2000) British surveys: the Census 1991, LFS 1996/97 and LFS 2000. In Spain, occupations were coded with the 3-digit 1974 version of the CNO in 1990 and with the 1994 version thereafter. To make the two classifications comparable, we established our own correspondence between the 1979 and the 1994 codes based on the frequency distributions observed in the dual-coded survey 2634 (CNO 1979 and CNO 1994), performed by the Spanish Centre for Sociological Research in 2006.

² For instance, in the German SOEP, small occupations such as ‘Sanitarians’ (ISCO-code 3222) and ‘Dieticians, Nutritionists’ (3223) are recoded as ‘Modern Health Associate Professionals except Nursing Associate Professionals’ (3229).

³ In the Swiss database, we distinguish senior officials and managers, secretaries, other office clerks and other elementary occupations on the basis on the industry in which they are employed. Likewise, for Spanish data, we differentiate unspecified business owners, mid- and low-rank office clerks, operators of mobile machinery, truck drivers and cleaners according to their sector of employment.

⁴ In the German SOEP and Swiss SAKE, this means dividing information about individuals’ monthly earnings through their usual working hours. While the British LFS has direct information on jobholders’ hourly wages (employees only), wage information is only available starting from winter 1992/1993 (and only for a part of respondents: first one, then two out of six waves). Accordingly, for Britain, occupations’ median earnings are calculated over the period 1993-2008.

For the smallest sample in our study, the SOEP, we make sure that an occupation’s median earning is reliable by also using intermediate years to calculate occupations’ median earnings: the year at the beginning (1990), then every third year in the middle (1993, 1996, and so on) up to the year at the end of the time period (2007).

The Spanish EPA does not include data on earnings. Consequently, we calculate occupations’ median earnings by relying on three other surveys, performed in 1989, 1990 and 2006. The 1989 and 2006 surveys were carried out by Spain’s Centre for Sociological Research. They contain detailed occupational and earnings information on about 6700 and 3600 individuals, respectively. The 1990 survey was part of Erik Wright’s international comparative class project and has 2900 valid cases. It was combined with the 1989 survey to provide single estimates of occupational earnings for the beginning of the period analyzed.

⁵ Since occupations come in lumpy units, rank-ordered occupations are aggregated into groups containing *as close as possible* to 20% of employment, but *not exactly* 20% (but rather 19.2% or 20.7%). However, all results shown below are corrected for these deviations.

⁶ The coding scheme is available from the authors.

⁷ The following six educational levels are distinguished: obligatory education, post-obligatory education but no upper secondary education, lower upper secondary education, higher upper secondary education, lower tertiary education, higher tertiary education. The recoding of these educational levels is available from the authors.

⁸ The following four age groups are distinguished: 18-30, 31-40, 41-50, 51-65 years.

⁹ We allocate individuals to these occupational categories on the basis of 4-digit ISCO-codes for Germany and Switzerland, 3-digit SOC-codes for Britain and CNO-codes for Spain. For the logic and coding of these occupational groups, see Authors (2006).