Effects of Adult Education-Training on Skills

Andrea Cegolon

L'apprendimento permanente costituisce un fattore strategico per competere in un'economia globale e della conoscenza. In tale contesto, l'educazione degli adulti e la formazione professionale rappresentano due possibili strategie per adattare le competenze della popolazione adulta alle esigenze di un mercato del lavoro in continuo cambiamento ma anche ai bisogni di società che invecchiano. Nonostante l'indiscutibile importanza di questi percorsi formativi, ricerche empiriche sull'argomento sono ancora piuttosto carenti, specie per ciò che riguarda indagini comparative condotte a livello internazionale. Da questo punto di vista, quest'articolo intende fornire alcuni spunti di riflessioni sul modo in cui l'educazione degli adulti e la formazione professionale riescono ad influenzare il livello delle competenze delle persone.

Lifelong learning is increasingly important in order to compete in a knowledge-based global economy. Adult education and Training (AET) are two possible strategies to adjust the skills of the adult population to the needs of either the changing occupational structure and aging societies. Nevertheless, despite the importance of AET, we are short of empirical evidence on the topic, particularly as regards the cross-national comparative research. In a way, this paper aims to help in this field of studies by gaining a better understanding of how AET can influence the level of skills in individuals

wo recent challenges are characterizing the social environment, pushing many countries and organizations to seek new ways to maintain a competitive advantage: the transition of modern economies to knowledge-based globalised economies and besides the demographic aging of societies. Enhancing the levels of skills in the population, required for the jobs both for now and for the future, is therefore a strategic concern in the economic growth and social development of countries all over the world.

On the one hand, globalization is speeding up technology and innovation: new occupations are emerging while replacing others; within each occupation, required skills and competencies are evolving, whereas the knowledge content of production processes and services is rising (ILO, 2011). At the same time, demographic processes related to increasing life expectancy and lower fertility rates are causing, on one side, problems for welfare state budgets; on the other, the shrinking proportion of young workers increases labor shortage (ILO, 2013).

In addition to these trends, there is strong evidence that poor cognitive skills, such as literacy and numeracy, have a negative impact on the quality of life of individuals, in particular on their earnings and employment prospects. A variety of surveys have shown that people with good skills, measured by standardized test scores, tend to have higher wages and better chances of being in work than people with low level of skills (Dearden et al. 2001, Vignoles et. al. 2010, Murnane et al., 2000, Hanushek and Zhang, 2008). In this context the prevailing point is that the success of a country largely depends on the possibility to rely upon a labour force with higher levels of individual competences. As a result, many governments aim at investing resources in order to increase the skill level of their citizens. Adult Education and Training (AET) are a possible strategy of adjusting the skills of the adult population to the needs of either the changing occupational structure and ageing societies (Cummins et al., 2015). AET also have important implications for social inequality. On the one hand, this objective is potential promising in order to reduce inequalities emerged also in early life. Moreover, the mentioned macro-trends of globalization and demographic changes are likely to have a strong impact on the need both for older and lower qualified people to take part in lifelong learning activities in order to update their skills to match labor market demands (Organization for Economic Co-operation and Development, 2013). On the other hand, AET may actually increases existing inequalities if well-educated people are the primary group taking advantage of these opportunities (Kilpi-Jakonen et al. 2014).

The Human Capital Framework

One of the most significant contribution of labour economics is the human capital theory (Becker, 1964). According to this perspective, people are considered valuable assets, somewhat recognised as a form of capital, like the physical capital. The OECD provides an efficient definition of this construct: it corresponds to any stock of «knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being» (OECD 2001, p.18). The possible sources of human capital differences are innate ability, school, pre-labor market influences and adult education and training (Acemoglu and Autor, 2014). A brief description of each source follows.

Workers can have different amounts of human capital because of innate differences. Research in psychology and neuroscience has documented that there is some genetic component of IQ in origin (Plomin and Deary, 2014). Many economists believe that this "unobserved" variable is very important in order to understand the distribution of wages. There is however a problem, we do not have good data on this component of human capital. Furthermore, the relevance of this observation for labour economics is that there is likely to be heterogeneity in human capital even when individuals have access to the same investment opportunities and the same economic constraints. Then the omission of this component in the Mincerian equation can lead to biased estimates (ability bias) of the rate of return to schooling, linked to the "endogeneity" of education¹ (Griliches, 1977).

Since the seminal work of Mincer (1970, 1974), schooling has been the focus of much research, since the component of human capital investments is the most easily observable and readily tracked over time. The empirical results suggest that education, measured as educational attainment, confers significant advantages to individual. On average, the economic rate of return to an additional education ranges between 5 and 10 percent (Card, 1999; Harmon et al., 2000).

It is, however, widely accepted that what is learnt is equally, if not more, important than the quantity of schooling acquired (Glewwe 1996; Ishikawa and Ryan, 2002). In other words, what matters is not only the "quantity" of years of schooling acquired but, above all, the "quality" of this investment, measured by the level of cognitive skills. Today the cognitive skills, identified by test scores – such as those incorporated into the international assessments – are good measures of relevant skills for the human capital (Hanushek et al., 2011). In this respect, consistent evidence indicates that better skills are significantly related to higher labour market earnings. According to Hanushek's estimate, a one-standard-deviation increase in numeracy skills is associated with an average increase in hourly wages of 17.8% (Hanushek et al., 2013).

In the main, schooling decisions take place while the young person is still living within the family environment, therefore it is widely accepted that the family plays a major role in determining the human capital development and subsequent inequalities between individuals (Cunha and Heckman, 2007). The empirical evidence reports a strong positive association between parental socio-economic status, typically measured by income or education, and the dimension of children's human capital, such as health and cognitive and non-cognitive skills (Blanden et al. 2007: Currie, 2009) at a given age; in turns it predicts key economic, social, health and behavioral outcomes in adulthood (Heckman, 2007). Besides the family, recognition is growing among economists that also peer group effects, to which individuals are exposed before they join the labour market, may also significantly affect their human capital. Some studies report positive influences of higher achieving peers, at least for some students, measured by test scores (Zimmerman, 2003: Gaviria and Raphael, 2001). Probably the main difficulty inherent with this approach as detailed in Evans et al. (1992) is that families may choose their residence (and schools) based on observed characteristics of potential peer groups (selfselection). At the same time families may possess unobserved characteristics, such as greater motivation, that positively influence students' outcomes. Thus peer variables could be positively correlated with unobserved individual determinants of outcomes, perhaps leading to upward biases in estimates of peer-group effects (Sacerdote, 2001).

A significant amount of human capital investment occurs through training or adult education courses, acquired by workers after schooling. In broad terms, there are three different types of AET: formal, non-formal and informal. *Formal AET* take place in education and training institutions and lead to recognised credentials and diplomas (Commission on European Communities, 2000).

Non-formal AET can take place both within or outside of educational and training settings (i.e., on-the-job training), but do not typically lead to formal credentials (*Ibidem*). *Informal AET* are any activity involving the pursuit of understanding, knowledge or skill, occurring without the presence of externally imposed curricular or pressure - i.e., learning by experience - (Livingstone, 2001).

In his classic book "Human Capital" (1964), Gary Becker distinguished between firm-specific and general training. The former provides a worker with specific firm skills, that is, such as increasing his/her productivity only with the current employer; the latter will contribute to the

^{1.} The problem of ability bias is basically that more able people could get more schooling and at the same time earn more not because of the additional schooling but just because they are more able. So if the individual's ability and educational attainment are correlated, estimation of economic return to education would give biased results.

worker general human capital, increasing his/her productivity with a range of employers. According to Becker, whether the firm or worker pays for this form of human capital depends on whether the job training is firm-specific or general. In perfectly competitive labour markets, workers pay for general training by receiving low wages during training periods, but they will reap the returns of this investment by earning higher wages later. And, since general training is fully transferable, workers' post-training wages will be the same across firms (Becker, 1964). In the case of specific training, the skills acquired will not be transferable to other firms: then, it is efficient for firms and workers to share the costs and the benefits of this kind of training investment (Hashimoto, 1981). Finally, if the training comprises a mix of general and specific components, there should be some sharing of costs (Albert et al., 2010).

Participation in AET

The belief among policy-makers, employers and individuals is that a continual skill formation plays an important role in the accumulation process of human capital (Jenkins et al. 2002). Nevertheless, despite the increasing emphasis placed in the last two decades on the positive role of lifelong learning, most of the research attention has been on the acquisition of human capital by young people through formal education. This paper focuses on two different kinds of lifelong activities - the formal and non-formal AET - and it intends to review the factors influencing the participation of individuals in these components of human capital, and the effectiveness of AET in improving the level of individuals' basic skills namely, numeracy and literacy. In this paragraph, I examine the literature concerning the determinants of the participation in AET. I focus on three factors shaping participation: age, gender, prior level of education.

Regarding age, the general pattern is that the likelihood of participation in AET decreases in time, which is primarily due to the lower perceived benefits of participation and possible incompatibility of learning with adult-life courses (Hostetler et al. 2006; Elman and O'Rand, 2007). Turning to prior education, there is a wide ranging evidence that individuals with higher educational attainments are more likely to participate in non-formal AET, (Bassanini et al., 2007; Dieckhoff and Steiber 2011; Albert et al., 2010). One possible explanation is that higher educated people tend to work in more demanding and knowledge-intensive jobs, which require more training (OECD, 2013). In literature this is also known as "a cumulative advantage" (DiPrete and Eirich, 2006). According to Blundell et al. (1999), a strong complementarity occurs indeed between the three main components of human capital - innate ability; qualifications and knowledge acquired through formal education; skills, competencies and expertise gained through workplace training. These findings, moreover, consistent with the cumulative and multiplier effects of learning, get further support in Heckman's research for whom "skills beget skills" (Cunha and Heckman, 2007). In other words, this literature «suggest that there should be strong investments in early childhood, both because the sensitive periods for acquiring several capabilities occurs early in life, but also because successful early in life is the foundation for successful later in life» (Carneiro et al. 2010, p. 256). As a result, individuals with higher initial education and those in better occupational positions are more likely to participate in non-formal AET.

On the other hand, formal AET have a different pattern. In particular, the general expansion of tertiary education in the last years has also attracted more mature students (Schuetze and Slowey, 2002). Some studies, indeed, show that individuals with no diploma or degree but rich in earlier experience are more likely to return to education as adults. (Elman and O'Rand 2004, Hällsten, 2011). At the same time, those already owning a high qualification have less incentives to return to formal education, especially for the high opportunity costs of this investment: acquiring a formal qualification typically last for one or more years, therefore it can be a big deterrent, in terms of time commitment. On the contrary, those with low levels of education, lacking of necessary entry qualifications, may face dispositional barriers to re-enter a formal education system (Kilpi-Jakonen et. al, 2014). Moreover, although the opportunity cost could be lower for lower educated, the absolute costs of formal qualification can be a barrier to entry. Then, individuals with a medium level of education are more likely to participate in formal AET. The third factor here taken into account is gender. Evidence from previous research shows a higher probability for women to participate in formal AET (Fouarge and Schils, 2009; Kilpi-Jakonen et al., 2012). A possible explanation is that women may feel more need to update their skills after family-related employment interruptions (childbearing), in order to remain competitive in the labor market (Stenberg et al., 2011). Dieckhoff and Steiber (2011) have shown that men have a higher probability of participating in non-formal AET. Under this view employers are more sensible to invest in men, because males do not tend to interrupt their career for family reasons (Ibidem). Therefore, women are more likely than men to participate in formal AET, while men have higher probability to participate in non-formal AET.

The Relationship between AET and Skills

Regarding the benefit of AET, there is a large international literature documenting empirical evidence that these learning activities improve labour market outcomes, such as employment and higher wages. Recent OECD analysis reveals a strong cross-country correlation at the aggregate level between labour force participation and employment on the one hand and both initial education and subsequent adult training on the other hand. At an individual level, there is a strong association between involvement in adult training participation and employment probability: on average, looking at individuals aged 25-54 years, an increase of 10% in the time spent in training is associated both with an increase in the probability of being economically active by 0.4% and a fall in the probability of being unemployed of almost 0.2% (OECD, 2004). Nevertheless, most of the research about AET focuses on their benefits in terms of wage premia. This literature provides strong evidence of wage effects of training, especially in the US and in the UK: an individual undertaking non-formal AET earns, on average, just above 5-10% higher real earnings than one who has not undertaken such learning courses (Blundell et al., 1999; Leuven, 2004). Though, when we consider formal AET, Jenks et al. (2002) suggest that this type of lifelong learning has no measurable impact on individuals' wage. In other words, taking a qualification during early ages has a remarkable impact on the wage, while taking the same qualification later, for example after 30 age, has no actual consequence as regards the wage. A possible explanation of this pattern is that employers can assume that adult education is a signal of lower ability: a qualification achieved later in life proves less motivation or ability in people.

Another strand of literature shows a strong positive effect of training on firm productivity. The major study for the UK worked out an industry panel data between 1984 and 1996 containing training, wages, labour, capital and valueadded. It found that training is associated with significantly higher productivity. In particular, raising the proportion of workers trained in an industry by 1% was associated with a 0.6% increase in productivity (value added per work) and a 0.3% increase in wages (Dearden et al., 2006). Similar positive effects have been found in other longitudinal surveys of firms in Mexico (Tan and Lopez-Acevedo, 2005) and Malaysia (Tan, 2000).

But what do we know about the impact of AET on learning outcomes? Most policy-makers believe that training translates into higher productivity, and therefore into higher incomes because individuals assume that the participation in these type of activities increases people's skills. However, a question is a matter of fact: is this assumption consistent with the evidence?

Unfortunately, information on the effectiveness of both formal and non-formal AET is very poor; the evaluation on whether learners acquire substantive skills is rather thin. In general, research from the UK and US try to measure the effectiveness of adult basic skills - literacy and numeracy provision - but they deal with small-scale studies conducted over a short span of time. Furthermore, few of the surveys are high enough quality to capture the complexities of the connections between interventions and outcomes.

Torgerson et al. (2003, 2004, and 2005) report the results of a systematic review about the experimental and quasiexperimental literature in the field of lifelong learning activities, published between 1980 and 2002. The aim of these studies was to investigate the effectiveness of adult learning programmes designed to increase literacy and numeracy skills. A total of 4,555 potentially relevant papers were identified by using electronic and hand searches. From this large database the authors identified: 12 papers reporting nine randomized controlled trials (RCTS) and 27 papers corresponding to 27 controlled trials (CTs). Of the nine RCTs included in the review, eight were undertaken in the US and one in the UK; five evaluated interventions in literacy, two programmes in numeracy and two in both numeracy and literacy. All of them were of highly quality owing to their adoption of an appropriate design for evaluating effectiveness. Focusing on five studies in all, the authors found statistically significant gains in three (when pooled), and non-significant gains in two. However almost all of them had methodological problems, such as small sample sizes, an unclear method of random allocation and high attrition rate. Only one study, conducted in California, was large enough to detect small, but important, improvements in literacy and numeracy among the participants. Regarding the CTs included in the review, 18 of them had no effect sizes (incomplete data) and only nine with full data. Of these nine trials, six evaluated interventions in literacy and three in both literacy and numeracy. Practically all they were undertaken in US, except one in New Zealand. Among the nine studies the results showed, in three cases, a statistically significant positive effect of the learning activities; five trials showed no difference; one showed a positive effect for the control group.

The quality of the trials was variable, but many of them lacked methodological accuracy because of large attrition, no equivalence at baseline and lack of matching on pretest scores. To sum up, the authors found some evidence that adult literacy and numeracy programmes are effec-

tive. Nevertheless, these findings are based on not completely reliable experiments owing to their scantiness, or heterogeneity, or low quality. Thus, any interpretation of the results must be considered with some caution.

In their literature review, Vorhaus et al. (2011) looked at 10 years of research related to adult literacy and numeracy. In particular, the authors reported the evidence of modest gains by learners in England from three studies. In 1998–99 Brooks et al. (2001) measured the progress of adult literacy students in dedicated mainstream basic skills (reading and writing skills) provision in England and Wales. About half the reading items were drawn from the least difficult tasks in the OECD survey (conducted in 1998), IALS (International Adult Literacy Survey). Of the 2,135 learners, from 71 colleges of further education and local education authorities, who took the reading pretest, 1,224 (57%) took the reading post-test. Writing scripts were received from 1,724 students at pre-test and 937 (54%) at post-test. Background data was collected on the students and 177 adult literacy tutors completed a questionnaire. The average gain in reading was small but significant, from the 19th to the 22th percentile on the IALS scale. The average gain in writing was very tiny: an increase in the average number of words written from 19 to 21, with no significant change in sentence length, accuracy of grammar or spelling, or handwriting. In another study of 2008, Brooks et al. tracked the progress of 179 adult literacy students and found their average gain was equivalent to about half of one IALS level. Finally, Brooks and Pilling (2009) report the progress in numeracy of adult numeracy learners and in reading/writing of adult literacy and ESOL learners after three-to-six months of instruction (typically one two-hour session a week) in 2004–06. Adult literacy learners' gain in writing was non-significant; the other four gains were statistically significant, but all represented about one third of (the British equivalent of) one IALS level.

Benseman (2010) explores the effectiveness of workplace literacy and numeracy programmes ("Upskilling") based on an evaluation of 18 workplace courses, set up by 16 companies in New Zealand. The companies covered a range of industries, locations, company sizes and organizational structures, while the courses covered a range of programme formats, duration and types of learners. The courses tried to integrate literacy and numeracy into workplace training (embedding approach). The evaluation took place over three years, and quantitative and qualitative data were gathered to identify the outcomes for the course participants, their workplace practices, the companies they worked for and their lives outside work. Reading and writing skills were assessed using "Go!", an assessment

tool developed by NFER (National Foundation for Educational Research) for NRDC (National Research and Development Centre for adult literacy and numeracy) (Rhys Warner et al., 2008). A total of 491 course participants were interviewed and assessed pre-course and 343 (69.8%) of these participants were also interviewed and assessed post-course. Among the participants re-tested for reading at the end of their course, 86% showed an improvement in their reading scores, while the reading scores for 4% did not change while for 10% decreased. Average reading scaled scores increased by 10.1 points out of 100. Around two-thirds (66.1%) of participants made gains in their writing score. Regarding numeracy, only seven learners completed pre and post-course numeracy assessments, and they increased their average score from 12.1 to 15.3 points out of 46.

Wolf and Evans (2011) conducted a longitudinal study of the impact on learners and their organizations of government-funded workplace programmes designed to increase the literacy skills of employees, involving 567 learners and over 53 workplaces. The reading and writing skills of participants were tested at the start of their courses, and then a year and two years later. Information was collected on all three occasions about their jobs, learning experiences, education, attitudes to work, and aspirations. At the same time, managers, training managers and course tutors were interviewed. The courses offered 30 hours of tuition, after which learners had no further free workplace entitlement. Most of the learners were volunteers, whilst a small number were effectively forced to participate by their employers. The project examined whether this period had any impact on skills and whether it changed participants' learning trajectories. The short workplace courses did not, in general, have any substantial immediate impact on participants' literacy skills. Among learners for whom English was their first language, there were no statistically significant improvements in literacy attainment. Amongst ESOL learners, there were small but statistically significant gains, but it is very likely that these resulted from continued exposure to an English speaking environment. Participants' average performance continued to improve over a two year's post-instruction period. Learners using their literacy skills actively, in and out of the workplace, were most likely to show consistent gains.

Wolf and Jenkins (2014) analysed the effect on reading comprehension skills of British adults who participated in government-funded literacy courses organized in workplace from 2003-2009. The study involved a relatively small sample of 500 learners in 53 different workplaces. After volunteering to participate in the study, they were followed from the enrollment until between two or three years later. The target learners were low-skilled employees, namely workers doing routine and repetitive jobs, such as people working in food processing companies, cleaners, car assistants, bus-drivers, etc. Since in almost all sites there was a 100% agreement to participate among workers approached, the main drawback in this study is the absence of a control group. Using different statistical method (OLS and Multilevel Model: linear growth model) the authors found two different groups with two different outcomes. Among learners mastering English as a second language, there was a statistically significant, though non large, improvement in the literacy skills, especially in the period not included in the course, whereas among the native English speakers there were not significant gains. These findings are consistent with those of Wolf and Evans (2011): the difference between the two groups of learners may refer to their linguistic difference in some ways, which explains why the former progressed differently and faster. Wolf and Jenkins stressed that «however it is also probable, and we believe more probable, that their greater improvement simply reflect more time spent in an English-speaking country. For that reason, this group's gains cannot be confidently attributed to the effects of the course» (Wolf and Jenkins, 2014, p. 604).

A particularly relevant paper is a cross-country comparison by Sgobbi (2014) who investigates how AET impact individual proficiency in individuals' cognitive skills in eleven EU countries, based on the PIAAC survey promoted by OECD. The aim is to point out the drivers of proficiency in literacy, numeracy and problem solving. A first set of OLS regressions examines the drivers of individual proficiency for the total adult population in selected countries, whereas a second set of regressions focuses on employed individuals. Both sets of regressions include two binary variables concerning adult education and training experienced by respondents in the 12 months preceding the survey, plus a set of covariates (age, gender, educational attainment, employment status, family background). The empirical analysis shows that the relationship between adult education and cognitive skills is either negative or non-significant, whereas the relationship between training and skills displays a positive effects. In addition, the effect of training gets smaller and less significant when the analysis is restricted to employed individuals.

Conclusions

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.

Despite widespread recognition that the investment in human capital for people of all ages is very important, little research has empirically examined the effects of participation in AET programmes on adult's skills. Gaining a better understanding of how adult individuals benefit from participating in AET is a very important area of study, thus providing policy-makers with informed decisions.

The key question of interest to policy-makers is as follows: whether or not these programmes are actually effective or, at least, so sufficiently effective to justify the cost to the public (Lee, 2005). The evaluation of these programmes has been the aim of a large methodological literature in economics, with specific focus on the impact of AET on wages. However, this approach leaves open the question of whether AET is effective in raising of individuals' skills. For AET programmes, indeed, to be really effective they need to increase human capital (skills) because only that can improve the productivity of individuals, which in turn can lead to a meaningful raise in their wages.

To make a short summary: previous research, especially from within the UK and US, seek to measure the effectiveness of literacy and numeracy provision in smallscale and over a short time-period, during which learner gains may not be apparent or are difficult to measure. Moreover, most of the investigated studies are of poor quality or insufficiently well-designed to capture the complexities of the connections between interventions and outcomes. Altogether, there is limited evidence of a significant association between participation in AET and proficiency (increased skills).

The combination of these findings makes an important contribution to the existing research by demonstrating the benefits of AET in terms of improved skills for adult people (especially low skilled), which will be essential to allocate funding for such programmes.

PIAAC, for example, is a rich cross sectional dataset, useful because it provides notable opportunities, on one side, to investigate how individuals benefits from participation in lifelong learning activities; on the other, to make comparison across countries. However, future analysis in this field could provide further information on how participation in lifelong activities can change literacy and nu-

meracy skills, thanks to longitudinal datasets, in order to deal with potential endogeneity of these learning programmes.

Furthermore, future research could make use of qualitative research to gain a better understanding of how and where adults participate in AET. Learning more about how individuals become aware of educational opportunities and difficulties to deal with would be useful in developing programmes and strategies to tackle social barriers. Lastly, future research could explore specific AET policies in some countries with the view to test the efficacy in a more timely way and develop a clear strategy by using best practice in the cultural context.

> Andrea Cegolon Università di Macerata

BIBLIOGRAPHY

Acemoglu, D. and Autor, D. (2014). Lectures in Labor Economics. Retrived from http://economics.mit.edu/files/4689. 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.

Altonij, J.G. and Spletzer, J.R. (1991). Worker Characteristics, Job Characteristics, and the Receipt of On-the-Job Training. *Industrial and Labor Relations Review*, 45(1), pp. 58-79.

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.

Becker, G (1964). Human Capital, 2nd ed. Columbia University Press, New York, 1975 and 3rd 1994.

Benseman, J. (2010). Planning and teaching effective workplace literacy, language and numeracy programmes: what does the research tell us? *Journal of Adult Learning*, 38(2), pp. 19-28.

Blanden, J. Gregg, P. and MacMillan, L. (2007). Accounting for Intergenerational Income Persistence: Noncognitive skills, ability and education, *The Economic Journal*, 117(1), pp. 43-60.

Blundell, R. Dearden, L. Meghir, C. and Sianesi, B. (1999). Human Capital Investement: 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.

Brooks, G. Pilling, M and Rashid, S. (2011). Stepping Stones: progression rates of adult literacy, language and numeracy learners from not counting towards the Skills for Life targets to counting towards them. Quantitative strand. National Research and Development Centre for adult literacy and numeracy: Institute of Education.

Brooks, G. Pahl, K. Pollard, A. and Rees, F. (2008). Effective and Inclusive Practices in Family Literacy, Language and Numeracy: a Review of Programmes and Practice in the UK and Internationally (Executive Summary). Reading: CfBT Education Trust.

Brooks, G. Davies, R. Duckett, L. Hutchinson, D. Kendall, S. and Wilkin, A. (2001). Progress in Adult Literacy: Do Learners Learn? London: Basic Skills Agency.

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.

Card, D. (1999). The Casual Effect of Education on Earnings, in O. Ashenfelter and D. Card. (Eds). *Handbook of Labour Economics*, Volume 3, Amsterdam: Elsvier.

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.

Commission on the European Communities (2000). A memorandum on lifelong learning. Brussels. Retrived from http://www.see-educoop.net/education_in/pdf/lifelong-oth-enl-t02.pdf.

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, Retrived from:http://static1.squarespace.com/static/51bb74b8e4b0139570ddf020/t/54da7607e4b081084af3c485/1423603207175/Cummins_Kunke 1_Walker_PIAAC.pdf.

Cunha, F and Heckman, J. (2007). The technology of skill formation, *American Economic Review*, 97(2), pp. 31-47. Currie, J. (2009). Healthy, Wealthy, and Wise: Socioeconomic Status, Poor Health in Childhood, and Human Capital Development, *Journal of Economic Literature*, 47(1), pp. 87-122.

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. Blossefeld, 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. Reed, H., Van Reenen, J. (2006). The Impact of Training on Productivity and Wages: Evidence from British Panel Data, *Oxford Bulletin of Economics and Statistics*, *68(4)*, pp. 397-422.

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.

Desjardins, R. Milana, M. and Rubenson, K. (2006). Unequal Chances to Participate in Adult Learning: International Perspectives, UNESCO, International Institute for Educational Planning.

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.

Evans, W.N. Oates, W.E. and Schwab, R.M. (1992). Measuring peer group effects: A study of teenage behavior, *Journal of Political Economy*, 100 (5), pp. 966-991.

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.

Gaviria, A and Raphael, S. (2001). School-Based Peer Effects and Juvenile Behavior, *The Review of Economics and Statistics*, 83(2), pp. 257-268.

Glewwe, P. (1996). The Relevance of Standard Estimates of Rates of Return to Schooling for Education Policy: A Critical Assessment. *Journal of Development Economics*, *51*, pp. 267-290.

Goldin, C. Katz, L. F. Kumiemko, I. (2006). The Homecoming of American Women College: The Reversal of the College Gender Gap, *Journal of Economic Perspectives*, 20(4), pp. 133-156.

Görlitz, K. and Tamm, M. (2015). Revisiting the Complementarity between Education and Training: The Role of Personality, Working Tasks and Firm Effects, *Education Economics (forthcoming)*.

Griliches, Z. (1977). Estimating the Returns to Schooling: Some Econometric Problems. Econometrica, 45 (1), pp. 1-22.

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., Schwerdt, G. Wiederhold, S. and Woessmann, L. (2013) Returns to Skills around the World: Evidence from PIAAC, NBER Working Paper No. 19762.

Hanushek, E. A., and Woessmann, L. (2011). The economics of international differences in educational achievement, in E. Hanushek, S. Machin, and L. Woessmann (Eds). *Handbook of the Economics of Education*, Vol. 3, Amsterdam: North Holland: pp. 89-200.

Hanushek, E. A. and Zhang, L. (2008). Quality consistent estimates of international returns to skill [mimeo], Stanford, CA: Stanford University, Hoover Institution.

Harmon, C., Oosterbeek, H. and Walker, I. (2000). The Returns to Education: A Review of Evidence, Issues and Deficiencies in the Literature, London School of Economics and Political Science.

Hashimoto, M. (1981). Firm-specific human capital as a shared investment. American Economic Review, 71(3), pp. 475-482.

Heckman, J. (2007). The Economics, technology and Neuroscience of Human Capital Formation, IZA discussion paper No. 2875. 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.

Illeris, K. (2003). Three Dimensions of Learning: Contemporary learning theory in the tension field between the cognitive, the emotional and the social. Paperback. Malabar, Florida: Krieger.

ILO (2010). A Skilled Workforce for Strong, Sustainable and Balanced Growth: A G20 Training Strategy. ILO, Geneva.

ILO (2013). Global Employments Trends 2013. Recovering from a second jobs dip. ILO, Geneva.

Ishikawa, M. and Ryan, D. (2002). Schooling, Basic Skills and Economic Outcomes, *Economics of Education Review*, *21*, pp. 231-243. 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.

Keep, E. (1999). Employer Attitudes Towards Adult Training, Skills Task Force research paper 15, London: Department for Education and Skills.

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. Blossefeld, 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. Blossefeld, 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.

Lee, D.S. (2005). Training, Wages, and Sample Selection: Estimating Sharp Bounds on Treatment Effects, NBER Working Paper No. 11721. Leuven, E. (2004). A review of wage return to private sector training. *EC-OECD Seminar on Human Capital and Labour Market Performance*, Brussels.

Livingstone, D. (2001). Adults' informal learning: definitions, findings, gaps and future research. Centre for the Study of Education and Work, OISE/UT. Retrieved from http://hdl.handle.net/1807/2735.

Mass, C.J.M. and Hox, J.J. (2005). Sufficient sample Sizes for Multilevel Modelling, Methodology, 1 (3), pp. 86-92.

Mincer, J. (1974) Schooling, Experience and Earnings, Columbia University Press: New York.

Mincer, J. (1970). The Distribution of Labor Incomes: A Survey with Special Reference to the Human Capital Approach, *Journal of Economic Literature*, 8(1), pp. 1-26.

Murnane, R. J. Willett, J. B., Duhaldebord, 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.

Niederle, M. and Vesterlund, L. (2010). Explaining the Gender Gap in Math Test Scores: The role of Competition, *Journal of Economic Perspectives*, 24(2), pp. 129-144.

OECD (2004). Improving Skills for more and Better Jobs: Does Training Make a Difference? Paris: OECD Publishing.

OECD (2001). The Well-being of Nations: The Role of Human and Social Capital. Paris: OECD Publishing.

Plomin D, Deary, I.J. (2014). Genetics and Intelligence Differences: Five Special Findings, *Molecular Psychiatry*, 20, pp. 98-108. Rhys Warner, J. Vorhaus, J. Appleby, Y. Bathmaker, A. Brooks, G. Cole, P. Pilling, M. and Pearce, L. (2008). The Learner Study: The impact of the Skills for Life strategy on adult literacy, language and numeracy learners. London: NRDC.

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.

Sgobbi, F. (2014). Adult education, training and individual performance: Some preliminary evidence from PIAAC. XXIX National Conference of Labour Economics, University of PISA, Pisa, 11-12 September 2014.

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.

Tan, W.T. and Lopez-Acevedo, G. (2005). Evaluating Training Program for Small and Medium Enterprises, Lesson from Mexico, World Bank Policy Research Working Paper 3760, Washington, DC: World Bank.

Tan, W.T. (2001), Do Training Levies Work? Malaysia's HRDF and Its Effects on Training, and Firm-Level Productivity, World Bank Institute Working Paper Tan.

Torgerson, C.J. Porthouse, J. and Brooks, G. (2003). A systematic review and meta-analysis of randomized controlled trials evaluating interventions in adult literacy and numeracy, *Journal of Research in Reading*, 26(3), pp. 234-255.

Torgerson, C.J. Brooks, G. Porthouse, J. Burton, M. Robinson, A. Wright, K. and Watt, I. (2004). Adult literacy and numeracy interventions and outcomes: a review of controlled trials, London: National Research and Development Centre for Adult Literacy and Numeracy.

Torgerson, C.J. Porthouse, J. and Brooks, G. (2005). A systematic review of controlled trials evaluating interventions in adult literacy and numeracy, *Journal of Research in Reading*, 28(2), pp. 87-107.

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.

Vorhaus, J. Litster, J. Frearson, M. and Johnson, S. (2011). Review of research and evaluation on improving adult literacy and numeracy skills. London: Department of Business, Innovation and Skills.

Zimmerman, D.J. (2003). The peer effects in academic outcomes: evidence form a natural experiment, *The Review of Economics and Statistics*, 85(1), pp. 9-23.

Wolf, A. and Evans, K. (2011). Improving literacy at work. London: Routledge.

Wolf, A. and Jenkins, A. (2014). Do 'learners' always learn? The impact of workplace adult literacy courses on participants' literacy skills, *British Educational Research Journal*, 40(4), pp. 585-609.