

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

Daniel Oesch^{1,*} and Jorge Rodríguez Menés²

¹University of Lausanne, Switzerland;

²University Pompeu Fabra, Barcelona, Spain

*Correspondence: daniel.oesch@unil.ch

We analyse 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, four hypotheses are examined: skill-biased technical change, routinization, skill supply evolution and wage-setting institutions. We find massive occupational upgrading which matches educational expansion: employment expanded most at the top of the occupational hierarchy, among managers and professionals. In parallel, intermediary 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 interpersonal service jobs. Yet country differences in low-paid services suggest that wage-setting institutions channel technological change into more or less polarized patterns of upgrading. Moreover, immigration surges in Britain and Spain seem decisive in having provided the low-skilled labour supply necessary to fill low-paid jobs.

Keywords: labour markets, technological change, inequality, occupations, employment, skills

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

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 USA 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 USA (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 USA 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 USA—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 underlines 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 (Tählin, 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 30 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 and thus covering many countries (although at the price of a somewhat rudimentary measure of occupations) diverge in their results: pervasive polarization (Goos *et al.*, 2009) as opposed to large country differences with an underlying trend towards upgrading (Hurley and Fernández-Macías, 2008).

We analyse the pattern of occupational change between 1990 and 2008 using large individual-level country surveys. Our comparative approach provides two kind of insights. First, by using the same methodological framework and time periods for four countries, we produce comparable cross-country results. Second, by confronting the implications of the different theoretical accounts of occupational change with the data, we examine which explanation 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 descriptive results for occupational change over the last two decades in our 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 and sectors. 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: first, we are better equipped to provide descriptive evidence of occupational change than to explain its causes; second, we may gain some explanatory leverage by specifying what empirical evidence is consistent or inconsistent with different explanatory accounts. We thus begin our discussion of explanations of occupational change by schematically dividing them into three accounts: (i) demand side, (ii) supply side and (iii) institutional.

2.1 *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 workers relative to low-skilled workers.

The SBTC explanation has been challenged by the ‘routinization’ hypothesis (Autor *et al.*, 2003; Manning, 2004). Its 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 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, p. 39), its pervasive effects can only be grasped indirectly, by detecting homogeneous trends across countries. The expectations of the two technological accounts diverge as to the shape of these trends: while SBTC predicts clear-cut upgrading, routinization anticipates polarized job growth at the bottom and, above all, the top of the occupational system at the expense of the middle.

2.2 *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—appears to be relatively stable over time, growth in the supply of skills fluctuates 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.

Over the last two decades, the four countries under study underwent a clear process of educational expansion, whereby the proportion of highly educated workers strongly increased at the expense of low-educated workers. This process of educational upgrading is similar in the four countries in our sample. To take the examples of Britain and Germany, between 1990 and 2008, the relative

share of their workforces not having any upper secondary schooling declined by 9 and 7 percentage points, respectively, while that of the labour force equipped with tertiary education expanded by 13 and 9 percentage points, respectively.¹

The recent evolution in educational attainment differs little across Western Europe. In contrast, changes in immigration are an important source of variation in our four countries' skill supply evolution—and these changes are not accurately captured by shifts in formal skills because immigrants often downgrade to jobs requiring skill levels below their educational attainments (Dustmann *et al.*, 2008). Between 1990 and 2008, the proportion of immigrants in the labour force has remained constant in Germany and augmented only slightly in Switzerland. In contrast, immigrants' share of the workforce increased considerably in Britain (from 3.4 to 8.3%) and massively in Spain (from 0.3 to over 15%).²

Based on these changes in the workforce's skill composition, marked occupational upgrading can be expected in all four countries—namely a strong expansion in the size of high-skilled occupations relative to medium- and low-skilled occupations. In Britain and Spain, the large increase in immigration may have offset, to some extent, the decline in low-educated labour supply. Hence, in these two countries, 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.

2.3 Institutional accounts: wage-setting institutions

A third and last explanation stresses that demand- and supply-side factors in labour markets are always channelled through institutional mechanisms (DiPrete and McManus, 1996; Levy and Temin, 2007). In this view, employment polarization occurs only 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 powerful unions, high minimum wages, heavy pay-roll taxes and generous unemployment benefits compress the wage structure, interpersonal service jobs may become too expensive and simply not be created (Krugman, 1994; Scharpf, 2000; for a critique see Oesch, 2010). Furthermore, relatively high minimum wages—by making the creation of low-skilled jobs less profitable—may induce firms to invest in workers' productivity and provide comparatively more highly

¹Own computations based on the British Labour Force Survey (LFS) and the German Socio-Economic Panel (SOEP).

²Own computations based on the British, Spanish and Swiss labour force surveys as well as the SOEP.

skilled jobs to less educated workers (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.

To get a sense of institutional differences across the four countries under study, we can compare measures for collective bargaining, unemployment benefits or 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. In the former countries, 60 and 80%, respectively, of wage earners were covered by a collective agreement in the early 2000s, as against only 50% in Switzerland and 35% in Britain (Visser, 2007). With respect to unemployment insurance (and hence the reservation wage), in 2000 Britain provided by far the lowest benefits with an average replacement rate of 37%, while Switzerland's rate was slightly more generous (77%) than that of Germany and Spain (66%) (OECD statistics database). Hence, economic incentives for low-skilled workers to accept low-paid jobs seem stronger in Britain than in the other countries. Finally, regarding the most consequential indicator—wage inequality, a partial outcome of wage-setting institutions—we find Switzerland and Germany to have had a more compressed wage structure in terms of both overall and lower-tail wage inequality than Britain and Spain over the period under study. 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.

When comparing these different explanations, only two predictions stand out as being controversial. Undisputed is the expectation that the strongest employment growth takes place in the high-skilled occupations. In contrast, expectations diverge with respect to (a) the evolution of low-skilled jobs 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 jobs than in mid-skilled jobs, slower growth in low-paid services than in total employment—the *routinization hypothesis* expects the opposite: stronger expansion in low- than mid-skilled jobs and in low-paid service jobs than in total employment. The *skill supply hypothesis* expects faster growth of mid-skilled occupations relative to low-skilled occupations in Germany and Switzerland, but not necessarily in Britain and Spain. 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 LFS, the SOEP, the Spanish Active Population Survey (EPA) and the Swiss Labour Force Survey (SAKE). Our analysis covers the period between 1990 (1991 for Britain and Switzerland) and 2008 (2007 for Germany). 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. These samples vary in their size between a minimum of 7977 (SOEP 1990) and a maximum of 62 697 individuals (EPA 2008).³ While the rising wage inequality of the 1980s in Britain and the USA suggests that significant changes had already taken place in the occupational structure during that decade, data limitations and comparability restraints due to German reunification force us to focus on the period after 1990.

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

3.1 *Distinguishing occupations*

We first restrict our samples to 18–65-year-old individuals who spend at least 20 h per week in paid employment. We thus exclude workers, like teenagers, senior workers or employees in small part-time jobs, who have a marginal attachment to the labour force. In contrast, we include all other jobs, regardless of whether they are filled by wage-earners, self-employed workers or employers. We next distinguish occupations using the detailed four-digit International Standard Classification of Occupations (ISCO 88) for Germany and Switzerland, the three-digit Standard Occupational Classification (SOC 90 and SOC 2000) for Britain and the three-digit 1994 National Classification of Occupations (CNO 94) for Spain.⁴ Small occupations which contain fewer than 10 individuals reporting

³Our samples only include individuals aged 18 to 65 who work at least 20 h per week. This leaves us with 54 760 (1991) and 41 402 (2008) individuals in the British LFS, 7977 (1990) and 11 185 (2007) in the German SOEP, 58 582 (1990) and 62 697 (2008) in the Spanish EPA, 8490 (1991) and 23 351 (2008) in the Swiss SAKE.

⁴In the British LFS, occupations are coded according to SOC 90 between 1991 and 2000, and according to SOC 2000 after 2001. We have transformed SOC 2000 codes into SOC 90 codes on the basis of three dual-coded (SOC 90 and SOC 2000) British surveys: the Census 1991, LFS 1996–1997 and LFS 2000. In Spain, occupations were coded with the three-digit 1974 version of the CNO in 1990 and with the 1994 version thereafter. To make the two classifications comparable, we established our own

wages are merged with other occupations to increase the accuracy of our estimates.⁵ 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 integrate the industry-part of an occupation only for a few large occupations,⁶ and this for two reasons: first, our national classifications distinguish occupations at a level of detail comparable with the ISCO four-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 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, p. 121).

3.2 *Determining job quality*

In a second step, we determine whether a given occupation is good or bad, advantageous or undesirable. A large array of an occupation's attributes matters to people and hence affects its quality: earnings, skill requirements, promotion prospects, job security or work autonomy. While these indicators capture different dimensions of an occupation, they are closely correlated. Hence, following Wright and Dwyer (2003, p. 294), we use earnings as the arguably most consequential and most reliably measurable indicator of an occupation's quality. We thus calculate the median earnings of every single occupation among the around 150 occupations we distinguish.⁷ Hence in what follows, we equate

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.

⁵For 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).

⁶In the Swiss database, we distinguish senior officials, managers, secretaries, other office clerks and other elementary occupations on the basis of the industry in which they are employed. Likewise, for our Spanish data, we differentiate the following occupations according to their industry of employment: business owners not further specified, mid- and low-rank office clerks, operators of mobile machinery, truck drivers, cleaners.

⁷We calculate an occupation's earnings as the average of its standardized hourly median earnings at the beginning and the end of the period under study, weighted by the number of individuals employed in the occupation at a given moment. 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

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 for the purpose of rank-ordering occupations. The focus of our analysis lies on the labour market's *quantity* side—employment—and not the price side—wages. Median earnings are solely used to determine the quality of an occupation *as a whole*.

3.3 Rank-ordering occupations into quintiles

Once we have calculated the median earnings of each occupation, we rank-order the 120 to 171 occupations from the lowest-paid to the highest-paid and then group them into five equally large quintiles containing as close as possible to 20% of total employment at the beginning of the period under study.⁸ The bottom quintile thus holds the 20% of employment in the occupations with the lowest median earnings. In Germany, for example, 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 the five quintiles evolved in terms of employment between 1990 and 2008.

Two concerns about our analytical approach need to be addressed. 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 the

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 survey with the smallest sample size in our study, the SOEP, we make sure that an occupation's median earnings are 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 analysed.

⁸Since occupations come in lumpy units, rank-ordered occupations are aggregated into groups containing *as close as possible* to 20% of employment, yet *not exactly* 20% (but rather 19.2 or 20.7%). All results shown below are corrected for these deviations.

end of the period. These correlations are very strong and range between 0.70 (Spain), 0.87 (Switzerland) and 0.90 (both Britain and Germany). Hence, like prior studies (Goos and Manning 2007, p. 122), we find considerable stability in the occupational earnings structure. This stability across nations and over time has also been observed for occupations' prestige scores and educational levels and has come to be known by sociologists as the 'Treiman constant' (Hout and Di Prete 2006, p. 3).

A second concern relates to the comparability of occupational changes across countries—some occupations may rank higher in terms of earnings in one country than in another. In theory, such differences do not affect our ability to investigate whether high-earning or low-earning occupations are expanding within each country. For we are comparing the evolution of 'good' and 'bad' occupations in each country—not tracing the evolution of the same occupations across countries. Regardless, in practice, the occupational hierarchy looks surprisingly similar in our four countries. Everywhere, sales assistants, waiters and agricultural labourers are found in the bottom Quintile 1, bricklayers and truck drivers in Quintile 2; plumbers and secretaries in Quintile 3, nurses and police officers in Quintile 4 and senior officials, computer professionals and medical doctors in the top Quintile 5.

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

Before examining changes in quintiles' sizes, we present in Tables 1 and 2 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 compositions, the last columns of Tables 1 and 2 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 occupations such as health care employees, teachers and social workers. It is noteworthy that computer professionals and (assistant) nurses have expanded very strongly in all four countries. In contrast, we can distinguish three groups of strongly *declining* occupations. A first group comprises the victims of de-industrialization and includes production workers such as mechanics, maintenance fitters and assemblers. These manufacturing jobs are not particularly low-paid, spreading 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 intermediary Quintile 3. Finally, the fall in employment has also been strong among

Table 1 The three occupations with the largest increase in their relative share of employment

Country	Occupation	Change in relative employment share (in percentage points)	Job quality quintile ^a
GB, 1991–2008	Care assistants and attendants	1.26	1
	Treasurers and financial managers	1.12	5
	Educational assistants	1.09	1
DE, 1990–2007	Legal professional, not 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 and analysts	1.25	5
	Secondary education teachers	1.04	5

^aJob 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 2 The three occupations with the largest decline in their relative share of employment

Country	Occupation	Change in relative employment share (in percentage points)	Job quality quintile
GB, 1991–2008	Other secretarial personnel, not 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 and 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

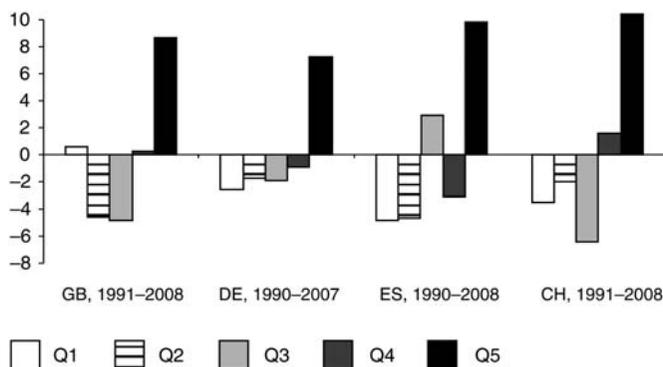


Figure 1 Relative net employment change in job quality quintiles (in percentage points).

agricultural workers and farmers. Yet unlike jobs in production or the secretariat, these jobs are unequivocally associated with low earnings and set in Quintile 1.

These findings suggest that the decline in agricultural, industrial and clerical employment and the parallel rise in business and welfare service jobs 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% 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%. 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% of net employment growth took place in occupations set in the top quintile.

Second, in Britain and Switzerland, employment declined most in the middle, in 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 *et al.* (2009), but consistent with Hurley and Fernández-Macías (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.

It may be that by looking at *relative* changes in employment, we overlook country differences in *absolute* job growth or decline. Indeed, although countries' business cycles evolved in parallel—a sharp recession in 1991–1993, a slow recovery in 1994–1997, sustained booms in 1998–2001 and 2004–2007 with a short dip in 2002–2003—the extent of job creation varied widely. Hence, while Spain embarked after 1994 on a decade of massive job expansion at an annual growth rate of 4%, 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 compute in Table 3 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 numbers of jobs in the high-paid occupations of Quintile 5 over the last two decades: 2.5 million 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, in 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, respectively, Germany lost 840 000 (−2.5%) and Switzerland 50 000 jobs (−1.8%). Differences in countries' job records since 1990 thus seem closely linked to changes at the low-paid end of the labour market (Scharpf, 2000; Kenworthy, 2003).

Table 3 Absolute net employment change in quintiles—in thousand jobs (and in percentage)

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Total
GB, 1991–2008	717 (3.1)	−645 (−2.8)	−704 (−3.0)	612 (2.6)	2815 (12)	2795 (12)
DE, 1990–2007	−840 (−2.5)	−545 (−1.6)	−604 (−1.8)	−283 (−0.8)	2483 (7.3)	211 (0.6)
ES, 1990–2008	443 (3.8)	470 (4.0)	1855 (16)	766 (6.6)	3128 (27)	6663 (57)
CH, 1991–2008	−53 (−1.8)	−3 (−0.1)	−150 (−5.0)	115 (3.8)	409 (14)	318 (11)

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

5. The impact of labour demand: technical change

In our effort to make sense of the observed pattern of occupational change, we begin by scrutinizing the role of demand-side factors such as technological change. We thus contrast the explanatory ability of the two main accounts invoking technology as a source of occupational change: SBTC and routinization. We do so by distinguishing different skill and task groups and then tracing how employment in these groups has evolved over time. SBTC predicts a positive and monotonous link between required *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 consist either of high-paid non-routine analytical and interactive tasks or of low-paid non-routine service and manual tasks.

We divide occupations according to their required skills into three levels: *low-skilled* occupations where more than 30% of workers have no upper secondary education; *high-skilled* occupations where more than 30% have tertiary education and the residual category of *mid-skilled* occupations. Similarly, we draw on Spitz-Oener's work (2006, p. 243) in order 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).⁹ Each occupation is allocated to a skill and task category according to its values *at the beginning* of the period analysed.

Has employment in these skill and task groups grown or declined over the last two decades? The upper half of Table 4 shows for all four countries very strong growth in high-skilled jobs, i.e. in occupations which contained in 1990–1991 more than 30% of workers with tertiary education. With the exception of Spain, where mid-skilled occupations also expanded, net employment growth was everywhere limited to high-skilled jobs. More ambiguous is the evolution of mid- and low-skilled occupations. While low-skilled occupations declined everywhere more than mid-skilled ones, employment in the latter occupations also dropped in Britain, Germany and Switzerland, but not in Spain. 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 4 presents the evolution of employment in occupations grouped according to their dominant task. In all four countries, there is a stark

⁹The coding scheme is available from the authors.

Table 4 Change in relative employment 1990–2008 in occupations according to their skill level and dominant tasks in 1990 (in percentage)

	GB, 1991–2008	DE, 1990–2007	ES, 1990–2008	CH, 1991–2008
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 and manual occupations	12	–7	31	–2
Routine cognitive and manual occupations	–33	–29	–41	–32
Non-routine analytical and interactive occupations	27	36	41	41

contrast between the strong expansion in *non-routine analytical and interactive* occupations (professionals, managers, etc.) and the marked decline in *routine cognitive and manual* occupations (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 relative decrease in low-end non-routine occupations' employment.

These results 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 is dominated by routine cognitive and manual tasks; likewise, a sizeable proportion of non-routine service and manual occupations is mid-skilled. Accordingly, we combine the three skill groups with the three task groups and thus create nine skill–task categories. Only for one of these categories—low-skilled non-routine service and manual occupations—do SBTC and routinization formulate opposed expectations: SBTC predicts decline, routinization expects expansion. These occupations, which accounted for between 5% (Germany) and 15% (Britain) of all jobs in 1990, increased their share of employment by 9% in Britain and 31% in Spain, but decreased it by 2% in Germany and 29% 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.

We finally 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 were caused by a shift in labour demand, there should be a parallel rise in earnings. Hence, if occupational change were demand-induced, changes in earnings (prices) and employment (quantity) should co-vary positively (Autor *et al.*, 2008, p. 319). We examine this argument by computing for each country real change in quintiles' median earnings over the period under study.

The results, shown in Figure 2, point to a strong covariance between changes in employment (see Figure 1) and in earnings in Switzerland and, above all, Britain. In both countries, employment *and* earnings expanded most strongly at the top, in 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 for employment by routinization. Pearson's correlation coefficients suggest that changes in wages and employment across quintiles co-vary positively in Switzerland (0.73) and, above all, Britain (0.85). Although 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—like in Britain—earnings increased more at the fringes than in the mid-range quintiles, but unlike in Britain, the relative rise in earnings in the two bottom quintiles contrasts with the relative decline in employment.

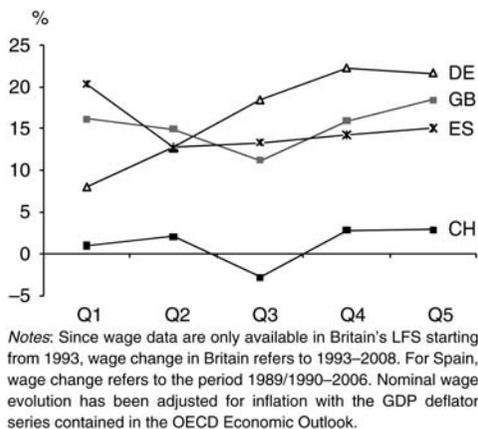


Figure 2 Real change in quintiles, median wages between early 1990s and end of 2000s.

Accordingly, the correlation between wage and employment change is weak and negative in Spain (-0.23).

Two caveats must be expressed. The data for Britain, Spain and Switzerland are among the very best available to investigate change in *employment*, but not in earnings; especially in Spain, the samples are small (see footnote 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.

Our analyses of demand-side factors suggest that the routinization argument accounts best for Britain's employment polarization. In Britain, shifts in demand seem to have favoured low-paid workers doing non-routine service tasks and, above all, high-paid workers performing analytical tasks, at the expense of mid-paid workers doing routine cognitive or manual tasks. At the other extreme, we observe in Germany a demand shift of the kind predicted by SBTC: a monotonous 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 (relative) job expansion in the bottom quintile. In Switzerland, skill upgrading of the type predicted by SBTC coexisted with real wage losses in the middle quintile.

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)¹⁰ and experience (distinguishing four age groups)¹¹. Combined, these two dimensions of skills result in 24 education-age groups. By decomposing countries' workforces into these groups, we can examine how they were distributed across the five quintiles in 1990/1991. For example, in Britain in 1991 42% of workers younger than

¹⁰The 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.

¹¹The following four age groups are distinguished: 18–30, 31–40, 41–50, 51–65 years.

30 years without post-obligatory education were employed in occupations set in the lowest-paid Quintile 1. We then simulate the type of occupational structure that would have unfolded if the distribution of education-age groups across quintiles had remained stable between 1990–1991 and 2007–2008 and the sole source of variation were changes in the size of the 24 education-age groups. Assuming such stability, 42% of uneducated young workers in Britain would still find, in 2008, employment in an occupation from Quintile 1. However, since educational expansion and ageing caused this group to decline from 4.6 to 1.8% of Britain's workforce between 1991 and 2008, relative employment in Quintile 1 would also have shrunk due to the lower supply of young uneducated workers. Likewise, assuming that a given education-age group will be employed in the same type of occupations in 2008 as it did in 1990, the exploding numbers of university-trained labour market entrants would lead to strong growth in Quintile 5. If, on the contrary, the predicted and observed changes in skills differed strongly, we should 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 3 predicts clear-cut and massive occupational upgrading. In all four 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 3 suggests that educational advance and occupational upgrading have everywhere gone hand in hand. 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 in these intermediate occupations fell by 2.0 (Britain), 2.1 (Germany) and even 3.2 (Switzerland) percentage points more than predicted by skill groups' evolution (Spain being an exception as the employment share of Quintile 3 expanded). 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 5.5 percentage points in Quintile 1. Instead, we observe an increase of 0.6 points in relative employment. Likewise, the massive upskilling tendency in Spain should have led to a much larger fall in

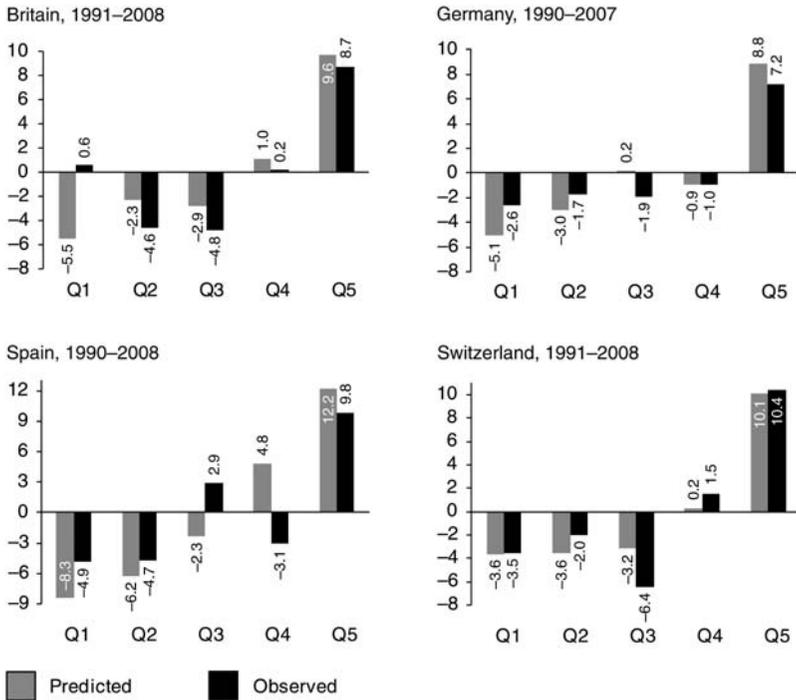


Figure 3 Predicted and observed change in relative employment in quintiles (predicted on the basis of skill supply evolution).

low-paid occupations set in Quintile 1 than the one we observe (-8.3 instead of -4.9 percentage points). Jobs at the low-paid (and, most likely, low-skilled) end of the labour market thus did not shrink faster than did low-skilled labour supply—the opposite seems true.

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 et al. (2008)* show for Britain, immigrants tend to massively downgrade upon arrival and compete with native workers at lower occupational levels than expected by their educational attainment. Hence, strong surges in immigration such as those experienced in Britain and Spain

between the late 1990s and 2008 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 (results shown in Table A1). The goal is to determine each group's net contribution to the observed pattern of occupational change. Three findings are noteworthy.

First, in both Britain and Spain, expansion in the low-paid occupations 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, foreign workers have also expanded strongly in the two bottom quintiles (by 4 percentage points in both Q1 and Q2). Without Spain's large immigration boom, we most likely would have observed a much stronger trend towards occupational upgrading. In fact, since 1990, the employment share of Spanish women in the two bottom quintiles has fallen markedly (-5 percentage points), that of Spanish men dramatically (-12.6). Unlike in Britain and Spain, shifts in employment were very similar for nationals and foreigners in Switzerland, whereas immigrants' impact on occupational change was negligible in Germany.

Second, occupational upgrading was strongly driven by *national women* in all four countries. While their share in the lowest-paid occupations 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 share of Quintile 5 increased from 20 to 27.2% of total employment. To this job growth of 7.2 percentage points, German women contributed 4.2 points, compared with German 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.

Third, the fall in the mid-range quintiles was determined by national men's employment trajectory. 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 declining employment. 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. Hence, immigration contributed to the polarization of Britain's employment structure, but it was not the only driving force.

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 occupations expanded in some countries, but not in others? One explanation focuses on how these countries' 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. Our data suggest that this relationship holds for our four countries: in 1990, the bottom quintile's median wage was much lower relative to the entire workforce's median wage in Britain and Spain—where institutions have less leverage on wages—than in Switzerland and Germany (65% in Britain, 68% in Spain, 73% in Switzerland, 78% in Germany). In parallel, between 1990/1991 and 2007/2008, employment in the bottom quintile 1 expanded, in absolute terms, much more markedly in Britain and Spain (3.1 and 3.8%) than in Switzerland and Germany (−1.8 and −2.5%), where relative wages in Quintile 1 were significantly higher.

A finding based on only four cases is very 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.¹² 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 for jobs in production and the back office—primarily determined by personnel costs (rather than by capital costs and technology use, which are limited). The results of this disaggregation, shown in Figure 4, 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 declining share of office clerks in Britain, Germany and Switzerland. This decline hollowed out the employment structure, for clerical jobs primarily disappeared from Quintile 3. The drop in clerical employment was particularly substantial in Britain and Switzerland, where clerks' share of the workforce fell

¹²We allocate individuals to these occupational categories on the basis of four-digit ISCO codes for Germany and Switzerland, three-digit SOC codes for Britain and CNO codes for Spain. For the logic and coding of these occupational groups, see [Oesch \(2006\)](#).

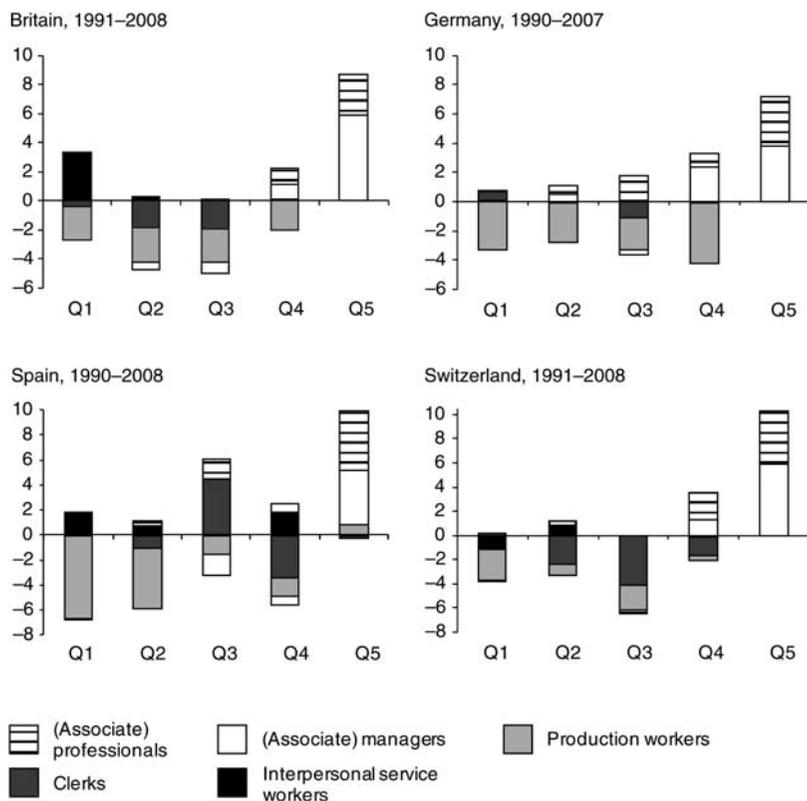


Figure 4 Net change in relative employment by occupational category (in percentage points).

by 4.1 and 7.7 percentage points, respectively. Contrary to the other three countries, clerks' relative employment remained stable in Spain. This stability in back office jobs may reflect a slower rate of computerization and thus 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—the two countries with a relatively lower wage floor—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 occupations 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 at the bottom, in Quintile 1. Consequently, variation in interpersonal service jobs goes a long way in explaining Britain's different pattern of occupational change. Employment at

the bottom of the British labour market only increased because of growth in interpersonal services. Otherwise, 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 met only in Britain and, to a lesser extent, Spain.

The results for Germany and Switzerland appear to run contrary to previous findings—made, among others, by Kenworthy (2009, p. 73), using aggregate data—that employment growth since the 1970s has primarily taken place in high-end services (such as finance and business services) and low-end services (such as retail trade and restaurants as well as social services). We thus conclude our empirical analysis by looking at sectoral shifts in employment and disaggregate change in the occupational structure according to four sectors: (i) production (manufacturing, construction and agriculture); (ii) business services (transport, communication, banking, real estate); (iii) private consumer services (sales, tourism and other personal services); and (iv) social services (public administration, education, health and social work, other community services). Since social services overlap to a considerable extent with public sector jobs, this analysis also gives us some insight into the role that welfare state development plays in job creation.

The results are shown in Figure 5 and reveal that everywhere the strongest employment growth took place in such social services. Yet contrary to what aggregate analyses suggest (Kenworthy, 2009, p. 73), social services did not primarily expand at the bottom, but at the top of the occupational hierarchy in all four countries. Together with growing business services, the increase in social services was thus responsible for the upgrading thrust observed in the occupational structure. While social services also expanded everywhere at the bottom of the employment structure, they did so to a smaller extent, reaching significant proportions only in Britain and Spain. It is thus social service jobs, frequently set in the public sector, which expanded at the low-paid end of the labour market—and not private consumer services such as retail trade, restaurants and hotels. In none of our four countries did these *McJobs* witness net employment creation in the low-end Quintile 1.

Rather, the polarizing effect stemming from social service expansion is accentuated by the evolution in business services: they not only contributed strongly to growth in the top quintile, but also expanded slightly in the bottom quintile in Britain, Germany and Spain. In parallel to this expansion at the margins, business

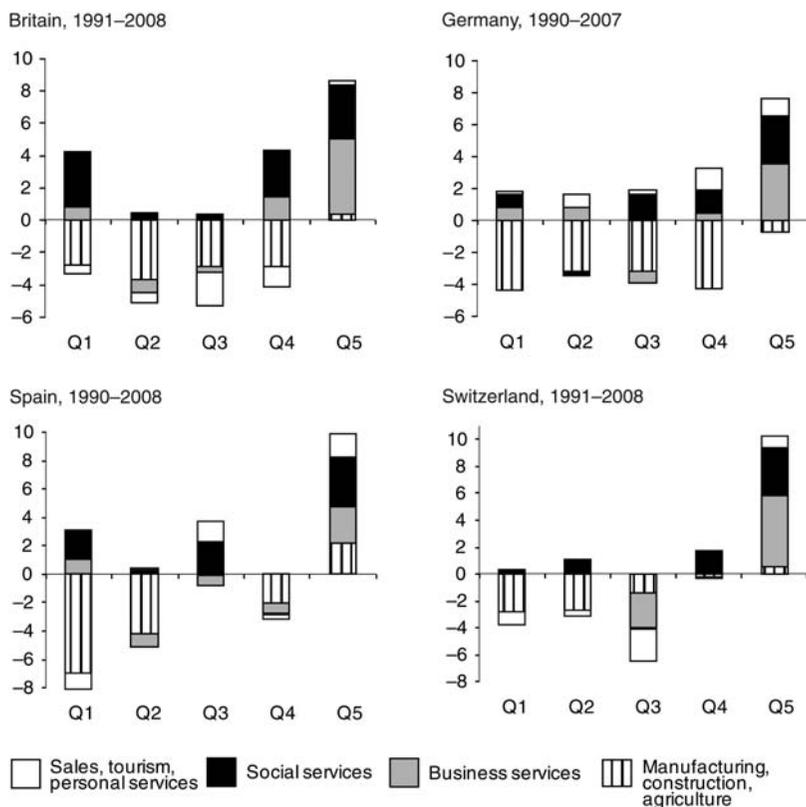


Figure 5 Relative change of sectors' share in total employment across quintiles (in percentage points).

service occupations declined in the middle quintile. Hence, whether jobs were created by private firms in business services or by government bodies in social services, both sectors seem to follow a U-shaped pattern of job distribution. An obvious explanation of this similarity would be that both sectors are subject to the same logic of computerization due to technological change: both are more likely to substitute mid-range jobs in accounting and the secretariat (in banks or the national health service) than either high-level expert jobs in planning and coordinating or low-level interpersonal jobs in cleaning and caring.

We now summarize our findings and revisit our initial hypotheses. To begin with, both 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 intermediary 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 terms of earnings, the latter are set at the very bottom.

There is an important caveat to the finding of technology-driven ‘polarized upgrading’: the routinization hypothesis has been tailored to explaining job changes in the USA (Autor *et al.*, 2003, 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 reveal that employment in the lowest paid quintile has only expanded in Britain—and there exclusively among interpersonal service jobs—and in Spain’s job-creation miracle, but not in Germany or Switzerland. Hence, while we observe a collapse of middling jobs in Quintiles 2 and 3 everywhere except in Spain, 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.

8. Conclusions

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

First, 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, in business and social services. Over the last two decades, educational expansion and occupational upgrading thus seem to have gone hand in hand. While this is most clearly the case in Germany and Switzerland, educational advancement may have slightly outpaced occupational upgrading in Britain and, above all, Spain. Second, employment declined more strongly in average-paid jobs (among clerks and production workers) than in low-paid ones (where interpersonal service workers cluster) in Britain and, more moderately so, Switzerland.

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 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 everywhere 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 is thus 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 in 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, job destruction in the middle of the occupational structure may be cause for pessimism. Wright and Dwyer's (2003, p. 322) concern about low-paid workers' declining opportunities for upward mobility in the American labour market may also apply to Western Europe.

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Appendix A

Table A1 Contribution by nationality-gender groups to the pattern of occupational change

		Net change in employment share (in percentage points)					
		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	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