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Gendered Labor Markets and Occupational Change in the Nordics[1]

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ABSTRACT

Recent research on changes in the occupational structure in the Nordic region points in different directions. Some studies indicate upgrading of jobs with better quality, advanced skill requirements, and higher wages, while others show tendencies toward polarization in the skill distribution of jobs. The present article finds gendered patterns of upgrading or polarization in the occupational structure in the Nordic countries in the years 2012–2019. The changes in the occupational structure have been more beneficial for women, who increasingly occupy higher-level positions. Especially, the public sector has served as a vehicle for high-level female positions. While previous research has stressed technological change, especially digitalization as the primary driver of change, this article argues that developments in the public sector also need to be considered to fully understand occupational change in the Nordic region.

KEYWORDS

gender / labor markets / occupational change / quality of jobs

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Introduction

In recent decades, technological change, mainly through digitalization, has had a profound impact on the occupational structure in Europe and the United States (Acemoglu & Autor 2011; Goos et al. 2009). However, research has reached differing conclusions on how the occupational structure is changing in the Nordic region. Some studies have found that the changes toward upgrading – a trend in the direction of jobs with better quality, advanced skill requirements, and higher wages – is unbroken, while others have shown tendencies toward polarization, with a growth in both ends of the skill distribution of jobs (Asplund et al. 2011, Berglund et al. 2020; Fernández-Macías 2012).

A complicating factor in assessing changes in Nordic labor markets is that they are highly gender-segmented. While a high percentage of people working in occupations in manufacturing and construction are men, women dominate occupations related to the welfare state, care jobs, cleaning, etc. One explanation of the high gender segregation is the large public sector, which, during its expansive phase in the 1960s and 1970s facilitated women labor market participation, both by overtaking many domestic services and by providing employment opportunities on a massive scale (Anker 1998; Cohen 2016). Thus, Nordic job demand shifts due to digitalization take place in a context of strong influence from political priorities related to the public sector, and changes in the occupational distribution may affect women and men very differently.

A few studies have addressed possible gender bias of occupational change, with a common trend in advanced economies being a declining share of women working in middle-skilled occupations (Cerina et al. 2021, Fernández-Macías et al. 2016, Green 2019). Webb (2009) studied employment restructuring, gender and occupational change in Japan, Sweden, the UK, and the USA since the 1980s, and found that pre-existing patterns of occupational segregation were uniformly reinforced. However, occupational upgrading also facilitated women moving into a range of professional and managerial occupations, especially in Sweden. A recent study from Norway in the period 2004–2018 showed that the share of female employment in the low-paid end of the occupational distribution decreases, while it increases in the upper end (Barth & Østbakken 2021). Studies from Germany further suggest that the effects of technological change have been more prominent for women, with job task content shifting from routine to nonroutine analytic and interactive tasks (Black & Spitz-Oener 2010; Lehmer & Matthes 2015).

The main purpose of the present article is to study whether changes in the occupational structure in the Nordic countries affect the occupational distribution of women and men differently. Hence, we ask whether the consequences of the changes in the occupational structure are similar for men and women, or if there are gendered patterns of upgrading or polarization in the Nordic countries.

We analyze data from the Labour Force Survey (LFS), from all the Nordic countries, focusing on the period between the financial crisis and the pandemic (i.e., 2012–2019). While previous studies have looked at occupational change in some of the Nordic countries, the present article is the first to include all five Nordic countries using similar data.

Technological drivers of occupational change

Most research has emphasized digital technological development as the main driver of recent decades change in the occupational distribution (e.g., Brynjolfsson & McAfee

2014). More specifically, it is not the demand for specific occupations per se that is changing, but the demand for new work tasks that workers should be able to conduct (Acemoglu & Autor 2011). Recent research asserts that non-routine tasks – either cognitive (such as that conducted by technicians), interactive (e.g., managers), creative (designers, etc.), or non-routine manual (such as waitresses) tasks – are either supplemented or non-replaceable by the digital technology. Routine work tasks (i.e., tasks that are possible to codify and robotize), either manual (such as those typical in assembly work) or cognitive (clerical work tasks, for example), are exposed to replacement by automation (Autor 2015; Autor et al. 2003).

Obviously, the distribution of occupations is affected by the mechanisms of task substitution and task complementarity, as occupations are defined as bundles of typical work tasks associated with occupational titles (Elias 1997). Moreover, by taking into account the distinction between the functional tasks associated with the occupation and the skills endowed in the individual needed to conduct those tasks (Acemoglu & Autor 2011), changes in the occupational structure also affect the skill level of workers in demand in the labor market. The most influential research has used occupations' average wages (per hour or full-time equivalents) as the basis for classifying occupations to measure changes in the occupational structure (Autor et al. 2006; Goos et al. 2009). Wages are related to skill-levels and coincide with the characteristics of the work tasks conducted within occupations (Goos & Manning 2007). Non-routine work tasks are accumulated at both ends of the wage distribution of occupations, with manual non-routine jobs in the lower-paid end and cognitive non-routine jobs at the higher-paid end. Routine work tasks, both manual and cognitive, tend to be found in the middle of the occupational wage distribution. Due to this distribution and the tendency of digitalized technological change to replace routine job tasks, employment in the middle of the occupational wage structure is at risk of declining, while employment at both ends of the distribution tends to increase. This polarization effect of technological change has been called routine-biased technological change, or RBTC (Goos et al. 2014), a pattern of change that strongly diverges from the upgrading pattern, called skilled-biased technological change (SBTC), which is found in much of the preceding research (Berman et al. 1998; Katz & Murphy 1992).

Empirical support for the replacement of occupational upgrading with polarization has been found in several countries. In the United States, Autor et al. (2006) showed that polarization replaced upgrading in the 1990s, and Goos and Manning (2007) and Dustmann et al. (2007) found similar patterns in the United Kingdom and Germany, respectively. Similar observations of polarization have been found in other OECD countries (Goos et al. 2009; OECD 2017). This includes the Nordic region, where Asplund et al. (2011) showed polarization tendencies in Finland, Norway, and Sweden (data from the period 1995–1996 to 2006), and several more recent studies have detected polarization on the Swedish labor market (Åberg 2015; Adermon & Gustavsson 2015; Heyman 2016).

The thesis of technology-driven occupational polarization has also been criticized. Several studies have observed large variations in how the occupational structure is changing (Eurofound 2017; Fernández-Macías 2012; Oesch & Piccitto 2019). Variations have also been found in a study of four Nordic countries in the period 2000–2015, with only Denmark having a clear pattern of polarization (Berglund et al. 2020). Thus, this variation indicates additional mechanisms to digital technological change with significance

for occupational change, especially variations in institutional settings, such as industrial relations systems, (de)regulation, as well as the size of public employment (see Eurofound 2017).

The theoretical foundation of the RBTC assumption has also been criticized. According to Autor et al. (2003), computerization should substitute work tasks that are repeatable, predictable and standardized, and therefore possibly programmable. Moreover, those work tasks should mainly be present in middle-level occupations (see Goos & Manning 2007). However, when Fernández-Macías and Hurley (2017) operationalized and tested it, they found that the level of routine tasks in jobs cannot predict polarized outcomes of occupational change because routine work tasks are not placed in the middle of the skill and wage structure of occupations, but rather at the bottom, and are linear related (negatively) to the occupational-wage structure. Furthermore, cognitive work tasks are positively related to the position in the occupational wage structure and are therefore more common in the upper than in the lower end. Both of these results point more toward SBTC than toward RBTC.

Productivity and occupational change

While criticism of the polarization thesis has mainly focused on the skills required for the new jobs created by digital technological change, the theoretical starting point of RBTC is the productivity-enhancing effects of the new technology on the required skills. Investments in technology usually increase the productivity of jobs, as the output of work per hour is amplified (Carlsson et al. 2014), which is a key factor for wage levels (Åslund et al. 2021; Carneiro et al. 2012). In the case of lower-level jobs that can be automated, the remaining jobs become more productive than before the change. Concerning higher-level jobs, digital technology augments the productivity of the human capital required for those jobs as the output becomes more valuable, for example, by increasing the quantity (e.g., architects can serve more customers by completing drawings faster) and quality (e.g., the design becomes more exact and complex with the aid of computers).

RBTC also includes a third category of workers, that of lower-level non-routine jobs, such as child-care workers, waiters, and haircutters. The productivity of those jobs is less affected by technological progress, and they are only exposed to substitution or augmentation by digitalization to a small degree. Consequently, low productivity in combination with low skill requirements make those workers exchangeable and render the wage level lower than in the two other categories of occupations.

However, the reason why digitalization should increase employment in low-paid non-routine jobs is, theoretically, not particularly clear-cut. Because there are fewer possibilities to substitute those workers with technology, the number in those jobs does not decline at the same rate as better paid routine jobs higher up in the hierarchy (such as clerical jobs or assemblers). However, this mechanism does not explain why those jobs also should increase in numbers. One suggested explanation, beside population growth, which automatically can increase some service jobs (such as childcare workers and elderly care), is the growth of higher-paid strata in the occupational structure, who may consume personal services (Mazzolari & Ragusa 2013).

One problem with this explanation is the so-called Baumol's cost disease, which states that differences in the potential for improved productivity between industries in

the economy tend to shift employment from those with great potential of productivity growth (meaning replacing labor with capital, such as machines and robots) into industries with fewer productivity increases (such as the service industry) (Baumol 1967). To the extent that the service industries follow general wage increases in society, where export industries and manufacturing are often the pacesetter, the costs of running service businesses increase while those costs cannot easily be compensated by productivity gains.

According to Esping-Andersen (1999; see also Oesch 2015), there are three possible outcomes of this cost disease dilemma. One is that the relative wages in service industries are pressed downward, a road often found in liberal employment regimes with weak unions (such as the UK). The service industries may then be able to absorb much of the employment shift from industries, albeit at the cost of increasing inequality. However, if wages are sticky downwards, due to strong unions, for example, the scenario is that those service tasks will not take place in the labor market, but remain within the family as unpaid work, while general unemployment levels tend to increase. This scenario has historically often been found in continental labor markets, such as Germany (Oesch 2015). In the Nordic countries, however, which have strong unions, wage compression, and governments committed to full-employment, tax-financed public employment has historically been used to create a large service sector that have moved women from unpaid domestic work into the labor market and absorbed the unemployed, without pressing down wages to make these services affordable. Moreover, the wage compression tends to decrease the wage level of high-skilled employees below their presumed market price. If digitalization also augments the productivity of high-skilled workers, this creates a strong mechanism in the Nordics in the direction of upgrading.

Private and public employment in the Nordic production regime

The above discussion gives a strong rationale for focusing on the private–public divide to understand the possible gendered occupational change in the Nordic region. The expansion of social welfare and public sector employment in these countries have had a tremendous impact on the Nordic occupational structure (Esping-Andersen 1990, 1999). Well-developed social security systems and social services, particularly parental leave benefits, child-care services and elderly-care, have created possibilities for a larger part of the labor force than in many other countries to participate in paid labor, especially in the public sector. This has impacted female employment, otherwise tied to domestic traditional work tasks (Esping-Andersen 1999). Moreover, the construction of the welfare state also implied new administrative jobs in the expanding bureaucracy.

In particular, the effects of welfare expansion are shown in the employment rates for women and men in the Nordic region (Table 1). The female employment rate was clearly highest in Finland until the middle of the 1970s. In Sweden, the female employment rate started to increase in the 1960s, reaching an all-time high in 1991 (79.3%). Denmark and Norway did not reach the Finnish level (around 69–70%) until in the first half of the 1990s. However, the financial crisis of 2009 hit the Danish labor market particularly hard. For women, the employment rate decreased from 73% in 2008 to 69% in 2010,

and it was not until 2017 that the employment rate passed the 70% level again. Iceland can be regarded as an outlier in the Nordic region, with higher employment rates for both genders.

Table 1 Employment rates in the Nordic countries, women and men

		1965	1972	1983	1991	2002	2012	2019	2024
Denmark	Women	–	–	64.3	70.1	71.8	68.5	72.2	74.5
	Men	–	–	76.2	79.1	80.1	73.6	78.1	80.0
Finland	Women	61.6	61.7	68.4	68.4	66.6	68.2	71.8	72.4
	Men	82.9	77.2	71.5	73.0	70.4	70.9	74.3	72.8
Iceland	Women	–	–	–	74.5	79.8	78.5	81.7	82.3
	Men	–	–	–	85.2	85.7	81.9	85.8	88.1
Norway	Women	–	47.9	63.3	67.0	73.7	73.8	73.1	75.0
	Men	–	81.0	83.5	77.1	79.9	77.6	77.4	79.1
Sweden	Women	52.8	60.1	74.8	79.3	73.4	71.8	75.4	75.2
	Men	88.6	84.5	83.0	82.7	76.9	75.6	78.8	78.1
Germany	Women	–	47.3	47.0	56.3	58.8	68.1	72.8	74.0
	Men	–	86.9	75.5	77.6	71.7	77.9	80.5	80.8
US	Women	41.5	46.8	56.2	63.3	66.1	62.2	66.3	67.5
	Men	84.4	82.3	76.5	78.9	78.0	72.3	76.5	76.3

Per cent of labor force. Source: OECD Database, extracted May 4, 2021. Figures for 2024 extracted May 14, 2025.

The strong relationship between female employment and the expansion of the Nordic welfare state is evident if we compare the figures of two countries from other welfare regimes included in Table 1, namely, the United States and Germany. The US is the archetype of the liberal welfare state, with individualized welfare through private insurance, and provided by private companies (Esping-Andersen 1999; Korpi & Palme 1998). However, this employment regime has never had female employment rates near the Nordic levels, even though they have increased over time. Germany is usually regarded as the main example of the 'conservative' welfare regime. According to OECD figures, female employment did not reach 50% until as late as 1989 and in 2004 it was 59%. Since then, it has increased strongly, up to 70% in 2015. This development can be partly explained by family-friendly welfare reforms in Germany, such as increased possibilities for parental leave and childcare (Seeleib-Kaiser 2016).

In summary, the expansion of welfare state in the Nordic region has had a strong and positive impact on female employment. However, the expansion of public sector jobs has also had the side effect of gender-segregating the labor market. In the 1980s, all of the Nordic countries (excluding Iceland) were in the upper half of the most gender-segregated labor markets in OECD (Charles 1992). The implications are that men and women may be affected by rather different factors that affect the occupational structure. Moreover, if those factors are specific for either of the two sectors, private and public, the outcomes should differ for men and women.

Changes in the public employment sector

The public sector has changed in at least three dimensions over the last decade, albeit with variations in the extent, timing, and rate, between the countries. First, the size of the sector has changed in some of the countries. Finland, Norway, and Sweden have seen few changes during the last 10 years in the share of the public sector of all employed, with Norway and Sweden with the highest level (29–30%), and Finland, together with Iceland, experiencing the lowest level (24–25%). Both Iceland and Denmark were severely hit by the Global Financial Crisis in 2009–2010, with declines in private employment, which made the relative size of public employment increase. Since then, however, the private labor market has recovered, and the relative size of public employment has decreased somewhat, in Denmark from 29.7% 2012 to 27.6% in 2019, and in Iceland from 26.9% to 24.9% (OECD 2022).

Second, new forms of organizing and governance of the public sector have been introduced, most importantly the introduction of the so-called New Public Management (NPM). NPM is a way of organizing and governing the public sector with more business-like methods, with strict budget and quality controls, decentralization and outsourcing of operations, and emphasizing the distinction between political decision-making and direct management (Alonso et al. 2015). This reorganization of operations particularly implies new functions in the organization, mainly focusing on control and budget discipline, as well as the coordination of in-house buy-and-sell systems.

Third, private providers of tax-financed welfare have expanded in the Nordic region. Sivesind (2017) compared Denmark, Norway, and Sweden and showed that employment in private welfare services since the 2000s has expanded in Norway and Sweden, catching up to and even passing the Danish level in 2013. In all three countries, people employed by private providers constitute about 20% of all employed in welfare industries. Furthermore, the characteristics of these private providers differ between the countries. In the Danish case, they mainly consist of non-profit organizations, while in the case of the other two countries, the lion's share are employed in for-profit companies (Sivesind 2017). The growth of for-profit welfare providers has been particularly strong in Sweden (Hartman 2011). Between 2007 and 2018, the share within education, health, and elderly care that were privately employed increased from 14% to 22% (SKR 2019).

Returning to possible consequences of these processes on the occupational structure, an increasing share of private welfare providers could imply that the lowest paid occupations increase in numbers in the private sector. The main reason for this is that several occupations in the public sector that start working in private establishments, such as assistant nurses and child-care workers, are relatively low paid. Moreover, private welfare companies financed through public means via procurements where the lowest bidder gets the contract have a strong incentive to increase profit by cutting labor costs. Examples include private schools that avoid employing accredited teachers, or health care institutions increasing the number of complementary personnel to physicians, such as assistant nurses. In the public sector, however, the outsourcing of activities may reduce the number of low-paid positions, at the same time as increasing the numbers in high-paid positions (Berglund 2024). The latter category will not be the kind of occupations one normally associates with the public sector, such as physicians or teachers. Instead, it will be occupations necessary to operate complex NPM systems, including outsourcing

activities to private providers. Examples of those occupations could be administrative managers, jurists, and economists.

Consequently, we expect the ongoing restructuring of the public sector to affect the overall labor market and occupational structure. First, in the private sector, we expect the mechanism of RTBC – that is, substitution of routine tasks, and expansion of higher-level cognitive tasks – to continue. This will reduce the number placed in the middle of the occupational pay structure and increase the numbers in the upper end. However, to the extent that the public sector makes use of private providers, the demand of people in the lowest paid service jobs may also increase, as tax money flows into the private sector. Therefore, we expect the private sector to polarize. Second, in the public sector, we expect to find a strong upgrading tendency; however, this upgrading is not primarily related to technological change, but to the restructuring of the public sector. On one hand, low-paid welfare service jobs are increasingly being outsourced to the private sector. On the other hand, new professional and administrative work tasks need to be conducted in the public sector to the extent that NPM systems and public procurements are key elements of public operations. The question then remains as to how these processes may affect the gendered labor market.

Occupational change and gender

Welfare state expansion in the Nordic region has led to a heavily gender-segregated labor market, with women concentrated on rather low-paid service sector jobs with reduced possibilities for advancement (Mandel & Semyonov 2006). However, the two processes discussed above – digital technological change and the restructuring of public sector jobs – may start to alter gender segregation in the Nordic labor markets. According to both RBTC and SBTC, the digitalization and technological advancement of production systems bias labor market change in favor of high-paid and high-skilled jobs. For a long time, a larger share of women than men have attained tertiary education. As of 2019, in the majority of the Nordic countries, more than 55% of women aged 25–34 years had tertiary education; Sweden was the only Nordic country in which men passed the 40% level (OECD 2021). The difference in educational attainment indicates that more women today have skills in tune with the changing occupational structure, and benefit from the rising demand for high-skilled labor. Men may become more likely to find employment further down the occupational structure than previously, particularly if the occupational structure is polarizing as several male-dominated occupations are located in the middle of the structure.

The recent changes in the public sector may also have altered both the horizontally and vertically gender-segregated Nordic labor markets. On one hand, privatization and other changes in public employment can imply more demand for low-skilled employees in the private sector. Traditionally, women tend to occupy those positions, but research is required to determine whether this tendency still holds. On the other hand, extensive public procurement of private services in some of these countries, as well as other organizational changes in the public sector (NPM), may upgrade the occupational structure within the public sector, as economists, jurists, and HRM experts constitute important professional functions. Thus, we expect that new career positions have opened up in the

public sector, and with a well-educated female workforce, there is a high probability that women will increasingly tend to occupy those positions.

In summary, there are two mechanisms behind an altered gender composition of the occupational structure in the Nordics. The first is the ongoing transformation due to digital technology, which increases the number of jobs higher up in the occupational structure and decreases middle-level jobs. Due to their educational advantage, women find more opportunities of employment in those high-skilled jobs than men, who instead tend to lose employment opportunities in middle-layer jobs. Second, restructurings in the public sector add to opportunities of high-paid jobs for women. However, low-paid jobs are increasing in the private sector, where an important factor is the privatizations of public sector jobs. How this affects the overall gender distribution in low-paid occupations remains uncertain, although fewer employment opportunities in middle paid jobs, as well as population growth in most of the Nordic countries, may increase the share of men.

Data and methods

The analyses in the present paper follow the so-called wage approach to measure changes in the occupational structure (Åberg 2015; Autor 2006; Berglund 2024; Goos & Manning 2007). As has been discussed above, wages are related to the technological component in a job, either by increasing productivity of production by replacing jobs or by augmenting the productivity of work tasks; the latter often renders higher wages for employed than for those that are replaced. However, a third category of jobs are exposed to Baumol's cost disease, where technology plays a very reduced role for productivity. The effect is that businesses using those jobs, which are often service jobs, are highly dependent on labor costs for profit, which tend to press wages to the lower part of the wage distribution. However, an alternative way of measuring the effect of technology is to focus on the specific work tasks that changes lead to (Fernandez-Macias & Hurley 2017), or the complexity of work tasks (Tåhlin 2023), or on job quality (Oesch & Piccitto 2019). Of course, all these avenues of research are of great interest for research on occupational change and gender. However, we believe that the wage-approach has its own rationale by pointing to the productivity aspect of technology, as well as directly relating to questions of inequality effects, such as between the genders, of technological change.

To analyze occupational change, we use Labour Force Survey (LFS) data from the years 2012 and 2019. LFS includes information on employees' occupation via occupational codes, in accordance with the international ISCO classification. In all countries, except for Sweden, the national versions of the ISCO classification on the three-digit level for the time period was used. Hence, DISCO in Denmark, AML 2010 in Finland, ÍSTARF95 in Iceland, and STYRK-08 in Norway, while in Sweden ISCO-08 was used. The focus of the analysis is not on occupation *per se*, but on the so-called occupational wage structure (OW Structure). The basis for the OW Structure is full-time mean or median wages linked to occupation. In Denmark, the Wage Structure Statistics – and particularly the component 'standard-estimated monthly profit', which is equivalent to a full-time monthly wage, including basic pay, various pay supplements, bonuses, and pension – was used to estimate wages. In Finland, occupational-wage data are based on

the Survey of Wage and Salary Structures maintained by Statistics Finland. The survey contains information on the earnings of employees from all sectors of the economy and is recalculated to full-time wages. Employees whose working hours were less than five per cent of the most common weekly working hours of full-time employees, as well as those whose earnings were less than 44% of the median earnings of the employee's occupational group, were excluded. The register lacks earnings data from employees working in enterprises with fewer than five employees. In Iceland, the wages are based on monthly income tax payments. In Norway, wages were calculated on the Wage Statistics. The register includes individuals with more than 5% employment and a monthly wage above 44% of the median wage. Monthly wages were then recalculated to fulltime equivalents before the median monthly wage is calculated for each occupation.

In Sweden, LFS introduced the international classification ISCO-08 in 2011. Unfortunately, the official wage statistics are not adapted to the international classification. To create a proxy for full-time wages per three-digit ISCO occupation, we merged LFS with the register data from the Longitudinal Integrated Database for Health Insurance and Labour Market Studies (LISA), which includes individual yearly incomes from different sources, including wage incomes. However, LISA measures yearly incomes and no indications of yearly working time are included. To calculate a proxy of full-time wages per occupation, we made use of the panels in LFS, where individuals are followed over four subsequent quarters over the year, and restricted the analysis of wage incomes to only those individuals in LFS defined as full-time employed (between 35 and 45 hours of usual working time a week) over those quarters. The mean full-time wages per occupation (on the three-digit level) were then calculated and ranked by occupation from lowest to highest wage. This was done separately for each year between 2011 and 2018 (currently the last year with full LISA data). We then continued by calculating the mean ranking of the occupations by wage 2011–2018. The ranking is based on all years in order to obtain a more reliable rank as the n per occupation becomes rather small for some of the years.

The analysis of OW Structure is done in a rather straightforward manner (see Berglund et al. 2020). First, occupations are arranged from the lowest to the highest wages. Thereafter, the distribution of employed individuals within the OW Structure is included. For the first year of the time period, 2012, the distribution is divided into five quintiles, that is, each quintile includes approximately 20% of the individuals, ranging from the fifth in the occupations with the lowest wages (Quintile 1) up to the fifth with the highest wages (Quintile 5). In the last step, the occupations included in each of the quintile are held constant over time, and the number of individuals recalculated for the last year of the period, which is 2019. The changes in numbers are below presented either in relative numbers (change in percentage points) or percentage change in absolute numbers. The latter can be done as the LFS includes weights to recalculate figures to represent the total population (i.e., the size of the labor force). These operations are done separately in each country.

Apart from occupation, gender and sector of employment are central variables for the present analysis. Sector makes a distinction between public and private employment, and we use this variable in the analysis of Finland, Norway, and Sweden. However, in the Danish and Icelandic cases, this variable is not included in LFS, so we only have to focus on the former countries on the significance of sector.

Results

In a first step, the overall change in the occupational structure for employees is presented (Figure 1). All five countries show strong growth in the quintile of occupations with the highest wages (see solid line). However, the increase is stronger in Sweden with 30% growth of the number of employed, compared to 15–22% in the other countries. Moving down the OW Structure, the growth in both Finland and Sweden is much weaker and even declining (Q1 and Q3 in Finland). This overall pattern indicates upgrading of the occupational structure. In Denmark, however, the tendency is more in the direction of polarization. The lowest-paid quintile has the second strongest growth during the period, while the middle-paid occupational categories are declining in numbers. In Norway, a comparatively weak growth is spread over all quintiles, beside the stronger growth in the highest paid quintile. However, the lowest-paid occupations have the second-strongest growth. Similarly, the Icelandic pattern indicates growth in all quintiles, although with stronger growth in Quintiles 4 and 5, and the weakest in the middle quintile.

Figure 1 also shows the pattern of change separately for men and women. One general difference between the genders is that the growth rate in the highest paid quintile is stronger for women in all five countries. Moreover, in Finland, Norway, and Sweden, occupational change moves in the direction of upgrading for women, while it is clearly polarization for men. In Denmark, the tendencies of polarization apply to both genders. In the Icelandic case, change is tending toward polarization for women, while men show employment growth in all quintiles.

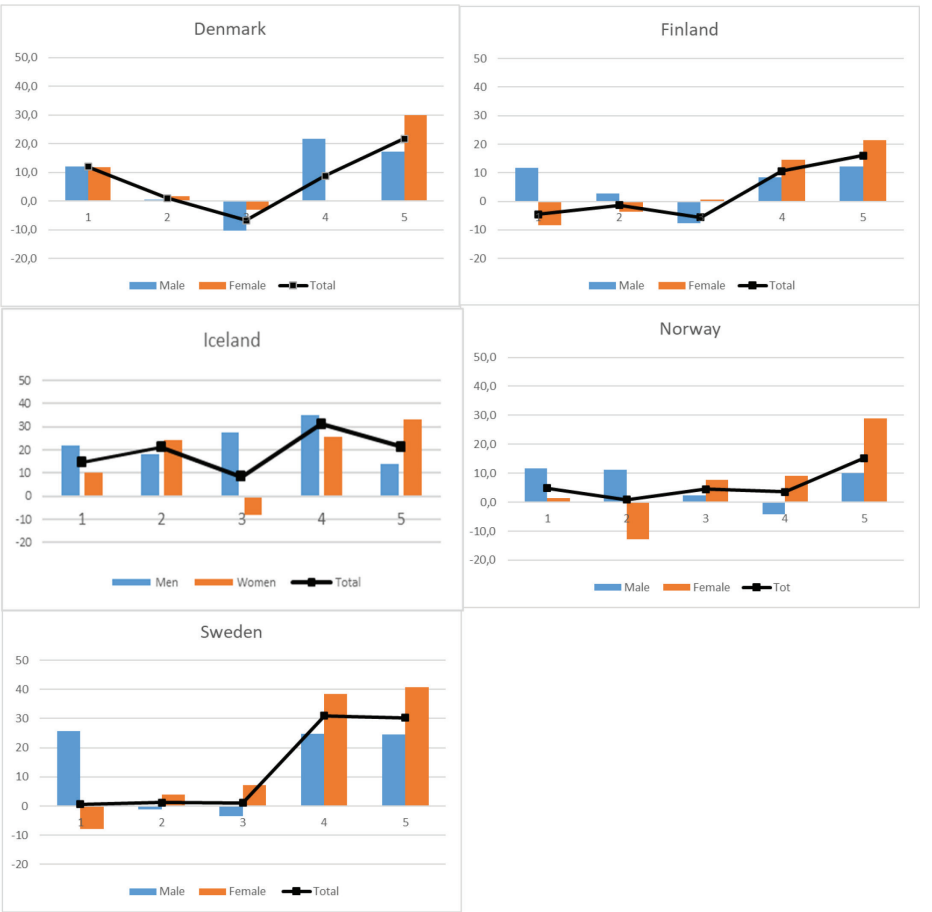
Table 2 shows the share of women within each quintile in 2012 and 2019 and indicates large variation. In Finland and Sweden, the low-wage quintile is clearly dominated by women, while the shares of the genders are more equal in Denmark. In the highest-paid quintile, women are a minority in all five countries, with the lowest share in Norway and the highest in Iceland. Focusing on how the female shares have changed over time, the table shows a clear gendered country pattern, as in Figure 1. In all countries, the share of women in the lowest-paid quintile (Q1) has declined. The decline is largest in Sweden (-6.3 percentage points) and weakest in Denmark (-0.1), although Denmark started with the most equal distribution in Quintile 1. Moreover, in all five countries, the female share has increased in the highest-paid occupational quintile. The increase is strongest in Iceland (3.8 percentage points) and weakest in Finland (2 percentage points).

Table 2 Female share within each quintile 2012 and 2019

		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Denmark	2012	54.8	38.0	49.6	60.0	35.6
	2019	54.7	38.2	51.6	55.3	38.0
Finland	2012	75.3	66.8	41.5	35.7	37.8
	2019	71.5	65.5	43.6	36.8	39.8
Iceland	2012	63.3	47.8	54.3	42.5	38.2
	2019	60.9	49.1	46.2	40.7	42.0
Norway	2012	66.6	50.2	40.8	58.8	27.7
	2019	64.5	44.1	42.1	61.9	31.0
Sweden	2012	74.8	47.8	42.4	45.4	35.0
	2019	68.5	49.1	45.0	48.0	37.9

Per cent. Employees.

Figure 1 Occupational change 2012–2019 for employees

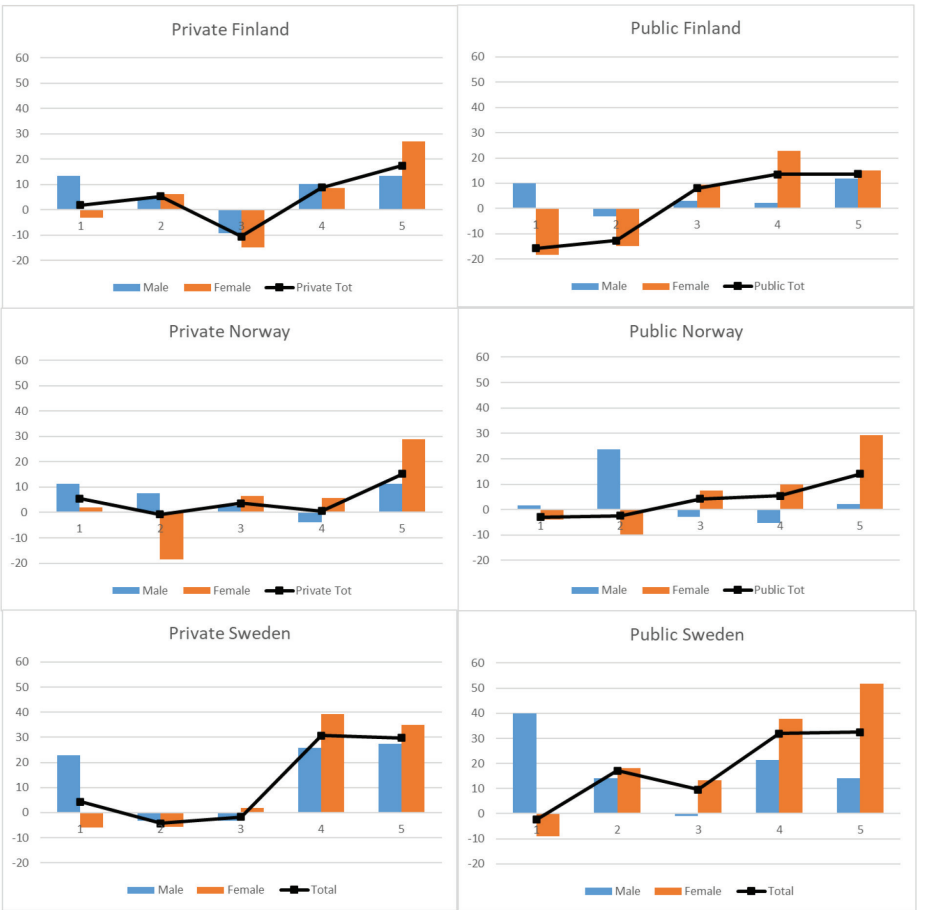


Percentage change of numbers within quintiles. Men, women, and total.

Gender and occupational change within sectors

As pointed out, the labor market is gender segmented in the Nordic labor markets; women do work in the public sector to a higher degree, and in the private sector to a lower degree. Figure 2 shows the pattern of occupational change within sectors, and for men and women separately (unfortunately, data are unavailable for both Denmark and Iceland). Overall, the pattern varies between the sectors. In all three countries, the public sector is clearly upgrading, with declining numbers in the lowest paid occupational categories, and increasing employment in better paid positions. The private sector, on the other hand, shows tendencies of polarization. The clearest example is found in Finland, which has strong declines in the middle quintile, while the other quintiles are growing. In Norway and Sweden, the lowest-paid occupational quintile shows relatively strong growth, while Quintiles 2 and 3 are declining (Sweden) or not growing at the same rate (Norway).

Figure 2 Percentage change of employees within quintile 2012–2019 in private and public sectors.



Also taking gender into consideration, occupational change for men moves clearly in the direction of polarization. This applies to all three countries in both the private and public sectors. However, the picture is more clear-cut in Finland and Sweden than in Norway, with strong employment growth in both the lowest- and highest-paid occupational quintiles, while the growth in the quintiles in between are sluggish or even show a decline. In Norway, the male pattern is not equally straight-forward but can be interpreted as moving toward polarization.

For women in the public sector, occupational changes are generally in the direction of upgrading. In all three countries, employment in the lowest-paid quintiles is decreasing, while growth is stronger higher up in the occupational structure. The strongest public sector upgrading for women is found in Sweden, where the decline in Quintile 1 is close to 10% and growth in Quintile 5 is over 50%. Finland and Norway have similar patterns; however, where there is a stronger decline in the lower quintiles in Finland, there is a stronger increase of Quintile 5 in Norway.

Changes for women in the private sector are not as clear as in the public sector. Generally, there is strong growth in the best-paid quintile in all three countries. However, changes for the rest of the quintiles are rather small (with the exception of the strong growth in Quintile 4 in Sweden), which makes the distribution resemble polarization in Finland and Norway and more of upgrading in Sweden.

Table 3 shows the share of women within sectors and quintiles. Overall, women are in a strong majority in the public sector across all quintiles, apart from the highest paid, where the distribution is more equal, or where men are the majority. Moreover, the share of women has increased in the highest paid quintile in the public sector of all three countries, and at the same time decreased in the lowest paid quintile. The increase in the share of women is particularly strong in Sweden (7.1 percentage points) and Norway (5.8 percentage points), and the decline in the lowest-paid quintile in Sweden (-6.5 percentage points) and Finland (-2.8 percentage points).

The overall distribution is more or less inverted in the private sector. Still, the gender distribution is more equal in the lowest-paid quintile (albeit still with a majority of women), but more unequal in the highest-paid quintile. Overall, changes over time are similar to those in the public sector: the share of women decreases in the lowest-paid quintile and increases in the highest-paid quintile.

Table 3 Female share within quintile and sector 2012 and 2019

	Quintile 1		Quintile 2		Quintile 3		Quintile 4		Quintile 5	
	Pri	**Pub**	**Pri**	**Pub**	**Pri**	**Pub**	**Pri**	**Pub**	**Pri**	**Pub**
Finland										
2012	69.4	90.7	58.5	80.7	23.1	76.8	29.3	54.8	29.8	55.3
2019	65.9	87.9	58.9	78.6	22.0	77.9	29.0	59.3	32.2	56.0
Norway										
2012	61.9	82.4	32.3	77.8	25.9	68.0	44.9	70.3	22.8	44.0
2019	59.8	81.5	26.5	71.8	26.6	70.2	47.2	73.3	25.5	49.8
Sweden										
2012	64.3	86.2	38.2	75.1	30.3	73.9	36.5	64.5	30.8	48.6
2019	57.9	80.2	37.6	75.8	31.4	76.4	38.9	67.4	32.1	55.7

Percentage. Employees.

Gendered change in major occupations

While the descriptions and analysis presented so far show patterns of occupational change, they do not provide insights into actual occupations in which the numbers in employment are rising or decreasing. Tables 4 and 5 show the change in the number employed (as a percentage) in major male and female occupational groups in Quintiles 1 and 5, respectively. In this analysis, we focus on the five largest occupational categories in each country.

In the lowest paid quintile (Table 4), and for both for men and women, occupations typical for the service sector of the economy dominate; these include personal

care workers, personal service workers, food preparation assistants, and cleaners and helpers. In most of the Nordic countries, employment in these occupations is increasing. However, there are some discrepancies, mainly related to gender. For example, the number of men employed as personal service workers is increasing in four of the five countries, with the strongest increase found in Norway (74%). The exception is found in Iceland, where this occupational group does not enter the top five among men. Among women, however, the increases in the number of personal service workers are weaker, and in some instances declining (FI and SE). In Denmark, for example, the increase is only 16% for women, and 52% for men. A similar pattern is found for personal care workers, at least in Finland, Norway, and Sweden, with much stronger increases among men (e.g., 51 per cent in Finland) than among women (7%), as well as for sales workers, with increases among men in all five countries (excluded in Sweden from the top-five list), and declines among women (with the exception of Denmark). In the Swedish case, the number of women is decreasing in all service sector occupations, while the numbers are increasing for men.

In most cases, the few occupations outside services that enter the top-five list are declining; for example, skilled agricultural workers in Denmark and Finland, assemblers in Iceland, and drivers in Sweden. In most cases, those jobs are dominated by men. However, a conspicuous exception is related to the number of women in Iceland working in mining, construction, manufacturing, and transport, which has increased by 179%.

Table 4 Percentage change in number of employed men and women in the five largest occupational groups within Quintile 1, ISCO-08 on two-digit level, 2012–2019

Denmark	**%Δ**		**Finland**	**%Δ**		**Iceland**	**%Δ**	
Occupation	**Men**	**Women**	**Occupation**	**Men**	**Women**	**Occupation**	**Men**	**Women**
51. Personal Serv. Workers	52	16	51. Personal Serv. Workers	11	−2	51. Personal Serv. Workers	–	56
52. Sales Workers	15	12	52. Sales Workers	9	−10	52. Sales Workers	35	−10
91. Cleaners and Helpers	–	15	91. Cleaners and Helpers	−2	−13	91. Cleaners and Helpers	−38	–
94. Food Prep. Assistants	–	30	94 Food Prep. Assistants	–	0	82. Assemblers	−23	−17
53. Personal Care Workers	−2	0	53. Personal care workers	51	7	92. Agricul, Forest., Fishery Labourers	−25	−27
61. Market orient. skilled agricult. workers	−23	–	61. Market orient. skilled agricult. workers	−16	–	–	–	–
93. Labourers in Mining, Construc., Manufac., Transp.	20	–	–	–	–	93. Labourers in Mining, Construc., Manufac., Transp.	87	179

(*Continued*)

Table 4 (*Continued*)

Norway		%Δ	Sweden		%Δ
Occupation	**Men**	**Women**	**Occupation**	**Men**	**Women**
51. Personal Serv. Workers	74	35	51. Personal Serv. Workers	23	−4
53. Personal Care Workers	30	5	53. Personal Care Workers	31	−6
42. Customer Serv. Clerks	–	−15	42. Customer Serv. Clerks	–	−12
91. Cleaners and Helpers	39	2	91. Cleaners and Helpers	36	−26
52. Sales workers	2	−7	94. Food Prep. Assistants	59	−8
61. Market orient. skilled agricult. workers	16	–	83. Drivers and Mobile Plant Operators	−3	–

Moving to gender differences in the upper end of the occupational structure (Quintile 5), the pattern in Table 5 is, in many cases, the reverse of what was found in the lowest-paid quintile. Overall, increases in the numbers in those major occupations dominate the declines, and the increases are generally stronger for women than for men. Several of the top-five occupations are different management and administrative positions, for example, administrative commercial managers, production and specialized services managers, business administrative professionals, and business administrative associate professionals. The occupational group production and specialized services managers is found as a top-five in several of the countries (exceptions are Denmark for both men and women, and Iceland for men). In both Finland and Norway, the numbers in this occupational category are decreasing for men, while a 29% increase is found in Sweden. In the female case, the numbers are on the rise in all four countries, with the strongest increase in Sweden of 59%. A similar pattern is found for administrative commercial managers, with stronger increases among women than men.

Table 5 Percentage change in number of employed men and women in the five largest occupational groups within quintile 5, ISCO-08 on two-digit level, 2012–2019

Denmark		%Δ	Finland		%Δ	Iceland		%Δ
Occupation	**Men**	**Women**	**Occupation**	**Men**	**Women**	**Occupation**	**Men**	**Women**
21. Science and Engineering Prof.	24	45	21. Science and engineering professionals	15	37	11. Chief Execut., Senior Officials and Legislators	29	−34
24. Business and Adm. Prof.	5	31	24. Business and Adm. Prof.	14	35	24. Business and Adm. Prof.	33	55
25. Info & Com Tech. Prof	18	–	25. Info & Com. Tech. Prof	83	58	62 Market-orient. Skilled Forest., Fish., Hunt. Workers	−10	–

Denmark	%Δ		Finland	%Δ		Iceland	%Δ	
Occupation	**Men**	**Women**	**Occupation**	**Men**	**Women**	**Occupation**	**Men**	**Women**
23. Teaching prof.	11	4	13. Production and special. services managers	−14	4	13. Production and Special. Services Managers	–	22
26. Legal, Social and Cultural Prof.	–	0	12. Adm. and commercial managers	−2	–	12. Adm. and commerc. managers	15	42
33. Business and adm. assoc. prof.	18	45	22 Health Prof.	–	10	22. Health Prof.	29	18
Norway	**%Δ**		**Sweden**	**%Δ**				
Occupation	**Men**	**Women**	**Occupation**	**Men**	**Women**			
12. Adm. and commerc. managers	51	61	12. Adm. and commercial managers	25	51			
13. Production and special. services managers	−9	14	13. Production and special. services managers	29	59			
21. Science and Engineering Prof.	45	49	21. Science and Engineering Prof.	32	–			
24. Business and Adm. Prof.	–	−1	33. Business and adm. assoc. prof.	22	33			
25. Info & Com Tech. Prof	24	–	25. Info & Com Tech. Prof	57	82			
31. Science and Engineering Assoc. Prof.	−6	19	24. Business and Adm. Prof.	–	6			

Discussion and conclusion

This study investigated occupational change in the Nordic region between 2012 and 2019. It focused on the period between the Global Financial and Euro Crises, and the year before the outbreak of the COVID-19 pandemic. During this period, the Nordic economies got back on track after the turbulent years of the financial crash, which hit some Nordic countries hard, particularly Iceland. Consequently, these years constitute an interesting period to study in terms of how the occupational structure is changing in times of growth and economic recovery, indicating whether the Nordic labor markets still are able to keep the road of high-quality job creation or if polarization lurks around the corner.

Overall, our results point in the direction of upgrading in three of the five Nordic countries. In Denmark, we find clear evidence of polarization, while the pattern is more undecided in Iceland. Although there are good reasons to focus on the period between two deep crises, the question arises as to whether the trends only reflect temporary fluctuations rather than the direction of occupational change in the Nordics. However, the results in the current study are well in line with previous research using a similar methodology. In a study of the Nordic countries (with the exception of Iceland) for the period 2000–2010, upgrading was found in Finland, Norway, and Sweden, while Denmark moved in the direction of polarization (Berglund et al. 2020). Similarly, a study of Sweden for the period 2000–2015 also showed strong upgrading (Berglund & Ulfsdotter Eriksson 2024). Thus, these trends seem to have continued during the present study period. Further, a forthcoming Norwegian working paper on occupational changes between 2011 and 2019 use the same type of data and methods as the present study. In addition to studying the start (2011) and end (2019) years, the forthcoming study also analyses data year by year to better control for temporary fluctuations. These analyses confirm the results found by way of the methods used in this article, thus indicating, with greater security, that the results, at least for Norway, are not a result of temporary fluctuations between years (Steen & Svalund 2024).

The most influential theories in the area have focused on technological change as the main factor shaping the occupational structure (e.g., Acemoglu & Autor 2011). In the Nordic region, however, many jobs are tax-financed, and employment takes place in the public sector. Several changes in the public sector, either by expansion/contraction, new governance principles including NPM, or the use of private providers, are not directly related to technological change. Still, changes in the public sector can have a profound impact on changes in the occupational structure, as public employment constitutes up to 30% of total employment in some of the Nordic countries. Moreover, the historical expansion of the public sector has led to strongly gender-segregated labor markets. This implies that changes in the two sectors may affect men and women rather differently.

The present study shows that changes in the occupational structure have affected men and women differently, and they have generally been beneficial for women, with increasing numbers occupying higher-level positions. This is in line with the European jobs monitor study, which found that the gendered gap in high-paying jobs declined significantly between 1995 and 2019. Using Sweden as a case, that study found that while there were many more men than women in high-paying jobs in 1995, the gap had almost disappeared by 2019 (Eurofound and European Commission Joint Research Centre 2021). Moreover, the research showed that the public sector served as a vehicle for high-level female positions. Compared to our data, in most Nordic countries, women now constitute the majority of high-paid occupations in the public sector. In the private sector, women's employment also increases in the highest-level positions, although there is still a long way to go to achieve gender equality.

At the low-end of the occupational structure, women still represent the vast majority (with the exception of Denmark). However, changes are moving in the direction of increasing the share of male employment in low-wage occupations, albeit at a rather slow pace. In at least some of the Nordic countries, immigration has provided a larger supply of low qualified men into low-paid positions (e.g., Berglund et al. 2025, Hermansen et al. 2023). A Norwegian study shows that, in recent years, occupational sex segregation has

been significantly affected by many immigrant men entering occupations traditionally dominated by women (Hermansen et al. 2023). A large share of these occupations is in the welfare state sector, often with public employers. Østbakken et al. (2023) analyzed gendered labor markets and occupational change in Norway between 2004 and 2017 and found that patterns of gender segregation are influenced by immigration. While we are not able to directly test the influence of immigration on the increasing numbers of male low-paid workers mainly in several service occupations, there are, as the above studies indicate, good reasons to expect it to be an important mechanism. Thus, immigration to the Nordic countries is a reasonable additional factor for occupational change beside both technology and restructurings of public employment.

Overall, the current study shows a strong growth of the most well-paid occupations in the Nordic region. This change is probably an effect of technological development, which a lot of current research emphasizes as having a profound impact on today's labor markets. However, our study shows that other processes are also at work in the Nordic labor markets. We have stressed the importance of changes in the relationship between the public and private sectors, which have historically had an enormous impact on the Nordic labor markets and societies. Moreover, this implies that structural occupational changes impact the labor market positions of men and women differently, mainly in the direction of greater gender equality, although there are also tendencies of increasing polarization among men. Moreover, while not directly tested, immigration to the Nordic countries may be an additional factor affecting the change of the occupational structure and its gender distribution.

The present study indicates that the largest changes take place in occupations where the demand for employees is increasing, such as within nursing and care, service work, and various forms of management positions. Hence, occupations do not seem to be automated away within the rather short time span covered in the present study. Since the end of the studied period, however, we have witnessed a global pandemic, outbreak of war in Ukraine, followed by high inflation and interest rates, with reduced growth rates as a consequence. These external chocks have most certainly affected the labor market, making it more uncertain if the trends revealed in the present study will continue.

Moreover, the last few years have seen substantial advancements in artificial intelligence (AI), which have intensified the relevance of digitalization and the potential automation of job functions. However, very few empirical analyses exist regarding the effects of the introduction of AI. Some studies (Eloundou et al. 2023; Felten et al. 2021) have suggested that a substantial share of the labor market is likely to be affected, and AI is expected to generate different dynamics compared to previous waves of technological change. A summary of studies on AI and labor market outcomes found that generative AI is capable of performing cognitive tasks that are concentrated in knowledge-intensive occupations, which are typically characterized by high wages and high skill requirements (Drydakis 2025). These are professions that have, until now, seen relatively limited automation due to technological advancements. At the same time, jobs that involve management or interpersonal interactions – such as those found in the service sector and in care work – are more challenging to automate. And, as we have shown, many of these occupations are female-dominated. Hence, whether the upgrading of the occupational structure and the narrowing of gender disparities observed in recent decades will continue remains an open question.

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