Researching Participation in Adult Education

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Inequality in adult education participation across national contexts

Is growing employer support exacerbating or mitigating inequality in participation?

Over the span of 20-30 years, evidence suggests that participation in adult education (inclusive of undertaking for job-related purposes) is on a significant upward trend since the 1990s in most OECD and many EU countries. The upward trend may be attributed partly to the increasing interest by employers (private, public, and non-governmental sectors) to invest in adult education due to its substantial benefits. As employer investment grows, who gets employer support to participate in adult education thus becomes an important research and policy question, particularly since inequality in participation may exacerbate social inequalities of various kinds. The purpose of this article is to explore whether the trend of increased participation in employer-supported adult education is exacerbating or mitigating the Matthew effect across different countries. It provides estimates of the change in probabilities of participation in employersupported adult education by various individual, socio-demographic, and job-related characteristics associated with adults between the period of 1994-1998 and 2013. Results of the data analysis based on the 2013 OECD Programme for the International Assessment of Competencies (PIAAC) and the 1994-1998 International Adult Literacy Survey (IALS) suggest that the growth of employer-supported adult education may be playing a role in mitigating inequality in participation. Reduced differences over time in the probabilities of participation between contrast categories associated with various individual, socio-demographic, and job-related characteristics (e. g. women compared to men, lowest educated compared to highest educated, etc.) are interpreted as reduced inequalities in the probability of participation associated with those contrast categories. Further research on additional and updated datasets is warranted to explore the trend of whether growing employer support for adult education is exacerbating or mitigating inequality in adult education participation in different countries.

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Inequality in adult education participation across national contexts: is growing employer support exacerbating or mitigating inequality in participation?

Richard Desjardins & Jungwon Kim

Abstract

Over the span of 20–30 years, evidence suggests that participation in adult education (inclusive of undertaking for job-related purposes) is on a significant upward trend since the 1990s in most OECD and many EU countries. The upward trend may be attributed partly to the increasing interest by employers (private, public, and non-governmental sectors) to invest in adult education due to its substantial benefits. As employer investment grows, who gets employer support to participate in adult education thus becomes an important research and policy question, particularly since inequality in participation may exacerbate social inequalities of various kinds. The purpose of this article is to explore whether the trend of increased participation in employer-supported adult education is exacerbating or mitigating the Matthew effect across different countries. It provides estimates of the change in probabilities of participation in employer-supported adult education by various individual, socio-demographic, and job-related characteristics associated with adults between the period of 1994–1998 and 2013. Results of the data analysis based on the 2013 OECD Programme for the International Assessment of Competencies (PIAAC) and the 1994–1998 International Adult Literacy Survey (IALS) suggest that the growth of employer-supported adult education may be playing a role in mitigating inequality in participation. Reduced differences over time in the probabilities of participation between contrast categories associated with various individual, socio-demographic, and job-related characteristics (e. g. women compared to men, lowest educated compared to highest educated, etc.) are interpreted as reduced inequalities in the probability of participation associated with those contrast categories. Further research on additional and updated datasets is warranted to explore the trend of whether growing employer support for adult education is exacerbating or mitigating inequality in adult education participation in different countries.

Keywords: Adult education participation; inequality of adult education; Matthew principle; growth of adult education; employer-supported adult education; PIAAC; IALS

1   Introduction

Already in the 1990s, Heckman et al. (1998) estimated that firm-based and other adult training accounted for over half of lifelong acquisition of human capital. On one hand, a few analyses since then have suggested that there is a growth of adult education since the 1990s (e. g., Desjardins, 2017; 2020). On the other hand, other more country specific analyses focusing on specific periods have also suggested some declines (e. g., Mason, 2010). Naturally, shocks to the economy and society such as the COVID-19 pandemic can have substantial short- to medium-term effects. Similarly, so can changes in governments that feature significantly different political and budgetary priorities. Over the span of 20–30 years, however, the evidence suggests that adult education is on a significant upward trend since the 1990s in many OECD and EU countries for which there is available data.

It is worthwhile at the outset to define adult education for the purposes of this article in terms of its relationship to the world of work and job-related training. Approaches to the definition and delineation of adult education can vary considerably by country. In some circles adult education is approached as something distinct or different to job-related training but this can be problematic. Foremost, motivations and purposes for undertaking learning of any kind are not neatly distinguishable, and nor are the implications. That is, the impact of learning in one sector or for a given purpose on other sectors and other purposes (e. g., adult education for democracy and civil society vs. work related reasons) is interrelated in complex ways. For example, learning for basic skills or for activities in civil society involving social relations and context-based experiences can be directly related to skill development that is relevant to the world of work. Additionally, adults undertake diverse forms of learning for job-related reasons, and employers support diverse forms of learning including formal qualifications in the regular system of education and in some cases even those undertaken for non-job-related reasons (see Desjardins, 2020, Fig. 2.7). It is therefore crucial to note that organized learning undertaken by adults that is job-related and/or employer-supported cannot be reduced to the concept of training. Indeed, this can involve formal and non-formal adult education including basic skills programs, compensatory or second chance education, higher education for mature students as well as popular forms of adult education. Accordingly, the concept adult education in this article includes job-related training, whether it is on- or off- the job, as well as other forms of adult education.

The upward trend in the growth of participation in adult education (broadly defined) since the 1990s may be attributed partly to the increasing interest by employers (private, public, and non-governmental sectors) to invest in adult education due to its substantial benefits. Lerman (2015) for example, documented the positive impacts, such as industry productivity and innovation, wage increment and tax benefits of continued investment in learning. As employer investment grows, who gets employer support to participate in adult education thus becomes an important research and policy question. One expectation is that the growth of participation in employer-supported adult education will exacerbate inequalities in participation. This follows from an as-

sumption about employers' general behavior of seeking benefits over costs (Becker, 1964), whereby participation in employer-supported training is likely to be selective. For example, adults with higher levels of education tend to be perceived as more capable by employers and thus tend to selectively train them for advanced skill development to boost productivity (Ci et al., 2015). Given that adult education has been found to be associated with various economic and non-economic benefits (see for example, Ruhose et al., 2019), the growth of inequality of participation in adult education may therefore exacerbate social inequalities of various kinds.

This article provides estimates of the growth of participation in employer-supported adult education by various individual, socio-demographic, and job-related characteristics associated with adults since the 1990s to ascertain the impact of changes on inequalities in adult education participation over time. The purpose is to explore the hypotheses of whether growing employer support for adult education is exacerbating or mitigating inequality in adult education participation. As mentioned, an expectation is that the growth of participation in employer-supported adult education will exacerbate inequality in participation. Inequalities in participation are ascertained based on differences in the probabilities of participation between contrast categories associated with various individual, socio-demographic, and job-related characteristics (e. g., women compared to men, lowest educated compared to highest educated, etc.). For example, reduced differences in the probabilities of participation between contrast categories are interpreted as reduced inequalities in the probability of participation associated with those contrast categories.

The article is organized as follows. First, a brief overview of recent research on patterns of inequality in adult education participation is provided. This includes the role of social disadvantage, and some macro, institutional, organizational, or other structural factors that may be affecting participation patterns. Second, the data and method used to generate estimates is elaborated. Estimates are based on analysis using the 2013 OECD Programme for the International Assessment of Competencies (PIAAC) and the 1994–1998 International Adult Literacy Survey (IALS). Twelve countries are included in the analysis, namely: Belgium, Czech Republic, Denmark, Finland, Ireland, Italy, Netherlands, Norway, Poland, Sweden, United Kingdom, and United States. A small number of other countries participated in both studies but due to restricted data access and/or comparability concerns, these countries are excluded from the analysis (e. g., Australia, Canada, Germany). Third, results are discussed with emphasis on inequalities of participation in adult education by various individual, socio-demographic, and job-related factors as well as changes over the period covered. Finally, some conclusions are drawn in relation to limitations as well as implications for further research.

2   Patterns of inequality in adult education participation

2.1   The role of social disadvantage and employer-support

There are well known patterns of inequality in adult education participation across a wide range of countries (e. g., Desjardins et al., 2006). Boeren (2009, 2016, 2017) elaborates on these patterns invoking the notion of the Matthew principle to portray the typical observation that it is adults with already high levels of education and skills and who are in high-skilled jobs that tend to participate the most in adult education including their chances to receive employer-support. More recently, in their review of adult education and socioeconomic inequality, Kosyakova and Bills (2021) confirm that "…Matthew effects are ubiquitous in the world of adult education" (p. 10). Lee and Desjardins (2019) highlight the relationship to skill inequality, where a workers' skill level has been found to be associated with the probability of participation. For example, adults with lower levels of literacy skills show an approximate probability of participation of .3 compared to approximately .74 for adults with higher levels of literacy skills (OECD, 2014). Individuals in need of improving their job-related skills and knowledge are thus rather less likely to seize adult education opportunities, which leads to further imbalance at the expense of low-skilled workers in the labor market (Boeren, 2009).

As mentioned, one reason for the prevalence of the Matthew effect, particularly in relation to the role of employer supported adult education, follows from an assumption about employers' general behavior in seeking benefits over costs (Becker, 1964). On this basis, the allocation of employer support for adult education is likely to be selective and be less favorable for adults associated with a range of disadvantaged individual, socio-demographic, and job-related characteristics. Vignoles et al. (2004), for example, found evidence to suggest that employers channel support to workers who are most likely to gain from adult education.

2.2   Structural factors affecting inequality of participation

At a macro, institutional and organizational level, research suggests that structural factors in different countries and contexts matter for mitigating inequalities in adult education participation, or alternatively may exacerbate them. For a recent review of the role of educational systems, the welfare state, and employment systems, see Kosyakova and Bills (2021).

It is worthwhile to highlight that system characteristics reflecting government intervention in the areas of education, lifelong learning and active labor market policy have been suggested to play an important role in reducing inequalities in participation (e. g., Groenez et al., 2008; Desjardins and Ioannidou, 2020). For example, Roosma and Saar's (2016) analysis confirm the significance of including structural and institutional factors in addition to individual characteristics in explaining barriers to participation in adult education. Similarly, Cabus et al. (2020) proposed a model to explain cross-national variability of participation in adult education with emphasis on employed adults including vulnerable sub-groups of the employed such as low-skilled, young and low-skilled, and immigrants. They consider employer's characteristics as well as system

characteristics and suggest that employees participate more often in adult education when it is employer supported. Institutional arrangements at the organizational and sectoral level have also been found to affect the likelihood and size of employer investments in continuing training for low-skilled workers in Germany (see Wotschack, 2020). Wotschack (2020) suggests that the role of employee representation, formalized HR practices, and bargaining coverage can benefit lower-skilled workers and thus affect the chances of participation in adult education.

Collectively, this research suggests that the extent and distribution of adult education (including inequality) in each country or context is likely driven by specific institutional features and specific policies that are related to the provision, take up and distribution of organized adult learning. Desjardins and Ioannidou (2020) discuss some institutional factors that promote adult learning, namely open, flexible, and permeable formal education structures combined with public support for education particularly second chances that are connected to formal qualification systems. They also discuss the role of active labor market policies and their potential effectiveness when connected to open and flexible educational structures as well as the importance of targeting such as the Basic Competence in Working Life program introduced in Norway in 2006 which involved state support for the provision of basic education to disadvantaged employees in the workplace (VOX, 2013).

3   Data and method

3.1   Data on trends

Research on whether inequality in participation is changing over time and what may explain those changes is limited. At the same time there are number of datasets that can enable such analyses in a cross-national setting such as the EU Adult Education Survey, the EU Labor Force Survey as well as the OECD Programme for the Assessment of Adult Competencies (PIAAC). Each vary in terms of the time series or number of cross-sectional panels available. Moreover, there are data at national levels over time that enables research of this kind (see Zanazzi, 2018), although this does not easily lend itself to comparative analyses of structural factors that may have an impact on inequality in participation. Table 1 (discussed below) helps to reveal changes over time of participation rates in employer-supported adult education since the 1990s.

3.2   Data used for analysis

The data presented in Table 1 and used for the analysis in this article is the 2013 PIAAC dataset as well as the 1994–1998 IALS dataset. Similar analysis can be considered using the three cross-sectional panels of the EU Adult Education Survey (2007, 2011, 2016) and a fourth scheduled for 2022 but this is left for further study. While the EU Labour Survey provides time series since the 1990s for many countries, it does not allow for an overview on employer support. An advantage of using the PIAAC study is that non-EU countries can be included although only the United States fits this category for this

analysis. However, the upcoming 2024 PIAAC dataset will enable an update with more countries, including several of them which will have three observations dating back to 1990s.

IALS was a large-scale co-operative effort undertaken by governments, national statistics agencies, research institutions and multi-lateral agencies in the period between 1994 and 1998 (for more details see OECD and Statistics Canada, 2000). PIAAC is a follow up study that targeted the same population with the same objectives and for the most part implemented near identical survey and measurement instruments that are comparable in nature (for more details see OECD, 2013a, 2013b). These are cross-sectional studies based on a unique combination of household survey methodologies (as in the case of Labour Force Surveys) and direct skill assessment methods. Both studies were primarily designed as international comparative assessments of literacy proficiency, which were administered to nationally representative samples of adults aged 16 to 65 (large sample sizes ranging between 2,000 to 5,000 cases per country). However, IALS was effectively the first large scale international comparative study of adult education ever undertaken which offers an important baseline measurement of the extent and distribution of adult education in the 1990s for a wide range of OECD countries. Similarly, PIAAC collected detailed information on a range of education and training activities undertaken by adults in the 12 months preceding the interview including formal education programs and other non-formal education activities such as workshops, seminars, on-the-job training as well as leisure and civic related courses. Therefore, with both datasets it is possible to empirically assess the extent of growth in adult education since the 1990s by a range of individual, socio-demographic, and job-related characteristics. Only adults aged 26–65 were included in the analysis to avoid distortions associated with full time students and variations over time in youth transition systems.

3.3   Method

A multivariate binary logistic model is used to estimate the inequality in participation associated with various individual, socio-demographic, and job-related characteristics based on the PIAAC data (results are presented in Table 2). See note for Table 2 for details on sample sizes and measures of fit.

The multivariate model is based on Boudard and Rubenson's (2003) research examining the determinants of adult education based on the IALS data which includes most of the same predictors used in this analysis. The individual and socio-demographic factors hypothesized to affect the odds of participation are: gender (men, women*)[1], age (21–40, 41–55, 56–65*), immigrant and language status (native-native, foreign-native, native-foreign, foreign-foreign*), highest level of educational attainment (less than upper secondary*, upper secondary, more than upper secondary)[2], literacy proficiency (Level 2 or below*, Level 3 or higher)[3] and parents' highest level of

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1   * Denotes reference category.
2   International Standardized Classification of Education (ISCED 1997) is used to identify category respectively as follows: <ISCED3, ISCED 3, and >ISCED 3).
3   See OECD (2013a, 2013b) for a definition of literacy proficiency levels.

education (at least one parent with more than upper secondary, at least one parent with upper secondary, both parents with less than upper secondary*)[4]. The job-related factors hypothesized to affect the chances to participate are: labor force status (employed, unemployed*), type of occupation (skilled, semi-skilled white-collar, semi-skilled blue-collar, elementary*), firm size (micro 1–10*, small 11–50, medium 51–250, large 250+), the frequency and variety of reading at work (little to no reading*, frequent and varied reading), earnings (lowest quintile, 20th–60th percentile, next to highest quintile, highest quintile, no earnings*), and sector (private*, public, NGO). Missing values for each independent variable are included in the logistic regression estimation models as separate categories to avoid the assumption of missing at random, or in the case of when values are missing by design such as those who had no earnings or did not read at work because they were not employed. All factors are included in the same binary logistic regression model. The dependent variable is whether an adult participated in employer-supported adult education or not.

The odds ratios along with the unadjusted (or observed) probabilities are used to estimate adjusted probabilities which are deemed to be simpler to interpret and to compare across the variables and enables the estimation of effect sizes (EF). The latter can be estimated as the difference between adjusted probabilities between two contrast categories associated with a variable (e. g., difference in adjusted probabilities between men and women is an effect size). Typically, contrast categories include the most pertinent advantaged category that applies across the majority of countries vs. the most disadvantaged category (this is usually the reference category by design). Summarizing the results in terms of effects sizes makes it easier to distinguish the relative importance of different predictors and thus produces an easy to interpret comparison of the most important predictors across countries. While the summary and interpretation of results is based on the above-mentioned approach, effect sizes are not reported due to space limitations. Unadjusted probabilities are defined as those resulting from bivariate distributions without statistically controlling for other variables. The formula used to estimate probabilities associated with odds ratios is as follows: [(p/(1-p)*odds ratio]/[1+(p/(1-p)*odds ratio)], where p is the unadjusted probability (see Liberman, 2005).

To ascertain the impact of growth in employer support on inequality in participation over time, it is deemed to be sufficient to only consider the changes over time in the unadjusted probabilities associated with each factor. This enables a focus on observed probabilities. The variable *sector* is only made available in the PIAAC dataset; therefore, changes in probabilities cannot be examined for this variable. Table 3 summarizes changes for the period between 2013 and 1994–1998. All data presented is based on the authors' own calculations of data made available.

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4 International Standardized Classification of Education (ISCED 1997) is used to identify category respectively as follows: <ISCED 3 (both), ISCED 3 (at least one), and >ISCED 3 (at least one).

4   Results and discussion

4.1   Growth of overall and employer-supported adult education

As mentioned, participation rates in adult education as measured in the 2013 PIAAC and 1994–1998 IALS studies can be seen to reflect an upward trend since the 1990s in nearly all the countries that participated in both studies. Table 1 displays the growth rates of overall and employer-supported adult education for populations aged 26–65. With few exceptions, the growth in employer-supported adult education is estimated to have outpaced the growth in overall adult education in nearly all countries.

As mentioned at the outset, there are other more country specific analyses focusing on specific periods which have also suggested some declines (e. g., Mason, 2010; Green & Hanseke, 2019). Base effects, the reference period, definition of participation (i. e., incidence or volume) and shocks to the economy or significant policy shifts may thus lead to substantially different empirically based perspectives on the trend.

Given that the trend in Table 1 is based only on two data points and there are potential sources of bias such as slightly different wordings to the relevant questions, additional analyses were performed using the EU Labour Force Survey (LFS) to cross-check the trend for the specific countries in this analysis (where possible) and over the approximate same period (see Desjardins 2020, Table 2.1). The latter is based on multiple data points based on the same question which were collected annually. While there are differences between the two sets of estimates, such as the fact that participation rates in the EU LFS are based on a 4-week reference period whereas those in IALS and PIAAC are based on a 52-week period, and the reference years are not identical, the trend overtime from the two sources concur in nearly all cases, which adds credence to the interpretation of the trend from IALS and PIAAC.

Table 1: Growth of overall and employer-supported adult education since the 1990s

	IALS Reference year	Years between PIAAC and IALS	Overall participation		Employer supported participation		Growth in overall participation			Growth in employer supported participation			Percentage point difference between annualized growth rate in employer supported participation and overall participation
			IALS 1994–98	PIAAC 2013	IALS 1994–98	PIAAC 2013	Difference (%)	Growth (%)	Annualized growth (%)	Difference (%)	Growth (%)	Annualized growth (%)	
Belgium	1996	16	21.6	46.7	11.1	35.9	25.1	116.2	7.3	24.8	223.4	14.0	6.7
Czech Republic	1998	14	26.8	46.7	20.1	37.9	19.9	74.3	5.3	17.8	88.6	6.3	1.0
Denmark	1998	14	55.7	63.6	35.4	52.1	7.9	14.2	1.0	16.7	47.2	3.4	2.4
Finland	1998	14	57.6	63	37.5	50.1	5.4	9.4	0.7	12.6	33.6	2.4	1.7
Ireland	1996	16	22	47.9	8.9	33.9	25.9	117.7	7.4	25	280.9	17.6	10.2
Italy	1998	14	21.9	22.1	7.8	16.2	0.2	0.9	0.1	8.4	107.7	7.7	7.6
Netherlands	1996	16	36.2	61.6	19.5	49.2	25.4	70.2	4.4	29.7	152.3	9.5	5.1
Norway	1998	14	47.8	60.7	37.6	51.3	12.9	27.0	1.9	13.7	36.4	2.6	0.7
Poland	1994	18	14	31.9	8.4	22.8	17.9	127.9	7.1	14.4	171.4	9.5	2.4
Sweden	1994	18	53.4	62.9	43.4	48.6	9.5	17.8	1.0	5.2	12.0	0.7	–0.3
UK	1996	16	44.7	53.3	32.8	44.9	8.6	19.2	1.2	12.1	36.9	2.3	1.1
US	1994	18	41.7	56.1	28.5	44.3	14.4	34.5	1.9	15.8	55.4	3.1	1.2

Source: Own calculations from PIAAC 2013 and IALS 1994–1998.

4.2 Inequality in participation by individual, socio-demographic and job-related factors

As the overall growth of adult education appears to be driven by employer-support it is important to ascertain whether the growth is narrowly concentrated on certain types of jobs or on workers with specific characteristics. In other words, who gets employer support and who does not become important questions. This is because not all sectors of the economy may be investing in adult education equally and not all workers may have equal chances of receiving employer support, which drives the risk of exacerbating social inequality and to marginalize large segments of the population. Table 2 summarizes the adjusted probabilities of participating in employer-supported adult education by the range of individual, socio-demographic and job-related factors (along with each characteristic associated with each factor) included in the analysis.

Table 2: Adjusted probabilities of participation in employer-supported adult education by individual, socio-demographic and job-related characteristics, 2013 PIAAC (Source: Own calculations from 2013 PIAAC.)

	BE	CZ	DK	FI	IE	IT	NL	NO	PL	SE	UK	US
Total population 26–65	0.35	0.38	0.52	0.49	0.33	0.16	0.48	0.50	0.22	0.47	0.44	0.43
Gender												
Men	0.38	0.44	0.51	0.49	0.36	0.20	0.53	0.51	0.24	0.48	0.47	0.47
Women	0.33	0.31	0.46	0.54	0.32	0.11	0.38	0.51	0.24	0.43	0.43	0.41
Age												
26–40	0.45	0.43	0.57	0.57	0.37	0.20	0.58	0.57	0.30	0.51	0.47	0.47
41–55	0.39	0.42	0.43	0.56	0.51	0.33	0.17	0.49	0.20	0.20	0.54	0.56
56–65	0.12	0.17	**0.21**	**0.26**	0.25	0.24	0.03	0.19	0.05	0.09	**0.28**	**0.29**
Immigrant-language status												
Native-native	0.36	0.38	0.54	0.50	0.34	0.17	0.50	0.52	0.22	0.51	0.45	0.46
Foreign-native	0.56	0.24	0.06	0.78	0.39	0.50	0.02	0.57	0.31	0.37	0.54	0.48
Native-foreign	0.35	0.23	0.29	0.16	0.51	0.38	0.11	0.31	0.05	0.03	0.34	0.39
Foreign-foreign	0.15	0.28	0.43	0.29	0.40	0.15	0.08	0.26	0.09	0.01	0.19	0.18
Education												
ISCED 4/5b/5A/6	0.52	0.50	0.66	0.64	0.43	0.36	0.64	0.61	0.41	0.60	0.56	0.56
ISCED 3	0.24	0.31	0.38	0.42	0.39	0.26	0.14	0.45	0.12	0.11	0.46	0.42
<ISCED 3	0.08	0.09	0.10	0.20	0.14	0.12	0.04	0.22	0.05	0.07	0.18	0.18
Literacy skill												
Level 2 or below	0.23	0.31	0.40	0.35	0.26	0.12	0.33	0.38	0.16	0.34	0.33	0.33
Level 3 or higher	0.52	0.52	0.45	0.67	0.61	0.42	0.32	0.62	0.34	0.31	0.59	0.59

(Continuing table 2)

	BE	CZ	DK	FI	IE	IT	NL	NO	PL	SE	UK	US
Parents' education												
<ISCED 3 (both)	0.26	0.27	0.45	0.42	0.28	0.13	0.42	0.39	0.11	0.41	0.33	0.27
ISCED 3 (at least one)	0.45	0.46	0.34	0.52	0.54	0.40	0.18	0.59	0.30	0.32	0.58	0.54
>ISCED 3 (at least one)	0.45	0.54	0.37	0.66	0.64	0.45	0.11	0.54	0.43	0.39	0.54	0.60
Labour force status												
Employed	0.46	0.50	0.66	0.64	0.48	0.25	0.61	0.61	0.35	0.58	0.56	0.55
Unemployed	0.11	0.20	0.21	0.09	0.04	0.04	0.11	0.21	0.03	0.05	0.07	0.22
Occupation												
Skilled	0.55	0.52	0.70	0.69	0.53	0.34	0.65	0.65	0.44	0.66	0.62	0.61
Semi-skilled white-collar	0.24	0.36	0.43	0.39	0.26	0.12	0.35	0.36	0.17	0.33	0.37	0.34
Semi-skilled blue-collar	0.16	0.31	0.33	0.29	0.18	0.13	0.35	0.33	0.12	0.22	0.29	0.26
Elementary	0.07	0.15	0.17	0.18	0.14	0.09	0.22	0.15	0.11	0.17	0.17	0.13
Firm size												
Micro (1–10)	0.36	0.42	0.49	0.50	0.33	0.17	0.46	0.48	0.18	0.45	0.37	0.43
Small (11–50)	0.57	0.67	0.74	0.74	0.60	0.38	0.67	0.71	0.45	0.72	0.69	0.76
Medium (51–250)	0.58	0.69	0.77	0.83	0.74	0.46	0.74	0.76	0.58	0.82	0.77	0.81
Large (251+)	0.68	0.83	0.89	0.88	0.81	0.63	0.83	0.83	0.67	0.88	0.82	0.89
Reading at work												
Little to no reading	0.31	0.39	0.44	0.46	0.31	0.14	0.43	0.44	0.22	0.36	0.38	0.34
Frequent and varied reading	0.75	0.73	0.80	0.82	0.68	0.54	0.85	0.76	0.56	0.74	0.79	0.78

(Continuing table 2)

	BE	CZ	DK	FI	IE	IT	NL	NO	PL	SE	UK	US
Earnings												
Lowest quintile	0.23	0.28	0.27	0.39	0.37	0.25	0.14	0.31	0.37	0.15	0.38	0.36
20th-60th percentile	0.53	0.55	0.54	0.67	0.76	0.50	0.24	0.75	0.64	0.29	0.63	0.53
Next to highest quintile	0.75	0.81	0.75	0.85	0.87	0.74	0.48	0.88	0.81	0.44	0.76	0.74
Highest quintile	0.81	0.83	0.83	0.86	0.88	0.90	0.48	0.87	0.82	0.68	0.86	0.83
No earnings	0.02	0.06	0.13	0.03	0.06	0.08	0.03	0.05	0.06	0.03	0.04	0.09
Sector												
Private	0.41	0.47	0.56	0.57	0.41	0.22	0.54	0.54	0.27	0.51	0.48	0.48
Public	0.54	0.67	0.90	0.82	0.69	0.35	0.81	0.77	0.48	0.80	0.87	0.77
NGO	0.77	0.76	0.87	0.72	0.86	0.34	0.85	0.75	0.35	0.78	0.84	0.78

Note: All variables in Table 2a and 2b were included in the same model.
Cox & Snell R square are as follows: BE (.301); CZ (.275); DK (.345); FI (.344); IE (.31); IT (.184); NL (.334); NO (.278); PL (.265); SE (.291); UK (.347); US (.306).
Sample sizes are as follows: BE (4388); CZ (4486); DK (6166); FI (4480); IE (5129); IT (4034); NL (4202); NO (4058); PL (4246); SE (3554); UK (7523); US (4074).

The most important factors affecting the probability of receiving employer-supported adult education vary somewhat by country but there are a few general observations that can be made as follows.

First, job-related factors are found to be more important than individual and socio-demographic factors in predicting the probability of receiving support. Of the 10 most important factors predicting employer support, only one or two tend to be associated with individual (or socio-demographic) factors across countries, and in some cases, it is none. Specifically, workers who are in jobs that earn more, are in larger firms, are more skilled, require more reading as part of the job, or are in the public or NGO sector are associated with the highest probabilities of receiving employer support. In contrast, workers who are least likely to receive support are those who are in jobs that earn less, are in blue-collar type or elementary type jobs, and require little to no reading as part of their job.

Second, the individual and socio-demographic factor that tends to matter most is level of educational attainment. Higher educated workers regardless of other factors tend to have a comparatively high probability of receiving employer support. But the exact rank order of the most important socio-demographic factors is mixed across countries.

Importantly, another substantial individual and socio-demographic predictor is parents' educational attainment (as a proxy of socioeconomic status) but this is not the case in all countries. In fact, having at least one parent with more than upper secondary is a more important predictor of receiving employer support than one's own level of education in Italy, Poland, the Czech Republic, Ireland, the US, and Finland. But in Denmark, Sweden, and the Netherlands, it is the reverse, where having both parents with the lowest levels of education is a better predictor, which is an indication that adult education may play an important role in mitigating the intergenerational transmission of social disadvantage in those countries.

A high level of literacy proficiency is also an important predictor in nearly all countries except Denmark, Sweden, and the Netherlands – the same countries where socio-economic status seems to play less of a role. In fact, in Sweden and the Netherlands, having a lower level of proficiency is a more important predictor of receiving employer support after adjusting for educational attainment, which suggests that low proficiency workers are effectively targeted to receive support whether they have high or low levels of education.

Age is somewhat important, but the pattern is mixed across countries. Early-career workers (aged 26–40) have higher probabilities of receiving employer support but mostly in the Nordic countries, the Netherlands and Belgium. This is also the case in the Czech Republic and Poland. But the pattern is reversed in the US, the UK and Italy where it is mid-career workers (aged 41–55) who have the highest probability of receiving employer support.

4.3   The impact of growth in employer-support on inequality in participation

The results discussed above were based on a multivariate analysis of the 2013 PIAAC data. The purpose was to discern the relative importance of different factors in terms of their relationship to receiving employer support for participating in adult education. The most important factors were signified by the extent of inequality associated with the contrast categories of each factor included in the analysis (e. g., most educated vs. least educated, men vs. women). This section focuses on the changes in probabilities of participating in employer-supported adult education since the 1990s by selected contrast characteristics for each individual, socio-demographic and job-related factor. The purpose of the analysis is to ascertain whether the growth of employer-supported adult education since the 1990s has exacerbated or mitigated the inequality of receiving employer support to participate in adult education among the contrast categories of each factor. Table 3 summarizes the results.

Table 3: Unadjusted probabilities of participation in employer-supported adult education by selected contrast characteristics for each individual, socio-demographic and job-related factor, and annualized growth between 2013 PIAAC and 1994–1998 IALS (Source: Own calculations from PIAAC 2013 and IALS 1994–1998.)

	BE			CZ			DK			FI			IE			IT		
	PIAAC prob.	IALS prob.	Annualized growth %	PIAAC prob.	IALS prob.	Annualized growth %	PIAAC prob.	IALS prob.	Annualized growth %	PIAAC prob.	IALS prob.	Annualized growth %	PIAAC prob.	IALS prob.	Annualized growth %	PIAAC prob.	IALS prob.	Annualized growth %
Gender																		
Men	0.38	0.16	9.2	0.44	0.25	5.2	0.51	0.37	2.8	0.49	0.36	2.5	0.36	0.10	15.5	0.20	0.12	5.3
Women	0.33	0.07	22.0	0.31	0.15	7.4	0.52	0.33	3.9	0.50	0.39	1.9	0.30	0.07	20.9	0.12	0.04	13.6
Age																		
26–40	0.45	0.14	14.6	0.43	0.20	7.9	0.57	0.40	3.1	0.57	0.44	2.1	0.37	0.12	13.0	0.20	0.10	6.7
56–65	0.16	0.04	21.4	0.21	0.07	13.0	0.34	0.15	9.1	0.31	0.15	7.7	0.22	0.03	46.4	0.06	0.02	15.4
Immigrant-language status																		
Native-native	0.36	0.11	13.7	0.38	0.20	6.1	0.54	0.35	3.7	0.50	0.38	2.3	0.34	0.09	18.0	0.17	0.08	8.2
Foreign-foreign	0.19	0.05	15.5	0.38	0.08	26.9	0.36	0.15	10.4	0.39	0.14	12.8	0.24	0.18	2.2	0.10	0.09	0.9
Education																		
ISCED 4/5b/5A/6	0.52	0.26	6.3	0.50	0.37	2.5	0.66	0.53	1.8	0.64	0.60	0.4	0.43	0.19	7.7	0.36	0.15	9.7
<ISCED 3	0.12	0.03	20.3	0.15	0.13	0.8	0.30	0.18	4.5	0.22	0.20	0.6	0.17	0.05	16.3	0.08	0.04	8.5
Literacy skill																		
Level 3 or higher	0.47	0.18	10.2	0.43	0.26	4.7	0.64	0.47	2.5	0.59	0.50	1.3	0.42	0.14	13.2	0.27	0.13	8.3
Level 2 or below	0.23	0.05	23.8	0.31	0.16	7.1	0.40	0.22	5.8	0.35	0.21	4.8	0.26	0.05	28.5	0.12	0.06	7.1
Parents' education																		
>ISCED 3 (at least one)	0.53	0.19	11.3	0.45	0.25	5.8	0.60	0.40	3.6	0.58	0.52	0.8	0.44	0.18	9.2	0.26	0.12	7.9
<ISCED 3 (both)	0.26	0.08	13.3	0.27	0.18	3.8	0.45	0.30	3.6	0.42	0.33	2.0	0.28	0.07	17.9	0.13	0.07	7.1

(Continuing table 3)

	BE			CZ			DK			FI			IE			IT		
	PIAAC	IALS	Annualized growth	PIAAC	IALS	Annualized growth %	PIAAC	IALS	Annualized growth %	PIAAC	IALS	Annualized growth %	PIAAC	IALS	Annualized growth %	PIAAC	IALS	Annualized growth %
	prob.	prob.	%	prob.	prob.	%	prob.	prob.	%	prob.	prob.	%	prob.	prob.	%	prob.	prob.	%
Occupation																		
Skilled	0.55	0.39	2.6	0.52	0.33	4.1	0.70	0.56	1.8	0.69	0.63	0.7	0.53	0.22	8.8	0.34	0.19	6.0
Elementary	0.25	0.04	30.2	0.37	0.21	5.2	0.41	0.27	3.9	0.39	0.27	3.3	0.28	0.07	20.4	0.14	0.09	3.6
Firm size																		
Large (200+)	0.56	0.24	8.4	0.65	0.33	6.9	0.81	0.56	3.2	0.74	0.68	0.7	0.71	0.24	12.1	0.38	0.22	4.8
Small (20–99)	0.48	0.13	17.1	0.56	0.21	12.0	0.66	0.44	3.5	0.64	0.52	1.6	0.53	0.11	25.5	0.26	0.13	6.9
Reading at work																		
Frequent and varied reading	0.58	0.23	9.3	0.58	–	–	0.71	0.51	2.9	0.69	0.58	1.4	0.56	0.20	11.3	0.39	0.18	8.0
Little to no reading	0.31	0.05	36.4	0.39	–	–	0.44	0.19	9.2	0.46	0.22	8.0	0.31	0.06	26.9	0.14	0.06	10.5
Earnings																		
Highest quintile	0.65	0.33	6.2	0.73	0.42	4.7	0.75	0.55	1.4	0.53	0.69	0.8	0.71	0.25	13.0	0.73	0.25	14.1
Lowest quintile	0.23	0.04	26.6	0.28	0.14	6.8	0.27	0.11	10.6	0.39	0.18	8.3	0.37	0.01	160.3	0.25	0.03	54.4

(Continuing table 3)

	NL			NO			PL			SE			UK			US		
	PIAAC	IALS	Annualized growth	PIAAC	IALS	Annualized growth %	PIAAC	IALS	Annualized growth %	PIAAC	IALS	Annualized growth %	PIAAC	IALS	Annualized growth %	PIAAC	IALS	Annualized growth %
	prob.	prob.	%	prob.	prob.	%	prob.	prob.	%	prob.	prob.	%	prob.	prob.	%	prob.	prob.	%
Gender																		
Men	0.53	0.26	**6.4**	0.51	0.38	2.3	0.24	0.10	**8.6**	0.48	0.44	0.5	0.47	0.36	2.0	0.47	0.31	2.8
Women	0.43	0.12	**16.6**	0.50	0.38	2.4	0.21	0.07	**10.3**	0.47	0.45	0.3	0.41	0.29	2.4	0.40	0.27	2.8
Age																		
26–40	0.58	0.25	**8.3**	0.57	0.42	**2.6**	0.30	0.11	**10.2**	0.51	0.46	0.7	0.47	0.40	**1.1**	0.47	0.32	**2.6**
56–65	0.27	0.05	**28.1**	0.31	0.20	**4.2**	0.10	0.02	**26.8**	0.34	0.28	1.2	0.28	0.12	**7.9**	0.36	0.17	**6.4**
Immigrant-language status																		
Native-native	0.50	0.20	9.8	0.52	0.39	2.4	0.22	0.09	8.9	0.51	0.47	**0.5**	0.45	0.33	**2.3**	0.46	0.31	**2.6**
Foreign-foreign	0.32	0.13	8.9	0.41	0.29	3.0	0.12	0.08	2.8	0.29	0.21	**2.3**	0.30	0.17	**5.0**	0.30	0.13	**7.6**
Education																		
ISCED 4/5b/5A/6	0.64	0.34	**5.6**	0.61	0.54	**0.9**	0.41	0.19	6.5	0.60	0.59	0.0	0.56	0.52	0.5	0.56	0.45	**1.4**
<ISCED 3	0.28	0.11	**10.3**	0.29	0.19	**3.7**	0.08	0.04	6.9	0.24	0.28	-0.7	0.25	0.23	0.4	0.16	0.08	**6.2**
Literacy skill																		
Level 3 or higher	0.59	0.25	**8.4**	0.60	0.46	**2.1**	0.31	0.15	**5.8**	0.58	0.50	0.8	0.54	0.47	**0.8**	0.55	0.39	**2.2**
Level 2 or below	0.33	0.11	**12.3**	0.38	0.23	**4.5**	0.16	0.07	**8.0**	0.34	0.29	1.0	0.33	0.19	**4.6**	0.33	0.15	**6.6**
Parents' education																		
>ISCED 3 (at least one)	0.60	0.27	**7.6**	0.59	0.49	1.5	0.39	0.21	5.0	0.57	0.51	0.7	0.55	0.48	0.9	0.53	0.42	**1.4**
<ISCED 3 (both)	0.42	0.17	**9.5**	0.39	0.31	1.9	0.11	0.07	3.4	0.41	0.41	-0.1	0.33	0.33	0.0	0.27	0.17	**3.5**

(Continuing table 3)

	NL			NO			PL			SE			UK			US		
	PIAAC	IALS	Annualized growth	PIAAC	IALS	Annualized growth %	PIAAC	IALS	Annualized growth %	PIAAC	IALS	Annualized growth %	PIAAC	IALS	Annualized growth %	PIAAC	IALS	Annualized growth %
	prob.	prob.	%	prob.	prob.	%	prob.	prob.	%	prob.	prob.	%	prob.	prob.	%	prob.	prob.	%
Occupation																		
Skilled	0.65	0.32	6.2	0.65	0.56	1.1	0.44	0.23	4.9	0.66	0.62	0.3	0.62	0.57	0.5	0.61	0.50	1.3
Elementary	0.42	0.26	3.7	0.40	0.30	2.3	0.16	0.07	6.7	0.35	0.36	–0.2	0.41	0.29	2.6	0.32	0.19	3.9
Firm size																		
Large (200+)	0.72	–	--	0.72	0.55	2.2	0.52	0.19	10.1	0.69	–	–	0.72	0.58	1.5	0.68	0.50	2.1
Small (20–99)	0.64	–	--	0.60	0.44	2.7	0.36	0.16	6.5	0.59	–	–	0.60	0.38	3.7	0.56	0.26	6.5
Reading at work																		
Frequent and varied reading	0.69	0.35	5.9	0.64	0.52	1.7	0.47	0.24	5.3	0.65	0.60	0.4	0.65	0.53	1.4	0.63	0.46	2.1
Little to no reading	0.43	0.12	16.4	0.44	0.19	9.8	0.22	0.06	15.2	0.36	0.30	1.3	0.38	0.21	5.1	0.34	0.11	12.3
Earnings																		
Highest quintile	0.37	0.37	0.0	0.74	0.54	2.4	0.76	0.19	15.2	0.77	0.63	–0.9	0.66	0.61	1.4	0.69	0.58	1.5
Lowest quintile	0.14	0.12	1.4	0.31	0.13	9.5	0.37	0.03	76.0	0.15	0.31	–2.8	0.38	0.24	3.5	0.36	0.17	6.1

Notes: Shaded boxes reflect a statistically significant ($p<.05$) reduction in inequality in participation between the two contrast groups.

With few exceptions, it can be seen from the results that employer-supported adult education has grown substantially for nearly every selected set of contrast characteristics for each individual, socio-demographic, and job-related factor considered in the analysis. In many cases, the probabilities to participate associated with specific characteristics more than doubled or even tripled particularly in countries that experienced the most overall growth including Belgium, Ireland, and Poland. In most cases, the growth of employer-supported adult education has led to a narrowing of differences in the probability to participate (i. e., reduced inequality of participation) among workers in advantaged vs. disadvantaged jobs in terms of earnings, skill orientation and other characteristics as well as with traditionally advantaged vs. disadvantaged socio-demographic characteristics such as gender, education level, and minority and socioeconomic status (as proxied by parents' level of education). In most of the remaining cases, very few show an increased inequality between the two contrast categories.

The dominance of job-related factors in predicting the probability of receiving support was examined earlier in the multivariate analysis which focused on adjusted probabilities. To be sure, the type of work that one is employed in remains very important in determining the chances to participate in adult education, particularly of the kind that is employer-supported. To reiterate, workers who are in jobs that earn more, are in larger firms, are more skilled, and require more reading as part of the job continue to be associated with the highest probabilities of receiving support. However, in nearly all cases, the growth of employer-supported adult education since the 1990s has contributed to narrowing the gap between jobs that are more advantaged vs. those that are more disadvantaged in terms of continued investment in adult education. That is, the growth in employer support has for the most part gone not only to workers in advantaged jobs but also in many cases to workers in disadvantaged jobs at least as much or even more to effectively narrow the gap.

This could reflect a few alternative explanations. It may be an indication of upskilling across the occupational spectrum in many countries, and accordingly increased employer-support for adult education. However, the extent to which this relates to a market-based phenomenon cannot be readily ascertained. This is because government policies and programs may have incentivized employers to invest more in disadvantaged workers. An example of this is the Basic Competence in Working Life program introduced in Norway in 2006 which involved the provision of basic education to disadvantaged employees in the workplace (VOX, 2013).

Worthwhile noting is that the private sector in the US and the UK is contributing to employer-supported adult education nearly as much as in the Nordic countries and the Netherlands (see Table 2). Notably, while Sweden featured the highest rate of employer-supported adult education for workers in disadvantaged jobs in the 1990s, it is now surpassed by its Nordic neighbors and often the US and the UK have either caught up to Sweden or surpassed it regarding several disadvantaged characteristics. As mentioned, while these developments may in part be due to government policies and programs in collaboration with the private sector in different countries, it is beyond the scope of the analysis presented here to ascertain whether this is the case.

Beyond the private sector, governments can arguably affect policies and programs in the public sector more easily and directly. This is important to keep in mind since results shown indicate that employers in the public sector tend to play a much more important role in supporting adult education than employers in the private sector (see Table 2).

It is important to note that due to data limitations, the analysis has not considered any qualitative differences between the type of adult education that is received by workers in advantaged vs. disadvantaged jobs, nor the extent or nature of employer support.

5   Conclusions

Results of the analysis suggest that employer support for adult education is playing an important role in mitigating inequality in adult education participation. These findings are contrary to what was expected. The expectation was that as the role of employers becomes more important in extending support for adult education, that this would exacerbate inequality of participation in adult education. This is because employers are expected to channel more support to more trainable and efficient trainees who tend to possess advantaged characteristics such as already higher levels of education and skills which follows from Becker's (1964) theory that the decision to invest in human capital is a function of the cost/benefit ratio. However, the analysis presented here, which was based on cross-nationally comparable data across several countries with very different institutional configurations and starting points, suggests that the trend in the growth of employer-supported adult education is the reverse of this expectation. Accordingly, the findings in this article do not support the general assumption about employer behavior as suggested from Becker's theory. This may be an indication that the cost/benefit ratio associated with employer investment in adult education is increasingly favorable even among the most disadvantaged adults and those in the lowest skilled jobs, which would be consistent with a broader trend of upskilling across the skill spectrum in a range of advanced economies. Alternatively, it may be an indication of the need to consider macro and other structural factors when considering employer behavior from a market-based perspective including the role of government intervention in the areas of education, lifelong learning and active labor market policy as suggested by the research literature discussed above.

Moreover, the notion that employer support for adult education could exacerbate inequality in participation to a higher degree in countries that are typically more associated with neoliberalism such as the US and the UK compared to countries that are typically more associated with progressive social policies such as the Nordic countries is also brought into question. In fact, the private sector was found to be almost equally involved in supporting adult education in the Nordic countries, the US, and the UK. Interestingly, the latter are also found to be much more successful at extending support to older workers than the Nordic countries and the Netherlands which is a feature that merits further comparative research. In recent years, much international comparative

research in education has suggested that certain types of welfare states or production regimes may exacerbate or mitigate inequalities of various kinds including participation in adult education (see Desjardins & Ioannidou, 2020 for a review and discussion of this research). However, the findings in this article suggest that the extent and distribution of adult education in a given country or context is likely driven by specific institutional features and specific policies that are more directly related to the provision, take up and distribution of adult education, rather than varieties of welfare states or production regimes as such.

Further research on additional and updated datasets is warranted to explore the hypotheses of whether the upward trend in growing employer support for adult education is exacerbating or mitigating inequality in adult education participation in different countries. The upcoming 2024 PIAAC dataset will enable an update with more countries, including several of them which will have three observations dating back to 1990s. These hypotheses may also be tested using data from the four cross-sectional panels of the EU Adult Education Survey (2007, 2011, 2016, 2022), with focus on comparative analysis investigating whether variations in structural factors (policies, programs) can reveal any discernable patterns that yield insights and nuances.

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