DemoSoc Working Paper

Paper Number 32

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

Daniel Oesch

daniel.oesch@unige.ch

and

Jorge Rodriguez

jorge.rodriguez@upf.edu

June, 2009

Department of Political & Social Sciences
Universitat Pompeu Fabra
Ramon Trias Fargas, 25-27
08005 Barcelona
http://sociodemo.upf.edu/

DemoSoc Working Paper

Abstract

This paper analyzes the pattern of occupational change in four Western European countries over the last two decades: what kind of jobs have been expanding – high-paid jobs, low-paid jobs or both? By addressing this issue, we also examine what theoretical account is consistent with the observed pattern of change: skill-biased technical change, skill supply evolution or wage-setting institutions? Our empirical findings show a picture of massive occupational upgrading that closely matches educational expansion. In all four countries, by far the strongest employment growth occurred at the top of the occupational hierarchy, among managers and professionals. Yet in parallel, in Britain and Switzerland, as well as in Germany and Spain after 1996 and 2002 respectively, relative employment declined more strongly in the middling occupations (among clerks and production workers) than at the bottom (among interpersonal service workers). This slightly polarized pattern of occupational upgrading is consistent with the 'routinization' hypothesis that technology is a better substitute for average-paid jobs in production and the office than for low-paid jobs in interpersonal services. However, we find large cross-country differences in the employment evolution at the bottom of the occupational hierarchy, among low-paid service workers: sizeable growth in Britain and Spain, but stagnation in Germany and Switzerland. This results points towards the possibility that wage-setting institutions filter the pattern of occupational change.

Keywords

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

1. Introduction

At the end of the 1990s, a consensus emerged among labour market researchers that affluent countries were witnessing an ongoing process of occupational upgrading. The available evidence for Western Europe and the U.S clearly suggested that high-skilled occupations were expanding at the expense of low-skilled occupations (e.g. Berman et al., 1998; Gallie et al., 1998; Maurin and Thesmar, 2004). However, this consensus view was shattered in the last few years by three influential studies finding an 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). These authors argued that over the last two decades, employment growth in the U.S. and Britain had 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 was declining.[1]

Three explanations potentially account for this puzzling finding of a polarizing employment structure in the United States and Britain. A first explanation focuses on labour demand and puts forward a more nuanced theory of skill-biased technological change where computers are both complementary to high-skilled analytical and low-skilled interpersonal tasks, while substituting 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 – the 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 brings in institutions and considers the creation of low-paid jobs and the resulting employment polarization a distinctive feature of the 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 very different institutions: Britain, Germany, Spain and Switzerland. The central question we address is to know what kind of jobs have been expanding (or declining) over the last two

[1] These findings of a polarizing employment structure have received all the more attention as they are remarkably consistent with the evolution of U.S. wage inequality in the 1990s, marked by rising upper-tail, but stable lower-tail inequality (Lemieux, 2008).

decades: high-paid jobs, low-paid jobs or both? Is occupational polarization limited to the Anglo-Saxon countries or is it a pervasive feature of post-industrial labour markets? 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 (Gallie, 2002; Felstead et al., 2007) and Switzerland (Sacchi et al., 2005; Sheldon, 2005). For Germany, conclusions diverge between occupational upgrading (Kern, 1998) 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, not only the numbers of professionals have strongly increased, but –if to a weaker extent – also those of low-skilled service workers (Bernardi and Garrido, 2008). If the quality of jobs is measured based on occupations' average earnings, studies find a trend towards polarization that is weak in Germany (Dustmann et al., forthcoming), but relatively marked in Britain (Goos and Manning, 2007). Finally, two recent studies based on the European Labour Force Survey diverge in their findings, one reporting a pervasive evolution towards polarization (Goos et al., 2009), the other one showing large country differences that nonetheless suggest a common trend towards upgrading (Eurofound, 2008).

We analyze the pattern of occupational change between 1990 and 2008 on the basis of large individual-level country surveys. The comparative setting of our study provides us with insight of two different 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 explanations of occupational change with the data, we examine what theoretical accounts are consistent with the observed pattern of occupational change. Typically, technological change is pervasive and should produce a similar pattern of occupational upgrading or polarization across Western European countries. In contrast, wage-setting institutions and, to a lesser extent, skill supply evolution vary from country to country and should lead to different patterns of employment change.

Our findings show a picture of massive occupational upgrading. In all four countries, by far strongest employment growth occurred at the top of the occupational hierarchy, among managers and professionals. In parallel to growth at the top, relative

employment declined more strongly in the middling occupations than at the bottom in Britain, Switzerland and – after 1996 or 2002 respectively – in Germany and Spain. Contrary to these country similarities, we find large cross-national differences in the employment evolution at the bottom of the occupational hierarchy, among low-paid service workers: sizeable growth in Britain and Spain, but stagnation in Germany and Switzerland.

Our paper is organized as follows. In section 2, we discuss the three competing explanations of occupational change mentioned. The dominant theoretical accounts include technological change on the demand-side, skill evolution on the supply side and wage-setting institutions as intervening factor. In section 3, we present the data and discuss our analytical strategy to examine occupational change. Evidence of the pattern of occupational change – first over the last two decades, then over subperiods of six years – is shown in section 4 and discussed with respect to technical change. Section 5 controls for changes in educational attainment and compares the observed pattern of occupational change with the pattern of change predicted on the sole basis of skill supply evolution. Moreover, we also look at another source of change in labour supply, namely immigration. Section 6 tries to make sense of the observed pattern of employment change by focussing on institutional explanations and thus looking whether different countries have created jobs in different occupational categories. Section 7 concludes by discussing the policy implications of our findings.

2. Theoretical accounts of occupational change

Transformations in the occupational structure are always the result of the interaction between demand and supply-side factors in a given institutional context. This interaction makes the isolation of a single driving force of occupational change an intricate task and has two implications for our study: Firstly, it implies that we will be better equipped to provide descriptive evidence of the pattern of occupational change than to explain its causes. Secondly, in order to have at least some explanatory leverage, it implies the necessity of clearly 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 accounts, (ii) supply-side accounts and (iii) institutional accounts.

(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 in accounting for changes in the employment structure (OECD, 2005). Until recently, the dominant explanation has been skill-biased technical change (SBTC), which expects the spread of computer-based technology to increase the demand for high-skilled workers relative to low-skilled workers. Through the automation of production processes and clerical tasks, SBTC implies an unambiguous upgrading of the occupational structure.

In the last few years, the explanation invoking skill-biased technical change has 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 many non-routine interactive tasks such as restaurant waiting, care giving or cleaning that are set at the very bottom of the occupational hierarchy, they readily take over the routine production and clerical tasks typically done in middle-range jobs. Accordingly, computerized technology seems complementary to both high-paid analytical and low-paid interactive jobs. Technical change is then not expected to lead to overall occupational upgrading, but rather to the hollowing out of the middle and hence to polarized growth in the employment structure (Goos and Manning 2007).

Explaining transformation of the occupational structure with technical change is plausible. Yet the technical-change thesis has the problem that the fundamental explanatory force is largely unobserved, a sort of unmeasured force producing pervasive change (DiPrete and McManus 1996: 39). The two hypotheses of SBTC and of routinization have in common the view that the broad trends of occupational change will be very similar across advanced economies.[2] An adequate test of this hypothesis

[2] An indicator for technological advancement is GDP per capita. At the beginning of the period under study in 1990 (at the end in 2007), Spain's GDP per capita stood at 81% (end: 97%) of the OECD average, Britain's at 100% (109%), Germany's at 112% (105%) and Switzerland at 149% (126%). Hence, the level of technological advancement seems very similar between Britain and Germany with

must thus involve cross-country comparisons: SBTC and routinization are pervasive and should thus be visible in all four countries under study – either as clear cut upgrading for SBTC or as polarized growth at the top and the bottom at the expense of the middle for routinization.

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

Unlike demand-side accounts that expect very similar patterns of change across countries, supply-side explanations anticipate cross-national variation in occupational change. This variation is explained with country differences both in the evolution and characteristics of labour supply (Nickell and Bell, 1996; Freeman and Schettkat, 2001). The idea is that firms determine their production techniques and the jobs they create on the basis of available input factors, among others 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, variation in a country's skill supply due to slow-down or acceleration in educational expansion and immigration possibly affects the pattern of occupational change.

For this matter, table 1 presents evidence for the evolution of skill supply in the four countries under study for the period between 1990 and 2008 (employed individuals only). All four countries underwent a clear process of educational expansion, where the share of workers with tertiary schooling strongly increased and the share of workers without upper secondary education declined. While 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.

Switzerland being somewhat more advanced. In contrast, Spain was clearly less advanced in 1990, but has made up much ground since.

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

	(1) % with less than upper secondary education			(2) % with upper secondary education			(3) % with tertiary education			(4) % 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	13.1	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	-33.1	38	59	21.3	12	24	11.8	0.3	15.5	15.3
Switzerland[1]	19	13	-5.7	60	50	-9.4	21	36	15.1	21.4	24.0	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 who work at least 20 hours per week.

In theory, the evolution of countries' educational attainment, shown in columns (1) to (3) in table 1, also integrates the effect immigration had on countries' skill supplies between 1990 and 2008. In practice, immigration may have an effect onto labour supply that is not accurately captured by formal skills levels. The reason is that immigrants are often employed in jobs requiring skill levels below their actual education and are hence downgraded (Dustmann et al., 2008). For this matter, 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 over this period 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: everywhere, the numbers of high-skilled workers have strongly expanded relative to those of medium- and low-skilled workers. Expectations of occupational upgrading are least ambiguous for Germany and Spain. In contrast, in Switzerland, skill supplies have decreased somewhat faster in the middle than at the bottom of the skill distribution. In Britain, the sizeable increase in immigration has possibly compensated, to some extent, the decline of low-skilled labour supply. Hence, for these two countries, a slightly polarized version of occupational upgrading – with strong growth at the top and a 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 insists on the fact 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 the employment structure only happens if low-paid service jobs are created in substantial numbers. However, creation of such jobs in hotels and restaurants, supermarkets and cleaning, care of the elderly and children strongly 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; Iversen and Wren, 1998; Scharpf, 2000; for a critical discussion: Salverda and Schettkat, 2007). In the same vein, relatively high minimum wages – by making the creation of low-skilled jobs less profitable – may induce firms to create more high-skilled jobs and thus improve the composition of jobs (Acemoglu, 2001). Hence, a common shift in labour demand – due for instance to technical change – may have very different effects on countries' occupational structure, depending on wage-setting institutions.

In table 2, we compare the wage-setting institutions of the four countries by looking at measures of collective bargaining, unemployment insurance benefits and wage inequality. In terms of coverage with collective agreements, Germany and Spain have a somewhat more protected (and hence probably less flexible) wage structure than Switzerland and Britain. With respect to the unemployment insurance (and hence the reservation wage), Britain stands out as having by far the lowest benefit level, while Switzerland's insurance is slightly more generous than that of Germany and Spain. If we compare measures of wage inequality at the beginning of the period under study, we find Switzerland and Germany to have a more compressed wage structure than Britain and Spain. This result holds regardless whether we look at overall wage inequality or only at lower-tail wage inequality.

Based on these indicators of wage-setting institutions, the probability of low-skilled service workers being priced out by high relative wages seems greater in Germany than in Britain, while Spain and Switzerland occupy an intermediate position. Hence, according to the institutional thesis, polarization of the occupational

structure due to the creation of low-wage service jobs seems most likely in Britain and least probable 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.

When summarizing the expectations stemming from the different explanations, we can limit our attention to the two aspects that are controversial. Undisputed is the expectation that 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 employment relative to total employment. While the *SBTC hypothesis* expects for all countries a negative change on both dimensions (less relative growth in low-skilled than in mid-skilled jobs, slower growth in low-paid services than in total employment), the exact opposite applies to the *hypothesis of routinization*. The *skill supply hypothesis* expects much faster growth of mid-skilled relative to low-skilled occupations in Germany and Spain, but not in Britain and Switzerland. Finally, the *institutional hypothesis* predicts stronger growth for low-paid services than for total employment in Britain, but not in Germany – Spain and Switzerland being indeterminate.

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

Labour Force Survey (EPA), and the Swiss Labour Force Survey (SAKE). For each country, we select two different waves, the first in 1990 (1991 for LFS and SAKE) and the second in 2008 (2007 for SOEP). 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 these surveys the number of observations of the workforce and, within the workforce, of observations with earnings.

Our analysis of the pattern of occupational change follows the methodological approach first used by Joseph Stiglitz in a report to the Clinton Administration and refined by Erik Wright and Rachel Dwyer (2003) for American data. Subsequently, it was applied by Goos and Manning (2007) for Britain and the European Foundation for the Improvement of Living and Working Conditions (Eurofound 2008) for the European Union plus Norway. This procedure involves the following three steps.

Distinguishing occupations: We first restrict our target population to individuals aged between 18 and 65 years who spend at least 20 hours per week in paid employment. We then distinguish occupations on the basis of 4-digit International Standard Classification of Occupations (ISCO) codes for Germany and Switzerland, 3-digit Standard Occupational Classification (SOC) codes for Britain and 3-digit 1994 National Classification of Occupations (CNO-94) in Spain.[3] Then, we merge the very small occupations – containing less than 10 individuals with wage information – into more general occupations.[4] Depending on the country, this leaves us with 171 (Britain), 145 (Germany), 120 (Spain) and 161 (Switzerland) different occupations.

Determining job quality: In a second step, we determine a given occupation's quality on the basis of jobholders' median earnings. We use earnings – and not skills – as an indicator for the quality or desirability of a given occupation. Hence, although

[3] In the British Labour Force Survey (LFS), occupations are coded according to SOC90 between 1991 and 2000, and starting from 2001 according to SOC2000. We have transformed SOC2000 codes into SOC90 codes on the basis of frequencies obtained in the three dual-coded (SOC90 and SOC2000) 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 correspondences between the 1979 and the 1994 codes based on the frequencies obtained in a dual coding applied to survey 2634 performed by the Spanish Centre for Sociological Research in 2006.

[4] 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).

earnings and skills are closely correlated, it must be kept in mind that in what follows, occupational upgrading means that occupations with a comparatively high median earning have expanded relative to occupations with a low median earning. We calculate an occupation's median earning over a given period as the average of an occupation's standardized hourly median earnings at the beginning and the end of the time period under study. In the German SOEP and Swiss SAKE, this means dividing information about individuals' monthly earnings through usual working hours. While the British LFS has direct information on jobholders' hourly wage (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.[5] The Spanish EPA does not include data on earnings. Consequently, we calculate occupations' average median earnings over the period under study by relying on three surveys that include national data on earnings, have a sufficiently large sample size and were performed in 1989, 1990, and 2006 respectively.[6]

Rank-ordering occupations into quintiles: Once we have calculated the median earning of each occupation over the period of interest, we rank-order the around 150 occupations from the lowest median earning up to the highest median earning. These rank-ordered occupations are then grouped into five equally large quintiles, containing as close as possible to 20% of total employment at the beginning of the time period under study.[7] The bottom quintile thus holds the 20% of employment in the occupations with the lowest median earnings. In the period under study, this quintile 1 includes in Germany, among others, waiters, personal care workers, shop salespersons, hairdressers, sewers, domestic helpers and cleaners. Likewise, we obtain in the highest

[5] 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). However, occupations' rankings strongly correlate over time: hairdressers, farm hands and waiters are always situated near the bottom, dentists, corporate managers and attorneys always near the top of the earnings distribution.

[6] The 1989 and 2006 surveys were carried out by Spain's Centre for Sociological Research. They contain detailed occupational and earnings information on about 6,700 and 3,600 individuals, respectively. The 1990 survey was part of Erik Wright's international comparative class project and has 2900 valid cases.

[7] 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.

quintile 5 the 20% of employment in the occupations with the highest median earnings. In Germany, these occupations comprise, among others, medical doctors, civil engineers, legal professionals, computer professionals, chief executives, sales and marketing managers. The pattern of occupational change is now determined on the basis of how occupations in these quintiles evolve in terms of relative employment over the period under study.

It must be noted that we only resort to wages in order to rank-order occupations. The focus of our analysis lies on the quantity side in the labour market – employment – and not on the price side – wages. Accordingly, we are not examining change in wage inequality, but change of employment in more or less well-paid occupations grouped into quintiles.

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

Before looking at changes in the size of the different job quality quintiles, we present in tables 3 and 4 for each country the five occupations that have made the largest contribution to employment growth and decline over the last two decades. In order to convey a sense of what occupation falls in what quintile, the last column of table 3 shows for each occupation the corresponding job quality quintile.

Schematically, the occupations with the biggest employment gains over the last two decades can be divided into two large categories: on the one hand, a category comprising professional and managerial occupations set in (private) business services such as financial managers, legal and computer professionals; on the other hand, a group including occupations set in (public) social services such as health care employees, educational specialists and social workers. Within these two categories, particularly strong has been the expansion of computer professionals and (assistant) nursing staff – and this in all four countries. Hence, care assistants or nursing associate professionals respectively were the occupation number 1 in terms of employment gains in Britain, occupation number 2 in Germany, occupation number 3 in Spain and occupation number 7 in Switzerland. Likewise, computer professionals were the fourth occupation in terms of growth in Britain, the sixth occupation in Germany and the second in Switzerland. Among the ten occupations with strongest employment growth, a majority (6 out of 10 in Britain and Switzerland) – or at least a sizeable minority (3

and 4 out of 10 in Germany and Spain) – are set in the highest-paying job quality quintile 5. Yet at the same time, among the three occupations with greatest employment gains, two (care and educational assistants) fall into the lowest-paying quintile 1 in Britain and one (office and hotel cleaners) in Spain.

Table 3: The five occupations with biggest absolute employment growth in each country

Country	*Occupation*	*Change in employment share in percentage points*	*Job quality quintile**
GB, 1991-2008	Care assistants & attendants	1.26	1
	Treasurers & financial managers	1.12	5
	Educational assistants	1.09	1
	Computer systems managers	0.94	5
	Other health professionals, not else specified	0.75	5
DE, 1990-2007	Legal professional, not else specified	2.57	5
	Nursing associate professionals	1.01	3
	Social workers	1.01	3
	Other teaching professionals, not else specified	0.94	4
	Finance and sales associate professionals	0.89	2
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
	Managers in service firms with less than 10 employ.	1.24	5
	Sales managers	1.15	5
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
	Business professionals, not else specified	1.04	4
	Other personal service workers	0.85	2

* 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 five occupations in each country with biggest absolute employment decline

Country	*Occupation*	*Change in employment share in percentage points*	*Job quality quintile*
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
	Counter clerks & cashiers	-0.95	2
	Electricians	-0.94	4
DE, 1990-2007	Agricultural workers	-1.25	1
	Industrial machine mechanics & fitters	-1.24	4
	Car, taxi, van drivers	-1.20	1
	Secretaries	-0.72	3
	Machine tool operators	-0.72	3
ES, 1990-2008	Unskilled construction workers	-4.27	2
	Self-employed farmers	-2.79	1
	Skilled agricultural workers	-2.25	1
	Owners and managers of small shops	-1.99	3
	Administrators in the public sector	-1.81	4
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
	Metal, machinery and related trades workers	-1.58	3
	Office clerks in banking	-1.30	4

When examining the five occupations with strongest employment decline over the last two decades (table 4), we can distinguish again two groups: craft workers such as mechanics and toolmakers on the one hand, office clerks and secretaries on the other. As predicted by the routinization hypothesis, these strongly declining clerical and craft occupations are neither the least-skilled nor the least-paid. Accordingly, they are mostly set in quintiles 3 and 4. However, alongside these middling occupations, strong employment decrease has also taken place in the very menial occupations of small vehicle drivers, agricultural, manufacturing and service labourers, all set in the lowest quintile 1. Spain is somewhat of an exception where IT-professionals were not among the ten most strongly growing occupations and where a clerical subcategory – cashiers and tellers with direct client-contact – did not decrease, but strongly increase. Combined with the strong decline in farmers, agricultural workers and shopkeepers since 1990, this occupational pattern suggests that Spain has embarked later on a process of economic modernization than the other three countries.

In a next step, we display in figure 1 the pattern of change within the entire employment structure. This figure shows relative employment growth or decline in a given quintile for the different countries. Hence, for Britain, the increase of 0.6 percentage points in quintile 1 means that the least-paid occupations' share of total employment has grown from 20% in 1991 to 20.6% in 2008. Likewise, the decrease of 4.8 percentage points in quintile 3 means that the employment share of the middling occupations has fallen from 20% to 15.2% between 1991 and 2008. Four observations can be made with respect to these results:

First, in all four countries, by far the strongest employment growth occurred in the top quintile. While 80 per cent of net employment growth took place in the occupations of the top quintile in Britain, Spain and Switzerland, net employment growth has been entirely concentrated in the best paid quintile 5 in Germany.

Secondly, employment declined the most in the middling quintile 3 in both Britain and Switzerland, whereas in Germany and Spain the decrease was stronger in the lowest-paid occupations of quintile 1.

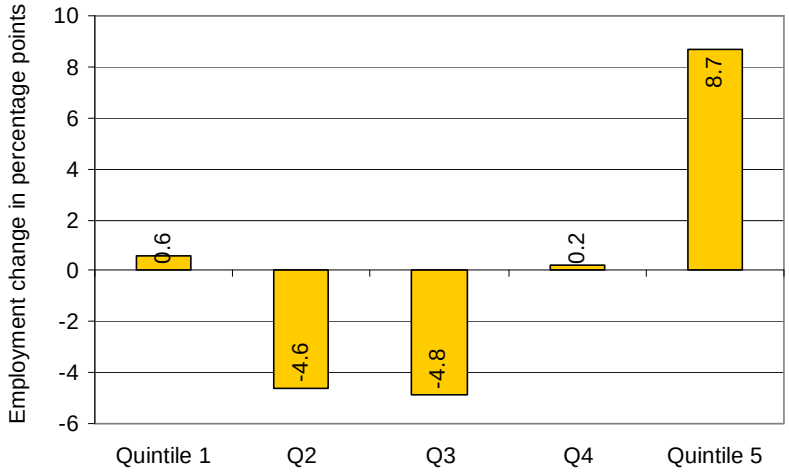
Thirdly, we can clearly discard the hypothesis of occupational downgrading over the last two decades for all four countries. To the contrary, we obtain the picture of occupational upgrading that is clearcut in Germany and – with the exception of the somewhat stronger decline in quintile 3 and 4 respectively – even more marked in Switzerland and Spain. Results are more contrasted for Britain, suggesting a pattern of "polarized upgrading" with very strong employment growth at the top of the occupational hierarchy, substantial losses in the middle and very slight growth at the bottom. We thus obtain for Britain a pattern of occupational change over the period 1991-2008 that is remarkably similar to that found in earlier studies covering different periods: 1979-1999 (Goos and Manning, 2007: 121), 1993-1999 (OECD, 2003: 41) and 1995-2006 (Eurofound, 2008: 12).

Fourthly, unlike Goos, Manning and Salomons (2009) but consistent with Eurofound (2008), we find sizeable country differences: while the best-paid occupations expanded in all four countries, we do not find the patent cross-national similarities predicted by either the SBTC- or the routinization-hypothesis with respect to the lower half of the occupational structure. SBTC describes well the upgrading

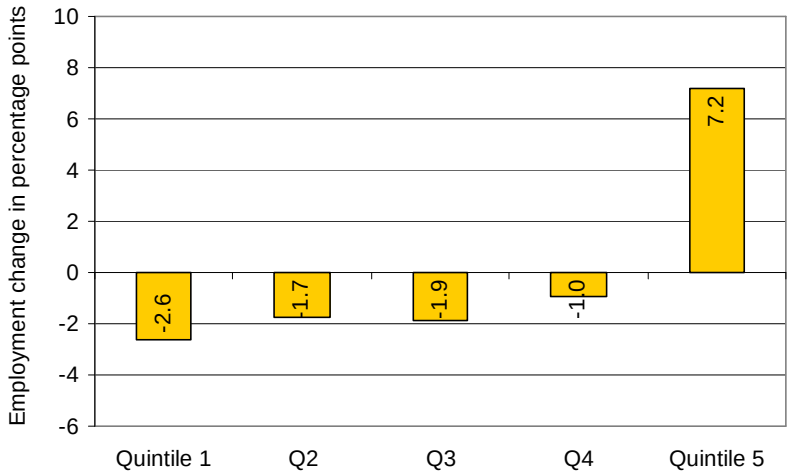
process observed in Germany and Spain, whereas routinization closely fits the pattern of polarization in Britain and, to a lesser extent, in Switzerland.

Figure 1: The pattern of change in the occupational structure (in job quality quintiles)

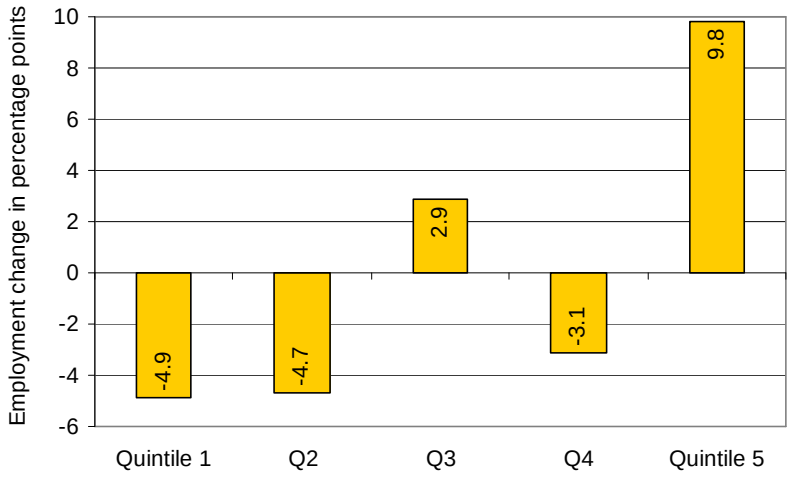
Britain, 1991-2008



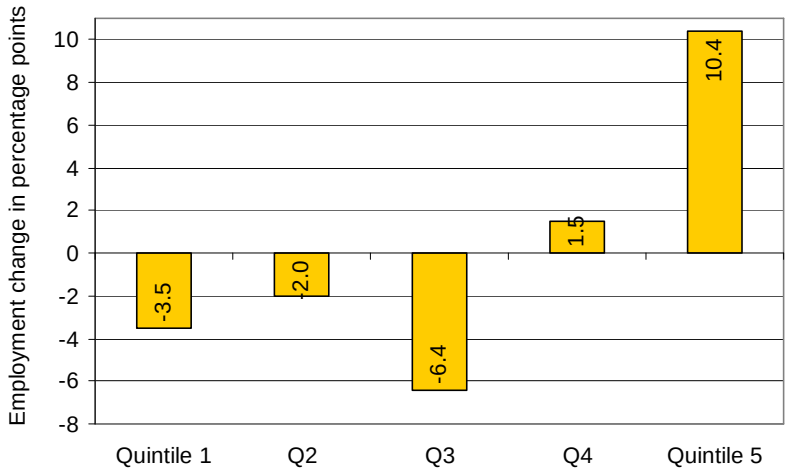
Germany, 1990-2007



Spain, 1990-2008



Switzerland, 1991-2008



Differences in countries' occupational trajectories are possibly due to the fact that the impact of technological change on the employment structure evolved over time, leading to a gradual shift from upgrading to polarization. Depending on whether this evolution started earlier or later in a country, it may not show in an overview of two decades. To test this argument, we examine occupational change for the four countries under study over three six-year subperiods (see figure 2).

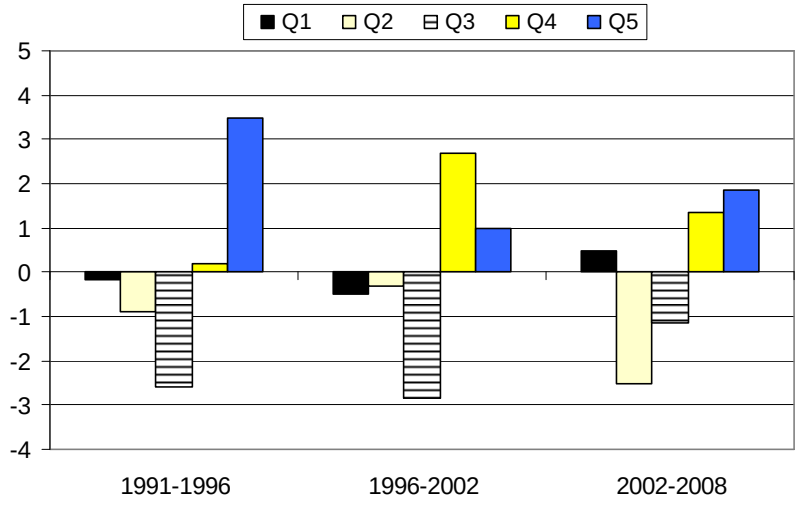
These results suggest that a transition from clear cut occupational upgrading to more polarized change has taken place in all four countries studied. The first subperiod 1990-1996 – marked by a sharp international recession and a strong rise in unemployment – coincides in all four countries with very strong growth in

employment at the top relative to the middle and the bottom of the occupational hierarchy. This finding suggests that the trend towards occupational upgrading may be particularly strong in recessionary periods, as the burden of economic restructuring and unemployment is disproportionately shouldered by low-skilled workers.

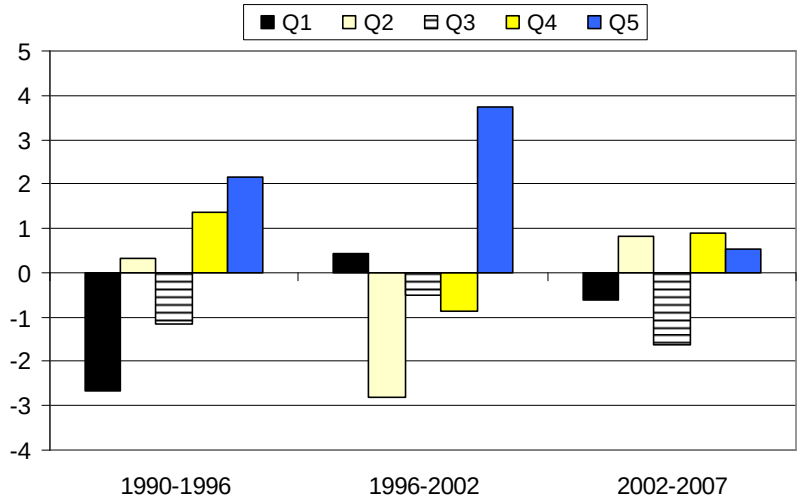
While the upgrading pattern holds for the second subperiod 1996-2002, both relative employment growth in the top quintile and decline in the bottom quintile become weaker, showing a trend towards polarization everywhere except in Spain. Spain ceases to be an exception in the last subperiod 2002-2008, when relative employment growth becomes limited, as in Britain, to either the lowest or the highest-paid quintiles. A constant feature across countries is thus the substantial fall in the middling jobs, a fall that contrasts with continuous growth at the top and stagnation at the bottom. Hence, polarization is not induced by equal growth at the extremes of the job structure, but by strong expansion in the top and a parallel collapse in the middle.

Figure 2: employment change in quintiles over subperiods (in percentage points)

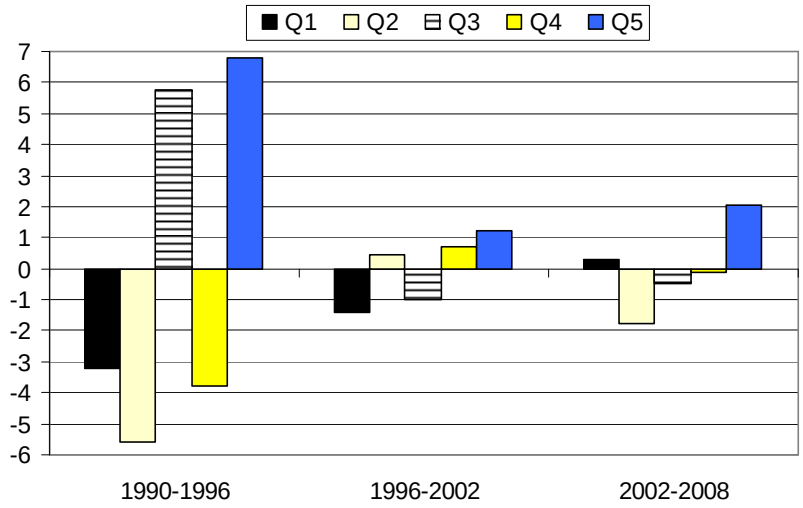
Britain, 1991-2008



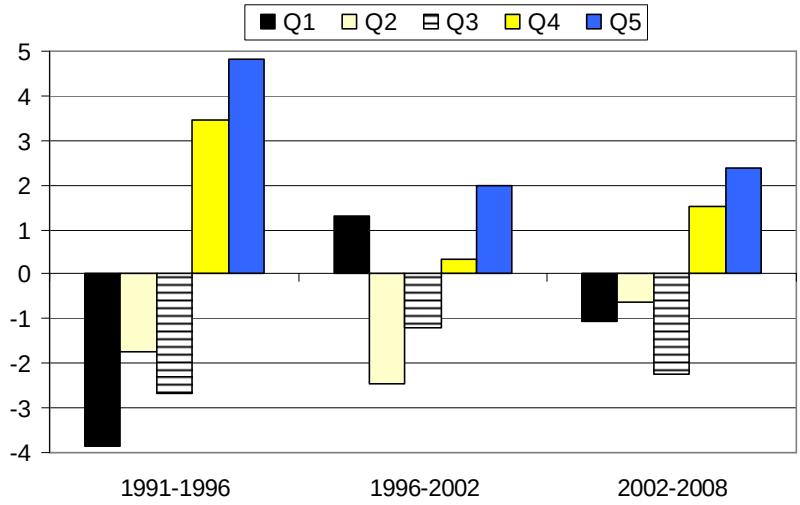
Germany, 1990-2007



Spain, 1990-2008



Switzerland, 1991-2008



5. The impact of skill supply change: educational expansion and immigration

The pattern of occupational change observed in figures 1 and 2 may be brought about by demand-side factors such as technological change or be the results of shifts on the supply-side in the workforce's skill composition. We examine this second argument 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 different levels)[8] and experience (distinguishing four different age groups)[9]. These distinctions are used to decompose the workforce into 24 education-age groups and to determine the contribution of each group to a quintile's employment in 1990. We then compute what the occupational structure would have looked like if the distribution of education-age groups within a given quintile had remained stable between 1990 and 2008 and the sole source of variation had come from change in the size of the 24 education-age groups. If this predicted pattern of change closely matched the observed pattern of change, it would suggest that occupational change is closely linked to changes in the workforce's skill composition. In contrast, if the predicted and observed changes differed strongly, we could assume that occupational change happened independently from the evolution in skill supply.

Between 1990 and 2008, the workforce in all four countries has become, on average, better educated and older. Accordingly, our decomposition analysis predicts – as shown in figure 3 and, in greater detail, in table A.2 in the annexe – clear cut and massive occupational upgrading. In all four countries, the pattern of occupational change predicted on the basis of skill supply evolution mirrors the observed pattern of occupational change closely. The correspondence between changing skill supplies and changes in the employment structure is stronger in Germany and Switzerland, where the educational system is dominated by vocational training, and weaker in Spain,

[8] 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.

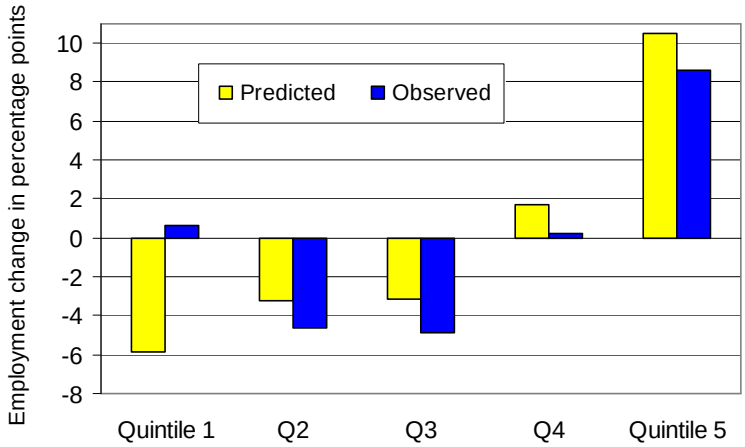
[9] The following four age groups are distinguished: 18-30 years; 31-40 years; 41-50 years; 51-65 years.

where educational expansion over the last two decades was particularly strong and outpaced occupational upgrading. Nonetheless, figure 3 suggests for all four countries that educational advance and occupational upgrading have gone hand in hand. Hence, the strong increase in skill supply – notably the expansion of tertiary education – clearly is an important explanatory piece of the occupational puzzle. There are, however, two important exceptions where we expect a different pattern of occupational change based on skill supply evolution.

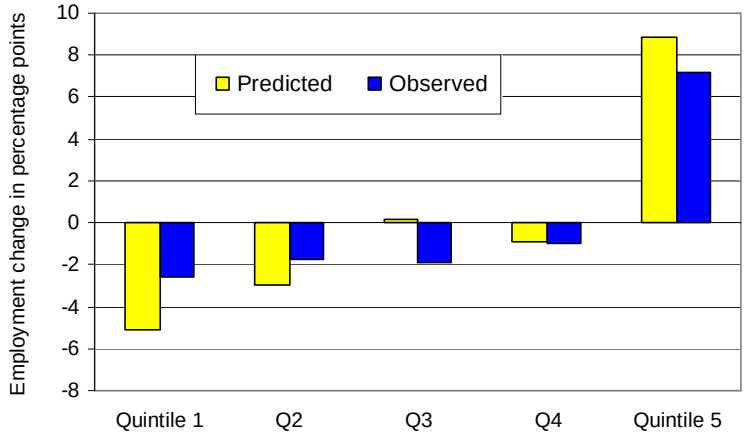
To begin with, the observed employment loss in quintile 3 is much larger than what our decomposition analysis predicts for Britain, Germany and Switzerland (Spain being an exception where the employment share of quintile 3 strongly expanded until 1996): relative employment fell by 1.7 (Britain), 2.1 (Germany) and even 3.2 (Switzerland) percentage points more than predicted by the evolution of skill groups. In parallel, we observe everywhere a smaller decline in the employment share of the lowest-paid quintile 1 than what could be expected based on the evolution of skill groups. In Germany and Spain, skill groups' changing size led us to predict a fall in quintile 1 of 5.1 and 8.3 percentage points. Yet, we only observe a decrease of 2.6 and 4.9 percentage points respectively. The gap between predicted and observed employment change in the lowest quintile is even larger in Britain, where we would have expected a large fall of 5.9 percentage points, but instead observe a small increase of 0.6.

Figure 3: predicted and observed change in relative employment of job quality quintiles (predicted on the basis of skill supply evolution)

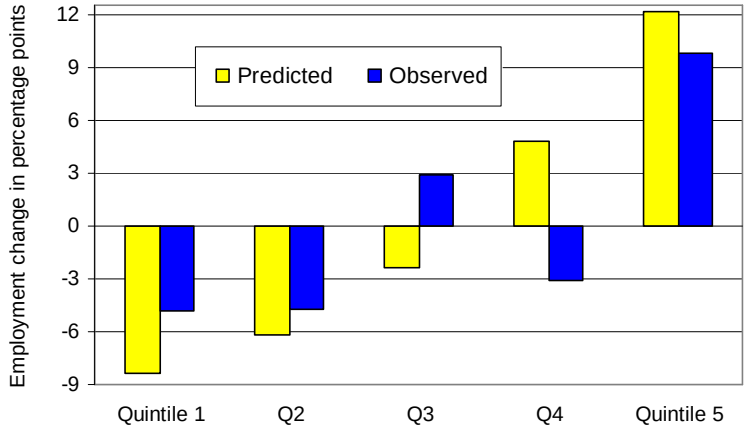
Britain, 1991-2008



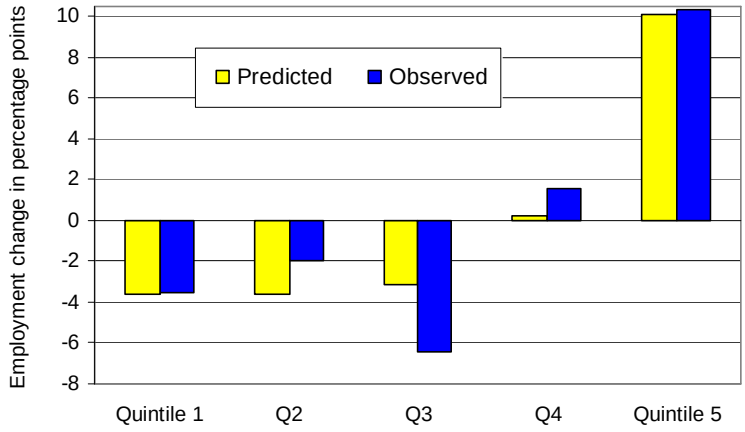
Germany, 1990-2007



Spain, 1990-2008



Switzerland, 1991-2008



Note: change in quintiles' relative employment is predicted based on the evolution of 24 education-age groups. Assuming an unchanged distribution of education-age groups within a given quintile between 1990 and 2008, relative change in each quintile's share is predicted on the basis of the employment evolution of the 24 education-age groups.

Hence, while skill supply and occupational structure have evolved in a surprisingly similar manner, both substantial loss of middling jobs and relative stability of low-paid jobs run contrary to predictions based on skill supplies. Above all Britain's and, to a lesser extent, Spain's skill evolution would lead us to expect a much larger decline in low-paid occupations than what we find – unless the parallel 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. The reason is that new immigrants are often unable to put their human capital into immediate use because of language barriers, information deficiencies and discrimination. Dustmann, Frattini and Preston (2008) thus show for Britain that immigrants tend to downgrade upon arrival and to compete with native workers at much 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 create the labour supply necessary to fill low-paid jobs of quintile 1. In Britain, the large inflow of foreign workers possibly explains the relative stability at the bottom of the employment structure – which is in contradiction with the strong decrease of low-skilled labour supply. We test this argument by disaggregating net change in employment for four different nationality-gender groups: national men, national women, foreign men and foreign women. Table 5 shows the net

contribution of every one of these groups to the observed pattern of occupational change over the last two decades. Three results need to be highlighted.

Firstly, immigrants strongly affected the pattern of occupational change in Britain and, above all, Spain. In Britain, expansion in the low-paid jobs of quintile 1 is exclusively due to employment growth among foreign workers. Hence, the net change of 0.6 percentage points in quintile 1 is the result of falling employment among national men and women (-1.1 percentage points), that has been more than compensated by an increase in employment among foreign men and women (+1.8 percentage points). In Spain as well, foreign workers have strongly expanded in the two bottom quintiles 1 and 2 (about 4 percentage points in each). Without Spain's large immigration boom, we would thus have observed a much stronger trend towards occupational upgrading. In fact, Spanish men's employment in the two bottom quintiles has fallen dramatically since 1990 (by 13 percentage points). Spanish women's employment in the same groups has also declined, but less markedly. Unlike Britain and Spain, the pattern of occupational change is very similar for nationals and foreigners in Switzerland,[10] whereas immigrants' impact on occupational change has been negligible in Germany.

Secondly, occupational upgrading in all four countries is strongly driven by *national women*. While their share in the lowest-paid jobs of quintile 1 strongly declined over the last two decades, their proportion in the highest-paid jobs of quintile 5 increased massively. 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 net job growth of 7.2 percentage points, German women contributed 4.2 percentage points, compared to 2.7 percentage points for German men (and 0.2 percentage points for foreign men). Very similar results are found for Britain, Spain and Switzerland. Hence, women's catch-up process in educational attainment seems everywhere to have spilled over to occupational achievement.

Thirdly, table 5 suggests that the fall in relative employment in quintiles 2 to 4 is strongly determined by the declining share of national men working in medium-paid

[10] A finding that is not surprising, given the fact that over half of the country's large foreign community was either born in Switzerland or has lived there for more than 15 years (Swiss Federal Office of Statistics, 2003).

jobs. Between 1990 and 2008, relative employment of national men working in quintiles 2 to 4 shrank by 16 percentage points in Spain, by 9.3 in Britain, by 7.2 in Switzerland and by 5.1 in Germany. In all four countries, national men only registered net employment growth in the highest-paid occupations of quintile 5. In Switzerland, the slight tendency towards occupational polarization, defined as a stronger decline in medium-paid relative to low-paid jobs, is exclusively due to the employment trajectory of national men. In contrast, in Britain, all four nationality-gender groups have undergone a polarizing pattern of change where job growth has been stronger at the bottom and the top than in the middle. Hence, although immigrants contributed to the polarization of Britain's employment structure, they were not the only driving force.

Table 5: 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	National men	-1.0	-3.4	-3.2	-2.8	3.2	-7.2
1991-2008	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	National men	-0.4	-1.9	-1.0	-2.3	2.7	-2.8
1990-2007	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	National men	-5.3	-7.3	-3.7	-5.1	3.7	-17.6
1990-2008	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	National men	-0.9	-2.3	-3.9	-1.0	3.3	-4.8
1991-2008	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

Note: Job quality quintile 1 contains at the beginning of the period 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.

6. The sources of different job trajectories in the middle and at the bottom

The analyses shown so far leave one central question unanswered: why is the employment share of low-paid jobs in the bottom quintile expanding in some countries and periods, but not in others? In a last set of analyses, we try to get a grip on this issue by disaggregating change in the employment structure according to occupational categories. On the one hand, this should give us an idea whether differences in countries' wage-setting institutions result in different trajectories in terms of interpersonal service jobs: did Britain's 'flexible' labour market create more low-paid service jobs than its more 'rigid' German counterpart? On the other hand, we want to see what kinds of jobs were responsible for the employment decline in the middle.

We thus disaggregate net employment change over the last two decades 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.[11] Results of these computations are shown in figure 4 and, in greater detail, in table A.3 in the annexe. They point towards three similarities and one strong contrast in cross-country employment trajectories.

The first and clearest cross-national resemblance concerns strong growth among managerial and professional occupations set in the two top quintiles. Occupational upgrading is driven in all four countries by massive expansion in the ranks of professionals and, above all, managers.

A second parallel concerns the strongly decreasing employment share of production workers, evident in all four countries. In Britain and Germany, these relative job losses were distributed quite equally across quintiles 1 to 4, whereas in Spain and Switzerland production workers' relative employment fell most strongly in the bottom quintile.

A third similarity concerns the falling share of office clerks in Britain, Germany and Switzerland. Since clerical jobs have mainly disappeared from quintile 3 (and, to a lesser degree, from quintiles 2 and 4), the relative reduction of office clerks is responsible for the observed trough in the middle of the employment structure. The

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

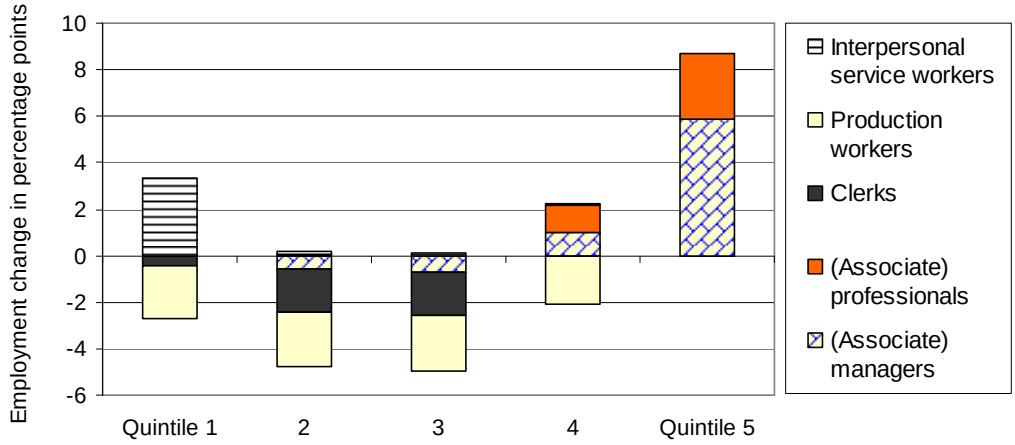
relative decline in clerical employment was very substantial in Britain and, above all, in Switzerland, where the share of clerks in the workforce dropped by 7.7 percentage points (as compared to 4.1 in Britain). Contrary to the other three countries, clerks' employment share remained stable in Spain and thus did not contribute to relative job decline in the middle quintile. This stability in back office jobs may reflect a slower rate of computerization and hence, possibly, lagged economic development.

The trajectory of interpersonal service and sales workers stands in stark contrast to these broad similarities. While the employment share of these mostly low-skilled service jobs remained unchanged in Germany and Switzerland, Britain and Spain witnessed a substantial increase. In Spain, this expansion took place above all in the lowest-paid quintile 1, but also in quintiles 2 and 4. In contrast, growth of interpersonal service jobs in Britain was almost exclusively concentrated in the bottom quintile 1. As a consequence, variation in interpersonal service jobs goes a long way in explaining Britain's different pattern of occupational change. Relative employment at the bottom end of the British labour market only expanded because of growth in interpersonal service jobs. If these service and sales 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.

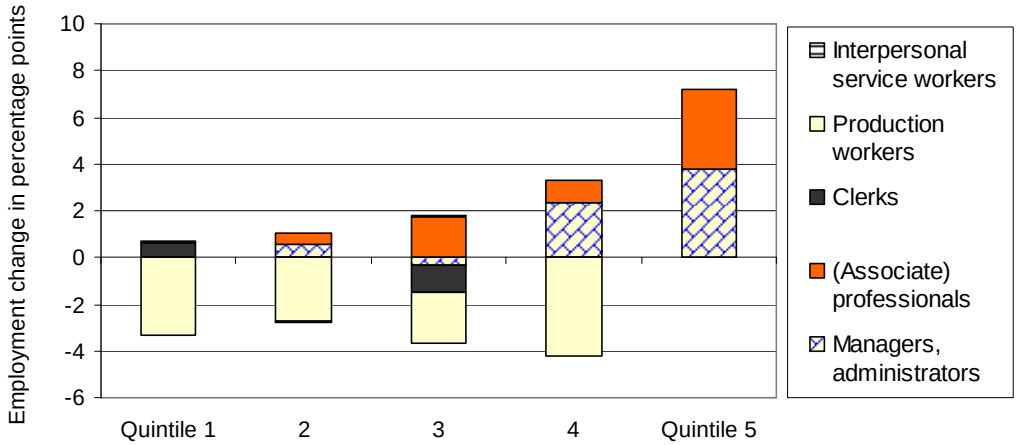
These results for different occupational groups explain why we see a more or less marked tendency towards polarization in the four countries under study. While the fall in clerical employment has led to comparatively stronger job growth at the bottom than the middle of the occupational structure in Britain,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

Figure 4: the pattern of net employment change by occupational categories

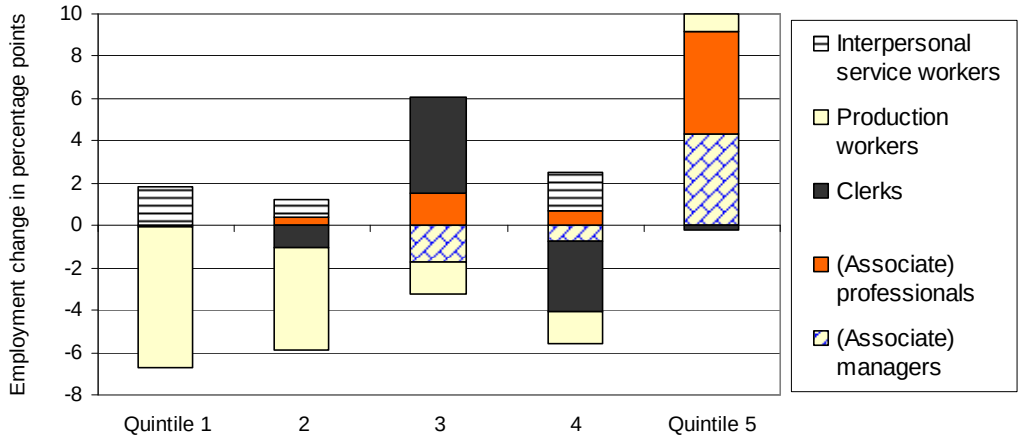
Britain, 1991-2008



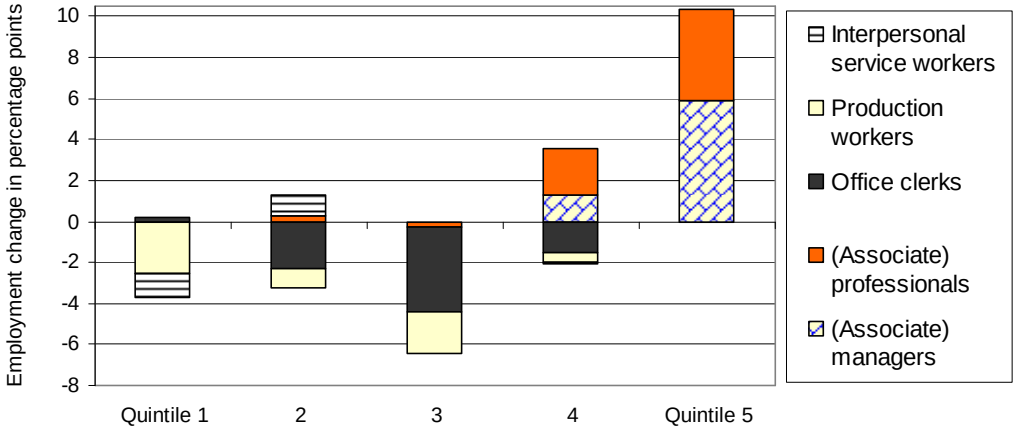
Germany, 1990-2007



Spain, 1990-2008



Switzerland, 1991-2008



We can now summarize our findings and come back to 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 clerical and production jobs than for interpersonal service occupations. While the former – above of all clerical jobs – cluster in the middle range of the occupational hierarchy in terms of pay, the latter are set at the very bottom. Hence, we see a stronger employment decline in the middle than in the bottom-paid occupations, leading to the slightly polarized pattern of upgrading predicted by routinization.

Yet there is an important objection to this explanation: the routinization hypothesis has been developed on the basis of empirical findings for job change in the United States (Autor et al., 2003, Autor et al., 2008) and Britain (Goos and Manning, 2007) – two countries with wage-setting institutions that are among the most flexible in the OECD. It is thus an open question to what extent observed growth at the bottom of the occupational structure can be extrapolated to countries where the wage structure at the lower end is more sheltered. Our results show that *relative* employment in the lowest paid quintile has only expanded in Britain – and there exclusively among interpersonal service jobs –, but not in Germany, Spain or Switzerland. Hence, while

we observe in all four countries a collapse of middling jobs in quintiles 2 and 3 (Spain prior to 1996 being an exception), relative growth in quintile 1 only took place in Britain, the country where the low-wage sector is least sheltered from market pressure. This finding points towards the possibility that different country institutions channel technological change into a more or less polarized pattern of occupational upgrading.

7. Conclusions

The objective of this paper has been to analyze the pattern of occupational change in four Western European countries. What kind of jobs have been expanding (or declining) over the last two decades: high-paid jobs, low-paid jobs or both? By addressing this issue, our paper also tried to examine what theoretical account is consistent with the observed pattern of change: skill-biased technical change, skill supply evolution or wage-setting institutions?

Our findings reveal two constant features across the four countries studied. 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 in all four countries. This is clearly the case in Germany and Switzerland, while educational advance may have slightly outpaced occupational upgrading in Britain and, above all, Spain. Secondly, in parallel to growth at the top, our analysis indicates that in Britain and Switzerland, as well as Germany after 1996 and Spain after 2002, relative employment declined more strongly in average-paid jobs (among clerks and some production workers) than in low-paid jobs (where most interpersonal service workers can be found). In particular in Britain the decrease in clerks' relative employment led to a drastic fall in the middling occupations.

Hence, we find a general thrust towards occupational upgrading – particularly marked in Germany and Spain – 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 of technical change, we cannot explain the trough in the middle of the employment structure. Solely based on change in the supply of skills, we would have expected a smaller decline in the

share of average-paid jobs, but a larger fall in the share of low-paid jobs. The polarized pattern of occupational upgrading observed for Britain and Switzerland (as well as for Germany after 1996 and for Spain after 2002) is consistent with the idea that technology is a better substitute for average-paid jobs in production and the office than for low-paid jobs in interpersonal services.

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 pervasive technical change. Low-paid interpersonal service jobs have expanded significantly in Britain and, somewhat less so, in Spain, but stagnated in Germany and Switzerland. A potential explanation may be that wage-setting institutions filter the pattern of occupational change: countries possibly only 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 the case in Britain, but not in Germany.

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 for the period since 1990. On the other hand, the strong 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 may 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 hange: 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.

Swiss Federal Office of Statistics (2003), *Ausländer und Ausländerinnen in der Schweiz: Bericht 2003*, Neuchâtel.

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. (forthcoming), 'Revisiting the German wage structure', *Quarterly Journal of Economics.*

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. (2002) 'The quality of working life in welfare strategy', in: Esping-Andersen, G. (ed.), *Why We Need a New Welfare State*, pp. 96-129. Oxford: Oxford University Press.

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.

Iversen, T. and Wren, A. (1998) 'Equality, employment, and budgetary restraint: the trilemma of the service economy', *World Politics* 50, 507-546.

Kern, H. (1998) 'Proletarisierung, Polarisierung oder Aufwertung der Erwerbsarbeit?', *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, Sonderheft 38, 113-129.

Krugman, P. (1994), 'Past and prospective causes of high unemployment', *Economic Review*, Federal Reserve Bank of Kansas City, issue Q IV, 23-43.

Lemieux, T. (2008), 'The changing nature of wage inequality', *Journal of Population Economics* 21, 21-48.

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.

Maurin, E. and Thesmar, D. (2004), 'Changes in the Functional Structure of Firms and the Demand for Skill', *Journal of Labor Economics,* 22 (3)**,** 639-64.

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 (2003) 'More and better jobs? Aggregate performance during the past decade', *OECD Employment Outlook*, 17-66.

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.

Oesch, D. (2006) 'Coming to grips with a changing class structure. An Analysis of Employment Stratification in Britain, Germany, Sweden and Switzerland', *International Sociology* 21 (2), 263-288.

Sacchi, S., Salvisberg, A. and Buchmann, M. (2005) 'Long-Term Dynamics of Skill Demand in Switzerland from 1950-2000', in: Kriesi, H., Farago, P., Kohli, M. and Zarin-Nejadan, M. (eds.), *Contemporary Switzerland: Revisiting the Special Case*, pp. 105-134, Basingstoke: Palgrave Macmillan.

Salverda, W. and Schettkat, R. (2007) 'The U.S.-European gap in service employment and demand: the research agenda', in: Gregory, M., Salverda, W. and Schettkat, R. (eds.), *Services and employment: explaining the U.S.-European gap*, pp. 14-41, Princeton: Princeton University Press.

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.

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 target population 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: The target population is defined as individuals aged 18-65 who work at least 20 hours per week. Data on work income are used to rank-order occupations from the lowest-paid to the highest paid depending on an occupation's median earning. 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: predicted and observed change in relative employment of job quality quintiles (Predicted on the basis of skill supply evolution)

		Q1	Q2	Q3	Q4	Q5
GB, 1991-2008	Predicted change	-5.9	-3.2	-3.1	1.7	10.5
	Observed change	0.6	-4.6	-4.8	0.2	8.7
	Δ obs.-pred.	6.5	-1.4	-1.7	-1.5	-1.9
DE, 1990-2007	Predicted	-5.1	-3.0	0.2	-0.9	8.8
	Observed	-2.6	-1.7	-1.9	-1.0	7.2
	Δ obs.-pred.	2.5	1.2	-2.1	0.0	-1.7
ES, 1990-2008	Predicted	-8.3	-6.2	-2.3	4.8	12.2
	Observed	-4.9	-4.7	2.9	-3.1	9.8
	Δ obs.-pred.	3.5	1.5	5.2	-7.9	-2.4
CH, 1991-2008	Predicted	-3.6	-3.6	-3.2	0.2	10.1
	Observed	-3.5	-2.0	-6.4	1.5	10.4
	Δ obs.-pred.	0.1	1.6	-3.2	1.3	0.2

Table A.3: contribution to the pattern of employment change by occupational categories

		Net employment change (in percentage points)					
		Q1	Q2	Q3	Q4	Q5	All quintiles
GB	Interpersonal service workers	3.3	0.2	0.1	0.0	0.0	3.6
1991-	Production workers	-2.3	-2.3	-2.4	-2.1	0.0	-9.1
2008	Clerks	-0.4	-1.9	-1.9	0.1	0.0	-4.2
	(Associate) professionals	0.0	0.0	0.0	1.2	2.8	4.0
	(Associate) managers	0.0	-0.6	-0.7	1.0	5.9	5.6
	Entire labour force	0.6	-4.6	-4.8	0.2	8.7	0
DE	Interpersonal service workers	0.1	-0.1	0.1	-0.1	0.0	0.0
1990-	Production workers	-3.3	-2.7	-2.2	-4.2	0.0	-12.4
2007	Clerks	0.6	0.0	-1.1	0.0	0.0	-0.5
	(Associate) professionals	0.0	0.5	1.7	0.9	3.4	6.6
	(Associate) managers	0.0	0.5	-0.3	2.3	3.8	6.3
	Entire labour force	-2.6	-1.7	-1.9	-1.0	7.2	0
ES	Interpersonal service workers	1.9	0.8	0.0	1.8	0.0	4.4
1990-	Production workers	-6.7	-4.9	-1.5	-1.5	0.8	-13.7
2008	Clerks	0.0	-1.0	4.5	-3.3	-0.2	-0.1
	(Associate) professionals	0.0	0.4	1.5	0.7	4.8	7.4
	(Associate) managers	0.0	0.0	-1.7	-0.7	4.3	1.9
	Entire labour force	-4.9	-4.7	2.9	-3.1	9.8	0
CH	Entire labour force	-1.1	1.0	0.0	0.0	0.0	-0.2
1991-	Production workers	-2.5	-1.0	-2.0	-0.5	0.0	-5.9
2008	Clerks	0.2	-2.3	-4.1	-1.5	0.0	-7.7
	(Associate) professionals	0.0	0.2	-0.3	2.2	4.5	6.6
	(Associate) managers	0.0	0.0	0.0	1.3	5.9	7.2
	Entire labour force	-3.5	-2.0	-6.4	1.5	10.4	0

Note: Job quality quintile 1 contains at the beginning of the period 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.