

Educational Expansion as a Driver of Longer Working Lives?

Regression Decomposition Analysis of Changes in Labour Force Participation at Older Ages in Twenty-first Century Europe

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Abstract: This study investigates the contribution of educational expansion to changes in labour force participation among Europeans aged 55-74 between 2000 and 2019, while accounting for changes in educational inequalities in labour market activity. We use data from the European Union Labour Force Survey (EU-LFS) for 26 countries and Kitagawa-Oaxaca-Blinder decomposition methods to analyse the extent to which changes in the education structure may account for rises in labour force participation rates among older workers in these countries, and the degree to which returns to education have changed. Overall, we found that educational expansion is positively associated with increases in labour force participation, albeit with substantial cross-country variation in the scale of this association. A driving factor was the decrease in the share of the population with low education levels, followed by an increase in the share of those with high education levels. While activity rates rose in most countries and among all levels of education, the largest increases were observed among people with a medium level of education. Activity rates of low-educated older workers, especially women, grew at a substantially lower pace in some countries, exacerbating educational inequalities in labour force participation at older ages. The study suggests that educational expansion has been a driver of longer working lives in Europe. However, it also indicates that changes in health, working conditions and age norms at the microlevel, as well as pension and labour market reforms at the macrolevel, can be assumed to have played a dominant role in countries where increases in labour force participation were the most significant.

Keywords: Educational expansion · Educational inequalities · Population ageing · Labour force participation · Europe

1 Introduction

Highly educated people are often in better health, enjoy better working conditions, have better opportunities to find work and earn higher incomes. As a result, they are often more able and willing to continue working until a later age than those with lower levels of education (Riekhoff/Kuitto 2022; Turek/Henkens 2023). Consequently, as levels of education have steadily increased across cohorts around the world, so too has the potential of an ageing workforce to continue working longer. This should be good news for policymakers who, in times of ageing populations, aim for longer working lives in order to keep pension systems sustainable. In this regard, educational expansion can therefore be seen as an automated mechanism that extends working lives at low current cost.

Despite the logic behind the assumption that educational expansion contributes to longer working lives, there has been little research to quantify the relationship between changes in education levels on the one hand and increases in retirement ages or labour market participation in older age groups on the other. In a recent systematic review on the reasons behind increases in labour market exit ages in OECD countries, *Boissonneault et al.* (2020) indeed identified changes in educational attainment as one of the main factors driving the trend towards longer working lives. However, they found only three studies to support this finding, one of which compared Denmark, Germany, and Sweden (*Larsen/Pedersen* 2017), with the other two being conducted in the United States only (*Blau/Goodstein* 2010; *Schirle* 2008). Each of these studies used different methods to reach conclusions about the contribution made by changes in education to changes in exit ages. More cross-national, comparative and focused research on this topic is therefore needed.

In the same systematic review, the authors identified 16 studies with evidence that changes to social security systems, and in particular pension systems, have contributed to the rise in labour market exit ages (*Boissonneault et al.* 2020). In recent decades, social security reforms have been pivotal in reshaping the possibilities and incentives to continue working longer. However, studies across Europe have shown that the impact of these reforms is often heterogeneous: not all groups in society may be affected in the same way and differentiation in employment effects can occur along gender and socioeconomic lines (*Ardito* 2021; *Geyer/Welteke* 2021; *Rabaté/Rochut* 2020; *Soosar et al.* 2021; *Staubli/Zweimüller* 2013). In some reforms, highly educated workers are the “low-hanging fruits”, whose exit behaviour is relatively easy to adjust; in other reforms, such as those closing early exit pathways, workers with low educational attainment may be affected to a greater degree (*Riekhoff et al.* 2020).

Apart from the heterogeneous impact of pension reforms, there may be other reasons why labour market exit behaviour varies by level of education. As the share of the workforce with tertiary education rises, the “returns” to higher education, in terms of increased labour market exit ages, might diminish across time, thus reducing the educational gap in exit ages. Furthermore, older workers with a lower level of education may be more vulnerable to the forces of deindustrialisation, globalisation, deregulation and economic shocks, leading them to become more prone to early

and involuntary exit (*Buchholz et al. 2009; Mäcken et al. 2022; Radl 2013*). Empirical evidence on these trends, however, is thus far mixed. Country-specific factors are likely to play an important role: while in some countries educational inequalities in exit and retirement ages increased, they decreased in other countries (*Amilon/Larsen 2023; Polvinen et al. 2022; Riekhoff/Kuitto 2022; Rutledge 2018; Turek et al. 2024*).

In short, while changes in the educational structure of the workforce may have contributed to increases in exit ages, the exit behaviour of groups with different levels of education may have also altered in various ways. However, there is little systematic empirical evidence of where, when, and by how much. The aim of this study is therefore to analyse the association between educational expansion and changes in labour force participation at older ages, while simultaneously investigating whether the returns to education in terms of exit behaviour have altered. It does so for a group of 26 European countries between the years 2000 and 2019, using harmonised labour force survey data and Kitagawa-Oaxaca-Blinder (KOB) regression decomposition methods. In this way, it aims to explore and describe the contributions of educational expansion and changes in educationally stratified exit behaviour to extending working lives after a period of 20 years systematically and comparatively across countries.

The article is organised into several sections. Section two, which follows, introduces the data and decomposition technique. The third section begins by describing trends in activity rates and education levels before going on to present the results of the decomposition analysis. The final section includes a discussion and conclusion.

2 Data and methods

2.1 Sample and variables

The data for this study are drawn from the European Union Labour Force Survey (EU-LFS), and have been collected on a quarterly and annual basis in a harmonised way in all EU member states, countries in the European Economic Area (EEA), and EU candidate member states since the early 1980s. The survey is conducted among a representative sample of individuals and includes a variety of questions about labour market status, type of employment, working hours, industry, occupation, and a set of sociodemographic background variables. We focus our analysis on 23 countries which are currently members of the EU,¹ plus Iceland, Norway, and Switzerland. We only included countries with sufficient sample sizes and information on individuals' levels of education. The United Kingdom was excluded due to large numbers of

¹ Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

missing values on the education variable. Files for the second quarter of the year are used to optimise comparability in data collection between the years (*EU-LFS 2023*). Data for the first quarter in 2000 are used for France only, due to missing data for the second quarter.

The study compares labour force participation rates – or activity rates – in the 55-74 year age group between the years 2000 and 2019. The age interval of 55-74 is relevant, since 55 is the age at which workers often begin to be considered as “older workers”. Furthermore, in the past at least, it was also the age at which they started to be at risk of early exit from the labour market. Even while working lives are getting longer in many countries, most people have withdrawn from the labour market by the age of 75. The year 2000 is the first year for comparison for several reasons. At this time, the transition from having an “early exit culture” to a new paradigm of “extended working lives” was still in its infancy in many countries, or had not yet even begun (*Ebbinghaus/Hofäcker 2013*). In other words, the most substantial increases in labour force participation among older workers occurred after 2000. Moreover, it was not until 1998-1999 that the EU-LFS introduced information about educational attainment in most countries. While data for 2020 and 2021 were available at the time of writing, we selected 2019 as the latest year in order to avoid the potential impact of Covid-19 on the labour force participation rates of older individuals.²

By this time, the cohort born between 1926 and 1945 that was aged 55-74 in 2000 had been almost entirely replaced by the cohort born between 1945 and 1964. One should also bear in mind that the educational expansion referred to in this study took place somewhere between the 1940s and 1980s, when these cohorts presumably finished school.

Our dependent variable measures whether an individual was participating or, in other words, was active in the labour force in a given year. Someone is considered active if they are employed, self-employed, or unemployed and actively seeking employment. When active, the dependent variable has the value one; if not, it is zero. Not being active usually means being retired, a housemaker, or unemployed but not seeking a job. While the study focuses on activity rates, the Appendix also present results for decomposition of employment rates (Tables A4 and A5). Employment rates differ from our main dependent variable of activity rates in that those who are unemployed but are seeking a job are excluded. We focus on activity rates because they approximate the distinction between being in the labour market and having exited the labour market more effectively than employment rates. Moreover, as an indicator, they are less volatile to cyclical fluctuations in the economy, since people might be (temporarily) unemployed during an economic downturn but they will not exit the labour market permanently. Nevertheless, the results for the decomposition of employment rates are very similar to those for the decomposition of activity rates.

² However, in most countries, labour force participation rates of older individuals continued to increase moderately in the years 2020 and 2021 as well. We performed the same analysis for the year 2021 with very similar results (not reported).

The main independent variable is highest attained level of education. In EU-LFS, distinction between education levels is provided with three levels, based on the International Standard Classification of Education (ISCED): low (maximum lower secondary education, ISCED 0-2), medium (upper secondary and post-secondary non-tertiary education, ISCED 3-4), and high (tertiary education, ISCED 5 or higher). In the analysis, we additionally control for age. Since EU-LFS only offers information on age in five-year intervals, age is a categorical variable with four values: ages 55-59, 60-64, 65-69, and 70-74.

2.2 Regression decomposition methods

Our analysis is based on decomposition techniques originally developed by *Kitagawa* (1955), *Oaxaca* (1973) and *Blinder* (1973). The Kitagawa-Oaxaca-Blinder (KOB) technique allows separation into two parts: first, the difference in activity rates between 2000 and 2019 that is due to changes in the educational and age structure of the population (the endowments or the “explained part”), and second, the difference that is due to changes in the returns to education and age (the coefficients or the “unexplained part”). We apply twofold decompositions with the coefficients of 2019 as the reference group (*Jann* 2008; *Oaxaca* 1973). This means that:

$$\hat{R} = (\bar{X}_{2019} - \bar{X}_{2000})' \hat{\beta}_{2019} + \bar{X}'_{2000} (\hat{\beta}_{2019} - \hat{\beta}_{2000})$$

where \hat{R} is the expected change in activity rates between years 2000 and 2019, decomposed into the part E that is explained by differences between the population’s characteristics \bar{X} in 2019 and 2000

$$E = (\bar{X}_{2019} - \bar{X}_{2000})' \hat{\beta}_{2019}$$

and the unexplained part U that is due to changes in coefficients $\hat{\beta}$ between both years

$$U = \bar{X}'_{2000} (\hat{\beta}_{2019} - \hat{\beta}_{2000}).$$

In simple terms, the endowments component measures the difference in activity rates between 2019 and 2000 as if the population in 2000 had had the same educational and age composition as the population in 2019. The coefficients component measures the difference in activity rates as if the various levels of education and age groups in 2019 had had the same coefficients as in 2000. All models are estimated using the *oaxaca* command in Stata (*Jann* 2008).

For each model by country and gender, coefficients of 2019 were selected as the reference group instead of the common option of using the coefficients from a pooled regression model. This was done because the sample sizes for both years tend to vary (see tables A1 and A2 in the Appendix, columns 1 and 2), resulting in the largest group dominating the coefficients in the pooled model and driving the results (*Rowold et al.* 2024). Although it is possible to weigh the pooled coefficients

by the sample sizes, having the reference coefficients from one designated year should allow better comparability between the genders and countries. We estimate these linear regression decomposition models by gender, and for each of the 26 countries separately. Given that our outcome variable is a binary variable with values zero and one, we estimate and decompose linear probability models. The advantage of linear probability models is that they are easy to interpret and allow comparison of coefficients across different samples (Mood 2010). As a robustness check, we also estimated and decomposed the same models using logistic regression with the *mvdcmp* command in Stata (Powers *et al.* 2011). The overall results remain largely the same, with some minor deviations in selected countries (see Tables A6 and A7 in the Appendix).

The models estimate means for activity in 2000 and 2019, as well as their differences. We multiply these means by 100 to obtain the activity rates in percentages. The differences between these values represent the percentage point changes in activity rates between 2000 and 2019. Our results indicate the percentage of these changes that can be attributed to changes in endowments and coefficients. EU-LFS sampling weights are applied to account for selection probabilities. We use the option in Jann's *oaxaca* command in Stata to normalise the categorical education and age variables, so that coefficients indicate deviations from the grand mean. This is done because the choice of the reference category alters the results (Jann 2008).

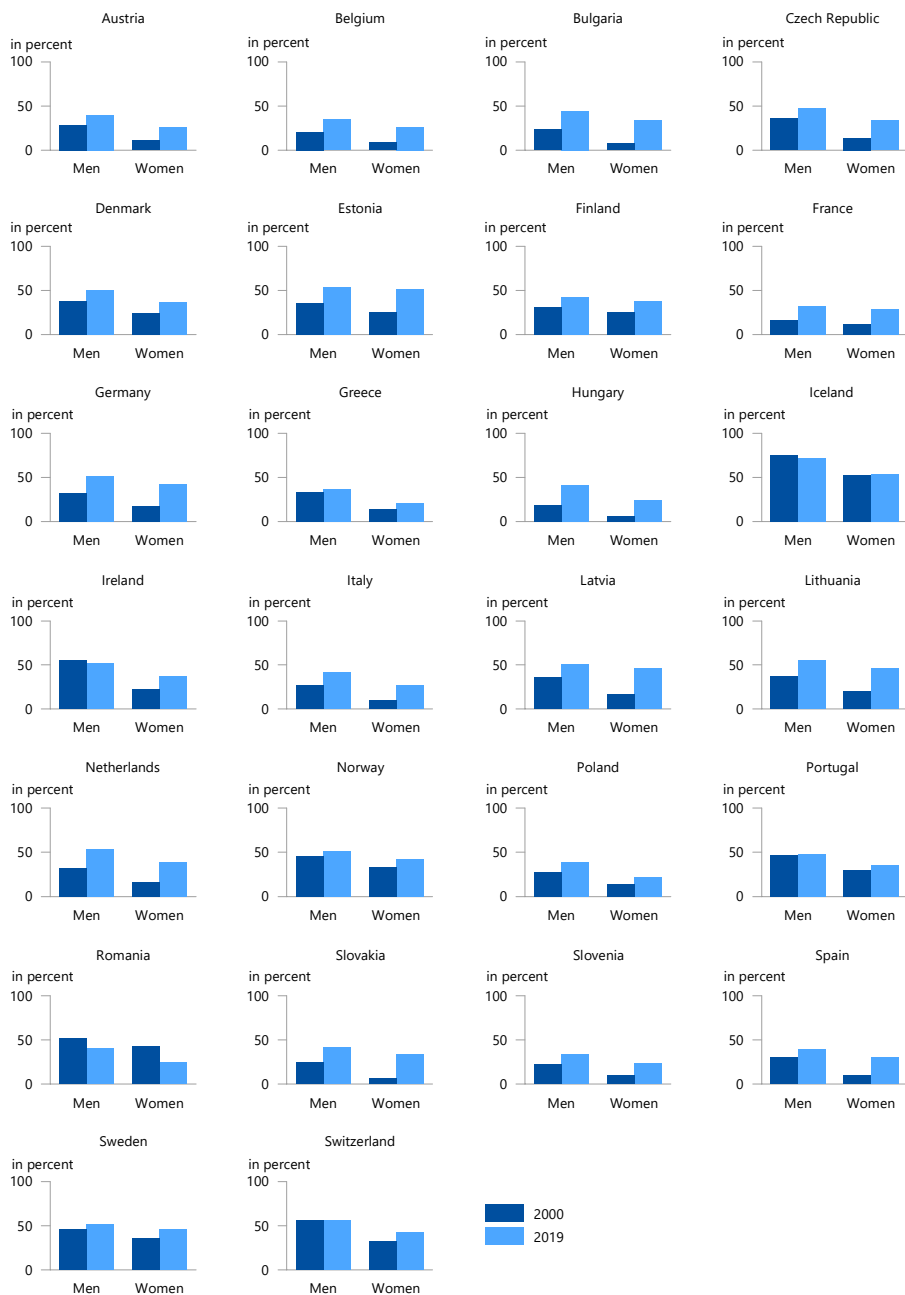
In presenting the results, we focus on the detailed explained and unexplained associations of education with the total changes in activity rates. This means that we estimate these associations for changes in each level of education. We also present the overall association of changes in educational composition and returns as percentages of the total change in activity rates.

3 Results

3.1 Descriptive analysis

The countries in our sample started from very different levels of labour force participation at the turn of the millennium. However, a characteristic shared by all European countries is that the proportion of older workers between the ages of 55 and 74 who are participating actively in the labour market has increased substantially over the two decades (on average, by 10 percentage points among men and 15 percentage points among women; Figure 1). While gender differences reflecting traditional patterns of women's lower labour market participation in general have persisted, women's activity rates in this age group have increased more than men's. The greatest increases in labour market activity rates of older women have been recorded in the Baltic and some of the Central and Eastern European (CEE) countries, but also in Germany and the Netherlands. Men's activity rates have decreased slightly in Iceland, Ireland, Portugal, and Switzerland, where older men have already been actively involved in the labour market. Activity rates have also increased only moderately in those countries that were hit hardest by the Great Recession, such

Fig. 1: Activity rates in 2000 and 2019, men and women aged 55-74



Source: Own calculations based on EU-LFS

as among women in Greece, Iceland, and Portugal. It is only in Romania that we observe a greater decrease in activity rates for both genders. Detailed activity rates for education groups by gender and country are provided in Table A3 in the Appendix.

Likewise, levels of education among older cohorts increased over time, although there are rather considerable cross-country differences in the educational composition (Figures 2 and 3). Overall, the share of low-educated persons among older workers decreased from about 56 percent on average in 2000 to 29 percent in 2019. At the same time, whereas only about 13 percent of those aged 55-74 had a high level of education in 2000, this share had increased to 23 percent two decades later. The patterns and trends for the medium level of education are more blurred though. On average, less than one third of older workers had a medium level of education in 2000, compared with nearly half in 2019.

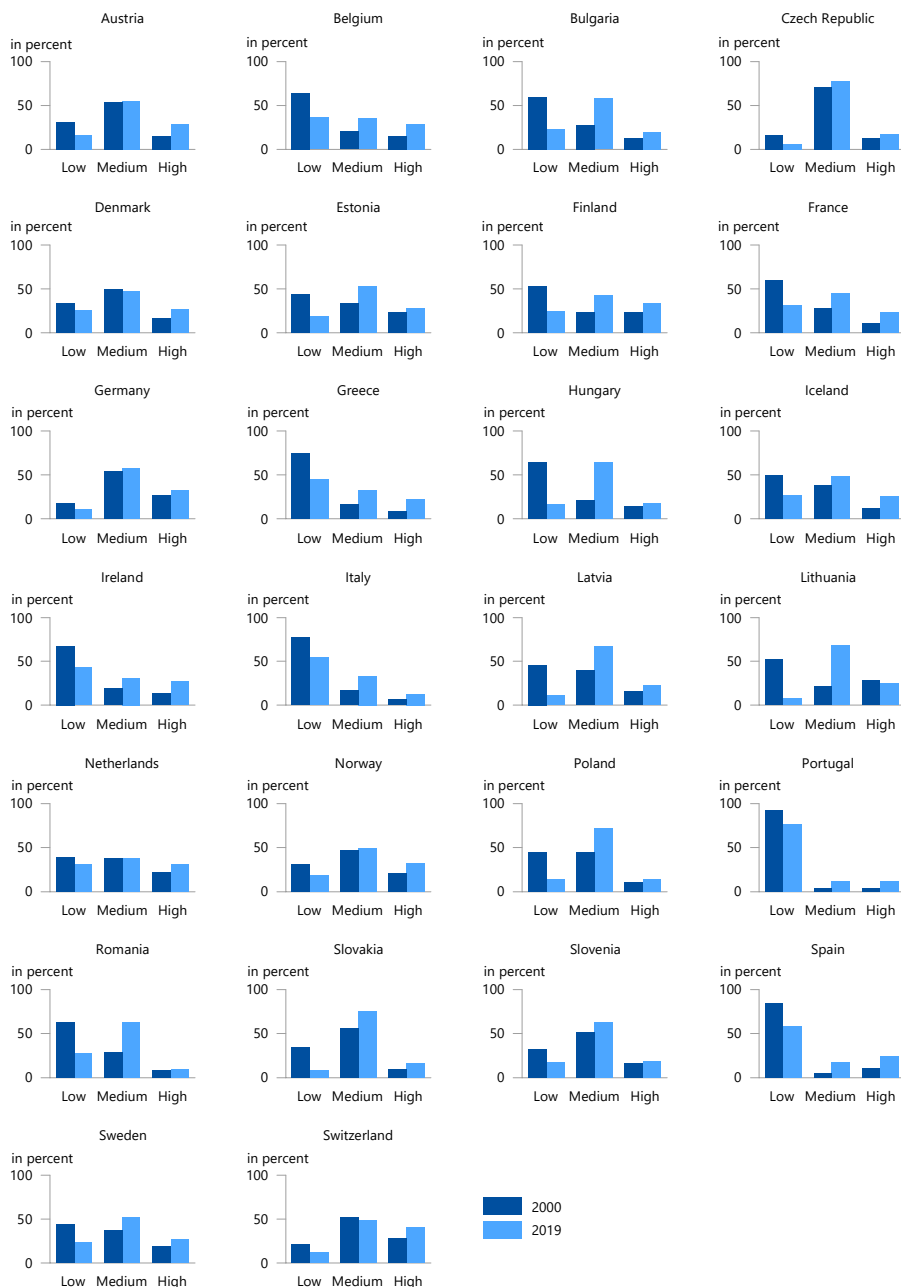
In many of the CEE countries, the largest fall recorded among both men and women has been in the share of the low-educated population. The share of people with a high level of education, in turn, has increased most in Spain, Ireland, Austria and Greece for men, and in Iceland, Finland, Estonia and Denmark for women. The educational expansion of women in the age group under observation in our study has been remarkable; while the share of high-educated men exceeded that of high-educated women in 2000 in almost all countries (only in Estonia, Portugal and Sweden were the shares almost the same), two decades later, women in the 55-74 year age category are better educated in 12 of the 26 countries included in our analysis, most notably in Estonia, Sweden and Latvia.

3.2 Regression decomposition

The first three columns of Table 1 summarise the activity rates in 2000 and 2019 (same as in Figure 1) and the changes therein. To give an indication of the measure to which education is associated with changes in activity rates, it also shows the percentage point changes attributable to the overall changes in the educational endowments in the population (column 4) and returns to education (column 5). Figure 4 and Figure 5 show the detailed contributions of education in the decompositions of the changes in activity rates for all countries and men and women, respectively. The countries are arranged by the magnitude of the percentage point changes in activity rates between 2000 and 2019 (indicated by the black dots). The darker colours indicate the contributions of changes in endowments and the lighter colours those of changes in coefficients. The white section encompasses the explained and unexplained parts due to age and the constant of the unexplained part. Full details of the decomposition models can be found in Tables A1 and A2 in the Appendix.

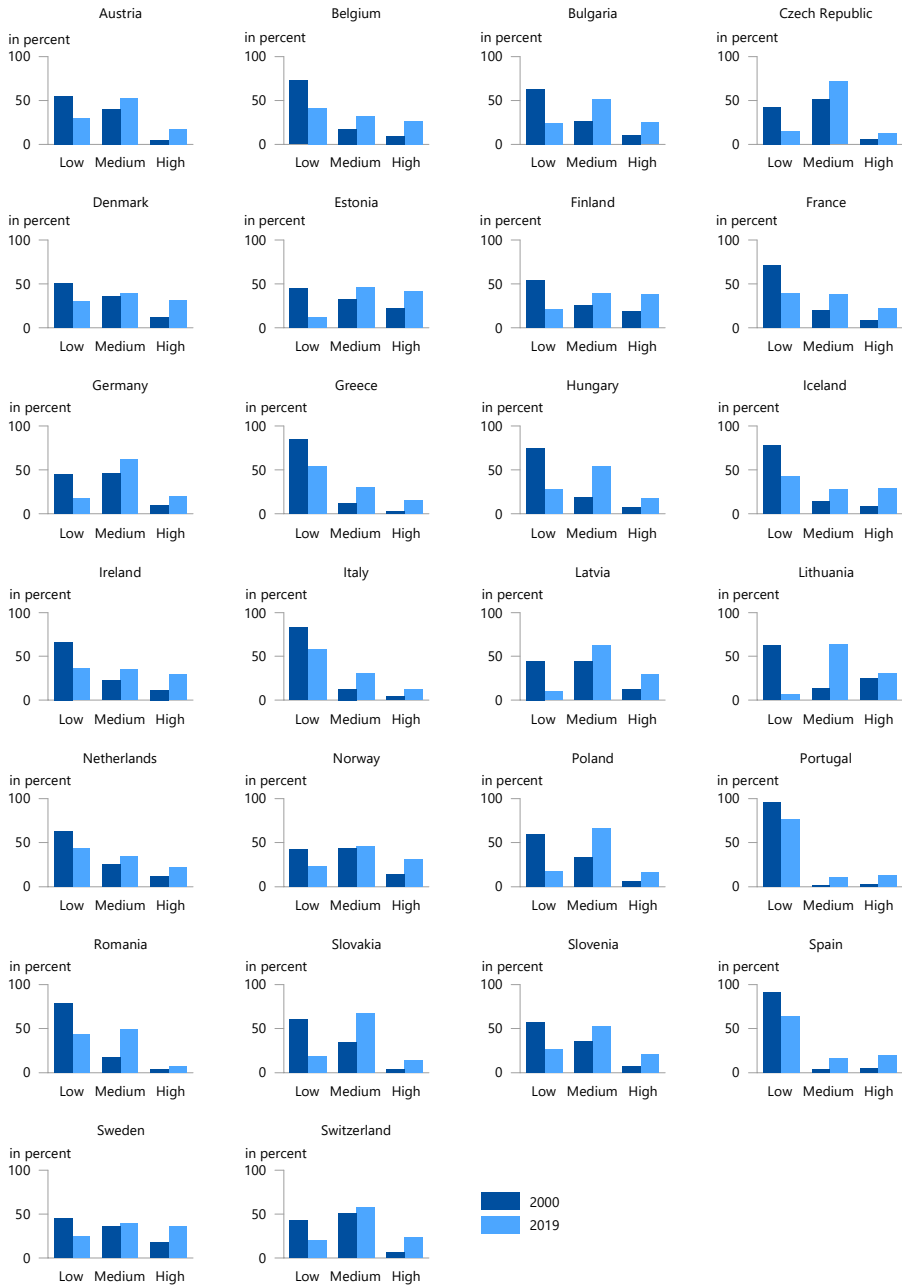
Educational expansion (i.e. changes in educational endowments) is associated very closely with rises in activity rates in most countries, both among men and women. However, the size of the contributions varies substantially as well. Percentages range from between one and six percent for Danish, Dutch and German men as well as Greek men and women, to more than 50 percent among Swiss and Portuguese men as well as Icelandic, Polish and Portuguese women (Table 1, column 4). In

Fig. 2: Distribution of education levels in 2000 and 2019, men aged 55-74



Source: Own calculations based on EU-LFS

Fig. 3: Distribution of education levels in 2000 and 2019, women aged 55-74



Source: Own calculations based on EU-LFS

most countries, these percentages typically lie between 15 and 30 percent for men and between 15 and 35 percent for women. Even in countries where activity rates remained stable or declined, such as in Iceland, Ireland (men), Romania and Portugal (men), educational expansion appears to have had an offsetting effect: the decline in activity rates in these countries would have been more severe if educational structures had not changed. Overall, in countries where the changes in activity rates were greatest, such as in several CEE countries as well as in Germany and the Netherlands, the relative contribution of educational expansion tended to be smaller. In these countries, the “other” part, in particular the unexplained part, played a more substantial role. In many of the countries where increases in activity rates were smaller, educational expansion played a relatively larger role. This can be seen among Norwegian and Swedish men, as well as among Finnish, Swedish, Polish, Portuguese and Norwegian women. In all of these cases, with the exception of Polish women, activity rates were already above the European average in 2000 to begin with. Only in Greece can a minor increase in activity rates be observed, together with a small share due to educational expansion.

In most countries, the educational expansion effect is due mostly to the decline in the share of the population with a low level of education. This can be observed in Figures 4 and 5 by the dark red colour in the bars and in Tables A1 and A2 by the often sizeable and predominantly statistically significant coefficients in column 6. Additionally, increases in the shares of the population with high education are associated with higher activity rates, although the size of this contribution varies more between countries than that of the contribution of low education (indicated in darker blue in Figures 4 and 5 and presented in column 8 in Tables A1 and A2). The role played by changes in the share of medium education is less clear. In many countries, the effect of the growing share of the population with medium education is negligible, while in some countries it is negative (indicated in dark grey in Figures 4 and 5 and presented in column 7 in Tables A1 and A2). The latter might be due to the normalisation of the categorical education variable. If, in 2019, those with medium education were less likely to be active than the average worker, an increase in the share of the population with medium education can be associated with a downward pressure on the activity rates.

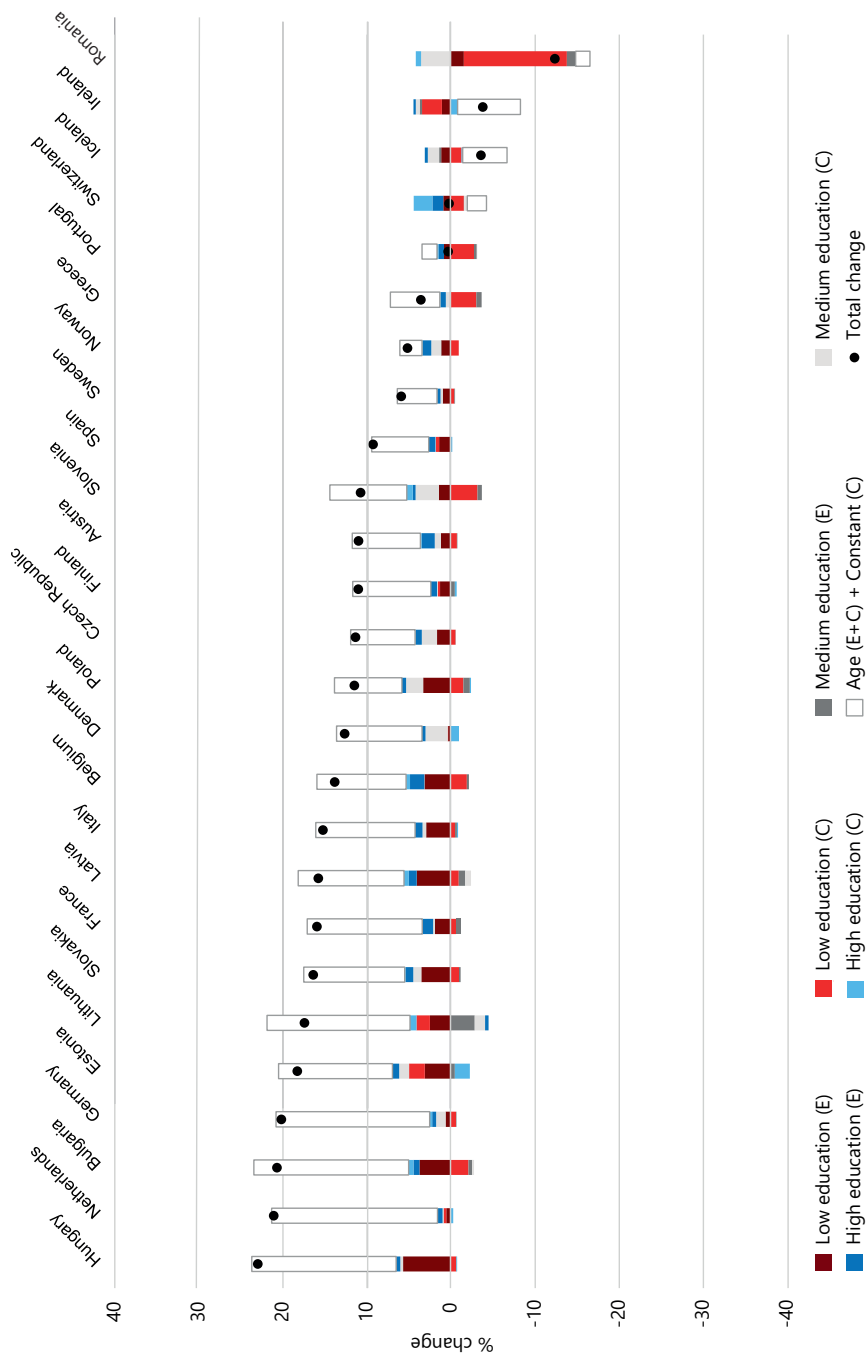
The degree to which changes in coefficients of education are associated with changes in activity rates is generally smaller than that of changes in the endowments of education (Table 1, column 5). Moreover, it is often negative, especially for those with low education (the lighter red parts of the bars in Figures 4 and 5 and column 14 in Tables A1 and A2 in the Appendix). The estimates for the unexplained part of the change should be interpreted in relation to the constant of the unexplained part. This means that in countries like Bulgaria, Germany, Greece, Poland, Slovenia, Portugal, Romania and Switzerland for men and Belgium, Bulgaria, France, Germany, Greece, Iceland, Italy, the Netherlands, Poland, Romania and Slovenia for women, activity rates rose at a slower pace among the lower educated than among the overall population, or even declined (see also Table A3 in the Appendix). In these countries, educational inequalities in labour market activity at older ages appear to have increased, especially since activity rates for those with medium and high

Tab. 1: Changes in activity rates and the percentages that can be attributed to changes in education endowments and coefficients, men and women

Country	Men					Women				
	1 Activity rate 2000	2 Activity rate 2019	3 Change in activity rate	4 % due to change in education endowments	5 % due to change in education coefficients	1 Activity rate 2000	2 Activity rate 2019	3 Change in activity rate	4 % due to change in education endowments	5 % due to change in education coefficients
Austria	28.8	39.8	+11.0	24.6	1.7	11.0	25.8	+14.9	22.3	4.0
Belgium	20.6	34.5	+13.8	33.5	-10.3	8.7	26.2	+17.5	28.7	-19.7
Bulgaria	23.6	44.4	+20.7	19.4	-8.3	7.6	33.6	+26.1	18.2	-10.8
Czech Republic	35.9	47.3	+11.4	20.7	11.8	14.0	33.3	+19.3	20.2	1.5
Denmark	38.0	50.7	+12.7	5.8	14.0	24.4	37.4	+13.0	17.6	7.9
Estonia	35.8	54.1	+18.3	19.0	7.0	24.9	51.9	+27.0	20.7	-0.7
Finland	31.0	42.0	+11.0	14.3	1.4	25.5	37.8	+12.3	23.9	2.3
France	16.4	32.3	+16.0	16.4	-2.1	12.1	28.4	+16.3	16.5	-5.7
Germany	32.0	52.2	+20.2	5.3	4.2	18.0	42.4	+24.4	14.2	-1.1
Greece	33.5	37.1	+3.6	3.5	-67.4	14.1	20.9	+6.9	1.1	-18.6
Hungary	18.3	41.3	+23.0	26.8	-1.6	5.9	24.2	+18.3	22.9	2.2
Iceland	75.2	71.7	-3.5	-49.7	0.7	52.5	54.1	+1.6	435.3	-451.0
Ireland	55.0	51.2	-3.8	-43.5	-54.5	22.0	36.2	+14.2	35.0	11.2
Italy	26.1	41.4	+15.3	23.7	-1.1	9.3	26.3	+16.9	32.2	-34.5
Latvia	35.1	50.9	+15.8	26.9	-6.5	16.7	46.0	+29.3	23.5	1.8
Lithuania	37.3	54.8	+17.4	-4.1	6.6	20.3	45.4	+25.1	11.7	0.3
Netherlands	32.6	53.7	+21.1	5.7	0.9	15.7	38.5	+22.8	13.1	-5.3
Norway	45.8	51.0	+5.2	42.1	6.9	33.7	42.4	+8.7	46.0	7.6
Poland	27.4	39.0	+11.5	26.5	3.7	14.0	21.2	+7.2	62.5	-37.7
Portugal	47.3	47.6	+0.3	333.7	-747.6	29.5	35.5	+6.0	51.1	-184.3
Romania	52.2	39.9	-12.3	20.6	65.4	42.6	24.1	-18.4	9.7	91.6
Slovakia	24.8	41.2	+16.4	26.0	0.7	6.3	33.9	+27.6	23.4	4.8
Slovenia	22.5	33.3	+10.8	11.8	3.2	10.4	23.6	+13.2	30.7	-33.8
Spain	30.2	39.5	+9.3	23.8	3.3	10.4	29.9	+19.5	19.6	6.3
Sweden	45.3	51.2	+5.9	21.2	-1.3	35.6	45.3	+9.6	31.3	4.7
Switzerland	55.9	56.1	+0.2	933.2	150.6	32.3	42.9	+10.6	36.2	2.0

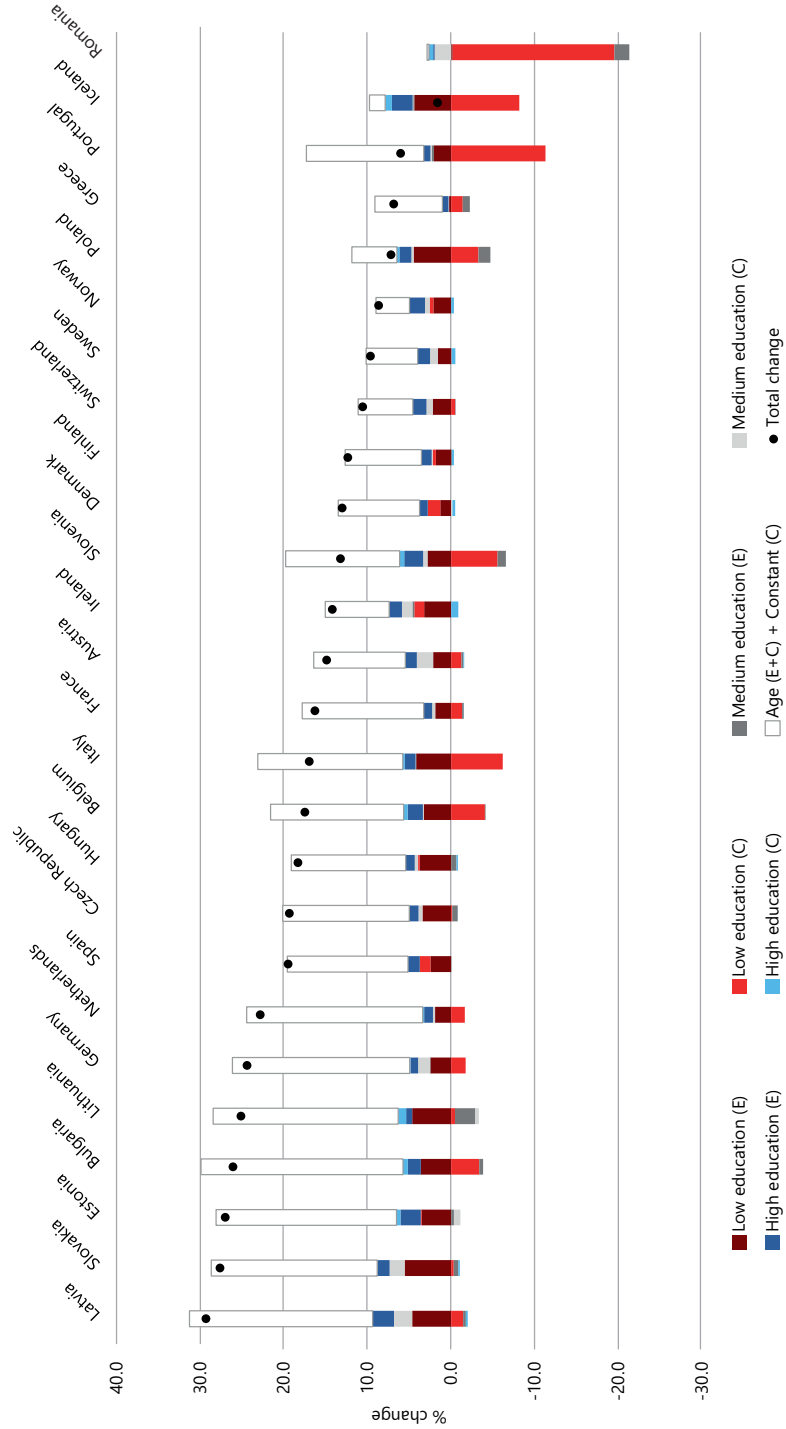
Source: Own calculations based on EU-LFS

Fig. 4: Detailed decomposition of change in activity rates between 2000 and 2019 among men, in percentage points (E = endowments, C = coefficients)



Source: Own calculations based on EU-LFS

Fig. 5: Detailed decomposition of change in activity rates between 2000 and 2019 among women, in percentage points (E = endowments, C = coefficients)



Source: Own calculations based on EU-LFS

education grew to a greater extent in many of these countries. The returns to having a medium level of education increased in many countries (light grey in Figures 4 and 5 column 15 in Tables A1 and A2), often offsetting the negative compositional effect of medium education that was mentioned in the last paragraph. In other words, those with a medium level of education were more often active in the labour market in 2000 than in 2019 in most countries. The change in the returns to high education was less straightforward across countries (indicated in light blue in Figures 4 and 5 and in column 16 in Tables A1 and A2). Whereas in some countries, a high level of education became increasingly associated with being active in the labour market (e.g. among Bulgarian, Romanian and Swiss men, as well as among Belgian, Bulgarian, Italian, Polish, Romanian and Slovenian women), in other countries the rises in activity rates were slower than among the overall population (most notably for Danish men, as well as for Irish men and women). Yet, in these cases, the contribution of the change in coefficients for high education remained small.

While our focus is not on the contributions of changes in the age structure or the unexplained part that is not due to education, the detailed findings for these can be found in tables A1 and A2 in the Appendix as well. Given that most countries recorded an ageing of their populations between 2000 and 2019, changes in the age distributions in the samples – in particular the growth of the sizes of the older age groups – tended to put downward pressure on activity rates. However, we also observe that activity rates generally increased across all age brackets, but especially between the ages 60 and 64 for both men and women, as well as between ages 55 and 59 for women.

4 Discussion and conclusions

This study showed that educational expansion is associated with considerable increases in labour market participation rates among older workers in Europe between 2000 and 2019. Activity rates among the 55-74 age group rose in almost all European countries. Increases were generally greater in those countries with lower activity rates in 2000 and, in particular, among women. Among men, increases in labour force participation appear to have come mainly at the “tail-end” of working life, i.e. between the ages of 60 and 64, while increases among women can also be ascribed to greater labour market inflows and attachment in the younger cohorts. Countries with relatively high rates of labour market participation in 2000, such as Sweden, Norway and Switzerland, generally experienced smaller increases. Another group with smaller increases or even decreases in activity rates consists of countries that were hit most severely by the Great Recession of 2008, including Romania, Iceland, Ireland, Greece, and Portugal. At the same time, education levels rose in all countries. The share of low-educated individuals in particular fell, while the shares of those with medium and high education increased.

Among men, the association of educational expansion with increases in activity rates was estimated at between 15 and 30 percent, while for women, the corresponding figures were mostly between 15 and 35 percent. In most countries,

the largest factor appeared to be the decrease in the share of the low-educated population. Increases in the share of highly educated persons were found to be associated with rises in activity rates as well, while the changes in the share of those with medium education showed mixed results.

Changes in education endowments should also be viewed in relation to the findings for changes in the coefficients of education. In some countries, the positive effect of the decline in the share of people with a low level of education seems partially or even completely offset by a reduction in the returns to low education. In other words, among a shrinking group of low-educated workers, activity rates rose at a slower pace or even declined. These results suggest that there is a risk that low-educated older workers, in particular women, are becoming increasingly marginalised in the labour market. For those with medium education, we found a somewhat opposite trend: in many countries, a growing group of medium-educated workers were more likely to be active. We found no cross-country evidence that returns to having a higher level of education decrease when the share of the higher-educated in society increases.

While the association of educational expansion with increases in labour market activity was substantial in most countries, the unexplained part due to age and unobserved variables was often larger, especially in countries that experienced large increases in activity rates. While we cannot be sure about what this unexplained part encompasses, it is safe to assume that in most countries it was related to pension reforms, including raises in the statutory retirement age, the closing of early exit pathways, and the introduction of financial incentives to retire later, as well as to changes in the labour market, norms for working longer and improvements in health and working conditions (Kuitto/Helmdag 2021; Riekhoff 2023; Riekhoff *et al.* 2020). Although this study did not directly investigate the potentially heterogeneous effects of changes in pension systems and labour markets, the results suggest that educational inequalities in activity rates increased in several countries. It is also important here to note the role of the economic situation: in some of the countries hardest hit by the Great Recession in the late 2000s, there was particularly slow growth in activity rates among older workers with low education. This was visible even more than ten years after the onset of the economic crisis.

This study has a few limitations. While it showed that educational expansion and inequalities play an important role in extending working lives, little can be concluded about the way in which education contributes to the chances and possibilities to be active in the labour force at older ages. Some studies have found that education can have a direct effect on retirement ages, even despite the long period of time between entering and exiting the labour market (Hardy 1984; Venti/Wise 2015). Most studies, however, emphasise that education usually sets the stage for subsequent opportunities in life and work, and that the impact of education on activity at older ages is mediated through, amongst other factors, occupational status, income, wealth, working conditions, and health (Amilon/Larsen 2023; Komp *et al.* 2010; Rohrbacher/Hasselhorn 2022; Thern *et al.* 2022; Turek/Henkens 2023). In particular, educational inequalities in health tend to increase with age (Leopold 2018), making the possibilities for extending working lives more unequal as well.

While EU-LFS offers the possibility to analyse harmonised data for a great number of countries, it is strictly cross-sectional and does not allow for longitudinal analysis of events and changes across working lives.

Moreover, the information on education levels is aggregated to distinguish between only three different levels. The role of medium education and changes therein would require further scrutiny in particular. In some countries, intermediate education is often more generic and potentially has lost some of its value in labour markets where higher qualifications and specialised skills are increasingly required. In other countries, such as Germany, medium education can include advanced vocational training programmes that offer the possibility of a steady and long career.

Finally, we were unable to specify the unexplained parts of the decompositions, with these parts often being substantial. We assumed that changes in pension systems and labour markets play an important role there, but this will need further research with different data and methods. Other economic and societal developments should not be ignored either. Educational expansion is inextricably linked to transitions from largely industrial economies to post-industrial and knowledge economies, where the nature of work and working lives have changed and where education and skills are likely to play a different role these days than was the case two decades ago. Additionally, this study was not able to take into account the impact of migration, as information on citizenship or country of birth is incomplete in EU-LFS for certain countries. Many European countries have experienced large inflows of immigrants, potentially with diverse educational backgrounds. Other countries in our study, especially the new EU member states, have witnessed large outflows of both high-skilled and low-skilled workers. While these are often younger age groups, many of them might want to stay in their host countries as they grow older. Therefore, it is only in future that the bulk of the effects stemming from migration will become apparent.

Although educational expansion was associated considerably with rises in labour force participation in almost all European countries, the assertion that educational expansion automatically extends working lives would be an oversimplification. Additionally, since most of the people in our study are likely to have finished their education 50 years earlier, it is no longer something that can be affected by current policy. More research is needed to explore how we can now reap the benefits of past educational expansion to full effect. Given that the labour market participation of women still lags behind that of men in many countries, the potential for activating older women would appear to be considerable. It is important to identify factors and policies across the life course that work as potential mediators and moderators as educational expansion of older workers in some countries – especially those where the share of the highly-educated has already grown to its limits – might slow down or come to a halt in the near future. Additional possibilities to promote activity in older ages will need to be explored, while the vulnerable position of low-skilled older workers is a particular factor that should be given consideration.

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Appendix
Tab. A1: Detailed decomposition of differences in activity rates between 2000 and 2019, men

Country	N	Activity rates				Explained part				Unexplained part										
		2019	2000	2019	2000	2019	2000	2019	2000	2019	2000	2019	2000							
				Change	L	M	H	55-59	60-64	65-69	70-74	L	M	H	55-59	60-64	65-69	70-74	Constant	
Austria	5,712	4,958	288	398	+110***	1.2***	-0.1	1.6***	-2.6***	0.2**	-0.3	-0.7	0.8	0.1	2.2***	3.0***	-1.9***	-1.7***	9.4***	
Belgium	2,756	4,832	206	34.5	+13.8***	3.2***	-0.2	1.7***	-0.4	0.1	0.2	-0.1	0.0	0.4	3.5***	1.6***	-2.1***	-2.2***	9.8***	
Bulgaria	6,796	4,758	23.6	44.4	+20.7***	3.8***	-0.5	0.7***	-0.9**	0.6**	-0.0	0.2	-2.1**	-0.2	-0.9*	6.7***	-1.1**	-4.0***	17.9***	
Czech R.	6,239	7,022	35.9	47.3	+11.4***	1.7***	-0.0	0.7***	-3.5***	0.4**	-1.0***	-0.4	-0.5	1.8*	-0.2	5.4***	-1.9***	-2.5***	11.5***	
Denmark	1,535	2,719	38.0	50.7	+12.7***	0.3**	0.0	0.4**	-2.3***	-0.2	-0.1	-2.7***	0.1	2.6**	-0.9*	-3.3***	4.0***	0.6	-1.0**	15.1***
Estonia	390	762	35.8	54.1	+18.3***	3.1**	-0.4	0.8	-0.2	-0.2	0.7	1.9	1.2	-1.8	-1.4	2.9	-0.4	-0.4	11.7***	
Finland	2,919	4,099	31.0	42.0	+110***	1.3***	-0.4**	0.7***	-2.9***	-0.8***	-1.2***	-2.5***	0.3	0.1	-0.2	1.9***	4.3***	-1.1***	-2.3***	14.0***
France	14,855	14,998	16.4	32.3	+16.0***	1.9***	-0.6***	1.3***	0.5*	-0.0	0.1	0.2	-0.6	0.2	0.0	2.4***	3.0***	-2.4***	-2.8***	12.6***
Germany	31,939	14,572	32.0	52.2	+20.2***	0.6***	-0.0*	0.5***	-0.7**	-0.5***	0.1	-0.6***	1.1***	0.3	-1.3**	6.7***	-1.0***	-2.0**	-2.0**	16.5***
Greece	9,131	7,772	33.5	37.1	+3.6***	0.2	-0.6***	0.6**	1.4***	-0.1	0.5***	0.0	-3.0***	0.5*	0.1	0.8**	0.4	-0.3	-1.0**	4.2***
Hungary	8,076	6,204	18.3	41.3	+23.0***	5.7***	-0.1	0.5***	-2.1***	0.8***	-0.4	0.3	-0.6	0.3	-0.1	3.1***	6.8***	-4.2***	-4.1***	17.0***
Iceland	373	494	75.2	71.7	-3.5	1.2	0.2	0.3	-0.1	0.8	0.0	1.1	-1.3	1.4	-0.1	-0.1	0.1	-0.1	0.1	-7.1*
Ireland	5,793	3,947	55.0	51.2	-3.8***	1.1***	0.3*	0.3*	-4.1***	-1.4***	-1.5***	-3.9***	2.4**	0.5	-0.8***	0.9	1.4*	0.0	-0.4**	1.5
Italy	18,504	18,030	26.1	41.4	+15.3***	3.0***	-0.2**	0.9***	-0.3	-0.3***	-0.0	-1.0***	-0.5	0.4**	-0.1	3.8***	1.9***	-1.8***	-2.7***	12.2***
Latvia	1,669	1,084	35.1	50.9	+15.8***	4.1***	-0.8	0.9**	0.4	-0.1	0.1	-0.9	-0.7	0.6	-0.8	5.6***	-1.6	-1.4*	10.2***	
Lithuania	690	1,872	37.3	54.8	+17.4***	2.5	-2.8**	-0.4	1.6	0.1	0.5	0.6	1.6	-1.2	0.8	-0.3	3.4**	0.6	-2.2**	12.7***
Netherlands	4,494	13,699	32.6	53.7	+21.1***	0.6***	0.0	0.6***	-1.3***	-0.1	-0.2	-1.2*	0.3	0.1	-0.2	-2.0***	6.3***	-0.4	-2.9***	21.5***
Norway	2,213	2,906	45.8	51.0	+5.2***	1.2***	0.0	1.0***	-1.5**	0.2	-0.0	-1.2**	-0.9	1.2	0.1	1.5**	1.0	1.8**	-1.2**	5.1***
Poland	4,195	7,723	27.4	39.0	+11.5***	3.3***	-0.8***	0.5***	0.7*	0.4**	-0.1	1.5***	-1.5*	2.0**	-0.1	3.1***	3.6***	-3.2***	-3.2***	5.2***
Portugal	4,755	4,789	47.3	47.6	+0.3	0.8***	-0.3*	0.7***	0.6	-0.1	0.2	-0.0	-2.7	0.0	0.1	2.6***	-0.2	-1.4**	-1.1**	1.2
Romania	4,656	7,551	52.2	39.9	-12.3***	-1.5***	-1.0**	0.0	0.4	0.1	-0.3	0.9***	-12.3***	3.6***	0.6**	5.1***	2.0***	-3.7***	-3.2***	-3.0***
Slovakia	2,785	3,191	24.8	41.2	+16.4***	3.5***	-0.2	0.9***	-0.9	0.3**	-0.3	0.9**	-1.0	1.0	0.1	1.2*	4.5***	-1.7***	-2.6**	10.6***
Slovenia	1,746	1,911	22.5	33.3	+10.8***	1.5***	-0.5**	0.3	-0.6	0.0	-0.4	0.8*	-3.1***	2.8**	0.7	7.5***	0.7	-3.7***	-3.0**	7.8***
Spain	16,954	19,158	30.2	39.5	+9.3***	1.4***	0.0	0.8**	1.7***	0.4**	1.2***	0.6**	0.4	0.0	-0.1	0.4*	1.2***	-0.8**	-0.9**	2.8***
Sweden	1,567	2,964	45.3	51.2	+5.9**	1.0**	-0.1	0.4**	-2.1***	-0.2	0.3	-2.0**	-0.4	0.3	0.0	-1.3*	3.5***	0.6	-2.1**	8.7***
Switzerland	1,930	4,418	55.9	56.1	+0.2	0.9***	0.0	1.3**	-2.3***	0.3	-0.4	-1.2**	-1.5**	-0.4	2.2***	-1.7**	1.5*	0.2	-0.2	1.6

Notes: L = low, M = medium, H = high, * p < 0.05, ** p < 0.01, *** p < 0.001

Source: Own calculations based on EU-LFS

Tab. A2: Detailed decomposition of differences in activity rates between 2000 and 2019, women

Country	N		Activity rates		Change		Education		Explained part		Age group		Education		Unexplained part		Age group		Constant	
	2000	2019	2000	2019	2019	2020	L	M	H	55-59	60-64	65-69	70-74	L	M	H	55-59	60-64		65-69
Austria	6,617	5,450	11.0	25.8	+14.9***	2.1***	-0.2*	1.4***	-1.7***	-0.2**	-0.2	0.4*	-1.2	1.9***	-0.1	8.2***	-0.6*	-2.6***	-2.8***	10.5***
Belgium	3,197	5,258	8.7	26.2	+17.5***	3.3***	-0.1	1.8***	0.3	0.1*	0.3	0.5*	-4.0***	0.1	0.5**	5.6***	1.5***	-3.6***	-3.6***	14.9***
Bulgaria	7,910	5,912	7.6	33.6	+26.1***	3.6***	-0.4*	1.6***	-2.2***	0.1	-0.5**	-0.6*	-3.4***	0.0	0.6***	8.6***	3.1***	-4.9***	-6.0***	26.4***
Czech R.	7,634	8,145	14.0	33.3	+19.3***	3.4***	-0.6***	1.1***	-3.3***	-0.0	-0.4**	-0.5*	-0.1	0.5	0.0	10.2***	0.1	-3.8***	-4.5***	17.4***
Denmark	1,645	2,773	24.4	37.4	+13.0***	1.3***	0.0	1.0***	-1.0	0.1	0.9*	-1.8**	1.5	-0.2	-0.3	0.5	4.1***	-2.0***	-2.3**	11.2***
Estonia	613	1,022	24.9	51.9	+27.0***	3.5**	-0.3	2.4***	0.8	-0.2	-0.7	1.3	0.1	-0.8	0.5	1.1	5.0***	-2.3*	-3.2*	19.8***
Finland	3,327	4,419	25.5	37.8	+12.3***	1.8***	-0.1	1.2***	-2.4***	-1.0***	-1.4***	-2.2***	0.4	0.1	-0.2	1.3*	5.5***	-1.9***	-2.7**	13.7***
France	17,295	16,976	12.1	28.4	+16.3***	1.9***	-0.2	1.0***	0.9***	0.1*	0.2	0.6***	-1.3**	0.4**	0.0	3.0***	2.3***	-2.7***	-3.5**	13.6***
Germany	35,251	15,313	18.0	42.4	+24.4***	2.5***	0.1	0.9***	0.9***	-0.2**	-0.4***	0.9***	-1.7***	1.4***	0.1	0.8***	7.3***	-2.5***	-3.6***	18.2***
Greece	10,053	8,594	14.1	20.9	+6.9***	0.2	-0.9***	0.7***	0.8**	0.0	0.5***	-0.1	-1.4	0.1	0.0	2.0**	0.1	-1.2**	-1.5**	7.5***
Hungary	11,136	8,075	5.9	24.2	+18.3***	3.8***	-0.6*	1.1***	-1.5***	0.1	-0.2	0.3	0.2	0.4	-0.2	7.5***	0.7*	-4.4***	-4.5**	15.6***
Iceland	389	529	52.5	54.1	+1.6	4.4***	0.1	2.5***	0.2	0.9	0.2	1.3	-8.1*	0.1	0.8	-0.5	-0.6	-0.3	1.2	-0.5
Ireland	6,002	4,085	22.0	36.2	+14.2***	3.2***	0.2	1.5***	-2.8***	-1.2***	-1.5***	-2.5***	1.2	1.2***	-0.9***	4.3***	4.0***	-1.4**	-1.2**	10.0***
Italy	19,160	20,374	9.3	26.3	+16.9***	4.2***	0.0	1.3***	-0.1	-0.2**	-0.1	-0.4***	-6.2***	0.1	0.3***	3.3***	3.0***	-2.4***	-3.0**	17.2***
Latvia	2,425	1,642	16.7	46.0	+29.3***	4.7**	-2.4**	0.7**	1.1	0.3	0.2	1.1	-0.5	-0.4	1.0	2.9***	5.6***	-3.5***	-4.7**	20.1***
Lithuania	962	2,655	20.3	45.4	+25.1***	4.7**	-0.3	2.6***	0.7	-0.0	-0.1	0.7	-1.4	2.2	-0.2	3.6***	4.5***	-3.4***	-4.3**	19.1***
Netherlands	4,078	12,743	15.7	38.5	+22.8***	1.9***	0.0	1.1***	-0.4	0.0	-0.2	0.0	-1.6*	0.2	0.2	3.0***	5.1***	-2.6***	-4.0**	20.2***
Norway	2,243	2,838	33.7	42.4	+8.7***	2.1***	0.0	1.9***	-0.8*	0.2	-0.0	-0.4	0.4	0.6	-0.3	0.3	1.9**	0.3	-1.6**	4.8***
Poland	5,394	9,826	14.0	21.2	+7.2***	4.5***	-1.4***	1.4***	0.4	-0.1*	-0.2	1.0***	-3.3***	0.3	0.3*	4.5***	-1.3***	-2.2**	-2.7**	6.0***
Portugal	5,933	5,672	29.5	35.5	+6.0***	2.0***	0.3	0.8**	0.8*	-0.0	0.3	0.1	-11.3***	0.2*	0.0	3.4***	0.8	-2.2**	-2.5**	13.4***
Romania	5,638	8,696	42.6	24.1	-18.4***	-0.2	-1.8***	0.2***	-0.2	-0.0	-0.2	0.3*	-19.3***	2.0**	0.5***	4.2**	-1.8**	-2.6***	-1.2**	1.8
Slovakia	3,481	3,995	6.3	33.9	+27.6***	5.5***	-0.6*	1.5***	-0.8	0.2*	-0.3	0.8**	-0.3	1.8**	-0.2	10.3***	1.9***	-4.9***	-5.2**	17.9***
Slovenia	1,878	2,058	10.4	23.6	+13.2***	2.8***	-1.0***	2.2***	0.6	-0.0	-0.3	0.7*	-5.5***	0.5	0.6**	7.6***	-1.1*	-3.9***	-3.7**	13.6***
Spain	19,095	21,391	10.4	29.9	+19.5***	2.5***	-0.1	1.4***	1.6***	0.3***	0.8***	0.8***	1.3	-0.1	0.0	4.3***	1.9***	-3.7***	-3.8**	12.1***
Sweden	1,700	3,273	35.6	45.3	+9.6***	1.6***	0.0	1.5***	-1.2*	0.1	-0.2	-1.1	0.0	0.9	-0.5	-1.1*	3.2***	-1.2*	-0.7	8.6***
Switzerland	2,678	4,626	32.3	42.9	+10.6***	2.2***	0.0	1.6***	-1.2*	0.3	0.2	-0.5	-0.5	0.7	0.0	0.8	2.5***	-0.9*	-1.8**	7.3***

Notes: L = low, M = medium, H = high, * p < 0.05, ** p < 0.01, *** p < 0.001

Source: Own calculations based on EU-LFS

Tab. A3: Labour force participation rates by gender, level of education, and year

	Men						Women					
	Low education		Medium education		High education		Low education		Medium education		High education	
	2000	2019	2000	2019	2000	2019	2000	2019	2000	2019	2000	2019
Austria	21.6	27.8	28.1	36.2	45.3	53.0	8.6	15.0	12.0	26.6	31.5	41.6
Belgium	14.4	21.0	24.3	35.9	41.3	49.9	6.3	12.8	11.6	29.4	21.4	42.9
Bulgaria	17.2	29.8	30.9	44.8	37.1	60.5	5.0	18.6	9.5	32.9	17.7	49.8
Czech Republic	19.5	26.2	36.8	44.7	52.5	65.7	5.8	15.3	17.8	32.8	40.8	58.6
Denmark	25.4	43.9	40.1	51.4	56.3	56.1	13.1	25.4	35.9	39.0	37.0	46.9
Estonia	19.3	31.7	35.7	54.3	67.5	68.5	13.4	29.7	28.7	46.9	42.6	63.9
Finland	25.4	28.8	30.8	44.0	44.1	49.2	18.8	17.9	28.7	37.9	40.2	48.9
France	11.5	23.7	19.6	31.9	33.9	44.5	9.3	19.4	15.8	31.1	28.1	39.3
Germany	23.9	44.4	29.0	49.6	43.7	59.4	11.4	28.2	20.9	42.7	34.4	54.5
Greece	33.7	31.7	28.4	38.6	41.3	45.6	14.1	17.6	11.4	20.9	22.8	32.6
Hungary	10.9	25.4	27.8	42.7	37.9	51.2	3.1	14.4	9.5	24.8	25.7	37.8
Iceland	72.0	67.8	76.2	72.8	85.2	73.6	49.9	35.7	57.5	61.0	68.1	74.6
Ireland	49.9	42.3	62.2	57.6	70.6	57.6	16.0	20.9	27.2	40.9	47.3	49.5
Italy	21.8	31.7	35.6	49.0	53.2	62.5	7.2	14.5	17.5	38.6	28.0	52.4
Latvia	24.4	25.1	41.6	51.2	50.8	62.7	8.8	18.5	18.2	42.4	40.6	62.6
Lithuania	26.4	34.7	43.4	52.5	53.1	67.2	12.3	17.0	26.3	39.8	36.6	63.3
Netherlands	23.8	43.4	35.2	54.1	44.0	63.4	11.0	24.7	20.9	44.8	30.8	55.9
Norway	34.4	40.6	46.2	49.1	61.5	59.9	20.2	32.2	38.5	37.9	59.1	56.3
Poland	23.0	21.7	27.2	39.6	47.6	53.2	12.0	6.6	14.6	20.1	30.6	41.4
Portugal	46.6	44.1	50.4	54.1	60.5	65.2	29.2	29.2	24.2	55.4	40.9	56.1
Romania	65.0	37.1	30.0	41.3	35.0	38.7	50.6	22.0	11.0	24.4	20.5	34.8
Slovakia	9.7	28.5	30.6	40.0	43.9	53.6	1.9	15.3	10.3	34.4	38.7	56.4
Slovenia	23.7	21.0	17.7	32.0	35.1	49.3	12.0	10.8	5.6	20.7	21.6	46.5
Spain	27.2	32.2	40.6	47.6	49.8	51.1	8.8	20.9	24.2	40.4	31.4	50.6
Sweden	38.1	41.9	48.1	52.9	56.5	55.9	24.4	27.0	39.4	47.0	55.9	57.7
Switzerland	49.2	44.4	55.7	51.4	61.2	65.1	24.2	30.2	36.8	41.5	52.1	57.1

Source: Own calculations based on EU-LFS

Tab. A4: Detailed decomposition of differences in employment rates between 2000 and 2019, men

Country	Employment rates										Unexplained part													
	2000			2019			Change			Education			Age group			70-74			70-74			Constant		
	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
Austria	27.5	38.4	10.9***	1.3***	-0.0	1.6***	-2.4***	0.2**	-0.3	-0.2	-1.0*	1.4*	0.1	2.2***	2.9***	-1.9***	-1.7***	-1.7***	8.7***					
Belgium	20.0	33.0	13.0***	3.1***	-0.2	1.6***	-0.4	0.1	0.2	0.1	-1.6	0.2	0.3	3.3***	1.4**	-2.0***	-2.1***	-2.1***	8.9***					
Bulgaria	20.9	42.7	21.8***	4.1***	-0.4	0.8***	-0.9**	0.6**	-0.0	0.2	-3.0***	-0.0	0.7***	0.1	6.3***	-1.4***	-4.2***	-4.2***	19.0***					
Czech R.	34.2	46.6	12.4***	1.8***	-0.0	0.8***	-3.4***	0.4**	-1.0***	-0.4	-0.6*	2.0*	0.1	0.5	5.2***	-2.1***	-2.6***	-2.6***	11.8***					
Denmark	36.5	49.1	12.6***	0.4**	-0.0	0.4**	-2.2***	-0.2	-0.1	-2.6***	-0.2	2.7**	-0.8*	-3.1***	3.8**	0.6	-1.0*	-1.0*	14.8***					
Estonia	32.0	51.1	19.1***	2.9**	-0.8	0.8	0.7	-0.2	-0.2	0.7	2.9	-0.2	-1.4	-1.2	3.6*	-0.8	-0.6	-0.6	13.0***					
Finland	28.3	39.0	10.7***	1.4***	-0.4**	0.7***	-2.7***	-0.7***	-1.1***	-2.3***	0.2	0.3	-0.3	2.6***	3.2***	-1.1**	-2.2***	-2.2***	13.1***					
France	15.3	30.3	15.0***	2.0***	-0.5***	1.3***	0.5*	-0.0	0.1	0.1	-0.8	0.3	0.0	2.4***	2.6**	-2.2***	-2.6**	-2.6**	11.7***					
Germany	28.5	50.7	22.3***	0.7***	-0.0*	0.5***	0.5**	-0.6***	-0.5***	0.1	-0.6***	1.3***	0.2	0.3	6.0**	-1.5***	-2.4***	-2.4***	18.2***					
Greece	32.5	32.6	0.1	0.4*	-0.8**	0.9***	1.2**	-0.1	0.4**	0.0	-3.5***	0.3	0.3	0.1	0.0	0.1	0.0	0.1	1.0					
Hungary	17.7	40.2	22.5***	5.8***	-0.0	0.5***	-2.0**	0.8***	-0.4	0.3	-0.6	0.4	-0.1	3.1***	6.6**	-4.0***	-4.0***	16.4***						
Iceland	74.7	69.9	-4.8	1.7*	0.3	0.5	-0.1	0.7	0.0	1.0	-2.5	2.1	-0.0	-0.3	-0.5	0.1	0.5	0.5	-8.3**					
Ireland	53.6	49.3	-4.3***	1.1***	0.2	0.3*	-3.8**	-1.3***	-1.4**	-3.7***	2.7**	0.4	-0.8**	0.7	1.2*	0.0	-0.4*	-0.4*	0.4					
Italy	25.2	39.2	14.0***	3.2***	-0.2*	0.9***	-0.3	-0.3***	-0.0	-0.9**	-0.8	0.4**	-0.1	3.3***	1.9**	-1.6***	-2.4**	-2.4**	10.9***					
Latvia	32.2	47.1	14.9***	4.3***	-0.7	1.0**	0.4	-0.1	0.1	0.1	-1.7	-0.3	0.7	-0.3	4.8**	-1.6	-1.3*	-1.3*	9.7***					
Lithuania	33.6	51.7	18.1***	2.6	-3.2**	-0.5	1.5	0.1	0.5	0.6	2.2	-1.3	0.5	0.5	3.0*	0.5	-2.5**	-2.5**	13.6***					
Netherlands	32.1	51.7	19.6***	0.5***	0.0	0.6**	-1.3**	-0.1	-0.2	-1.1*	0.4	0.1	-0.3	-1.9**	6.0**	-0.6	-2.6**	-2.6**	20.0***					
Norway	45.0	50.1	5.1**	1.2***	0.0	1.0***	-1.5**	0.2	-0.0	-1.2**	-0.8	1.1	0.1	-1.6**	1.0	1.9***	-1.1**	-1.1**	5.0***					
Poland	25.3	38.1	12.7***	3.4***	-0.7**	0.5***	0.7*	0.4**	-0.1	1.4***	-2.1**	-2.2**	-0.0	3.4***	3.4**	-3.3**	-3.3**	6.8***						
Portugal	46.1	45.1	-0.9	0.8***	-0.4**	0.7***	0.5	-0.1	0.2	-0.0	-2.1	-0.0	0.1	2.0***	0.0	-1.2*	-0.9*	-0.9*						
Romania	51.8	39.1	-12.6***	-1.5***	-1.0**	-0.0	0.4	0.0	-0.3	0.9**	-12.2**	3.6**	0.6**	5.2***	1.7**	-3.6***	-3.2***	-3.2**						
Slovakia	21.3	39.7	18.3***	4.0***	-0.1	1.0***	-0.9	0.3**	-0.3	0.9**	-1.2	0.7	0.2	2.8***	4.0**	-2.1***	-2.9**	11.7***						
Slovenia	21.4	32.0	10.6***	1.4***	-0.5**	0.3	-0.6	0.0	-0.4	0.8*	-3.1**	3.1**	0.6	7.8***	0.3	-3.6***	-3.0**	7.5***						
Spain	27.6	35.0	7.4***	1.9***	0.0	1.0***	1.5**	0.3***	1.0**	0.6***	-0.2	0.0	-0.1	0.2	0.9**	-0.5**	-0.5**	1.3						
Sweden	42.3	49.0	6.7***	1.0***	-0.0	0.4**	-1.9**	-0.2	-0.2	-1.9**	-0.3	0.2	0.0	-1.0	3.5**	0.3	-2.1**	-2.1**	9.1***					
Switzerland	54.4	54.4	-0.0	1.0**	-0.0	1.3***	-2.2***	0.3	-0.4	-1.1**	-1.3*	-0.7	2.0***	-2.1**	1.6*	0.3	-0.2	-0.2	1.4					

Notes: L = low, M = medium, H = high, * p < 0.05, ** p < 0.01, *** p < 0.001

Source: Own calculations based on EU-LFS

Tab. A5: Detailed decomposition of differences in employment rates between 2000 and 2019, women

Country	Employment rates				Explained part						Unexplained part						
	2000	2019	Change	L	Education			Age group			L	M	H	Age group			Constant
					M	L	H	55-59	60-64	65-69				70-74	55-59	60-64	
Austria	10.6	25.2	14.5***	2.1***	-0.2**	1.4***	-1.6***	-0.2**	0.3	-1.0	1.8***	-0.1	8.0***	-0.5*	-2.5***	-2.8***	10.1***
Belgium	8.5	25.2	16.7***	3.3***	-0.3	1.8***	0.3	0.1	0.3	0.5	-4.3***	0.2	0.4*	1.3***	-3.4***	-3.5***	14.2***
Bulgaria	6.8	32.6	25.8***	4.1***	-0.4*	1.7***	-2.0***	0.1	-0.5**	-0.5*	-4.3***	0.1	0.7***	3.0***	-4.8***	-5.8***	25.9***
Czech R.	13.3	32.8	19.5***	3.6***	-0.6***	1.2***	-3.2***	-0.0	-0.4**	-0.5*	-0.6	0.6	0.0	10.0***	0.2	-3.8***	17.4***
Denmark	23.5	36.6	13.1***	1.2***	0.1	1.0***	-1.0	0.1	0.9*	-1.7**	1.5	0.0	-0.4	0.9	3.6**	-2.0**	11.2***
Estonia	23.7	50.4	26.7***	3.2**	-0.6	2.6***	0.8	-0.2	-0.7	1.3	1.1	-1.3	0.3	1.6	4.4**	-2.4*	19.7***
Finland	23.3	36.1	12.8***	1.9***	-0.1	1.3***	-2.3***	-1.0***	-1.3***	-2.1***	0.4	0.1	-0.2	2.0***	5.0**	-2.0***	13.8***
France	11.3	26.5	15.2***	1.9***	-0.2*	1.0**	0.8**	0.1*	0.2	0.6***	-1.4**	0.4*	0.0	2.9***	2.0**	-2.5***	12.7***
Germany	15.5	41.4	25.9***	2.6**	0.0	1.0***	0.8**	-0.2**	-0.4***	0.9**	-2.0***	1.5**	0.1	2.2***	6.6***	-2.9***	19.9***
Greece	13.5	17.8	4.2***	0.3	-1.0***	0.8***	0.6**	0.0	0.4**	-0.1	-1.4	0.0	0.1	1.3***	-0.1	-0.7**	4.9***
Hungary	5.9	23.7	17.8***	3.8***	-0.6*	1.1***	-1.5**	0.1	-0.2	0.3	0.2	0.4	-0.2	7.2***	0.7*	-4.2***	15.1***
Iceland	50.9	53.5	2.6	4.2***	0.0	2.5***	0.2	0.9	0.2	1.3	-7.3*	0.1	0.7	-1.0	-0.3	0.2	0.1
Ireland	21.5	34.9	13.4***	3.2***	0.2	1.5***	-2.7**	-1.1**	-1.4**	-2.4***	1.0	1.2**	-0.8**	4.1***	3.6**	-1.3**	9.4***
Italy	8.9	25.2	16.3***	4.2***	-0.0	1.3***	-0.1	-0.1**	-0.1	-0.4**	-6.1***	0.0	0.3**	3.1***	2.9**	-2.3**	16.5***
Latvia	16.0	44.2	28.2***	4.8***	-0.2	2.5***	0.6	-0.0	-0.1	0.7	-1.9	2.6*	-0.2	3.1***	4.5***	-3.1***	18.9***
Lithuania	19.5	42.9	23.4***	5.1***	-2.8**	0.8**	1.0	0.3	0.2	1.0	-1.2	-0.4	1.2	2.5**	5.3**	-3.1**	17.9***
Netherlands	15.4	37.3	21.8***	1.9***	0.0	1.1***	-0.4	0.0	-0.2	0.0	-1.7*	0.2	0.2	2.8**	4.9**	-2.5**	19.4***
Norway	33.5	42.1	8.6***	2.1***	0.0	1.8***	-0.8*	0.2	-0.0	-0.4	0.4	0.6	-0.3	-0.5	2.0**	0.3	4.8***
Poland	12.8	20.9	8.1***	4.6***	-1.4**	1.5***	0.4	-0.1*	-0.2	1.0**	-4.2***	0.2	0.4**	4.6**	-1.1**	-2.3**	7.6***
Portugal	29.0	33.7	4.6**	2.0**	0.1	1.0**	0.7*	-0.0	0.3	0.1	-10.6***	0.1*	0.1	3.1***	0.6	-2.1**	11.5***
Romania	42.5	23.8	-18.7***	-0.2	-1.8***	0.2***	-0.2	-0.0	-0.2	0.3*	-19.2***	2.0**	0.5**	4.1***	-1.8**	-2.5***	1.3***
Slovakia	5.7	32.1	26.4***	6.0***	-0.6*	1.6***	-0.7	0.2**	-0.3	0.8**	-1.0	1.7**	0.6**	9.4***	1.9**	-4.6**	17.1***
Slovenia	10.3	22.4	12.1***	2.8**	-1.0***	2.3***	0.1	-0.0	-0.2	0.7*	-5.6**	0.5	0.6**	7.1***	-1.1*	-3.6**	12.5***
Spain	9.3	25.9	16.6***	2.6***	-0.2*	1.7***	1.4**	0.2***	0.7**	0.7***	0.9	-0.1	0.1	3.7***	1.4**	-3.1**	9.7***
Sweden	34.0	43.5	9.5***	1.7**	-0.0	1.5**	-1.2*	-0.1	-0.2	-1.0	-0.2	1.1	-0.4	-1.2*	3.3**	-1.2*	8.2***
Switzerland	31.6	41.1	9.5***	2.2**	-0.0	1.7***	-1.1*	0.3	0.1	-0.5	-0.1	0.5	-0.0	0.4	2.4**	-0.8	6.1***

Notes: L = low, M = medium, H = high, * p < 0.05, ** p < 0.01, *** p < 0.001

Source: Own calculations based on EU-LFS

Tab. A6: Detailed decomposition of differences in labour force participation rates between 2000 and 2019, men (logistic regression)

Country	Activity rates																	
	Explained part					Unexplained part												
	2000	2019	Change	Education		Age group		Education		Age group		Constant						
			L	M	H	55-59	60-64	65-69	70-74	L	M	H	55-59	60-64	65-69	70-74		
Austria	28.8	39.8	+11.0***	-0.4	0.0	-0.4	0.6	-0.1	0.1	0.1	-0.9	0.9	0.2	1.5*	1.8*	-1.5**	-0.9	10.0***
Belgium	20.6	34.5	+13.8***	3.0***	-0.2	1.6***	-0.3**	0.2**	0.2***	0.1***	-2.3*	-0.1	0.7*	1.4	-0.0	-0.4	-0.7	10.9***
Bulgaria	23.6	44.4	+20.7***	3.7***	-0.4	0.7***	-0.8***	0.5***	0.2***	0.2***	-1.4	-0.3	0.4*	-1.4**	4.7***	0.8	-3.5***	17.5***
Czech R.	35.9	47.3	+11.4***	3.8***	-0.0	1.6***	-6.1***	0.6***	-1.4***	-0.8***	-0.7	1.8	0.1	1.1*	3.0***	-1.6***	-1.6**	11.6***
Denmark ^a	38.0	50.7	+12.7***	0.5***	-0.0	0.6***	-0.1***	-0.1***	0.2**	0.5	2.3*	-1.1**	-2.7***	1.3*	2.0*			14.1***
Estonia	35.8	54.1	+18.3***	3.4***	-0.5	0.9***	0.8**	-0.2***	0.7***	2.6	0.9	2.0	-2.0	-2.2	0.5	-0.2	1.5	12.1***
Finland	31.0	42.0	+11.0***	1.7***	-0.5**	0.9***	-3.0**	-0.8***	-1.0**	-2.8***	-0.0	0.0	-0.0	1.7*	2.3**	-0.4	-1.8**	14.9***
France	16.4	32.3	+16.0***	1.9***	-0.5***	1.2***	0.4***	-0.0***	0.1***	0.1***	0.1	0.3	-0.1	-0.1	1.2***	-0.2	0.7	12.3***
Germany	32.0	52.2	+20.2***	0.5***	-0.0**	0.3***	0.3***	-0.3**	0.3***	0.1***	-0.5**	1.1**	0.2	-1.4***	2.3***	-0.1	-0.2	18.3***
Greece	33.5	37.1	+3.6***	0.2	-0.8**	0.7***	1.5***	-0.1***	0.3***	0.0***	9.4	-1.4	-0.4	-3.4	-2.5	-1.1	7.0	-5.8
Hungary	18.3	41.3	+23.0***	5.2***	-0.1	0.5***	-1.4**	0.6***	-0.3***	0.2***	0.4	0.2	-0.2	0.6	4.6***	-2.2***	-2.2**	17.1***
Iceland	75.2	71.7	-3.5	1.4*	0.3	0.4	-0.1**	0.7***	0.1*	0.9***	-0.6	1.1	-0.2	-1.7	-0.1	0.7	0.6	-7.2*
Ireland	55.0	51.2	-3.8***	1.3***	0.3*	0.3*	-4.2***	-1.3***	-4.2***	2.2*	0.6	0.6	-0.8***	1.3	0.8	0.1	-0.5*	1.6
Italy	26.1	41.4	+15.3***	3.2***	-0.3**	1.0***	-0.3***	-0.0**	-1.1***	-2.3**	0.4*	0.0	3.5***	0.8*	-0.9**	-2.4***	13.9***	
Latvia	35.1	50.9	+15.8***	4.4***	-0.7	1.0***	0.4***	-0.1***	0.1***	-1.4	-0.9	0.0	-0.6	3.9*	1.7	-0.5	11.1***	
Lithuania	37.3	54.8	+17.4***	3.4**	-3.7	-0.6***	1.9*	0.1**	0.5**	0.8**	1.6	-1.4	1.0	0.2	1.8	1.1	-2.0	12.7***
Netherlands	32.6	53.7	+21.1***	0.9***	0.0	1.0***	-1.7***	-0.1***	-0.3***	-1.5***	0.1	-0.0	-0.3	-2.2***	2.6***	0.7	-1.1	22.5***
Norway	45.8	51.0	+5.2***	5.1	0.0	4.4	-5.6	0.6	-0.1	-4.8	-0.9	1.4	-0.0	-1.4	0.4	1.5*	-0.6	5.2***
Poland	27.4	39.0	+11.5***	3.4***	-0.6**	0.5***	0.6**	0.4***	-0.0**	1.4***	-17.5	11.8	1.2	20.5	24.1	-16.2	-25.7	7.6
Portugal	47.3	47.6	+0.3	0.9***	-0.4**	0.7***	0.6**	-0.1***	0.2**	-0.0**	-4.0	-0.1	0.2	3.7**	-0.3	-1.8*	-1.8**	2.4
Romania	52.2	39.9	-12.3***	-1.6***	-1.0**	-0.0	0.4**	0.1**	-0.2**	0.8***	-10.4***	3.1***	0.5***	4.9***	2.5***	-3.3***	-3.8**	-4.3**
Slovakia	24.8	41.2	+16.4***	2.5***	-0.1	0.7***	-0.5**	0.3**	-0.1**	0.7***	0.8	0.6	-0.3	-1.3*	1.7**	0.1	-0.6	12.0***
Slovenia	22.5	33.5	+10.8***	1.0***	-0.3*	0.2***	-0.3***	0.1**	-0.2**	0.7***	-22.1	14.2	6.8	37.8	12.9	-14.2	-24.7	-1.1
Spain	30.2	39.5	+9.3***	1.6***	-0.0	0.9***	1.6**	0.4***	0.8**	0.7***	0.2	0.0	-0.1	0.0	-0.1	-0.1	0.2	3.1***
Sweden	45.3	51.2	+5.9**	1.3**	-0.1	0.5***	-2.3***	-0.2***	-0.3**	-2.2***	-0.6	0.3	0.1	-0.4	2.6**	0.8	-2.3*	8.8***
Switzerland	55.9	56.1	+0.2	1.5***	-0.0	2.1***	-3.3***	0.3**	-0.5**	-1.5***	-3.3	-0.7	4.8	-2.8	2.5	0.2	-0.3	1.2

Notes: L = low, M = medium, H = high, * p < 0.05, ** p < 0.01, *** p < 0.001.

^a In Denmark, all in age group 70-74 were inactive in 2000, thereby predicting failure perfectly and automatically omitting the variable in the model. As a result, age groups 65-69 and 70-74 were merged to allow the model to be estimated.

Source: Own calculations based on EU-LFS

Tab. A7: Detailed decomposition of differences in labour force participation rates between 2000 and 2019, women (logistic regression)

Country	Activity rates										Unexplained part														
	2000		2019		Change		Education			Age group			Education			Age group			Constant						
	L	M	L	M	H	55-59	60-64	65-69	70-74	L	M	H	55-59	60-64	65-69	70-74	L	M	H	55-59	60-64	65-69	70-74	Constant	
Austria	11.0	25.8	+14.9***	1.3***	-0.1	0.8***	-0.7***	0.1***	-0.1***	0.2***	-2.5*	3.0***	-0.1	4.6***	0.2	-1.6*	-2.0	11.7***							11.7***
Belgium	8.7	26.2	+17.5***	3.2***	0.1	1.6***	0.2***	0.2***	0.6***	-4.8*	-4.8*	0.1	0.6	3.1*	2.9*	-0.9	-5.1***	15.3***							15.3***
Bulgaria	7.6	33.6	+26.1***	2.9***	0.1	1.1***	-1.2***	0.1***	-0.4***	-2.7**	-2.7**	0.1	0.4*	4.4***	2.6***	-1.9***	-4.5***	25.5***							25.5***
Czech R.	14.0	33.3	+19.3***	-1.1	0.1	-0.3	0.7	-0.0	0.1	0.1	-0.5	-0.6	0.1	6.9***	-0.2	-2.7***	-2.7***	19.4***							19.4***
Denmark ^a	24.4	37.4	+13.0***	0.7*	0.0	0.5*	-0.3***	0.0**	-0.2***	2.1*	-0.3	-0.4	-0.7	0.8	0.0	0.0	0.0	10.9***							10.9***
Estonia	24.9	51.9	+27.0***	3.5***	-0.3	2.4***	-0.2***	-1.3***	-3.0***	1.2***	0.9	-1.2	0.3	0.5	2.5	-2.2	-0.4	19.8***							19.8***
Finland	25.5	37.8	+12.3***	3.4***	-0.0	2.1***	-0.8***	0.1***	0.7***	-0.2	0.2	-0.1	1.4*	-0.1	0.4	0.4	-1.1	14.9***							14.9***
France	12.1	28.4	+16.3***	1.9***	-0.1	0.9***	0.7***	0.1***	0.7***	-0.8*	0.3**	-0.0	0.3	0.2	0.4	0.4	-0.2	12.4***							12.4***
Germany	18.0	42.4	+24.4***	2.4***	0.1	0.9***	-0.2***	-0.3***	0.8***	-0.9**	1.2***	-0.0	-1.5***	2.6***	0.1	-0.6	19.2***								19.2***
Greece	14.1	20.9	+6.9***	0.2	-1.1***	0.9***	1.2***	0.1***	-0.3***	-2.4	0.4	-0.0	1.6***	0.4	-0.0	-2.3	7.9***								7.9***
Hungary	5.9	24.2	+18.3***	2.8***	-0.2	0.7***	-0.8***	0.2***	-0.1***	2.9***	2.9***	0.1	-0.3***	2.5***	1.2**	-1.8***	-2.1**	12.9***							12.9***
Iceland	52.5	54.1	+1.6	4.5***	0.1	2.7***	0.2***	0.9***	0.1	1.4***	-8.8*	-0.0	0.9	-0.2	-0.3	-0.4	0.7	-0.3							-0.3
Ireland	22.0	36.2	+14.2***	2.0***	0.2	0.9***	-1.6***	-0.8***	-0.7***	-1.8***	0.7	1.1***	-0.7***	0.2	1.5	-0.9*	0.2	13.9***							13.9***
Italy	9.3	26.3	+16.9***	5.0***	0.2	1.5***	-0.2**	-0.3***	-0.1***	-0.7***	-3.2***	-0.1	0.2***	1.0**	2.6***	-0.1	-2.7***	13.9***							13.9***
Latvia	16.7	46.0	+29.3***	4.9***	-0.1	2.5***	0.6**	-0.0***	-0.1***	0.6***	-1.1	2.2	-0.3	1.7*	2.7**	-2.4**	-1.7	19.8***							19.8***
Lithuania	20.3	45.4	+25.1***	5.4**	-2.1	0.8***	0.9**	0.2***	0.2***	1.1***	-0.8	-0.5	1.3	2.4*	4.4**	-2.9*	-3.6*	18.5***							18.5***
Netherlands	15.7	38.5	+22.8***	2.0***	0.0	1.1***	-0.3***	0.0***	-0.2***	0.0***	-0.4	0.1	0.1	-0.6	2.7**	0.0	-1.9	20.3***							20.3***
Norway	33.7	42.4	+8.7***	1.7***	0.0	1.5***	-0.6***	0.2***	-0.3***	0.6	0.2	-0.3	-1.0*	-0.1	-0.1	1.0	5.9***								5.9***
Poland	14.0	21.2	+7.2***	4.3***	-0.4*	1.1***	0.2**	0.1***	-0.1***	1.0***	0.8	-0.1	-0.1	-0.4	-0.0	0.1	0.5	0.2							0.2
Portugal	29.5	35.5	+6.0***	2.1***	0.3	0.8***	0.8***	-0.0***	0.2***	0.1***	10.5	-0.1	-0.0	-3.1	-1.2	1.4	3.2	-8.8							-8.8
Romania	42.6	24.1	-18.4***	-0.4	-1.9***	0.2***	-0.2***	0.0	-0.2***	0.3***	-20.1***	2.4***	0.4***	4.5***	-0.8	-3.0***	-2.0***	2.2							2.2
Slovakia	6.3	33.9	+27.6***	4.7***	-0.1	1.1***	-0.4***	0.3***	-0.2***	0.7***	2.0	0.3	-0.2*	2.2**	1.7*	-1.5	-1.9	18.8***							18.8***
Slovenia	10.4	23.6	+13.2***	2.9***	-0.7*	2.0***	0.5***	0.0***	-0.2***	0.8***	34.9	-8.7	-2.5	-24.7	-5.5	14.0	18.9	-18.5							-18.5
Spain	10.4	29.9	+19.5***	2.3***	-0.0	1.3***	1.6***	0.5***	0.6***	1.2***	2.6**	-0.1	-0.0	1.4***	0.4	-1.2*	-1.1	9.9***							9.9***
Sweden	35.6	45.3	+9.6***	0.8	-0.0	0.7	-0.4	-0.0	-0.1	-0.4	0.0	0.7	-0.3	-1.6***	-0.3	-1.4**	3.1***	9.1***							9.1***
Switzerland	32.3	42.9	+10.6***	2.1***	0.0	1.5***	-0.9**	0.2***	0.1***	-0.4***	-0.8	0.9	0.0	0.8	1.2*	-0.5	-1.2	7.5***							7.5***

Notes: L = low, M = medium, H = high, * p < 0.05, ** p < 0.01, *** p < 0.001.

^a In Denmark, all in age group 70-74 were inactive in 2000, thereby predicting failure perfectly and automatically omitting the variable in the model. As a result, age groups 65-69 and 70-74 were merged to allow the model to be estimated.

Source: Own calculations based on EU-LFS

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