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Challenges of Nordic Labour Markets

A Polarization of Working Life?

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Abstract

Labour-market polarization is characterized by increased employment in occupations at the top but also at the bottom of the skills and wage distributions, followed by a relative decline in 'middling' occupations. This paper documents a polarization trend also in the Nordic labour markets and contrasts it to comparative findings for the USA. Employment growth in the top-paying occupations is found to have been dominated by a large increase in the category of 'Engineering professionals and other professionals', whereas the growth at the bottom end stems mainly from increased employment in 'Personal and protective services'. The drop in the middle has been driven by a marked relative decline in the category 'Office clerks'. Analysis of the extent to which differences in wage development across skill groups have enhanced or attenuated this process of polarization in employment patterns suggests that the U-shaped pattern of employment change prevails also after controlling for concomitant changes in relative occupational wages. Hence, it seems that also the Nordic countries have experienced a shift from skill-biased technological change to non-routine-biased technological change – or, more likely, a combination of the two – and that this process has not been particularly dampened by compressed wage structures or relatively more rigid wages.

Key words: Labour market, polarization, occupation, relative wages

JEL: J21, J23, J31

Tiivistelmä

Työmarkkinoiden 'polarisoituminen' tarkoittaa, että työllisyys kasvaa hyvin palkatuissa, korkeaa osaamista vaativissa ammateissa, mutta myös osaamis- ja palkkajakauman alimpaan osaan kuuluvien tehtävien osalta. Vastaavasti työllisyyden osuus kaventuu jakauman keskiosaan sijoittuvissa ammateissa. Tässä paperissa osoitetaan, että tällainen U-muotoinen työllisyyskehitys on nähtävissä myös Pohjoismaiden työmarkkinoilla ja että kehitys muistuttaa keskeisiltä osin Yhdysvaltojen työmarkkinoilla tapahtunutta kehitystä. Tulokset paljastavat niin ikään, että työllisyyden muutokseen ovat vaikuttaneet erityisesti tietyt ammatit ja tehtävät: korkeapalkkaisilla asiantuntijatehtävien kasvu, matalapalkkaisilla henkilö- ja turvallisuuspalvelujen kasvu sekä keskipalkkaisilla toimistotöiden suhteellisen määrän vähentyminen. Lisäksi selvitetään, missä määrin osaamisryhmien välisten palkkaerojen muutos on mahdollisesti vahvistanut tai hidastanut työllisyyskehityksen polarisoitumista. Tulokset kertovat, että työllisyyden U-muotoinen kehitys säilyy likimain samanlaisena myös suhteellisten palkkojen muutosten huomioon ottamisen jälkeen. Esitetyt tulokset viittaavat siten siihen, että myös Pohjoismaat ovat siirtyneet tietotaitoihin pohjautuvasta teknologisesta kehityksestä (skill-biased technological change) ei-rutiininomaisia tehtäviä korostavaan teknologiseen kehitykseen (non-routine-biased technological change) – tai, pikemmin, niiden yhdistelmään – ja että Pohjoismaiden palkkarakenteiden erityispiirteet (kuten suhteellisen pienet palkkaerot ja jäykät palkat) eivät ole juurikaan vaimentaneet tätä muutosta.

Asiasanat: Työmarkkinat, polarisoituminen, ammatti, suhteellinen palkka

1 Introduction

A certain 'polarization' of labour markets has been observed since the 1990s in many countries (see Acemoglu and Autor, 2011). This trend is characterized by increased employment especially at the top but also at the bottom end of the skill and wage distributions, accompanied by a decline in the intermediate range. Depending on the major forces behind this development, it may have important implications also for future employment structures and, hence, for wage changes and income distributions. Concomitantly it raises concerns about the opportunities for upward mobility of low-paid workers (cf. Wright and Dwyer, 2003).

We should expect the Nordic labour markets to be no less – possibly even more – vulnerable than those of other countries to the demand-side forces causing a polarization of job structures. Finland, Norway and Sweden, which are the three Nordic countries under study, all represent highly open economies and can, as a consequence, be expected to be exposed to high intensities of technological and structural change due to globalization. Foreign off-shoring of specific tasks, which is a common feature of open economies, implies an upgrading of production technologies causing skill-biased technical change. Additionally, computerization has long permeated the Nordic economies, with particularly Finland and Sweden holding a front-line position in information and communication technologies (ICTs), including research and development (R&D). This suggests that the spread of computer-based technology could potentially be of even more profound importance for job restructuring in the Nordic countries than elsewhere.

On the other hand, compared with most other countries, the Nordic economies are still typically portrayed as having rather compressed wage structures due to rigid wage-setting procedures. Wage compression is, in turn, likely to affect the relative demand for different types of labour and may, ultimately, impede the creation of low-paid jobs in substantial numbers.[1] Since the mid-1980s, however, wage-setting institutions have been decentralized to a varying degree also in the Nordic countries (e.g. Andersen et al., 2007). As this decentralization tendency has typically concerned white-collar workers to a much larger extent than blue-collar workers, also the wages of workers located at different points of the skills and/or pay distribution may have responded differently to changes in labour demand. Hence, while the technological forces polarizing employment structures should be expected to be no less powerful in the Nordic countries, the reaction in terms of occupational wage changes might be different.

Against this background, it is of particular interest to investigate the ongoing changes in the distribution of jobs in the Nordic labour markets to find out whether they have experienced a clear tendency towards job polarization. In particular, the objective is to deepen our understanding of how changes in the demand for labour have affected the Nordic job composition in terms of 'good' and 'bad' jobs, as defined either by the level of qualification (skills) or by the level of pay. Crucial questions addressed are: What types of jobs have been created? Has job creation occurred mainly at the top of the qualification ladder? What types of jobs have been lost? Has there been a decline rather than an increase in jobs in the middle and, especially, at the bottom end? What is the quality of the jobs lost, in terms of qualifications and in terms of pay?

[1] E.g. Krugman (1994). For a recent critique, see especially Oesch (2010).

In addition to presenting new evidence for the northern part of Europe, we also make an effort to contrast our results to those of the outside world. This is done by comparing the Nordic outcome with evidence derived in a comparative way for the USA, where the role of institutions is in several crucial dimensions distinctly different compared to the situation in the Nordic countries.

In the next section, we summarize the international debate and evidence on job polarization. The data used is described in Section 3. In Section 4, we lay out occupational employment patterns and trends, based on observations from 1996 to 2006, and compare employment growth in low-, middle- and high-paid occupations in order to test the hypothesis of a polarization of the employment structure. Section 5 shifts the focus to wage dispersions and occupational wage trends while Section 6 analyzes to what extent changes in wage structures have affected labour demand and, as a consequence, possibly distorted our conclusions with respect to polarization. More precisely, we derive a measure of demand shift, conditional on wages, to improve our evaluation of the polarization hypothesis. The paper concludes, in Section 7, with a brief discussion of our key results.

2 Polarization of work: the international debate and evidence

While analyses of the job structure in the Nordic countries are still scant, an intense debate has been going on in several other countries, notably the UK and the USA. Much of the discussion surrounding the development of the distribution of jobs arose as a result of substantial changes in the overall wage structure. A heated debate concerning the secular growth in wage inequality took place in the 1980s.[2] In the 1990s, several papers appeared arguing that the globalization of production had caused a widening in the wage distributions of rich countries. Following standard theories of international trade, the hypothesis was that competition from low-cost countries had resulted in a structural change reducing the demand for low-skilled labour. Concomitantly, however, several studies (e.g. Berman, Bound and Machin, 1998) showed that skills upgrading was occurring also within industries and was not simply due to ongoing structural reshuffling across industries. These shifts in demand from unskilled labour toward skilled labour were interpreted as being the consequence of a skill-biased technical change.[3]

The understanding of the impact of technology on the demand for labour of different skills has been modified in more recent years, as emerging new evidence documents important structural changes in the labour markets of several OECD countries. Autor, Levy and Murnane (2003) argue that the changing job-skill demands are the result of computer technology replacing workers in so-called routine tasks but not workers in non-routine cognitive tasks, while having little impact on non-routine manual tasks. They also provide empirical evidence for the USA in support of their hypothesis of computerization reshaping the skill composition of jobs and, ultimately, the structure of labour demand. Spitz-Oener (2006), building on the Autor–Levy–Murnane model, obtains similar evidence of 'polarized upgrading' for West Germany.[4]

[2] See Katz and Autor (1999) for a comprehensive review of the debate and the evidence, and e.g. Card and DiNardo (2002) and, especially, Lemieux (2006a, 2006b, 2008) for a critique of it.

[3] A few recent papers relate technological change to international outsourcing of specific tasks within firms, thus partly reconciling the idea of the changes being driven by globalization with the evidence on skill-biased technical change causing a widening in wage distributions, see e.g. Kranz (2006).

[4] It is worth noting, though, that the evidence in support of polarized vs. occupational upgrading when measuring the quality of jobs in terms of skills is rather mixed (see e.g. Oesch and Rodriguez Menés, 2010).

Organizational and technical change is nevertheless argued to have polarized the labour market also in terms of tasks: strong relative growth of especially high-paid jobs ('lovely' or 'good' jobs) but also, albeit to a lesser extent, in low-paid jobs ('lousy' or 'bad' jobs), an evolution having occurred at the expense of middle-paid jobs ('middling' jobs). Evidence in support of such a pattern of job polarization was, in effect, provided for Canada already in the late 1980s (Myles, Picot and Wannell, 1988, 1990), although their contribution is, for some reason, seldom recognized in the international literature in this field. The bulk of the evidence has, over the past ten years or so, been provided for the USA. This includes Acemoglu (1999), Autor, Katz and Kearney (2006, 2008), Goldin and Katz (2007) and, most recently, Autor and Dorn (2009).[5] Corresponding evidence has been reported by Goos and Manning (2007) for the UK, by Dustmann, Ludsteck and Schönberg (2009) for Germany[6] and by Goos, Manning and Salomons (2009) for a total of 16 European countries using the harmonized European Labour Force Survey (ELFS).[7,8] Support for the ICT-based polarization hypothesis has recently been provided also by Michaels, Natraj and Van Reenen (2010) using industry-level data for 11 OECD countries. Acemoglou and Autor (2011) summarize the main empirical results and theoretical considerations within this strand of research.

Another common feature of these papers is that they demonstrate that the aforementioned Autor–Levy–Murnane (2003) model of computerization-induced changes in the demand for skills can also rationalize the documented patterns of polarized job growth.[9] In other words, the finding of rising employment shares in both the highest-paid and the lowest-paid jobs, at the expense of middling jobs, is shown to be consistent with the evidence on computer technology having displaced workers in routine tasks. The rationale then is that jobs that can be replaced by computer technologies are not distributed uniformly across the wage distribution. Instead, high-paid jobs typically require non-routine analytical skills and low-paid jobs mainly non-routine interpersonal (manual) skills, whereas middle-paid jobs usually require routine-manual and routine-cognitive skills.

In addition to demand-side factors, notably technology, supply driven as well as institutional factors have most likely contributed to the observed restructuring of job distributions. However, several recent studies show that both supply-side (such as educational expansion and immigration) and wage-setting institutions (such as unionization and minimum wages) can definitely contribute to the understanding of the changes observed in at least certain jobs but, as opposed to technical change, they seem to fail to explain the job polarization process as

[5] Autor and Dorn (2009) move, in effect, one step further in the sense that they also investigate whether the displaced routine workers tend to move toward non-routine cognitive jobs higher up the occupational distribution or downward toward non-routine manual jobs located at the bottom end of the occupational distribution.

[6] Evidence in support of polarized employment growth in Germany is also reported by Antonczyk, DeLeire and Fitzenberger (2010), although their prime focus is on exploring whether Germany has seen a polarization of wages similar to that observed for the USA.

[7] The hypothesis of the job distribution having become more polarized receives support also from the predictions of US employment growth along the whole wage distribution reported by Juhn, Murphy and Pierce (1993) and Juhn (1999), as well as by Goos and Manning (2007), who employ the same method to UK data. A polarization of the European labour market is reported also by CEDEFOP (2011) based on calculations for EU–27. The predictions by CEDEFOP (2010) concerning European jobs also project a U-shaped net employment change by occupational groups.

[8] It should, though, be noted in this context that the pervasive polarization found by Goos, Manning and Salomons (2009) does not receive support in two recent cross-country studies. Both Hurley and Fernández-Macías (2008) and Oesch and Rodriguez Menés (2010) report important country differences when it comes to employment change in middle-paid and, especially, in low-paid jobs.

[9] While the critique of the key role assigned to the skill-biased technical change hypothesis has been questioned by Lemieux (2006b, 2008) on different grounds, he notes that his explanations of the changing nature of wage inequality do not rule out the polarization-of-jobs explanation. Nonetheless, he also underlines the weak points of the 'routinization' hypothesis proposed by Autor, Levy and Murnane (2003).

a whole (e.g. Goos, Manning and Salomons, 2009; Oesch and Rodriguez Menés, 2010).[10] Although the polarization of employment is by no means a pure demand-side story, existing evidence thus justifies a strong labour-demand perspective, which is also the approach adopted in the subsequent analyses.

3 Data

We have compiled information on employment shares, wages and formal education for three-digit occupations using comparable national-level micro databases. The goal was to obtain, for each country under study, one dataset close to 1996, one close to 2001 and one close to 2006 in order to assess major changes over time. The Finnish data comes from the Labour Force Survey conducted by Statistics Finland covering the years 1999, 2001 and 2005. The Norwegian data is taken from Wage Statistics of Statistics Norway comprising the years 1997, 2000 and 2006. Both the Finnish and the Norwegian data contain occupational codes and measures of earnings and working time which are comparable over the years investigated. The Swedish data is from Statistics Sweden collected for the years 1997, 2001 and 2006. However, only the latter period, from 2001 to 2006, contains comparable occupation data, for which reason the information concerning 1997 is utilized more restrictively. The US data is the March public files of the Current Population Surveys (CPS), calculated for the years 1995, 2000 and 2005 for reasonably comparable occupational codes.

Comparing occupational codes over time and across countries turned out to be much more challenging than we had expected, even at the three-digit level. We put a lot of effort into constructing comparable figures but were, nevertheless, not fully convinced that we had succeeded in matching our detailed occupation data correctly. Accordingly, our focus is for the most part on comparisons at the two-digit level, which distinguishes between a total of 22 occupational categories. However, also at this more aggregate level, the comparability of occupational codes across countries is not entirely satisfying. The reason is that we are unable with certainty to distinguish between trends occurring as a result of changes in occupational definitions from those stemming from true changes in occupational employment and pay. Needless to say, it is important to keep this shortcoming in mind when interpreting the results presented in the subsequent sections.

However, although these words of warning are justified, it is also fair to note that the quality of our data is well in line with the data used in other recent cross-country studies of job polarization (cf. e.g. Oesch and Rodriguez Menés, 2010). Hence, we do believe that our comparisons at the two-digit level within countries over time are meaningful and add to our understanding of what is actually happening in the economy in terms of change, and not only as a result of revised definitions. Accordingly also our comparisons across countries can be seen to provide important information on crucial similarities and dissimilarities in the patterns observed.

[10] For further evidence on alternative explanations, see e.g. Blinder (2009) concerning the foreign off-shoring hypothesis and Manning (2004) as well as Mazzolari and Ragusa (2007) concerning the marketization of household production hypothesis. It is, however, noteworthy that initial results by CEDEFOP (2011) on factors underlying the growth in elementary occupations across Europe rather point to the contrary, assigning technological factors a modest role in this process.

4 Occupational employment patterns and trends

Table 1 presents a ranking into deciles of our 22 occupational categories at the two-digit level based on the median wage level of each category in the year closest to 2006.[11] 'Corporate managers' and 'Physical, mathematical and engineering professionals' appear as one of the two top deciles in all four countries investigated, whereas 'Labourers in construction and manufacturing', 'Personal and protective services' and 'Service elementary occupations' are throughout among the two bottom-end deciles. The distributional pattern of occupations is also otherwise highly similar across the four countries. Among the few exceptions are: 'Stationary-plant and related operators' and 'Customer services clerks' in Sweden, and 'Models, sales and demonstrators' in Norway. However, we suspect that these outliers are explained by differences in classifications across countries rather than by true differences in occupational pay. The main picture is that of strikingly similar rankings of occupations across countries.

Table 1 Rankings of two-digit occupations by their median wage in the year closest to 2006

	Decile ranking				
Two-digit occupation	*Finland*	*Norway*	*Sweden*	*USA*	*Mean*
Nine top-paying occupations:					
Corporate managers	10	10	10	9	9.75
Physical, mathematical, engineering professionals	9	10	10	10	9.75
Life science and health professionals	8	9	9	10	9.00
Teaching professionals	10	9	8	8	8.75
Engineering, science associate professionals	9	8	8	8	8.25
Other professionals	7	7	9	7	7.50
Life science and health associate professionals	5	6	7	9	6.75
Executive officers	6	7	7	6	6.50
Teaching associate professionals	7	8	6	4	6.25
Nine middle-pay occupations:					
Metal. machinery and related trades work	6	5	5	6	5.50
Stationary-plant and related operators	8	6	1	7	5.50
Extraction and building trades workers	3	5	6	5	4.75
Models, sales and demonstrators	4	1	6	6	4.25
Precision, handicraft, printing, etc.	5	6	3	2	4.00
Drivers and mobile-plant operators	3	2	5	5	3.75
Machine operators and assemblers	4	3	4	3	3.50
Customer services clerks	6	3	1	3	3.25
Office clerks	2	4	3	4	3.25
Four lowest paying occupations:					
Other craft and related trades workers	1	4	4	1	2.50
Labourers in construction and manufacturing	2	1	2	1	1.50
Personal and protective services	1	2	2	1	1.50
Service elementary occupations	1	1	1	2	1.25

[11] First, the median wage level is calculated for each of the 22 two-digit occupational categories. Then the occupational categories are ranked according to their median wage and, finally, classified into deciles. We use a distinction between top-pay, middle–pay and low-pay occupations that is close to the one adopted by Goos, Manning and Salomons (2009).

In Table 2, we first report the employment share of each two-digit occupation in the year closest to 2006. These shares are reasonably similar across countries, with only a few conspicuous exceptions. Most notably, we find that the USA has a lower employment share in the nine categories identified as top-paying occupations, especially in the engineering and science associate professions, and a considerably larger share in middle-pay occupations such as models, sales and demonstrators, and machine operators and assemblers. Finland and Sweden, in contrast, appear to have a larger share employed at the bottom end of the distribution, particularly in personal and protective services. Note, though, that at least some of these differences might be due to differences in definitions rather than to genuine differences in occupational employment.

The right-hand side of Table 2 reports employment growth (in per cent) over the previous decade. It is worth noting that this growth rate is calculated over slightly different periods for the four countries investigated: 1995 to 2005 for the USA, 1997 to 2006 for Norway, 1999 to 2005 for Finland, and 2001 to 2006 for Sweden. Sweden, closely followed by Finland, has experienced the most rapid growth in employment in the nine top-paying occupations, whereas the lowest growth rate is found for the USA. All countries, with the exception of Sweden, reveal negative growth rates for the middle-pay occupations. In all countries, with the exception of Finland, employment has expanded also in the lowest paying occupations. Note, however, that the weak decline in employment in the lowest-paying occupations observed for Finland is entirely due to a negative growth rate for the category of other craft and related trades workers.

Figure 1 summarizes, separately for each country, our results with respect to the relationship between occupational median wage levels and employment growth rates. More precisely, the figure plots calculated employment growth, measured as percentage growth per decade (cf. Table 2), for our 22 two-digit occupations, now classified into the different deciles of the occupational wage distribution according to the situation in the initial year. We obtain a U-shaped relationship for Norway and Sweden and, in line with results found by e.g. Autor, Katz and Kearney (2006), also for the USA. For Finland, on the other hand, such a pattern is not discernible. Instead, Finland seems to have experienced an upward-sloping pattern of employment growth: employment has been growing in the upper part of the occupational wage distribution, and declining in the lower part of the occupational wage distribution.

Figure 2 displays the results obtained when repeating the same exercise based on three-digit instead of two-digit occupations. The overall pattern is highly similar to the one depicted in Figure 1. Moreover, now the U-shape shows up for Finland as well.

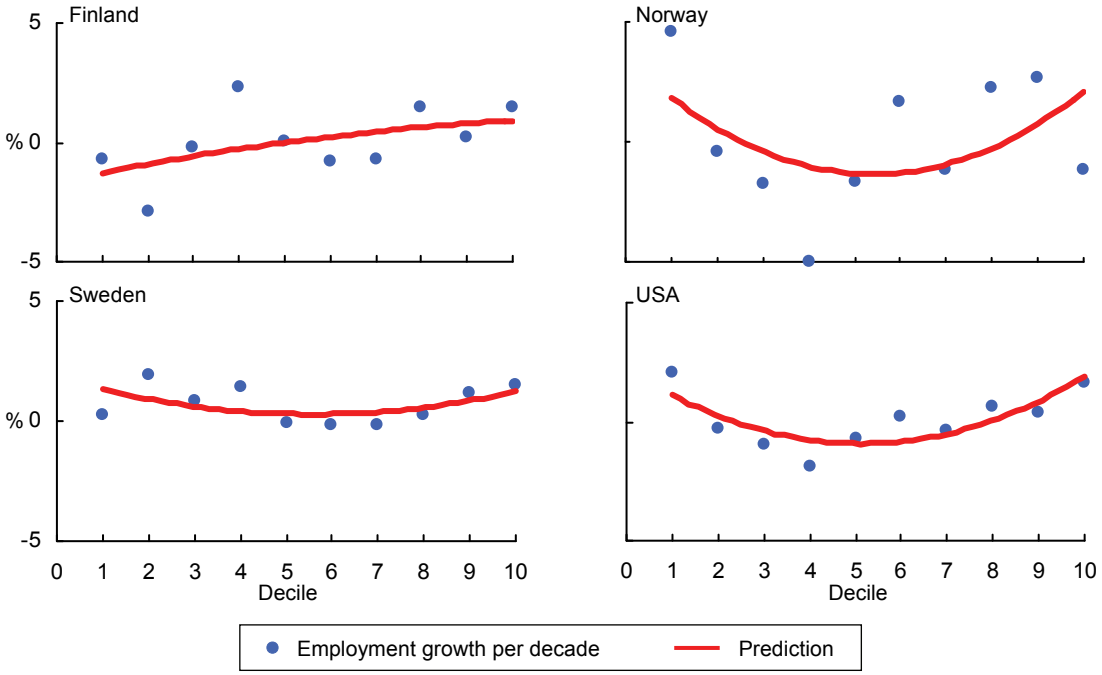
All in all, the growth in employment observed at the top end of the occupational wage distribution has been dominated by a marked expansion of engineering professionals as well as other professionals. The drop in the middle has largely been caused by a considerable decline in the relative importance of the category 'Office clerks'. At the bottom end of the distribution, all four countries investigated have experienced an increase in the employment share of especially 'Personal and protective services'.

Table 2 Occupational employment shares and growth rates

	Employment share (%), year closest to 2006					*Employment growth (%), over the past decade**				
Two-digit occupation	*Finland*	*Norway*	*Sweden*	*USA*	*Total*	*Finland*	*Norway*	*Sweden*	*USA*	*Total*
Nine top-paying occupations:										
Corporate managers	4.31	10.68	4.87	9.70	7.39	1.66	-0.30	1.18	-0.81	0.43
Physical, mathematical, engineering professionals	5.55	4.78	3.54	2.85	4.18	0.19	-0.89	0.58	0.89	0.19
Life science and health professionals	2.94	1.50	1.76	2.77	2.24	-0.91	0.25	0.62	0.75	0.18
Teaching professionals	3.21	1.14	4.91	0.89	2.54	-0.23	0.39	0.15	0.03	0.09
Engineering science associate professionals	4.22	4.84	4.64	1.99	3.92	2.35	2.28	-0.09	0.42	1.24
Other professionals	2.73	6.32	5.47	5.15	4.92	0.21	2.02	1.57	0.63	1.11
Life science and health associate professionals	4.80	1.63	2.68	3.84	3.24	1.09	0.73	0.02	0.34	0.54
Executive officers	9.15	10.92	7.81	2.01	7.47	-0.46	0.04	0.75	-0.24	0.02
Teaching associate professionals	3.36	6.54	2.00	2.12	3.50	0.74	-1.22	0.10	0.69	0.08
	40.27	**48.35**	**37.68**	**31.32**	**39.40**	**4.64**	**3.30**	**4.88**	**2.70**	**3.88**
Nine middle-pay occupations:										
Metal. machinery and related trades work	9.87	8.24	3.62	4.91	6.66	-2.14	-2.12	-0.84	-0.11	-1.30
Stationary-plant and related operators	1.80	1.68	1.31	0.23	1.25	0.06	0.89	-0.14	0.02	0.21
Extraction and building trades workers	4.11	5.17	4.47	4.32	4.52	1.08	0.47	0.95	0.33	0.70
Models, salespersons and demonstrators	7.18	4.28	3.81	9.08	6.09	1.19	0.70	1.57	-0.46	0.75
Precision, handicraft, printing, etc.	1.41	0.51	0.39	0.49	0.70	-0.71	0.03	-0.16	0.11	-0.19
Drivers and mobile-plant operators	4.12	4.22	2.94	4.16	3.86	-0.10	-0.05	0.88	0.03	0.19
Machine operators and assemblers	1.92	5.63	5.52	7.25	5.08	-0.09	-2.2	-0.32	-2.59	-1.30
Customer services clerks	1.81	1.47	1.52	7.20	3.00	-0.26	-0.38	0.38	1.36	0.28
Office clerks	6.94	11.03	7.58	10.7	9.06	-2.92	-2.82	-1.13	-2.33	-2.30
	39.16	**42.23**	**31.16**	**48.34**	**40.22**	**-3.89**	**-5.48**	**1.19**	**-3.64**	**-2.96**
Four lowest paying occupations:										
Other craft and related trades workers	3.96	1.27	0.37	0.45	1.51	-1.38	-0.32	0.02	0.02	-0.42
Labourers in construction and manufacturing	2.47	2.15	1.36	0.82	1.70	-0.02	-1.40	-0.33	0.34	-0.35
Personal and protective services	10.7	4.72	13.83	13.29	10.64	0.44	3.16	1.40	1.71	1.68
Service elementary occupations	3.45	1.30	3.98	3.13	2.97	0.22	0.75	1.05	-0.42	0.40
	20.58	**9.44**	**19.54**	**17.69**	**16.82**	**-0.74**	**2.19**	**2.14**	**1.65**	**1.31**

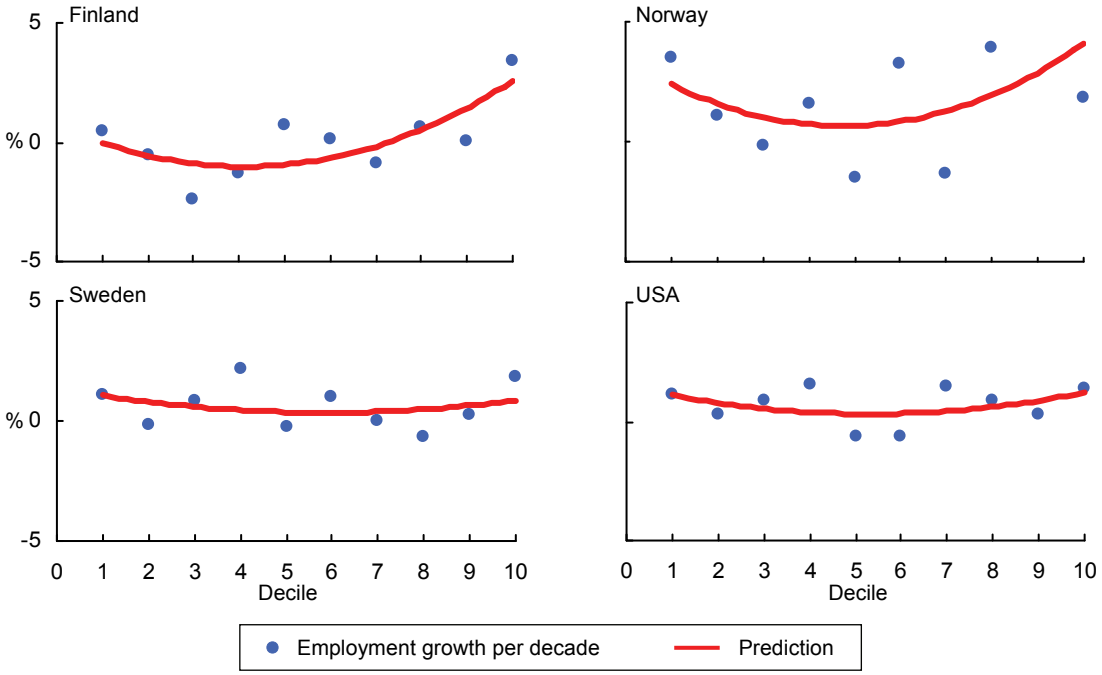
Notes: * 1997–2006 for Norway, 1999–2005 for Finland, 2001–2006 for Sweden and 1995–2005 for the USA; growth figures are normalized to growth per decade. Total means cross-country average.

Figure 1 Occupational employment growth (%) over the past decade, by decile of the initial occupational wage distribution, two-digit occupations



Notes: The figure shows employment growth rates in per cent (normalized to growth per decade) for each decile of the occupational (median) wage distribution in the initial (starting) year of the time period investigated. This initial year varies to some extent across the countries investigated, as does the length of the time period covered (see the notes of Table 2).

Figure 2 Occupational employment growth (%) over the past decade, by decile of the initial occupational wage distribution, three-digit occupations



Notes: See Figure 1.

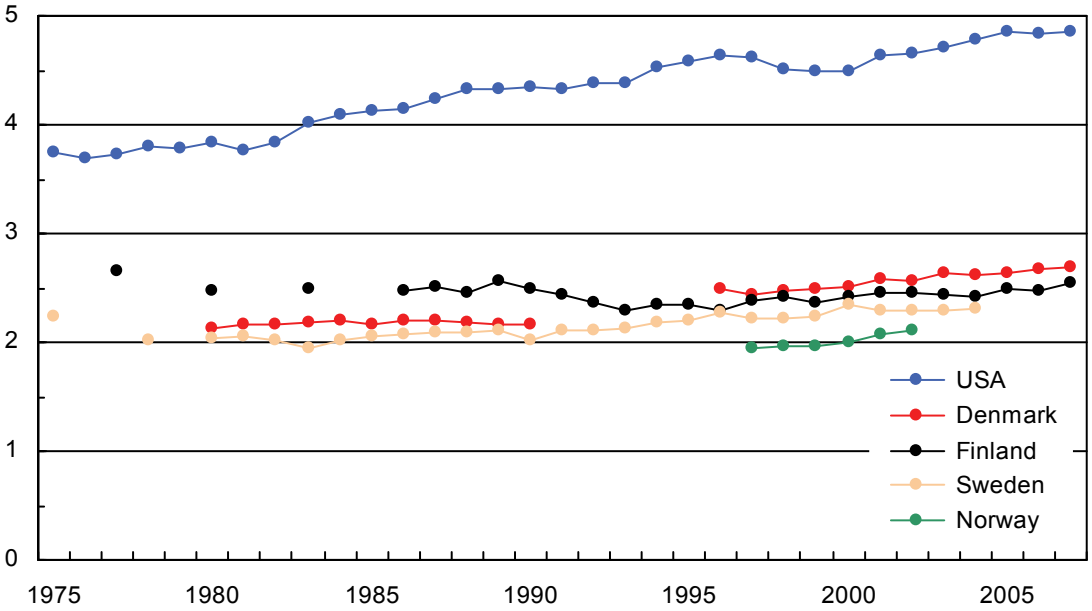
5 Wage dispersion and occupational wage trends

In order to link occupational employment patterns to wage patterns, we start by looking at the overall development of relative wages across and within the four countries under scrutiny. Figure 3a plots the evolution of relative individual wages in the Nordic countries as compared to the USA using information contained in the OECD earnings database. The overall wage dispersions displayed in the figure are calculated as the 9th decile over the 1st decile of gross hourly wages (d9/d1). As we would expect, the dispersion of wages is more than twice as large in the USA as in the Nordic countries. While all countries have experienced a growth in wage differentials, the increase has been most pronounced in the USA, where wages were most dispersed already in the first place.

Figure 3b turns the focus to the development of relative individual wages among the lower-paid, that is, among those located in the lower half of the wage distribution. The measure used, i.e. the ratio of the median to the 1st decile of gross hourly wages (d5/d1), reveals a similar cross-country pattern as the d9/d1 measure in Figure 3a. However, there seems to have been less growth in the dispersion of low wages (d5/d1) than in overall wage dispersion (d9/d1). Indeed, the bottom half of the wage distribution seems quite flat in the Nordic countries. This implies that most of the increase in wage dispersion has occurred among those earning above the median wage. This holds true especially in the Nordic countries.

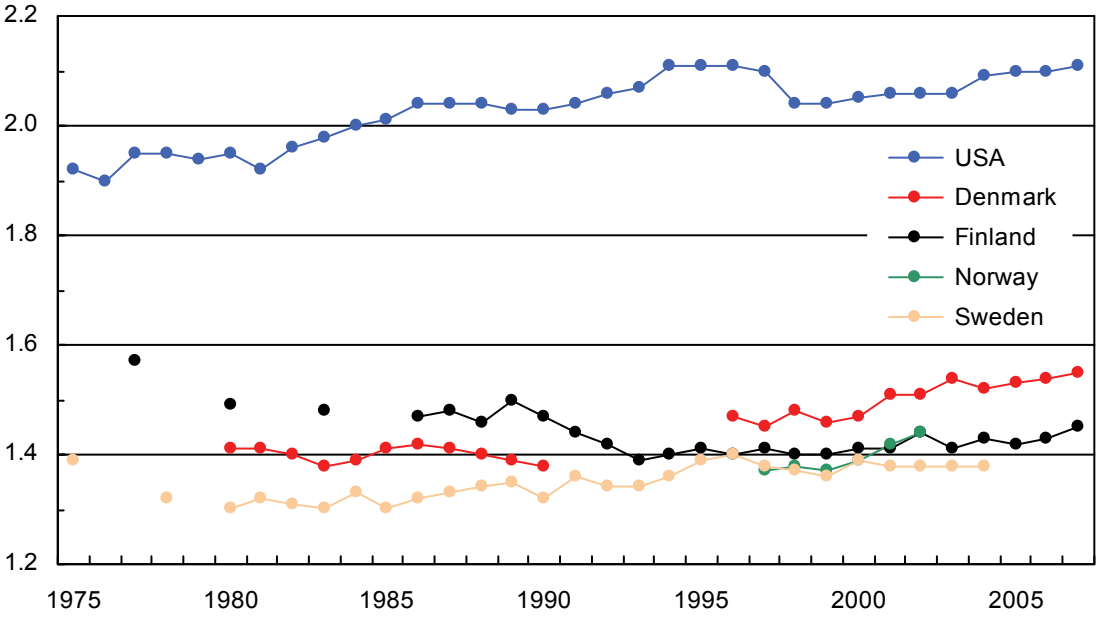
Figure 4 summarizes the average annual growth in overall wage dispersion (d9/d1) and below-median wage dispersion (d5/d1) for the period 1997 to 2007. The growth rates are calculated from the numbers underlying Figures 3a and 3b. When presented in this mode, the growth in overall wage dispersion appears to have been strongest in Norway (note, though, that the

Figure 3a Decile ratios of gross hourly wages, d9/d1, 1975–2007



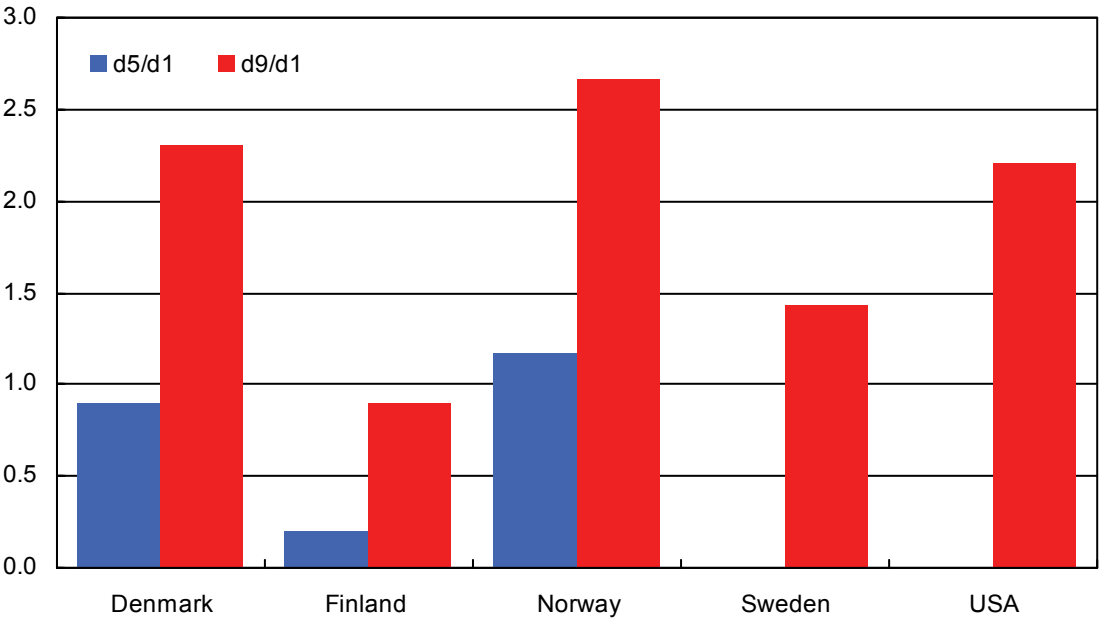
Source: OECD earnings database.

Figure 3b Decile ratios of gross hourly wages, d5/d1, 1975–2007



Source: OECD earnings database.

Figure 4 Average annual growth (%) in relative gross hourly wages, 1997–2007



Source: Calculated from the OECD earnings database as follows: Denmark, Finland and the USA for 1997 to 2005, Norway for 1997 to 2002, and Sweden for 1997 to 2003.

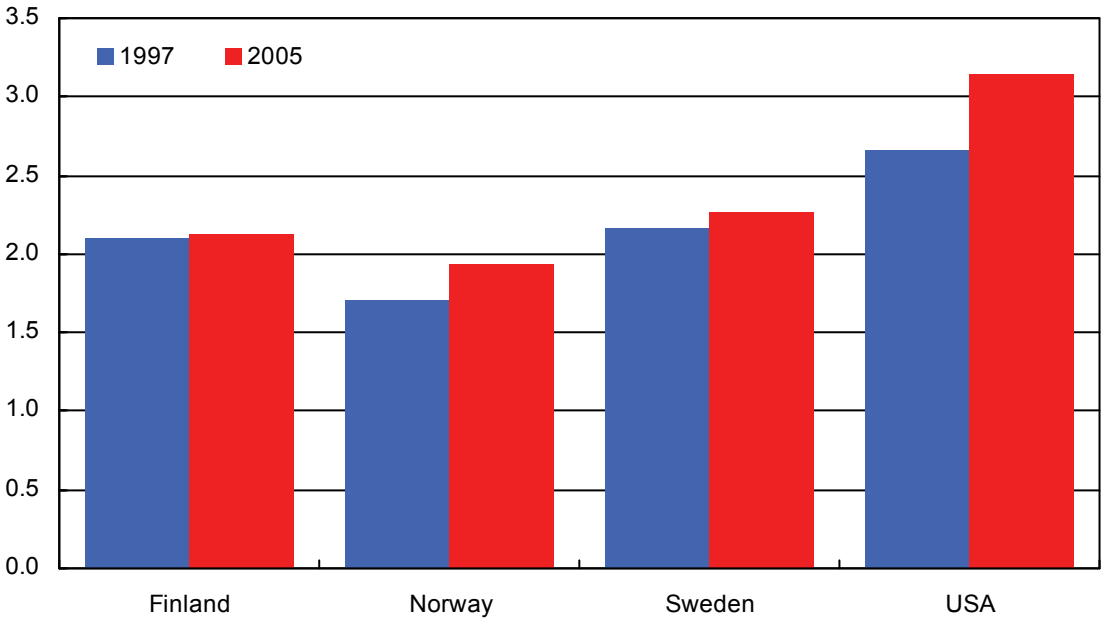
growth rate for Norway is based on the 1997 to 2002 period only) and weakest in Finland. In line with Figure 3b, not much has happened in the lower half of the wage distribution. Indeed, the USA had reached the level of below-median wage dispersion prevailing in 2007 already in 1996.

Figure 5, in turn, highlights the ratio of the median gross hourly wage in the top two-digit occupation over the median gross hourly wage in the bottom two-digit occupation for each country investigated. As in the case of overall wage dispersion (Figure 3a above), Norway turns out to have the most compressed wage structure also from an occupational point-of-view while it is the most dispersed in the USA. The difference between the USA and the Nordic countries in between-occupational wages is still stark, but not equally outstanding as when measured by the overall dispersion in individual wages. This implies that also the differences in within-occupational wages are much larger in the USA than in the Nordic countries.

Figure 6, finally, relates the median wage level of each two-digit occupation to the average wage level of the country for the end year of the time period investigated. The US occupational wage distribution displays both the highest and the lowest relative wages which is, on the other hand, hardly surprising in view of the size of the country's overall and occupational wage dispersions (Figures 3a and 5). The difference in relative wages is particularly large between engineering professionals and labourers in construction and manufacturing.

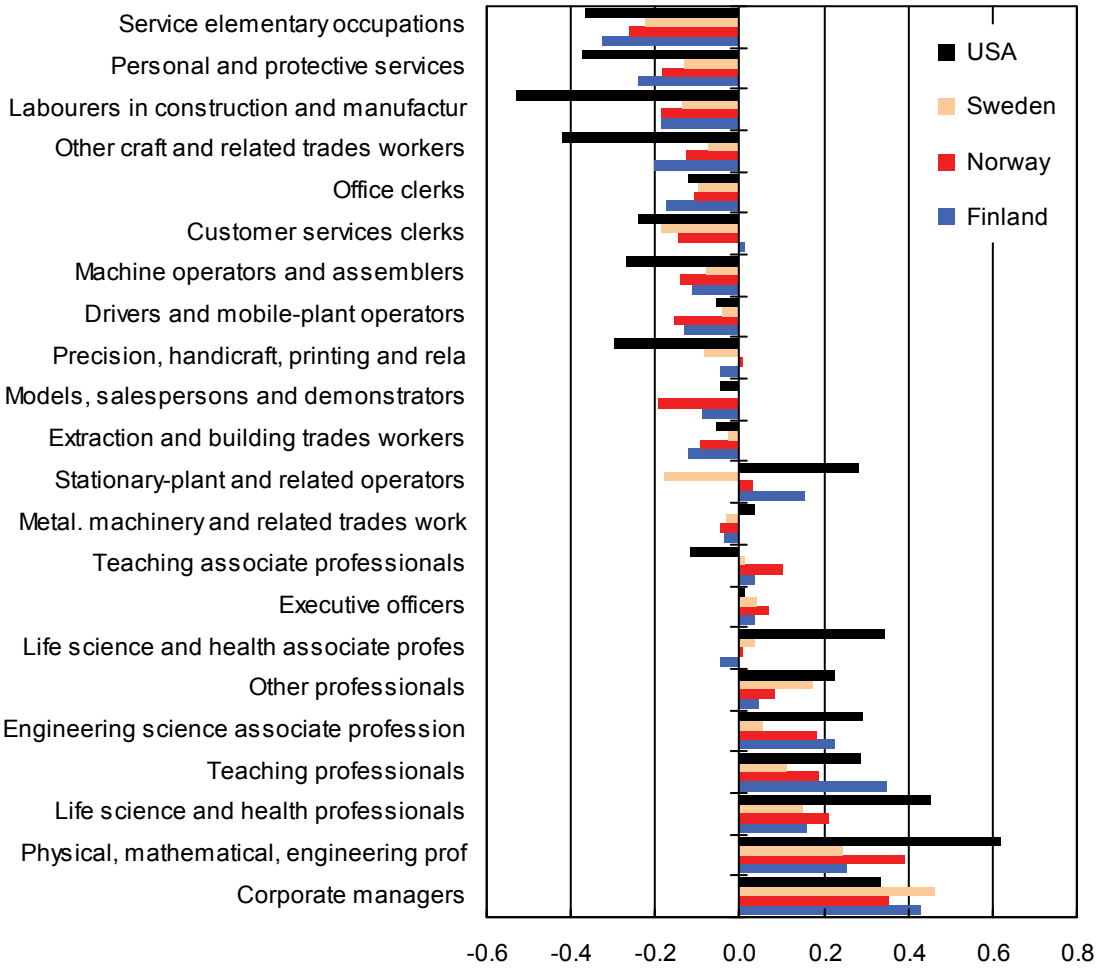
Consider next the development of relative wages within each occupation. Table 3 provides information on the growth over the past decade in the median occupational wage level of each two-digit occupation, measured relative to the mean. We find the strongest wage growth for

Figure 5 Relative occupational median wages, top-to-bottom occupation



Note: Calculated, using the available national-level micro databases, from the median wage level for the top and the bottom two-digit occupation for the year closest to 1997 and 2005, respectively.

Figure 6 Relative occupational wages, median two-digit occupational wages relative to the country average, by country for the year closest to 2006



the top-paying occupations in Sweden, followed by Finland. The middle-pay occupations have typically experienced a weakening in their relative wage position (mostly negative growth rates). In the lowest-paying occupations, the decline in the relative wage position has been substantial in both Norway and Sweden. On average, across all four countries, the top-paying occupations have gained while the middle-pay and, especially, the lowest-paid occupations have lost in relative terms.

These changes in relative wages across occupations may, of course, have induced changes also in relative employment patterns. We therefore proceed to explore whether the observed occupational patterns have changed as a result of shifts in demand or simply due to movements along the demand curve.

Table 3 Change in relative occupational wages over the past decade, deviations of the growth in median two-digit occupational wages from the growth in the country average wage level

Two-digit occupation	*Finland*	*Norway*	*Sweden*	*USA*	*Total*
Nine top-paying occupations:					
Corporate managers	0.049	-0.024	-0.067	0.082	0.010
Physical, mathematical, engineering professionals	0.002	0.012	0.123	0.112	0.062
Life science and health professionals	0.065	0.030	0.095	-0.070	0.030
Teaching professionals	0.008	-0.167	0.114	-0.147	-0.048
Engineering science associate professionals	0.039	-0.022	0.125	0.060	0.050
Other professionals	0.146	-0.127	0.009	-0.054	-0.006
Life science and health associate professionals	-0.003	-0.027	0.190	-0.009	0.037
Executive officers	0.056	-0.103	0.101	0.057	0.028
Teaching associate professionals	0.164	-0.046	0.125	0.007	0.062
	0.058	**-0.053**	**0.091**	**0.004**	**0.025**
Nine middle-pay occupations:					
Metal. machinery and related trades work	0.005	-0.073	-0.007	-0.130	-0.051
Stationary-plant and related operators	-0.238	-0.034	-0.589	0.018	-0.211
Extraction and building trades workers	0.022	-0.100	0.102	-0.049	-0.006
Models, salespersons and demonstrators	0.060	-0.049	0.101	0.008	0.030
Precision, handicraft, printing, etc.	0.095	-0.156	-0.158	-0.020	-0.060
Drivers and mobile-plant operators	0.011	-0.083	0.189	-0.083	0.008
Machine operators and assemblers	0.075	-0.126	-0.241	-0.068	-0.090
Customer services clerks	0.001	-0.104	0.083	0.011	-0.002
Office clerks	0.010	-0.095	0.143	0.110	0.042
	0.005	**-0.091**	**-0.042**	**-0.023**	**-0.038**
Four lowest-paying occupations:					
Other craft and related trades workers	0.043	-0.061	-0.197	-0.042	-0.064
Labourers in construction and manufacturing	-0.012	-0.141	-0.469	-0.085	-0.177
Personal and protective services	-0.012	-0.118	0.001	0.082	-0.012
Service elementary occupations	0.024	-0.151	0.123	-0.018	-0.005
	0.011	**-0.118**	**-0.136**	**-0.016**	**-0.065**

Note: Total means cross-country average.

6 The role of shifting demand

Consider the following relative demand equation:

$$\ln\left(\frac{n1}{n2}\right) = a - \sigma \ln\left(\frac{w1}{w2}\right), \tag{1}$$

σ where is the elasticity of substitution between $n1$ and $n2$, and a is a relative demand shifter reflecting, for instance, technological change. Moving the wage term to the left-hand side provides a simple formulae for calculating the change in the relative demand shifter, a:

$$\Delta a = \Delta \ln\left(\frac{n1}{n2}\right) + \sigma \Delta \ln\left(\frac{w1}{w2}\right), \tag{2}$$

where Δ indicates change per unit of time.

Table 4 presents results for the demand shift calculated separately for each two-digit occupation. For illustrative purposes, we have evaluated the shift in demand under the assumption of unit elasticity of relative demand with respect to own relative wage ($\sigma = 1$).[12] Our results for the cross-country average indicate that the underlying growth in demand for the nine top-paying occupations is slightly larger: 4.11 as compared to 3.88 (in Table 2 above) when adjusted for relative wage growth. For Finland and Sweden it is conspicuously higher, though. The drop among the middle-pay occupations is also magnified: an average of -3.27 compared to -2.96. The growth in demand among the lowest-paying occupations is, in contrast, slightly overestimated when using employment figures only: 1.05 versus 1.31. This finding implies that part of the employment growth in these occupations is due to the notable weakening in their relative wage position (cf. Table 3).

Table 4 Corrected employment change, when keeping relative occupational wages constant

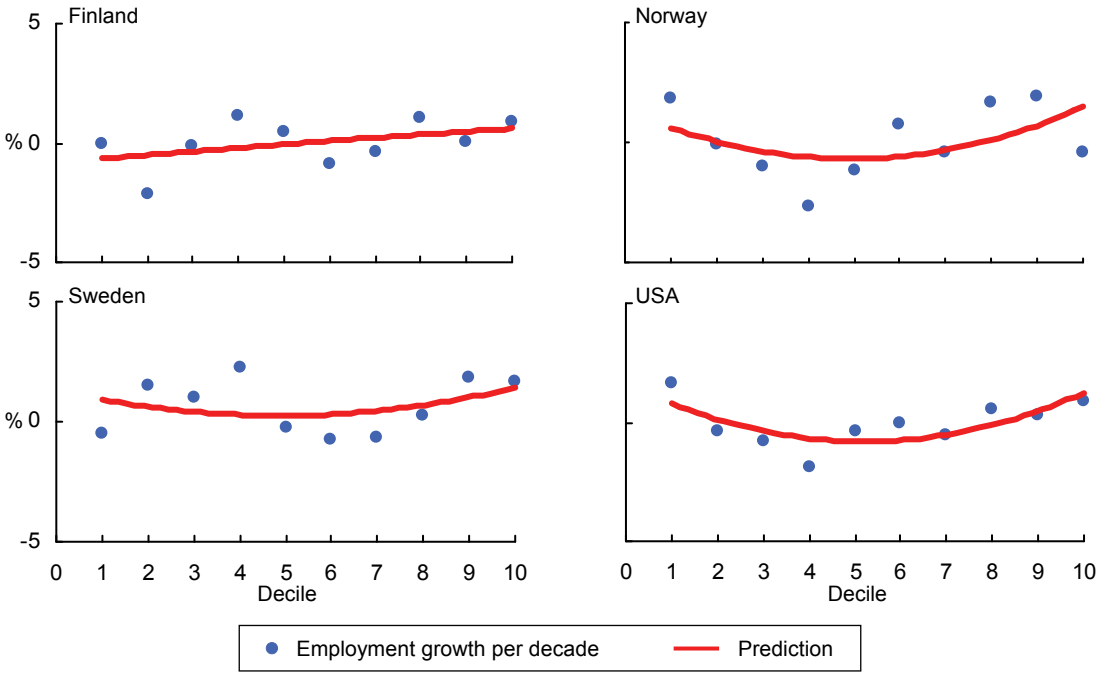
Two-digit occupation	*Finland*	*Norway*	*Sweden*	*USA*	*Total*
Nine top-paying occupations:					
Corporate managers	1.71	-0.32	1.12	-0.73	0.44
Physical, mathematical, engineering professionals	0.19	-0.88	0.71	1.01	0.26
Life science and health professionals	-0.85	0.28	0.72	0.68	0.21
Teaching professionals	-0.22	0.22	0.27	-0.11	0.04
Engineering science associate professionals	2.39	2.26	0.04	0.48	1.29
Other professionals	0.36	1.89	1.58	0.57	1.10
Life science and health associate professionals	1.09	0.70	0.21	0.33	0.58
Executive officers	-0.40	-0.07	0.85	-0.19	0.05
Teaching associate professionals	0.91	-1.27	0.22	0.69	0.14
	5.18	**2.81**	**5.72**	**2.73**	**4.11**
Nine middle-pay occupations:					
Metal. machinery and related trades work	-2.13	-2.19	-0.85	-0.24	-1.35
Stationary-plant and related operators	-0.18	0.86	-0.73	0.04	0.00
Extraction and building trades workers	1.10	0.36	1.05	0.28	0.70
Models, salespersons and demonstrators	1.25	0.65	1.67	-0.45	0.78
Precision, handicraft, printing, etc.	-0.62	-0.13	-0.32	0.09	-0.24
Drivers and mobile-plant operators	-0.09	-0.14	1.07	-0.05	0.20
Machine operators and assemblers	-0.01	-2.33	-0.56	-2.66	-1.39
Customer services clerks	-0.26	-0.48	0.46	1.38	0.28
Office clerks	-2.90	-2.91	-0.98	-2.22	-2.25
	-3.84	**-6.31**	**0.81**	**-3.83**	**-3.27**
Four lowest paying occupations:					
Other craft and related trades workers	-1.34	-0.38	-0.18	-0.02	-0.48
Labourers in construction and manufacturing	-0.03	-1.54	-0.8	0.26	-0.53
Personal and protective services	0.43	3.04	1.4	1.79	1.67
Service elementary occupations	0.24	0.59	1.17	-0.44	0.39
	-0.70	**1.71**	**1.59**	**1.59**	**1.05**

Note: Total means cross-country average.

[12] We regard this to be a conservative assumption. A commonly used estimate for college/non-college substitution is 1.4 (see e.g. Autor, Katz and Kearney, 2006).

In Figure 7, we illustrate the change in the demand shifter for each decile of the initial (starting-year) two-digit occupational wage distribution. The overall pattern is very similar to that observed in Figure 1. In other words, we still have a 'smiley' pattern in all countries, except for Finland, where the decline in the category 'Other craft and related trades workers' keeps demand down (at the two-digit level) also after conditioning on the change in relative wages.

Figure 7 Corrected occupational employment growth (%) over the past decade, by decile of the initial occupational wage distribution, two-digit occupations



Notes: See Figure 1.

7 Conclusions

We have found a tendency of polarization also in the Nordic labour markets; employment has grown both at the top and at the bottom of the occupational wage distribution, whereas it has grown less or declined in its middle spectrum. This pattern is highly similar for Norway, Sweden and the USA. In Finland, there has been less growth in employment at the bottom end of the distribution, at least when using two-digit occupations. However, when extending the analysis to occupations at the three-digit level, a pattern of polarization is clearly discernible also for Finland.

Looking at all four countries together, employment growth in the top-paying occupations has been dominated by a large increase in the category of 'Engineering professionals and other professionals'. The drop in the middle has, in turn, been driven by a marked relative decline in the category 'Office clerks', whereas the growth at the bottom end has come about mainly from

increased employment in 'Personal and protective services'. This overall pattern, which is similar to that found in other countries, is consistent with the polarization hypothesis and theories relating technical change to computerization and substitution of work away from routine jobs, which are more prevalent in the middle of the wage distribution, towards non-routine jobs, which are more prevalent at the fringes of the wage distribution.

At the same time, however, relative wages have increased for the top-paying occupations and declined for the middle-pay and, especially, for the lowest paying occupations. This indicates that the growth in the demand for top-paying occupation holders is underestimated, rather than overestimated, if we take into account only the change in employment. By the same token, the drop in the middle may be underestimated while the growth in the bottom might be due to substitution rather than to a genuine demand shift.

Calculations based on the assumption of unit elasticity of substitution show, however, that the U-shaped pattern of employment change observed (at the two-digit level) in three out of the four countries under scrutiny prevails also after controlling for concomitant changes in relative occupational wages. Hence, it seems that also the Nordic countries have experienced a shift from skill-biased technological change to non-routine-biased technological change – or, more likely, a combination of the two – and that this process has not been particularly dampened by compressed wage structures or relatively more rigid wages.

Having said this, it should nevertheless be kept in mind that our results need to be interpreted with some caution, particularly when it comes to comparisons across countries, as we have not been able to reach a fully satisfactory cross-country comparability of occupational codes. Nonetheless we are convinced that our results provide useful new insight into the polarization of work, especially when it comes to the evolution within countries over time. Moreover, steadily improving quality of occupational codes will certainly foster future research within this particular field, and also encourage further efforts to ameliorate the comparability of occupational codes both across countries and over time.

The short time span covered by our data is inevitably a constraint on the analysis performed. Skill-biased technological change, computerization and globalization have affected the US economy for a long time and must be expected to have affected also the Nordic economies for decades. Since all four countries covered in our analysis are characterized by advanced technologies and extensive computer usage, we have no reason to believe that computerization has affected the Nordic countries much differently than the USA.

However, the openness of the countries differs widely, implying that globalization might have a different impact in the Nordic countries than in the USA. In 2009 the trade-to-GDP ratio was 90.1 for Sweden, 69.4 for Norway and 72.3 for Finland compared to only 30.4 (in 2008) for the USA. The more open the economy, the more vulnerable it may be when it comes to keeping up with technological change that reduces the demand for middling jobs. Hence, to the extent that globalization enforces polarization it could, therefore, be expected to have driven structural change more forcefully in a country like, say, Sweden than in the USA, thus lowering the share of middling jobs much more in Sweden. Indeed, this line of reasoning receives support in that the employment share of middling occupations (according to Table 2) is by far the largest, or 48.3 per cent, for the USA compared to 42.2 for Norway, 39.2 for Finland and only 31.2 for Sweden.

The middling jobs come out as the losers in the polarization process. A factor of importance to this structural effect would then be the extent of downward wage rigidity (DWR) in the middling jobs. As unionization rates are relatively high in Finland and Sweden and relatively low in the USA, it might be the case that DWR is stronger in Finland and, notably, in Sweden. On the other hand, the aim of the so-called Swedish model, a long-standing union policy pursued in Sweden, is not to prevent, but rather to encourage, structural mobility and skills upgrading of workers. Hence, our results do not run counter to the notion that the Nordic models of wage setting combine wage compression with structural mobility.

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