

the public-use files as available on the OECD's PIAAC webpage. PIAAC builds on knowledge and experiences gained from previous international adult assessments - the International Adult Literacy Survey (IALS), conducted between 1994 and 1998, and the Adult Literacy and Lifeskills Survey (ALL), conducted between 2003 and 2008.

The current analysis includes only 4 of the 24 countries: Italy, Sweden, UK, and France. In order to capture lifelong learning activities taking place after the completion of initial education, I leave individuals aged 16-24 out of the analysis. Then, I focus on individuals aged 25-65, the normal age range to enter in the labour market. Overall, the final sample covers four countries and includes 21,157 individuals.

Methods

Since individual observations in the dataset are not independent because clustered within countries, multilevel regressions models, which combine individual and contextual factors, should be an appropriate technique, because they can account for the nested structure of the data. However, the application of multilevel models for an international survey-data-set, like PIAAC, is a bit troubling. Firstly, in these surveys the country selection is not a random sample, but a convenient sample of those countries where researchers are willing and have the financial means to participate in the study. Secondly, the analysis of this paper is restricted only to a sub-sample of four countries (and, in any case, the total number of countries included in PIAAC sample are less than 25), consequently the application of multilevel model would have a low number of degrees of freedom on the country level¹. Then, as pointed out by Möhring (2012, p. 3), *“the advantages of multilevel models, as the introduction of random slopes and cross-level interaction effects, cannot be fully applied due to statistical reasons. If models are correctly specified paying regard to the small number country level, only low number of macro level indicators can be controlled for”*.

Given the above, to address research question I carry out separate logistic regressions for each country and each learning activity. The dependent variable is a dichotomous variable indicating whether a person participated AET in the 12 months prior the survey. As mentioned earlier, I distinguished between 2 types of AET, formal and non-formal. The “Logit” model is specified as the log odds of equation:

$$\text{Ln} [p_i / (1-p_i)] = \alpha + \beta_1 \text{Age}_i + \beta_2 \text{Female}_i + \beta_3 \text{Educ}_i + \beta_k x_i \quad (1)$$

As independent variables, I consider three factors: age (in year bands), gender (a dummy variable which has value 1 for females, and 0 for males) and education level (from primary to tertiary level). In addition to these variables, I include a set of covariates (x_i), related to individual characteristics: subjective working condition (employed or self-employed, retired, unemployed, etc.), working sector (private sector, public sector), social classes (unskilled workers, skilled manuals, professionals, etc.), the number

¹ Mass and Hox (2005), conclude that only samples with more than 50 macro units produce unbiased estimators.

of individuals in the households, the number of children, the health condition, the language mastery (whether the respondent is a native speaker), the highest qualification of parents and the number of books at home at age 16.

This approach uses a method called 'Maximum Likelihood', which allows to find the value of the parameters β which maximises the likelihood of observing what I have actually observed in the data. So, if the model leads to a large improvement in the likelihood, compared to the null model, then it has some explanatory power and is better than the null model.

4. Empirical Results

In the following paragraph, the results of the logistic regressions regarding the influence of individual characteristics on participation in both formal and non-formal AET are set out (Tables 1 and 2). In particular, in order to address the research question I focus on discussing the effect of age, education and gender on participation in different types of lifelong learning activity.

Table 1 – The determinants of participation in formal AET, Logit estimates

	France		Italy		Sweden		UK		Pooled	
	OR	S.E.	OR	S.E.	OR	S.E.	OR	S.E.	OR	S.E.
<i>Female</i>	0.782***	0.17	0.967***	0.224	1.422***	0.173	1.172***	0.172	1.043***	0.102
<i>Age Bands</i> (reference: 25-35)										
36-45	0.681***	0.152	0.490***	0.139	0.604***	0.103	0.812***	0.119	0.738***	0.079
46-55	0.295***	0.077	0.187***	0.073	0.412***	0.078	0.686***	0.107	0.555***	0.067
56-65	0.070	0.045	0.050	0.045	0.139***	0.041	0.246***	0.073	0.219***	0.053
<i>Education levels</i> (reference: Primary or less)										
Lower secondary	0.798***	0.253	2.468	2.517	3.922	2.904	1.285**	0.665	1.47**	0.623
Upper secondary and post secondary	0.503***	0.113	3.306	3.000	4.409	3.252	2.866**	1.228	2.384**	0.961
Tertiary	-	-	-	-	12.852	9.405	2.873**	1.228	3.387**	1.380
<i>Constant</i>	0.042**	0.024	.003	0.009	0.011	0.017	0.117*	0.063	0.020**	0.009
<i>LL_0</i>	-2,862,746		-2,972,890		-1,149,170		-6,417,471		-1,44E+07	
<i>LL_1</i>	-2,463,786		-2,345,294		-917,131,800		-5,955,877		-1,28E+07	
<i>Chi2</i>	131.237***		128.131***		297.658***		103.195***		376.082***	
<i>N</i>	2,583		1,845		2,369		3,547		10,498	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Controlling for: current work situation, type of contract, sector, social class, health, household, number of book at age 16, parental education and native speaker condition.

Table 2 – The determinants of participation in non-formal AET, Logit estimates

	France		Italy		Sweden		UK		Pooled	
	OR	S.E.	OR	S.E.	OR	S.E.	OR	S.E.	OR	S.E.
<i>Female</i>	0.947***	0.071	0.883***	0.124	0.968***	0.133	0.938***	0.124	0.924***	0.055
<i>Age Bands</i> (reference: 25-35)										
36-45	1.141***	0.122	1.164***	0.209	0.839***	0.138	1.281***	0.213	1.207***	0.083
46-55	1.232***	0.126	1.105***	0.215	0.799***	0.132	1.323***	0.226	1.338***	0.105
56-65	0.738***	0.110	0.892***	0.271	0.520***	0.100	1.143***	0.232	1.116***	0.128
<i>Education levels</i> (reference: Primary or less)										
Lower secondary	1.718***	0.443	0.836*	0.481	2.422**	1.099	1.559***	0.453	1.089***	0.188
Upper secondary and post secondary	2.668***	0.620	1.154*	0.637	3.237**	1.398	1.830***	0.470	1.587***	0.248
Tertiary	4.183***	0.919	1.750*	1.028	3.032**	1.388	2.165***	0.582	2.321***	0.381
<i>Constant</i>	0.233***	0.074	0.302*	0.176	1.731	1.109	0.755***	0.303	0.353***	0.075
<i>LL_0</i>	-10,400,000		-8,858,951		-1,829,766		-8,502,565		-31,700,000	
<i>LL_1</i>	-9,292,254		-7,835,782		-1,622,649		-7,331,267		-27,600,000	
<i>Chi2</i>	308.575***		204.537***		246.087***		272.754***		889.647***	
<i>N</i>	2,718		1,864		2,382		3,556		10,528	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Controlling for: current work situation, type of contract, sector, social class, health, household, number of book at age 16, parental education and native speaker condition.

Age

As evident in Table 2, there is a significant relationship between all age bands and participation in non-formal AET in all countries selected. Contrary to my expectations, in Sweden the rate of decrease in the odds of AET participation for older groups of individuals is higher. Here, individuals aged 36-45 have an expected decrease in odds of participating in non-formal AET of 0.839 ($p < 0.01$), with respect to the reference group (individuals aged 25-35). Afterwards, the odds tend to decrease with the age, till the older groups (56-65). Conversely, in the other three countries, the pattern is a bit different. The 36-45 age group experiences the highest odds of entering in non-formal AET, compared to the reference group (25-35). For example, in Italy individuals aged 36-45 have an odds of 1.164 ($p < 0.01$) of being in non-formal AET. Afterwards the relative odds decrease with age. Instead, in the UK and in France, the odds of participating in non-formal AET increases until age 46-55 and then it drops.

Results for formal AET (Table 1) indicate that overall the relationship between the outcome and age is statistically significant, except for the oldest individuals (56-65) in Italy and France. In all countries, the odds of taking part in formal AET diminish with the age at a rate steeper than the one observed for non-formal AET. This trend is particularly evident in Italy where being a person aged 36-45 lowers the odds of taking part in formal AET in the prior 12 months of about 0.490 ($p < 0.01$), compared to the reference group (25-35). Then with age the odds drop to 0.187 ($p < 0.05$) for people 46-55 and to 0.050 ($p > 0.10$) for the oldest group. This trend is a bit less marked in the UK, where the odds decrease from 0.812 ($p < 0.01$) for people aged 36-45, to 0.686 ($p < 0.01$) for individuals aged 46-55, and 0.246 ($p < 0.01$) for people closer to retirement.

Summary: as age increases the odds of the individual to participate in any type of AET increases. This result is in concordance with my expectation and with the human

capital theory (Becker, 1964), which states that younger individuals have higher probability of participating in adult learning activities due to higher net returns over the remaining life (see also Ben-Porath, 1967; Li et al., 2000; Fourage and Schils, 2009).

Education

The results for non-formal AET (Table 2) in Italy indicate that compared to people who have just finished primary school, those who with a post-secondary qualification or a university degree (or more) have the higher odds to enter formal AET (OR = 1.750, $p < 0.10$); followed by those holding an upper secondary diploma (OR = 1.154, $p < 0.10$) and those who got a lower secondary qualification (OR = 0.836, $p < 0.10$). There are a barely detectable statistically significant difference between all categories. In France and Sweden the association between education level and the odds of entering non formal AET is stronger; Italy depicts the weaker relationship.

With regard to formal AET, the overall results suggest an association of increasing strength between the education level and the odds of entering formal AET. Nevertheless, as I hypothesised in the literature review section, the differences between lower and higher educated individuals in the odds to participate in formal AET is found to be smaller in countries with less stratified school system, such as the UK and Sweden, compared to Central and Conservative countries, like Italy and France. In Italy, with respect to people holding only a primary diploma, those who reached a lower secondary level have an higher odds of being in formal AET (OR = 2.468, $p > 0.10$), this is even higher (OR = 3.306, $p > 0.10$) in those in upper secondary level. In the UK the differences between levels are less marked. The odds of entering formal AET there is 1.285 ($p < 0.10$), 2.866 ($p < 0.05$) and 2.873 ($p < 0.05$), for individuals in lower secondary, upper secondary, and tertiary levels, respectively.

Summary: the results in Table 1 and 2 strongly support my expectation for which better educated persons participate more often in non-formal adult learning courses than their lower counterparts. However, the same educational effect, with the exception of France, is also found for formal AET. In most countries education seems one of the most important influencing predictor for participation in both types of AET. This could be due to the already mentioned complementary relationships between initial and AET and/or because of higher skill requirements and higher learning capacity of better educated persons (Brunello, 2001; Albert et. al. 2010).

Gender

In France women have lower odds to enter in formal AET (OR = 0.782, $p < 0.01$). The association between both learning activities and gender turns out to be highly significant in all countries. Furthermore, my expectation about a less market gender difference in Sweden and in the UK, compared to Italy and France, is partially confirmed, since it is found only for non-formal AET, but not for formal AET. Indeed in Italy women have almost the same odds of men to enter in formal AET (OR = 0.967, $p < 0.10$), while in Sweden is 1.422 ($p < 0.01$).

Summary: The results of the multivariate logistic model show that, in line with my expectations, men are more likely to participate in non-formal AET. While women are

more likely to enter in formal AET only in the UK and in Sweden, but not in France and in Italy.

5. Conclusion

The combination of two factors - the demographic aging of societies and a shift in the age distribution of labour force - results in the need for policies to encourage people to upgrade skills in order to remain at work. Policies providing opportunities for adult individuals to participate in AET programmes are necessary to ensure economic security in retirement, a competitive labour force and economic growth. The implementation of policies focusing on lower income groups and especially unemployed are crucial, as they are the most in need of skills upgrading and most at risk for economic insecurity.

This study investigated the factors influencing the participation of individuals aged 24-65 in formal and non-formal AET for four countries: Italy, UK, Sweden, and France. The following analysis especially focused on three variables: age, prior education and gender.

First, as hypothesised, the general pattern with regard to age profiles is for participation in all types of AET to be concentrated among young adults with the probability of enrolment to decrease with age. The exact functional form differs a bit among countries and learning activities. In some cases, the decrease over the age is monotonic, whereas in others the rate at which participation decreases change over the life course. More specifically, participation in formal AET tends to decrease in a linear way: whereas participation in non-formal learning activities tends to be enough stable among middle ages groups (36-45 and 46-55), afterwards reducing dramatically for the oldest individuals.

Secondly, as expected in the literature review section, the more-highly educated individuals are more likely to participate in non-formal learning activities in all countries. Regarding formal activities, I expected that medium-educated individuals would be more likely to participate in formal AET. Instead, with the exception of France, I found the same educational effect observed for non-formal AET. However, as hypothesised, the differences between lower and higher educated individuals in the odds to participate in formal AET is found to be smaller in countries with less stratified school systems, such as the UK and Sweden, compared to Central-Conservative and Southern Europeans countries, like Italy and France. Overall the results suggest an association of increasing strength between the education level and the odds of entering both types of AET.

Lastly, as the outset, I expected that men would be more likely to participate in non-formal AET. The results from the logistic regressions, confirm this hypothesis, though I also expected that women to be more likely to enter in formal AET. This hypothesis found evidence only in the UK and in Sweden, but not in France and in Italy. Furthermore, my expectation about a less market gender difference in Sweden and in the UK, compared to Italy and France, is partially confirmed, since it is found only for non-formal AET but not for formal AET.

Bibliography

- Albert, C. García-Serrano, C. and Hernanz, V. (2010), On-the-job training in Europe: Determinants and wage returns, *International Labour Review*, 149(3), pp. 315-341.
- Arts, W. and Gellisen, J. (2002), Three worlds of welfare capitalism or more? A state-of the art report, *Journal of European Social Policy*, 12(2), pp. 137-158.
- Bassanini, A. Alison, B. Brunello, G. de Paola, M. Leuven, E. (2007), Workplace training in Europe, in Brunello, G. Garibaldi, P. and Wasmer, E. (Eds). *Education and Training in Europe*. Oxford University Press, Chap. 8-13.
- Ben-Porath, Y. (1967), The Production of Human Capital and the Life Cycle of Earnings, *The Journal of Political Economy*, 75(4), pp. 352-365.
- Becker, G. (1964), *Human Capital*, 2nd ed. Columbia University Press, New York, 1975 and 3rd 1994.
- Blundell, R. Dearden, L. Meghir, C. and Sianesi, B. (1999), Human Capital Investment: The Returns from Education and Training to the individual, the Firm and the Economy. *Fiscal Studies*, 20(1), pp. 1-23.
- Blundell, R. Dearden, L. Meghir, C. (1996), *The Determinants of Work-Related Training in Britain*, London: The Institute for Fiscal Studies.
- Bunello, G. (2001), On the complementary between education and training in Europe, *IZA Discussion Paper, n. 309*, Institute for the Study of Labor, Bonn, Germany.
- Carneiro, P. Dearden, L. And Vignoles, A. (2010), The economics of vocational education and training, in P. Peterson, E. Baker and B. McGaw (Eds). *International encyclopedia of education*, Volume 8, Elsevier, Oxford, pp. 255-261.
- Cummins, P.A. Kunkel, S.R. and Walker, R.M. (2015), *Adult Education and Training Programmes for Older Adults in the U.S.: National Results and Cross-National Comparisons Using PIAAC Data*, Paper Commissioned by American Institutes for Research, Retrieved from: http://static1.squarespace.com/static/51bb74b8e4b0139570ddf020/t/54da7607e4b081084af3c485/1423603207175/Cummins_Kunkel_Walker_PIAAC.pdf.
- Cunha, F and Heckman, J. (2007), The technology of skill formation, *American Economic Review*, 97(2), pp. 31-47.
- Dämmrich, J. Vono de Vilhena, D. and Reichart, E. (2014), Participation in Adult Learning in Europe: The impact of Country-Level and Individual Characteristics, in H.P. Blossfeld, E. Kilpi-Jakonen, D. Vono de Vilhena and S. Buchholz (Eds), *Adult Learning in Modern Societies. An International Comparison from a Life-course Perspective*, Cheltenham: Edward Elgar.
- Dearden, L. McIntosh, S. and Vignoles, A. (2001), *Basic Skills, Soft skill and Labour Market Outcomes: Secondary Analysis of the NCD.*, DfEE Research Report No. 250 and Research Brief No. 250 and CEE Discussion Papers Nos. 3 and 4.
- Dieckhoff, M. and Steiber, N. (2011), A re-assessment of common theoretical approaches to explain gender differences in continuing training participation, *British Journal of Industrial Relations*, 49 (s1), pp. 135-157.
- DiPrete, T.A. and Eirich, G.M. (2006), Cumulative advantage as a mechanism for inequality: A review of theoretical and empirical developments, *Annual Review of Sociology*, 103, pp. 318-358.
- Elman, C. and O'Rand, A.M. (2007), The effects of social origins, life events, and institutional sorting on adults' school transitions, *Social Science Research*, 36 (3), pp. 1276-1299.
- Elman, C. and O'Rand, A.M. (2004), The race is to the swift: Socioeconomic origins, adult education, and wage attainment, *American Journal Research*, 110 (1), pp. 123-160.
- Esping-Andersen, G. (1990), *The Three Worlds of Welfare Capitalism*, Princeton, NJ: Princeton University Press.

- Fenger, M. (2007), Welfare regimes in Central and Eastern Europe: incorporating post-communist countries in a welfare regime typology, *Contemporary Issues and Ideas in Social Sciences*, 3(2), pp. 1-30.
- Fouarge, D. and Schills, T. (2009), The effect of early retirement incentives on the training participation of older workers, *Labour*, 23 (s1), pp. 85-109.
- Hällsten, M. (2011), Late entry in Swedish tertiary education: Can the opportunity of lifelong learning promote equality over the life course? *British Journal of Industrial Relations*, 46 (3), pp. 537-559.
- Hanushek, E. A. and Zhang, L. (2008), Quality consistent estimates of international returns to skill [mimeo], Stanford, CA: Stanford University, Hoover Institution.
- Hostetler, A Sweet, S. and Moen, P. (2006), Gendered career paths: a life course perspective on returning to school, *Sex Roles*, 56 (1-2), pp. 85-103.
- ILO (2010), A Skilled Workforce for Strong, Sustainable and Balanced Growth: A G20 Training Strategy. ILO, Geneva.
- ILO (2013), Global Employment Trends 2013. Recovering from a second jobs dip. ILO, Geneva
- Jenkins, A. Vignoles, A. Wolf, A. and Galindo-Rueda, F. (2002), Determinants and Effects of Lifelong Learning. London: Centre for the Economics of Education, London School of Economics and Political Science.
- Kilpi-Jakonen, E. Bunchholz, S. Dämmrich, J. McMullin, P. and Blossfeld, H.P. (2014), Adult learning, Labor Market Outcomes, and Social Inequalities in Modern Societies, in H.-P. Blossfeld, E. Kilpi-Jakonen, D. Vono de Vilhena and S. Buchholz (Eds), *Adult Learning in Modern Societies. An International Comparison from a Life-course Perspective*, Cheltenham: Edward Elgar.
- Kilpi-Jakonen, E. Vono de Vilhena, D. Kosyakova, Y. Stenberg, A. and Blossfeld, H.-P. (2012), The impact of formal adult education on the likelihood of being employed: a comparative overview, *Studies of Transition States and Societies*, 4 (1), pp. 48-68.
- Mass, C.J.M. and Hox, J.J. (2005), Sufficient sample Sizes for Multilevel Modelling, *Methodology*, 1 (3), pp. 86-92.
- Möhring, K. (2012), The fixed-effects as an alternative to multilevel analysis for cross-national analyses. GK SoClife, Working paper n. 16.
- Murnane, R. J. Willett, J. B., Duhaldobord, Y. & Tyler, J. H. (2000), How Important Are the Cognitive Skills of Teenagers in Predicting Subsequent Earnings? *Journal of Policy Analysis and Management*, 19(4), pp. 547-568.
- OECD (2013), OECD Skills Outlook 2013: First Results from the Survey of Adult Skills, Paris: OECD Publishing.
- Schuetze, H.-G. and Slowey, M. (2002), Participation and exclusion: A comparative analysis of non-traditional students and lifelong learners in higher education, *Higher Education*, 44 (3-4), pp. 309-327.
- Stenberg, A. de Luna, X. and Westerlund, O. (2011), Does formal education for older workers increase earnings? Analyzing annual data stretching over 25 years, *SOFI working paper n. 8*, Stockholm University.
- Vignoles, A. De Coulon, A. and Marcenaro-Gutierrez, O. (2010), The value of basic skills in the British labour market, *Oxford Economic Papers*, 63 (1), pp. 27-48.