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Desjardins, R. (2018). The relationship between attaining formal qualifications at older ages and outcomes related to active ageing, *European Journal of Education*, 54(1), 30-47. <https://doi.org/10.1111/ejed.12315>

The relationship between attaining formal qualifications at older ages and outcomes related to active ageing

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Abstract

Active ageing has become a policy concept that serves as an important response to the ageing of many societies, primarily because it is thought to lead to positive outcomes such as increased employment, productivity, health and other well-being into older ages. This article presents results of an analysis of the relationship between attaining qualifications at older ages and active ageing in later life. The analysis is based on data made available by the Programme for the International Assessment of Adult Competencies (PIAAC). Results of the analysis show that adults who attain higher levels of qualifications in mid to later life are associated with an increased probability of, being employed, participating in continued learning, and scoring higher on the PIAAC literacy scale when they are older. The findings suggest that open and flexible formal education structures at all levels is good for activating the population to be employed, to engage in continued learning and to develop and maintain literacy skills into older ages.

Keywords

Active ageing, lifelong learning, adult formal education, older adults, qualifications, outcomes, adult learning, continued learning, benefits of lifelong learning

Introduction

The ageing of many societies is now well recognized as having major implications for public policy (Walker & Maltby, 2012). As a consequence, a major policy concept to have emerged in the last 15 years is referred to as *active ageing* (e.g., Cedefop, 2012; Eurostat, 2011). Active ageing is thought to lead to positive outcomes such as increased employment, productivity, health and other well-being into older ages (e.g. MacArthur Foundation, 2012). Furthermore, the education of adults and continued learning in mid to later life is thought to be a central element to the promotion of active ageing (Davey, 2002). With this as a backdrop, this article discusses the empirical relationship between gaining a qualification at a non-traditional age (36 or over) and selected indicators of active ageing and associated outcomes in later life.

A number of large-scale studies, including the 1994-1998 International Adult Literacy Survey (IALS), the EU Adult Education Surveys (AES) as well as the 2012-2016 OECD Programme for the International Assessment of Adult Competencies (PIAAC), have provided data which reveals that in comparison to younger adults, older adults in a range of OECD countries show substantially lower levels of continued learning activity (e.g., Desjardins, forthcoming; Desjardins, Rubenson and Milana, 2006; Chisholm, Larson and Mosseux, 2004). These observed declines, however, are based on averages which do not do justice to the vast differences that are observed at the individual level. For example, there are many adults who continue to learn and are active into old age, and conversely there are many adults who slow their engagement in various activities already at earlier ages. An important question is whether prior educational interventions in adulthood can help to reverse age-related declines in all kinds of activities related to active ageing.

The focus of the analysis is on the attainment of formal qualifications in mid to later life because other less formal types are often themselves integral to activities that reflect productive and healthy living, making it difficult to disentangle indicators of active ageing which can reflect either antecedents or outcomes or both. Continued learning into older ages, for example, is thought to be a core indicator of active ageing but it is often directly embedded in various activities such as employment, particularly to the extent that the learning is of an informal nature. For this reason, the analysis focuses on formal learning in mid to later life and its relationship to subsequent non-formal learning at older ages as well as other indicators of active ageing. On this basis, the question that is investigated is whether the attainment of qualifications at age 36 or older has any relationship to active ageing in later life. Specifically, are opportunities to delay attainment (second chances), or, to otherwise upgrade qualifications at older ages, associated with increased probabilities of positive outcomes at older ages (50 to 65) including increased employment, continued learning, or cognitive skills? The analysis is based on data made available by PIAAC.

Conceptual approach, theoretical perspectives and previous research

The following discusses some of the core concepts related to the analysis, some perspectives on the role of learning in fostering active ageing as well as some of the related previous research.

Formal adult education and qualifications

Formal adult education typically refers to learning undertaken by adults that is organized, taught and leads to recognized qualifications awarded by education or training institutions that are supported and recognized by the state as well as other stakeholders (European Commission, 2006). These include *general* and *vocational* oriented formal education undertaken by *non-traditional students* at all levels. Non-traditional students are defined as adults who did not follow the front-loaded path which reflects the shortest and most direct path associated with a qualification and tend to be over the age of 25 with few exceptions (e.g. MA or PhD up to the age of 30). In contrast, *non-formal adult education* is also structured (in terms of learning objectives, learning time or learning support), but may not lead to widely recognized qualifications, or if it does, it is not necessarily in a direct manner and may necessitate other learning as part of a flexible programme of education.

The following discusses different types of formal adult education that typically correspond to different levels of qualifications. The incidence of each of these types by country is reported in Figure 1 and discussed in a subsequent section.

Adult Basic Education (ABE) and *Adult General Education (AGE)* reflect many forms of compensatory, second chance, or remedial education. These are the most widely recognized as formal adult education across most high-income countries, but can also be considered non-formal, particularly in many low- and middle-income countries. While they are undertaken by non-traditional students, they are formal to the extent that they may be widely recognized and lead to qualifications that are equivalent to ISCED 1, 2 or 3 (i.e. secondary education or lower). Some provisions for basic skills may be considered non-formal but can eventually be connected to lower and/or upper secondary equivalencies (i.e. ISCED 2 or 3).

Adult Higher Education (AHE) typically involves formal education undertaken by non-traditional students which correspond to ISCED 5 or 6 (i.e. tertiary education). Qualifications attained via this path may be distinguishable or indistinguishable from regular higher education depending on the country which can affect their extent of recognition and valorisation. Even if the form or content experienced by younger or older participants may be indistinguishable, there are often adaptations to the provision that enable and support older adults to participate which should not be taken for granted since this is not the case in many OECD countries. Moreover, such provisions can be directly targeted to older adults and be linked to Continuing Education for professionals such as certificate programmes, or graduate degrees for adults (ISCED 5a), and may have a vocational orientation such as provisions via vocational colleges, polytechnics or other professional schools (ISCED 5a, 5b).

Adult Vocational Education (AVE) can involve formal education undertaken by non-traditional students which correspond to ISCED 3b, 3c, 4, or 5b (i.e. vocationally oriented secondary and post-secondary education), but also non-formal education that has no links to the formal qualification system. Non-formal AVE is typically aligned with market related stakeholders involving job-related training or other forms of work-based learning. Nevertheless, through complex institutional frameworks, non-formal provision may lead to formal recognition by equivalency or modularization of qualifications. The extent of formal vs non-formal AVE is the source of greatest variation in provision across countries and in terms of terminology. For example, in some countries there is little to no distinction between traditional vs non-traditional students in Vocational Education and Training (VET) structures (e.g. Finland, the Netherlands). Moreover, in some countries there may be widely held views that such provisions do not entail adult education as defined here or as reported from data that are collected in studies such as PIAAC or the EU Adult Education Survey. Alternative labels that relate to AVE to the extent that students are non-traditional include *Continuing Education (CE)*, *Continuing Technical and Vocational Education and Training (CTVET)* or work-based learning.

Adult Liberal Education (ALE) which includes sport, hobby and other leisure-oriented provisions is typically non-formal and rarely formal in the sense that it leads to recognized qualifications. However, in some countries with highly flexible systems, such provisions may be connected to basic skills training and/or lead to formal recognition by equivalency or modularization of qualifications. For example, in Denmark, courses taken at Folk High Schools which may be oriented toward basic skills or other content that may qualify may be flexibly combined with other courses and count toward a recognized qualification.

In most cases, formal adult education that leads to a recognized qualification reflects an extended period of learning and may occur over a period longer than 12 months, particularly if it is pursued on a part-time basis. For this reason, it is important to distinguish between the *flow and stock of formal adult education* when it comes to measurement and research on the outcomes associated with formal adult education. The flow of formal adult education can be defined as the incidence and duration of formal educational activity during a specific reference period, which is typically four weeks as in the case of most Labour Force Surveys, or 12 months as is the case of IALS, PIAAC and the EU Adult Education Survey. It is worthwhile to highlight a few points related to the properties of the flow of formal adult education. First, flows may or may not have led to a recognized qualification but rarely is this measured in adult education surveys. Second, flows are recent and immediately precede the survey date. This latter point means that little to no time has passed since the activity which makes it unsuitable for most analysis related to the implications or outcomes of formal adult education. A similar point can be made for any non-formal activity since it rarely, if ever, captures a cumulative count of time spent learning in non-formal settings. In contrast, the stock of formal adult education is a past activity that is cumulative and reflected in adults' highest qualifications attained, which were attained at mature ages, or alternatively, when they were non-traditional students at the time they completed their highest

qualification. In some cases, this may correspond to the typical reference periods mentioned but for the majority of adults, it corresponds to a period preceding the reference periods, and can be as long as decades. For these reasons, the stock of formal adult education is a much more appropriate measure for conducting analysis on the outcomes of formal adult education. This is in contrast to Triventi and Barone (2014) who use a flow measure of formal adult education and report inconclusive and mixed findings on associated outcomes, for example, in comparison to non-formal types of learning that are only very recent and immediately preceding the survey. Unfortunately, it is not always clear in the research literature whether the flow or stock of formal adult education was used, or what the implications are of the shortcomings associated with the actual measures used in the analysis.

Depending on the cut-off used to distinguish traditional and non-traditional students, measures of the stock of formal adult education may reflect a delay in attainment by only a few years, which would otherwise be counted as qualifications attained by regular or traditional students. In many other cases they reflect the decision by older adults to return to formal education in mid to later life. For the multivariate analysis in this article, which seeks to estimate the potential outcomes of formal adult education on active ageing in later life, the cut-off between traditional vs on-traditional students is set to the age of 36. This enables a comparison of the potential outcomes associated with attaining higher qualifications in mid to later life vs earlier ages and vs lower level of qualifications.

The role of learning in fostering active ageing

Theoretically, educational interventions can be important for stimulating interest and motivation for continued learning in later life, as well as improve access to, and engagement in, opportunities related to all kinds of mental, social and physical activities. Many of the benefits of education have been linked to the notion active ageing (Phillipson, 2010), or alternatively successful ageing (Walker, 2002). The mechanisms in which education can lead to such benefits are numerous including social engagement, improved self-confidence, enhanced knowledge, intellectual stimulation, and giving meaning to life (Jamieson 2007). Not least, it can also be directly linked to increased productivity, whether on the labour market, or in the voluntary sector, and accordingly associated rewards, which in turn, boost these various mechanisms mentioned such as self-confidence, stimulation and generally feeling more valorised and relevant.

On this basis, educational interventions can help to boost continued learning (e.g., Tuijnman, 1989) and employment more generally, but also into older ages if the interventions are more recent (e.g., Jenkins, 2006; Jenkins, Vignoles, Wolf and Galindo-Rueda, 2003); as well as a higher likelihood of a continued development or at least a mitigation of the age-related decline of cognitive skills associated with ageing (Desjardins and Warnke, 2011). The evidence in terms sustained cognitive activity into old age is relatively strong. For example, Yaffe et al. (2009) found in a study of more than 2,500 elders over an eight-year period with four measurement points that initial education as well as other factors predicted the maintenance of high cognitive functioning. Similarly, in a meta-study of results from different longitudinal and randomized-control studies, Plassman et al. (2010) concluded that there is strong

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evidence that cognitive training in adulthood helped to mitigate the age-related decline of skills.

Data and methods

Dataset

The analysis is based on data made available by PIAAC (also known as the Survey of Adult Skills), which is a large-scale co-operative effort undertaken by governments, national statistics agencies, research institutions and multi-lateral agencies in a period corresponding roughly to 2012 (for more details see OECD 2013a; 2013b). It was primarily designed as an international comparative assessment of literacy proficiency which was 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, PIAAC can also be seen as a large scale international comparative study of adult learning because it offers possibilities to investigate life course patterns of selected activities that reflect active ageing and for example, the relationship between attaining qualifications at older ages and further active ageing in later life. The study collected detailed information on a range of education and training activities undertaken by adults in the 12 months preceding the interview including formal education programmes and other non-formal learning activities such as workshops, seminars, on-the-job training as well as leisure and civic related courses. It also collected data on the age at which adults attained their highest level of qualification. While PIAAC provides unique data enabling some analysis of the implications of attaining qualifications in mid to later life, an important limitation is that data was only collected for adults up to the age of 65.

Method

Separate models are estimated using the binary logistic regression function, each focusing on the following active ageing outcomes over the age of 50: employment at time of survey, non-formal learning activity in 12 months preceding survey, and literacy scores as measured in PIAAC. Nineteen countries are included, namely: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Korea, Netherlands, Norway, Poland, Slovak Republic, Spain, Sweden, United Kingdom and United States. Country level fixed effects are accounted for in the models by including dummies for each country. Norway is the reference group. Only adults aged 50 to 65 are included in the analysis in order to focus on the age range with the sharpest decline of activities as shown below. It is necessary to pool the country datasets together due to small sample sizes associated with focusing on a narrow age range and whether different qualifications were attained before or after the age of 36.

Table 1 summarizes the variables included in the models and the sample sizes. Gender and the log of age are adjusted for in all models. The main independent variable in focus is the level of qualification by whether it was attained before or after the age of 36 which is also included in all the models. Specifically, the active ageing outcomes for adults who attained their highest qualification at age 36 or older are compared to those who attained a similar qualification at an earlier age as well as adults who attained the preceding lower level of qualification. The following two sections take a closer look at the main independent variable in focus as well the four outcomes of active ageing that are modelled as dependents before presenting the results of the multivariate analysis.

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Table 1. Summary of variables included in the model and sample sizes

	Sample size	% Employed	% Participated in employer supported AE	% women	% ISCED 2 at <36	% ISCED 2 at >=36	% ISCED 3 at >=36	% ISCED 3 at <36	% ISCED 4 at >=36	% ISCED 4 at <36	% ISCED 5b at >=36	% ISCED 5b at <36	% ISCED 5a at >=36	% ISCED 5a at <36
Austria	1480	57	17	51	26.1	0.1	50.8	0.7	6.5	0.2	6.6	1.1	6.7	1.3
Belgium	1566	58	20	50	28.3	0.0	38.9	0.5	2.7	0.0	17.7	0.6	11.0	0.3
Czech Republic	1824	56	25	51	17.0	0.0	62.7	1.1	2.9	0.1	0.9	0.5	13.1	1.5
Denmark	3039	67	40	51	23.9	2.3	33.9	4.2	1.4	0.5	16.9	4.4	9.6	2.9
Finland	1964	65	34	50	24.4	0.0	29.3	6.2	3.0	1.8	16.3	3.0	10.7	5.3
France	2404	55	15	51	39.2	0.2	40.5	1.3	0.0	0.0	5.5	0.5	10.8	1.9
Germany	1548	72	26	51	9.6	0.0	51.9	1.2	2.9	0.1	12.9	1.8	18.7	0.9
Ireland	1627	56	20	50	44.8	0.1	18.3	0.4	10.1	4.6	6.5	3.8	7.0	4.3
Italy	1485	44	8	54	68.2	0.9	21.8	0.7	0.4	0.0	0.2	0.0	7.0	0.8
Japan	1598	76	18	49	18.3	0.0	44.7	0.2	1.4	0.0	13.2	0.0	21.9	0.3
Korea	2020	67	13	49	44.9	0.2	35.3	0.3	0.0	0.0	5.3	1.0	9.7	3.2
Netherlands	1758	65	32	51	39.3	0.3	27.2	3.1	0.0	0.0	2.7	1.5	21.1	4.8
Norway	1275	72	35	50	28.8	0.8	18.9	5.0	9.4	3.3	4.1	1.6	20.3	7.6
Poland	1513	48	11	53	16.5	0.0	61.2	0.9	4.7	0.7	0.0	0.0	12.9	3.0
Slovak Republic	1678	54	13	52	24.7	0.0	58.6	1.0	0.5	0.0	0.0	0.0	13.6	1.7
Spain	1647	48	16	50	57.4	1.4	17.1	1.0	1.4	0.2	5.0	0.3	14.5	1.6
Sweden	1459	74	33	51	25.5	3.9	31.6	4.1	5.4	2.6	7.5	2.3	12.8	4.2
United Kingdom	2653	64	28	51	29.4	2.8	28.0	8.4	0.2	0.1	9.8	3.3	12.6	5.2
United States	1576	70	26	53	10.7	0.0	39.3	3.1	7.0	2.5	5.3	2.7	22.4	6.8
Total	34114	65	21	51	24.8	0.4	39.0	2.1	3.4	1.0	6.9	1.5	17.3	3.6

Source: Based on PIAAC, 2012.

Attainment of formal qualifications at older ages

Given that the focus of the analysis is on differentials between attaining formal qualifications in mid to later life vs younger ages, it is worthwhile to take a closer look at how this variable is defined more precisely and how it compares across countries.

To reiterate: a key question is whether opportunities to delay attainment (second chances), or, to otherwise upgrade qualifications at older ages, is associated with increased probabilities of experiencing positive outcomes at older ages including increased employment, continued learning, or cognitive skills.

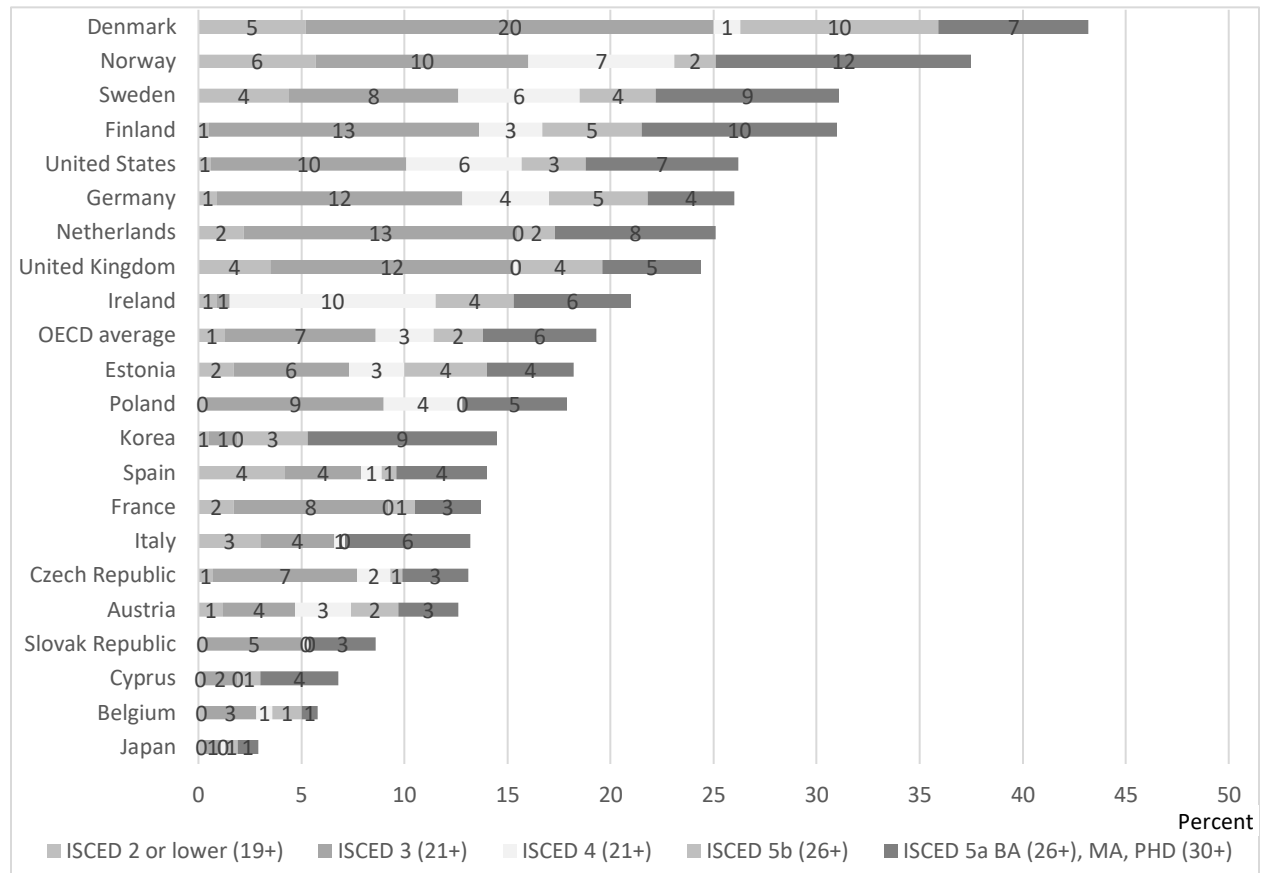
It is apparent from the PIAAC data, that formal education systems at all levels of qualifications have in several countries become much more open to non-traditional (or mature) students. Figure 1 shows that the stock of qualifications that was attained via formal adult education, namely by adults at an age beyond what would normally be associated with a front-loaded path, or alternatively, the shortest and most direct route associated with a specific qualification as follows:

- ISCED 2 (lower secondary) or lower at age 19 or older (referred to as Adult Basic Education)
- ISCED 3 (upper secondary) at age 21 or older (referred to as Adult General Education or formal Adult Vocational Education)
- ISCED 4 (post-secondary, non-tertiary) at age 21 or older (referred to as formal Adult Vocational Education)
- ISCED 5b (bachelor, tertiary type-B) or 5a (bachelor, tertiary type-A) at age 26 or older (referred to as Adult Higher Education)
- ISCED 6 (master) or higher at age 30 or older (referred to as Adult Higher Education)

Results show that in Denmark, for example, 43% of all qualifications held by the adult population were attained as mature students, or alternatively, formal adult education. This reflects an openness of formal education structures to non-traditional (or mature) students, which may or may not involve adaptations to accommodate older adults. As already mentioned, in many cases, these data reflect a delay in attainment by only a few years, but in many other cases they reflect the decision by older adults to return to formal education in mid to later life.

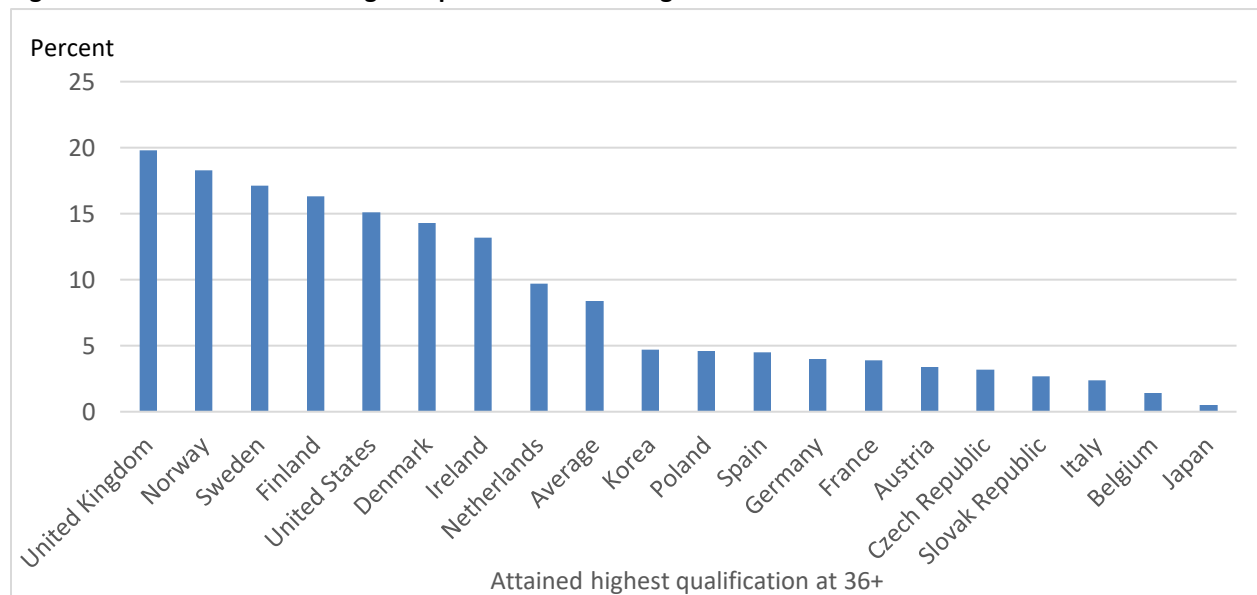
To emphasize the latter, Figure 2 narrows in on the proportion of adults who attained their highest qualification at age 36 or older which is the cut-off used for the main independent variable in focus in the multivariate analyses. As can be seen, the numbers reflect a substantial phenomenon in several countries which is likely to affect the lives of many late career aged and older adults.

Figure 1. Stock of qualifications attained via formal adult education



Source: Based on PIAAC, 2012.

Figure 2. Adults who attained highest qualification at the age 36 or older



Source: Based on PIAAC, 2012.

Outcomes associated with active ageing included in the analysis

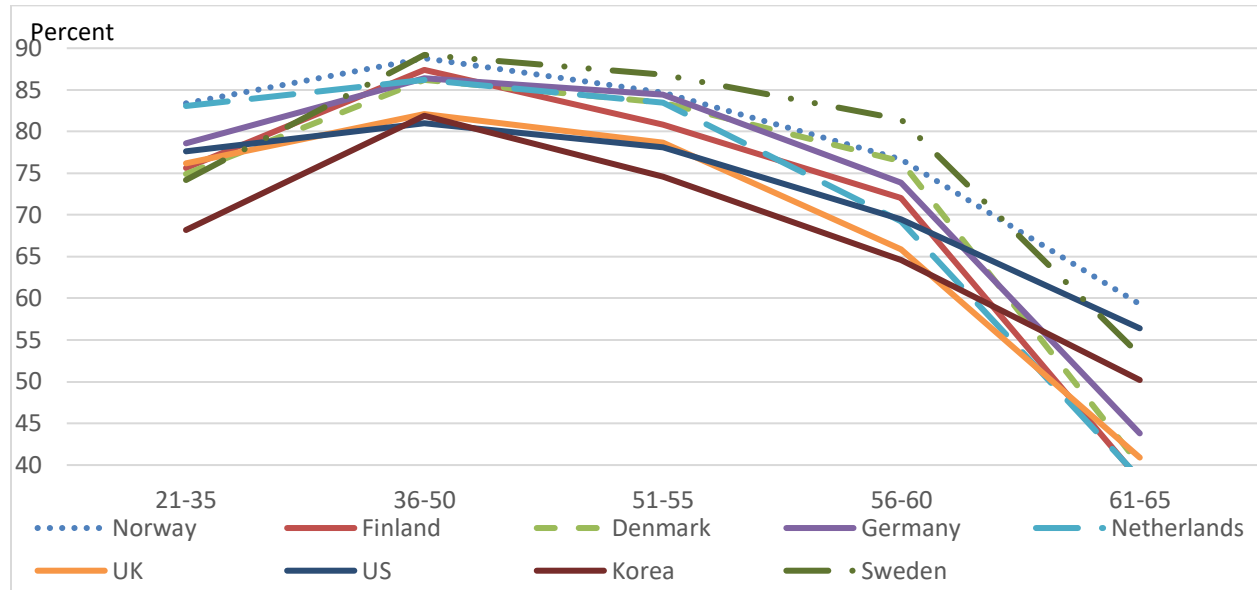
Undertaking a formal qualification in mid to later life itself constitutes a form of active ageing, but the purpose of the analysis is to investigate whether this type of event has a positive relationship with further active ageing in later life and other outcomes. Accordingly, four indicators of active ageing in later life are modelled as outcome (dependent) variables in the multivariate analysis, namely employment, continued learning, and cognitive skills. The following discusses the life course pattern associated with these indicators by country. The patterns are clear. In all cases, the average level of the activities and otherwise outcomes decline with age.

Employment can be seen as important form of active ageing for adults in many occupations although not all since some occupations involve routine work that may not be demanding in terms of different types of activities. However, any work that involves mental, social and/or physical activity can in theory be seen as involving active ageing. Not least, gainful employment into old age is an important outcome in its own right whether or not this is directly linked to active ageing, particularly in ageing societies where this is an important policy priority. Figure 3 depicts a cross-sectional life course pattern of the employment rate up to the age of 65. Only data from the countries which feature the highest rates of formal adult education as was measured by PIAAC are depicted as an example. Not surprisingly, across all the countries considered, employment activity declines on average with age. As can be seen, employment rates are highest among mid-career adults aged 36 to 50 and begin to gradually decline thereafter until the age of 65. More precision is given to late-career aged adults who are over the age of 50 since this is the target group included in the multivariate analysis below.

As alluded to, continued learning is associated with continued employment into old age for many adults since informal learning is integral to most occupations. However, PIAAC has data on the flow of continued learning of the non-formal type by age which is a more precise indicator of this type of active ageing. As is well known in the research literature, older adults are less likely to participate in any type of continued learning. In particular, they are less likely to receive employer support for participating in continued learning (e.g., Desjardins, Rubenson and Milana, 2006). Figure 4 shows that in most countries, mid-career adults aged 36 to 50 are the most likely to receive employer supported adult education. Thereafter, the probability of participating in this type of learning declines sharply, reaching as low as .2 for those aged 61 to 65 in most of the countries. Naturally, the patterns of participation in formal education display an even sharper drop off by age since most formal education is front loaded in the early years. Although, as discussed above this is becoming more common in some OECD countries and may be beneficial for active ageing.

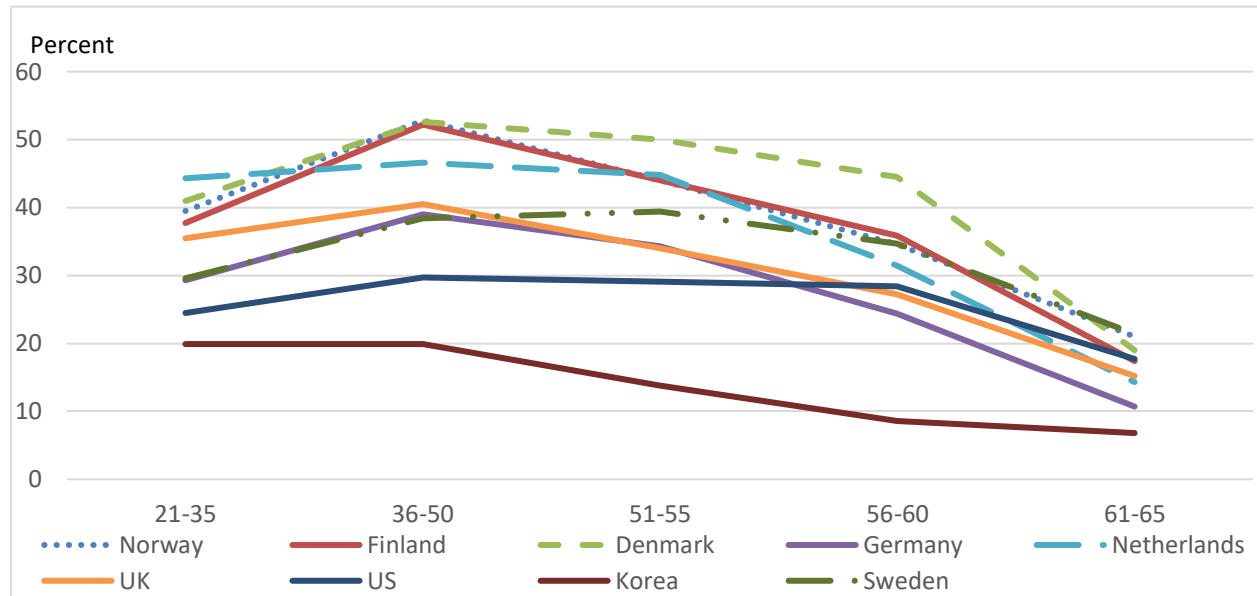
Much research has revealed that cognitive skills decline, on average, with age (Desjardins and Warnke, 2011). On the basis of the PIAAC data, a similar cross-sectional pattern is observed for literacy skills in a wide range of countries, which is an important type of cognitive skill (see Figure 5; Barrett and Riddell, 2016).

Figure 3. Cross-section of employment rate by age



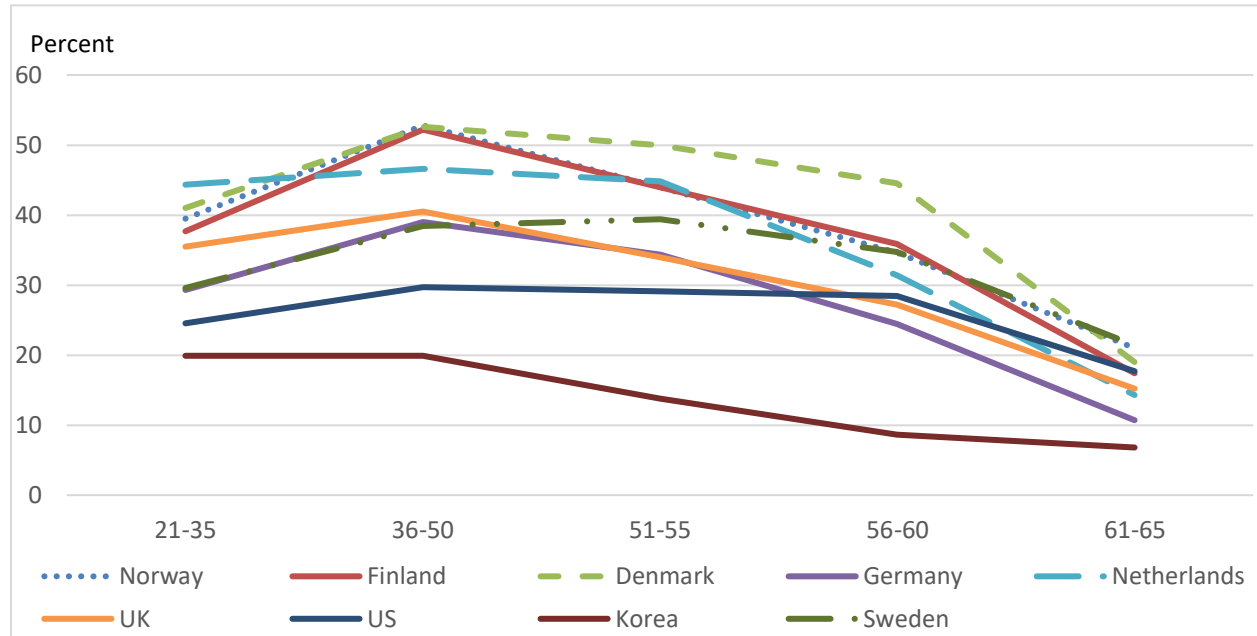
Source: Based on PIAAC, 2012.

Figure 4. Cross-section of job-related employer supported adult education by age



Source: Based on PIAAC, 2012.

Figure 5. Cross-section of the proportion of adults who score at Level 3 on the PIAAC literacy scale by age



Source: Based on PIAAC, 2012.

Results and analysis

Tables 2 to 4 summarize the model estimates. The log odds from the multivariate models were used to estimate adjusted probabilities (or alternatively, predicted probabilities) which are simpler to interpret and to summarize in graphical format as in Figures 6 to 8. The following discusses the results for each of the three models.

Table 2. Logistic regression parameters predicting employment rate

	Logit	s.e.	p-value	Odds ratio	Statistical difference to lower qualification			Statistical difference to comparable qualification within normative age		
					Diff	Pooled s.e.	t-stat	Diff	Pooled s.e.	t-stat
Constant	45.98	0.78	0.00							
Log of age	-11.15	0.19	0.00	0.00						
Women	-0.61	0.03	0.00	0.54						
ISCED 2 at >=36	0.60	0.17	0.00	1.82						
ISCED 3 at >=36	0.64	0.10	0.00	1.89				0.15	0.10	1.52
ISCED 3 at <36	0.48	0.04	0.00	1.62						
ISCED 4 at >=36	0.26	0.15	0.09	1.30	-0.22	0.16	-1.42	-0.43	0.17	-2.49
ISCED 4 at <36	0.69	0.09	0.00	2.00						
ISCED 5b at >=36	1.05	0.12	0.00	2.87	0.57	0.13	4.45	0.17	0.14	1.25
ISCED 5b at <36	0.88	0.06	0.00	2.41						
ISCED 5a at >=36	1.50	0.10	0.00	4.49	1.02	0.10	9.80	0.20	0.11	1.85
ISCED 5a at <36	1.30	0.05	0.00	3.66						

Source: Based on PIAAC, 2012.

Note: Results are adjusted by country.

Table 3. Logistic regression parameters predicting participation in employer supported adult education

	Logit	s.e.	p-value	Odds ratio	Statistical difference to lower qualification			Statistical difference to comparable qualification within normative age		
					Diff	Pooled s.e.	t-stat	Diff	Pooled s.e.	t-stat
Constant	23.89	0.80	0.00							
Log of age	-6.27	0.20	0.00	0.00						
Women	-0.27	0.03	0.00	0.77						
ISCED 2 at >=36	0.75	0.18	0.00	2.12						
ISCED 3 at >=36	1.03	0.10	0.00	2.80				0.37	0.11	3.44
ISCED 3 at <36	0.67	0.05	0.00	1.95						
ISCED 4 at >=36	1.39	0.15	0.00	4.00	0.72	0.15	4.75	0.36	0.17	2.15
ISCED 4 at <36	1.02	0.09	0.00	2.78						
ISCED 5b at >=36	1.54	0.11	0.00	4.64	0.87	0.12	7.31	0.19	0.13	1.48
ISCED 5b at <36	1.35	0.06	0.00	3.85						
ISCED 5a at >=36	1.90	0.08	0.00	6.67	1.23	0.09	13.10	0.35	0.10	3.59
ISCED 5a at <36	1.55	0.05	0.00	4.70						

Source: Based on PIAAC, 2012.

Note: Results are adjusted by country.

Table 4. Logistic regression parameters predicting skills at Level 3 or higher on the PIAAC literacy scale

	Logit	s.e.	p-value	Odds ratio	Statistical difference to lower qualification			Statistical difference to comparable qualification within normative age		
					Diff	Pooled s.e.	t-stat	Diff	Pooled s.e.	t-stat
Constant	7.69	0.69	0							
Log of age	-2.28	0.17	0.00	0.10						
Women	-0.07	0.03	0.01	0.93						
Attained ISCED 2 at >=36	-0.18	0.21	0.39	0.84						
Attained ISCED 3 at >=36	0.70	0.09	0.00	2.01				-0.29	0.10	-2.86
Attained ISCED 3 at <36	0.99	0.04	0.00	2.68						
Attained ISCED 4 at >=36	1.26	0.14	0.00	3.53	0.28	0.14	1.94	-0.18	0.16	-1.15
Attained ISCED 4 at <36	1.44	0.08	0.00	4.23						
Attained ISCED 5b at >=36	1.68	0.10	0.00	5.35	0.69	0.11	6.25	-0.04	0.12	-0.38
Attained ISCED 5b at <36	1.72	0.06	0.00	5.59						
Attained ISCED 5a at >=36	2.22	0.08	0.00	9.20	1.23	0.09	13.93	-0.20	0.09	-2.18
Attained ISCED 5a at <36	2.42	0.05	0.00	11.27						

Source: Based on PIAAC, 2012.

Note: Results are adjusted by country.

Attaining qualifications at older ages linked to continued employment into older ages

The findings from PIAAC reveal that adults with higher levels of education have a stronger attachment to the labour market into old age (see Table 2). This is the case regardless of the age at which adults attained their highest qualification. Figure 6 visualizes the results to highlight that adults aged 50 to 65 who attained higher levels of qualifications are associated with an increased probability of being employed more generally which is consistent with previous research. The analysis is novel however, by helping to reveal that qualifications attained at older ages (36 or over) is associated with an increased probability of being employed at older ages. This is the result for most cases, but the comparison group is important.

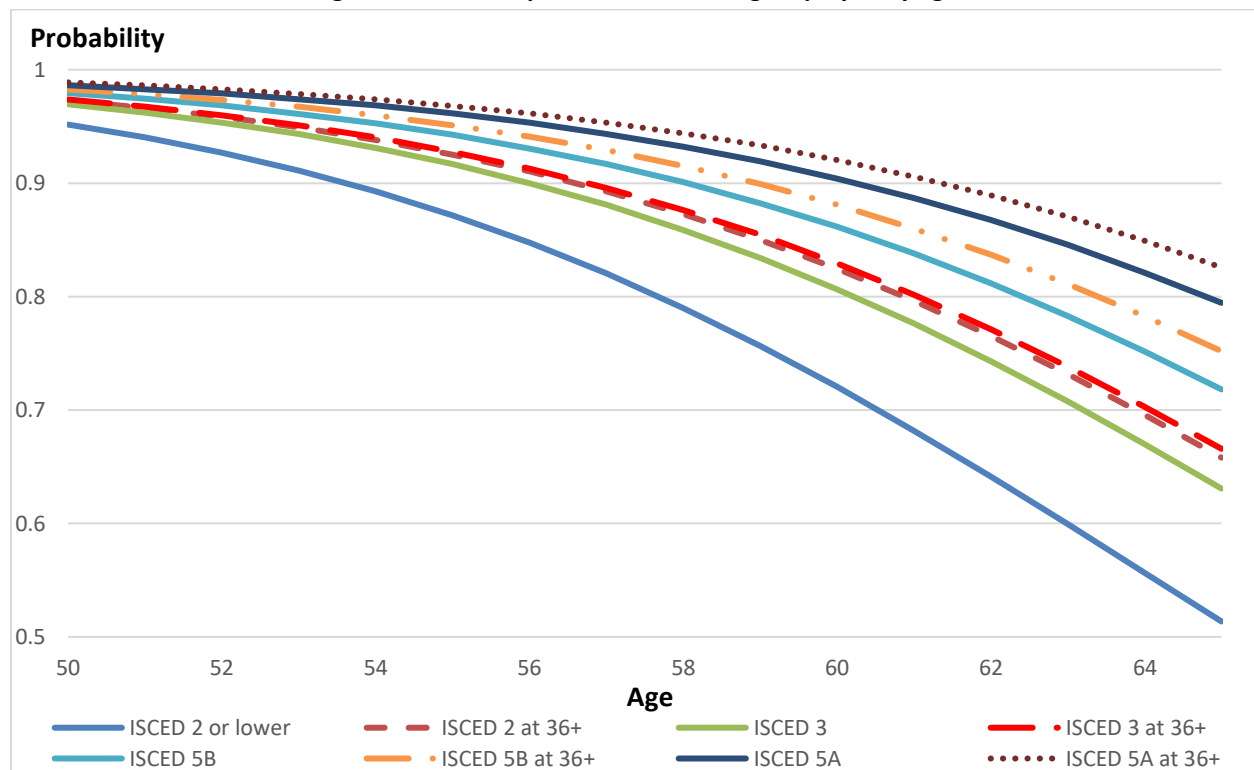
Specifically, if we compare adults who completed a higher qualification at an older age with those who remained at a lower level qualification, then the difference is significant and substantial. As an example, adults who completed the equivalent of an upper secondary (i.e. ISCED 3) qualification at an older age (36 or older) are associated with a statistically significant boost in the probability of being employed when over the age of 50 compared to an adult who never not completed an upper secondary education. The pattern is similar if we compare adults who completed the equivalent of an ISCED 2 qualification at an older age (36 or older) to an adult who did not.

In contrast, comparing adults who completed a higher qualification at older ages with adults who completed a comparable qualification at younger ages, follows the same pattern in most cases, but this tends to be statistically insignificant at the 5 percent level or only marginally statistically significant (i.e. $p < .1$). Arguably, however, the relevant comparison group is not those who completed the same qualification at younger ages, but rather the group that the non-traditional student would be in had they

not returned to complete a higher qualification. For example, the boost in probability for adults who return to complete an ISCED 5a qualification compared to those whose highest qualification is ISCED 3 is rather substantial. The only exception to the pattern is with regard to adults who attain some kind of post-secondary qualification that is not tertiary (i.e. ISCED 4). In fact, adults appear to be associated with a substantially reduced probability of being employed at older ages if they completed this latter type of qualification over the age of 35. However, the ISCED 4 category is highly variable and inconsistent across countries and for this reason is not included in the chart.

Overall, these results point to potentially substantial labour market benefits of formal adult education designed to help adults attain qualifications that are comparable to basic education (ABE), upper secondary education (AGE) as well as higher education (AHE). Specifically, attaining qualifications at older ages appears for the most part to boost employability of many adults into older ages. This suggests that open and flexible educational structures that lead to recognized qualifications and can cater to older adults needs and aspirations can be linked to the promotion of labour market employment.

Figure 6. Predicted probabilities of being employed by age



Source: Based on PIAAC, 2012.

Attaining qualifications at older ages linked to continued learning into older ages

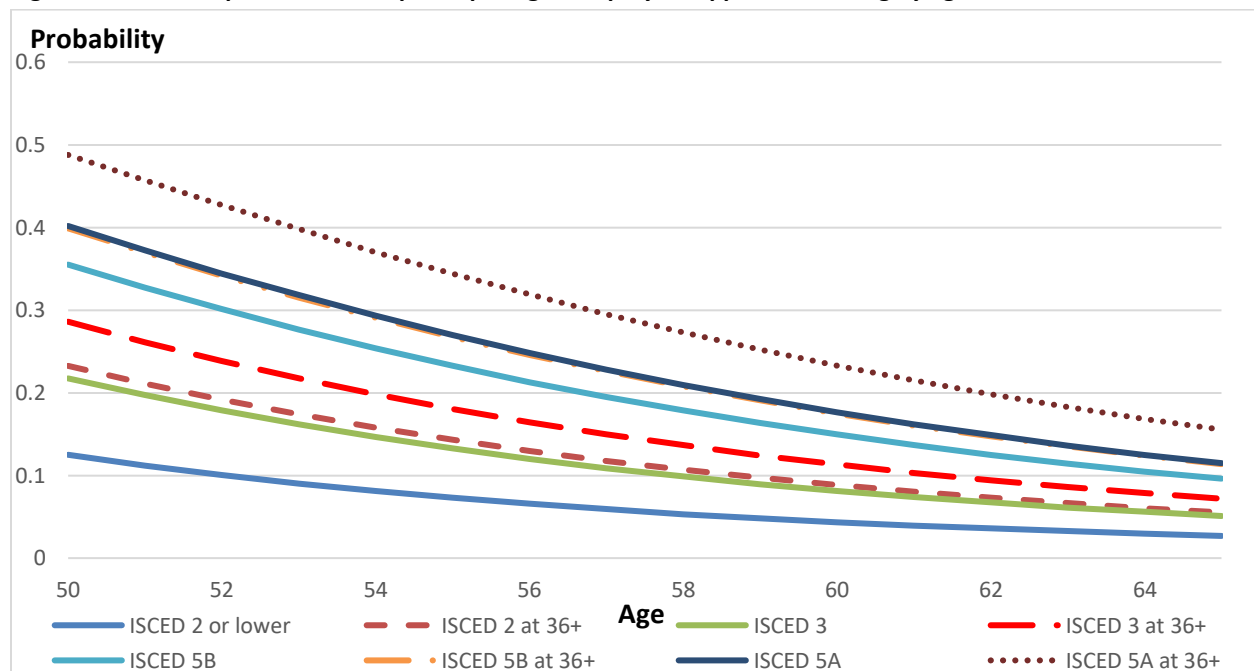
Additional analysis that is not shown reveals that adults with higher levels of education have a higher probability of participating in non-formal education into older age. This is the case regardless of whether adults attained their highest qualification at older or younger ages. Importantly, having attained a higher

qualification at an older age (36 or over) is associated with an increased probability of continued participation in non-formal education into older ages. This provides further evidence that open and flexible qualification systems that cater to older adults may help to promote continued learning into older ages. Importantly, adults with higher levels of education have a higher probability of receiving employer sponsored training into older age. This is the case regardless of whether adults attained their highest qualification at older or younger ages (see Table 3).

It can be seen from Figure 7 that adults who attain higher levels of qualifications are associated with an increased probability of participating in employer supported adult education, which is consistent with previous research showing that continued participation in adult education over the lifespan is strongly related to qualification levels (e.g. Desjardins, Rubenson and Milana, 2006). The added value of the analysis is to reveal that attaining qualifications at older ages is strongly associated with an increased probability of receiving employer supported training at older ages. The pattern is similar at every level of qualification and for the most part regardless of whether the comparison group are those who remained at a lower level of qualification or those who completed a comparable qualification at younger ages.

Specifically, adults who completed the equivalent of an upper secondary (i.e. ISCED 3) qualification at an older age (36 or older) are found to be associated with a substantially and statistically significantly ($p < .05$) increased probability of receiving employer supported training when over the age of 50 compared to either an adult who did not complete an upper secondary education or those who did so at younger ages. The result is similar for adults who return to complete the equivalent of an ISCED 2, ISCED 5b or 5a qualification at an older age (36 or older) when compared to either an adult who remained at a lower level qualification or those who attained a comparable qualification within the normative age.

Figure 7. Predicted probabilities of participating in employer supported training by age

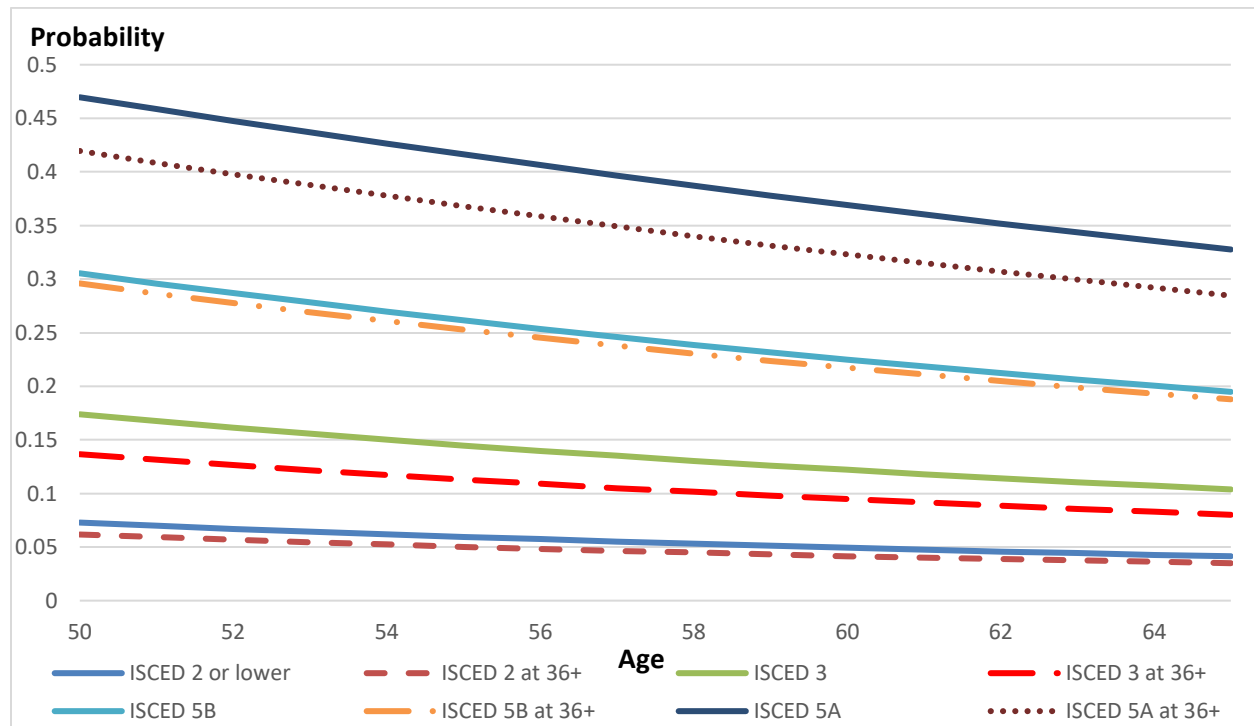


Source: Based on PIAAC, 2012.

Attaining qualifications at older ages linked to increased cognitive skills into older ages

In general, adults with higher levels of education score higher on the PIAAC literacy scale into older ages. This is the case regardless of whether adults attained their highest qualification at older or younger ages (see Table 4). Figure 8 shows that adults who attained qualifications at later ages tend to score on average at higher levels compared to other adults who stayed at lower levels of qualifications. However, the data show that adults who completed their highest qualification at younger ages have a higher probability of scoring at Level 3 or higher compared to those who attain comparable qualifications at older ages. The differences are statistically significant at the university (ISCED 5a) and upper secondary (ISCED 3) levels. This suggests that on average those adults who tend to complete their highest qualification at younger ages are at an advantage in terms of their level of cognitive skills, and that this maintained into late career ages. It is likely that this is because those adults who earn higher qualifications at younger ages are able to secure work opportunities at an earlier age which fosters the practice and maintenance of literacy skills as well as more enhanced opportunities to develop them over the course of their career.

Figure 8. Predicted probabilities of scoring at Level 3 or higher on the PIAAC literacy scale



Source: Based on PIAAC, 2012.

Concluding remarks and implications

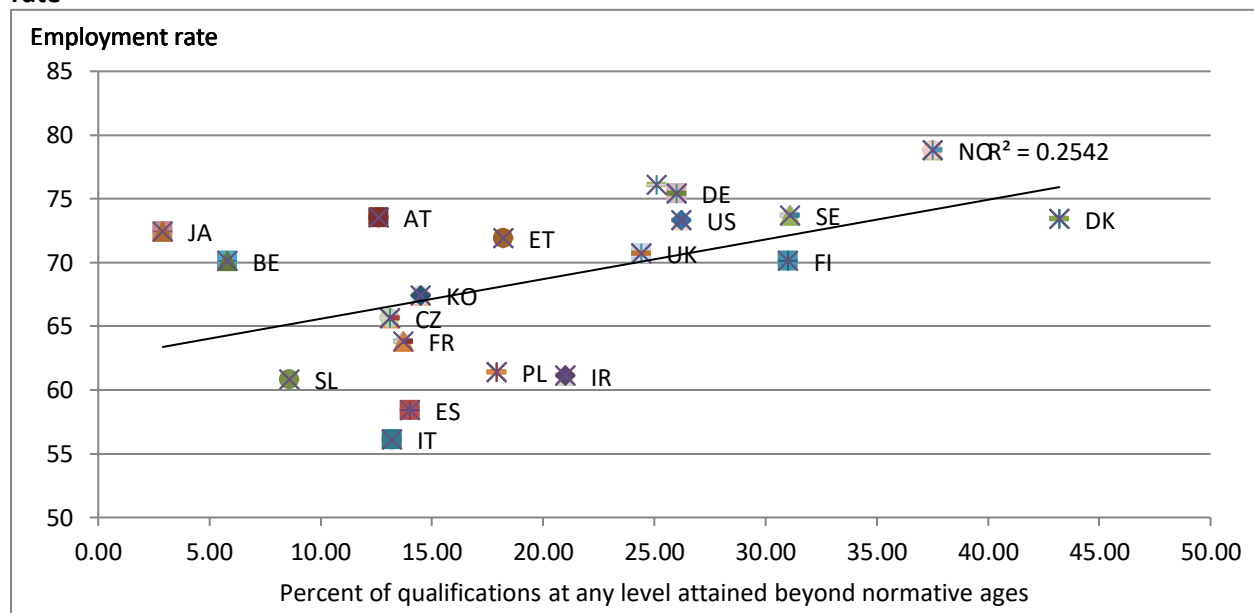
The empirical analysis presented suggests that formal education structures that are open to older adults and by extension flexible to meet their needs and aspirations is a good thing for activating the population to be employed, to engage in continued learning and to maintain and develop literacy skills

as measured in PIAAC into older ages. This follows from results which show that attaining nearly any type or level of qualification in mid to later life is associated with increased probabilities of experiencing positive outcomes related to active ageing.

A note of caution is required, however. Namely, the results presented are not causal. Instead they are indicative of a potentially substantial relationship. For example, it is possible that adults who decided to return and complete a higher qualification at an older age are also the ones with other unobserved attributes that may explain their higher probabilities of employment and learning into older age. Theory however helps to support the findings, particularly the existence of well-reasoned research that has explored the multiple pathways and mechanisms that offer plausible explanations for how an updated and more recent educational experience can have positive and sustained effects in adults' lives.

Separately, it is interesting to note that the individual level analysis presented above which suggests that open and flexible formal education structures promote labour market attachment, boost employment levels and increase learning and other outcomes such as skills into old age, can also be at least partly revealed at a macro level on the basis of the PIAAC data. For example, Figure 9 shows a strong positive correlation between the degree of openness of formal educational structures to non-traditional (or mature students) and overall employment rates at the country level (correlation is .68 or .50 depending on whether outliers are excluded). The degree of openness of higher education systems is defined as the proportion of adults who attained their highest qualification at non-traditional ages. Similar results can be found by narrowing the concept to the openness of higher education systems which focuses only on ISCED 5a, 5b or higher.

Figure 9. Percent of adults attaining highest qualification as non-traditional students by employment rate



Source: Based on PIAAC, 2012.

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Note: Pearson correlation coefficient is .50 with all countries, but .68 when Belgium and Japan are removed as outliers due to very low openness of higher education systems.

Another limitation is that the analysis is based on pooled data across countries so as to avoid low sample sizes. A country by country analysis would be much more telling and help to account for cross-national differences in the incidence of attaining higher qualifications at older ages and other idiosyncrasies. However, even with larger sample sizes this type of analysis would be difficult in countries in which formal educational structures are relatively closed to older students and remain primarily focused on younger age cohorts who follow the shortest and most direct path typically associated with a given qualification.

Indeed, there are large cross-national differences in the extent to which formal education structures are open to non-traditional students (see Figure 1). Only a small number of countries have well developed adult learning systems, which offer oportuntieis for Adult Basic Education (ABE), Adult General Education (AGE), Adult Vocational Education (AVE) and Adult Higher Education (AHE) in flexible ways, which make it possible for adults to return at older ages to complete a higher qualification. Of course, this depends on demand and not all countries have reached occupational and production structures where relatively large shares of population can afford to return to formal education and importantly, stand to benefit financially from this decision on labour markets. Notwithstanding, the supply of opportunities is critical to foster the demand, and not least, to support the development of human capacities. This requires public support in the form of financing and structural policies that foster flexible pathways and opportunities to acquire qualifications that are widely recognized (i.e. ABE, AGE, AVE and AHE). Countries that do feature well developed adult learning systems indeed tend to invest in flexible educational structures and feature advanced policies and forms of governance that seek to develop the opportunity structure of citizens over their entire lifespan.

In Desjardins (2017), I highlight some distinguishing factors of advanced adult learning systems which include: the degree of openness of formal education systems to non-traditional students; flexible and open qualification systems that integrate different types of adult learning (i.e., ABE, AGE, AVE and AHE) in ways that lead to recognized qualifications that are equivalent or comparable to those attained in the regular education system; diverse provision catering to diverse individual, employer and industrial needs; targeting and outreach to socially disadvantaged adults; as well as, high and widely distributed participation in adult education and foundation skills such as those measured in PIAAC. The analysis presented here suggests at least in part that greater levels of employment and the concomitant active ageing could be added to the list outcomes associated with investment in advanced adult learning systems.

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References

- Barrett, G., and Riddell, C. (2016). Ageing and Literacy Skills: Evidence from IALS, ALL and PIAAC, Discussion Paper No. 10017 Institute for the Study of Labor (IZA), Bonn, Germany. <http://ftp.iza.org/dp10017.pdf>
- Cedefop (2012). Working and Ageing: The Benefits of Investing in an Ageing Workforce. Luxembourg: Publications Office of the European Union. http://www.cedefop.europa.eu/files/3064_en.pdf
- Chisholm, L., Larson, A., & Mosseux, A.-F. (2004). Lifelong learning: Citizens' views in close-up. Findings from a dedicated Eurobarometer survey. Luxembourg: Office for Official Publications of the European Communities.
- Davey, J. (2002). Active Ageing and education in mid and later life, *ageing and society*, vol. 22 (1), pp. 95-113.
- Desjardins, R., Rubenson, K., & Milana, M. (2006). Unequal Chances to Participate in Adult Learning: International Perspectives, *Fundamentals of Educational Planning Series*. Paris: UNESCO International Institute of Educational Planning.
- Desjardins, R., & Rubenson, K. (2013). Participation patterns in adult education in comparative perspective, *European Journal of Education*, Volume 48, Number 2, pp. 262-280.
- Desjardins, R., & Warnke, A.J. (2011). Ageing and skills: A review and analysis of skill gain and skill loss over the lifespan and over time, OECD Education Working Papers, No. 66, OECD Publishing.
- Desjardins, R. (forthcoming). PIAAC thematic report on adult learning, OECD Education Working Papers, No. XX, OECD Publishing.
- Desjardins, R. (2017). *Political Economy of Adult Learning Systems: Comparative Study of Strategies, Policies and Constraints*. London: Bloomsbury publishing.
- European Commission (2006). Classification of Learning Activities – Manual. Luxembourg: Publications Office of the European Union. <https://ec.europa.eu/eurostat/documents/3859598/5896961/KS-BF-06-002-EN.PDF/387706bc-ee7a-454e-98b6-744c4b8a7c64>
- Eurostat (2011). Active Ageing and Solidarity Between Generations: A Statistical Portrait of the European Union. Luxembourg: Publications Office of the European Union.
- Jamieson, A. (2007). Education and the quality of life in later years, *Quality in Ageing*, 8(3), 15–23.
- Jenkins, A. (2006) Women, lifelong learning and transitions into employment, *Work, Employment & Society*, 20(2), 309-328.
- MacArthur Foundation (2012). The scope and benefits of lifelong learning, Network on Aging in Society, Columbia University Mailman School of Public Health.
- OECD (2013a). *OECD skills outlook 2013: First results from the Survey of Adult Skills*. Paris: OECD Publishing.
- OECD (2013b). *The Survey of Adult Skills: Reader's companion*. Paris: OECD Publishing.

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Phillipson, C. (2010). Active ageing and universities, *International Journal of Education and Ageing*, 1(1), 9–22.

Plassman, B.L., et al. (2010). Systematic review: Factors associated with risk for and possible prevention of cognitive decline in later life, *Annals of Internal Medicine*, vol.153 (3), pp. 182-193.

Triventi, M., & Barone, C. (2014). Returns to adult learning in comparative perspective. In H-P Blossfeld, E. Kilpi-Jakonen, D. V. de Vilbena, & S. Buchholz (Eds.), *Adult learning in modern societies: An international comparison from a life-course perspective* (pp. 56-75), Cheltenham and Northampton: Edward Elgar.

Tuijnman, A.C. (1989) Recurrent Education, Earnings, and Well-being: A Fifty-Year Longitudinal Study of a cohort of Swedish Men, *Acta Universitatis No. 24*. Stockholm: Almqvist & Wiksell International.

Vignoles, A., Galindo-Rueda and Feinstein, L. (2004) The Labour Market Impact of Adult Education and Training: A Cohort Analysis, *Scottish Journal of Political Economy*, 51(2), 266–280.

Walker, A., & Maltby, T. (2012). Active ageing: A strategic policy solution to demographic ageing in the European Union, *International Journal of Social Welfare*, vol. 21 (s1), DOI: 10.1111/j.1468-2397.2012.00871.x

Walker, A. (2002). A strategy for active ageing, *International Social Security Review*, 55(1), 121–139.

Yaffe, K., et al. (2009). Predictors of maintaining cognitive function in older adults — The health ABC study, *Neurology*, vol. 72, pp. 2029-2035.