Does workplace training participation vary by type of secondary level qualification? England and Germany in comparison

Introduction

A large body of research has investigated the determinants of workplace training, especially with regard to its association with education (e.g. Belzil, Hansen & Kristensen, 2008; Brunello, 2004; OECD, 1999, 2003; O'Connell & Byrne, 2012). These studies reveal that the higher the level of education the higher the likelihood to participate in workplace training. In particular, tertiary educated individuals are more likely to participate compared to those with lower levels of education (Belzil et al., 2008; Brunello, 2004; OECD, 2003). However, the majority of the population in advanced western nations is educated only to the secondary level (Eurostat, 2019). Very little is known about workplace training undertaken by this group and, specifically, how participation may vary by the type of secondary qualification attained, vocational or general. The literature on labour market prospects does address the distinction between general and vocational education and shows a great variation in labour market outcomes depending on the type of qualification attained (e.g. Breen & Buchmann, 2002; Brunello & Rocco, 2017; Gangl & Mueller, 2003; Hanushek, Woessman & Zhang, 2015; Shavit & Mueller, 1998, 2000;). Yet, only a limited number of studies have explored the association between general and vocational qualifications and workplace training participation.

Drawing on the comparative data from the Programme for the International Assessment of Adult Competencies (PIAAC), this article investigates the association between the types of secondary level qualification and participation in workplace training in Germany and England. In particular, it addresses the following research questions: Is there a difference in

the likelihood to participate in workplace training between vocational and general qualification holders? If so, does this association vary in Germany compared to England? This study offers, therefore, two contributions to the literature on workplace training. First, it provides new insights on how participation varies by type of secondary qualification. Second, by exploring how this association differs in Germany and England, it offers comparative evidence. The interest of this work is to investigate training events at the workplace, without restricting the investigation to any specific training program. In addition, the definition available in PIAAC suggests that the training responses should be interpreted as more formal courses of instruction, rather than informal on-the-job training (OECD, 2013). Given the cross-sectional nature of the PIAAC data, this article seeks to describe patterns in training participation and not to disentangle causal effects.

The exploration of differences in workplace training participation between general and vocational qualifications has several important economic implications, including the widening wage inequality across workers. It is well known that those educated to the secondary level earn less than those with higher qualifications (for a review, see Walker & Zhu, 2007); furthermore, studies have suggested that individuals who have attained a vocational qualification earn lower wages compared to those with a general one (Conlon, 2001; Corvers, Heijke, Kriechel & Pfeifer, 2010; Hanushek, et al., 2015; Karasiotou, 2004). Given its potential positive association with wages (see, for example, Blundell, Dearden & Meghir, 1996 in the United Kingdom; Schomann & Becker, 2002 in Germany); training might play a role in balancing wage differences between employees with different qualifications.

Cross-country studies have shown that differences in institutional settings, such as the structure of the educational and labour market systems, influence training participation (Bassanini, Booth, Brunello, De Paola & Leuven, 2007; Dieckhoff, Jungblut & O' Connell, 2007; O' Connel & Byrne, 2012). In this work, Germany and England have been chosen as countries to be compared because they represent two different types of skill production regimes as well as labour market economies (Estevez-Abe, Iversen and Soskice, 2001; Soskice, 1999). Whilst England has a comprehensive educational system that promotes general qualifications and it is an example of a liberal labour market where the connection between education and labour market is rather loose, Germany has a stratified education system which focuses on the provision of vocational qualifications and prepares individuals for work. Furthermore, its coordinated labour market is characterized by a tight connection between the educational and labour market systems, and job allocation is conditional on educational credential. A comparison between these two countries will offer further insights on how institutional differences may influence the association between education and workplace training.

The remainder of this paper is as follows. Section 2 reviews the relevant literature on the topic and describes the theoretical framework. Section 3 describes the PIAAC data and its suitability for this study; then it provides details on logistic regression. Section 4 presents and discusses the results while Section 5 offers concluding remarks.

Background

Educational differences in workplace training participation

A substantial body of evidence indicates that workplace training shows a pattern of cumulative advantage; namely, that those with higher skills or educational attainment are also more likely to participate in training (Blundell, Dearden & Meghir, 1996; Kilpi-Jaconen, Vono de Vilhena & Blossfeld, 2015; Lynch, 1992; OECD, 1999; O'Connell & Byrne, 2012). This could be, for example, because highly educated are thought to be more trainable; namely, that they are expected to experience a greater enhancement in their productivity than those less educated (Dieckhoff, 2007; Oosterbeek, 1998). In addition, highly educated individuals tend to work in occupations which are knowledge-intensive and are more likely to require training to remain updated (OECD, 2013). These findings suggest that current allocation principles are in inverse relation to need and that training is likely to exacerbate - rather than mitigate- existing labour market inequalities.

Research on this topic shows that labour market inequalities are also related to the type of school qualification achieved. Vocational qualifications constrain young people's chances of continuing into higher education and gaining access to more rewarding occupations. As more socially disadvantaged students are overrepresented in vocational education paths (Iannelli, Smyth & Klein, 2016), this might reinforces inequalities present in society. Yet, very little evidence exists on how workplace training participation varies by type of secondary qualification attainments, vocational or general. Verhaest and Omey (2013) show that having attained a general qualification increases the likelihood to participate in training on the job compared to having attained a vocational one in Belgium; the same pattern holds for Dutch school leavers (Heike, Meng & Ris, 2013) and across most of the countries available in the

International Adults Literacy Survey (IALS) (Hanushek et al., 2015). In contrast, Wolbers (2005) concludes that vocational qualifications are better predictors of participation in training compared to general ones using data from the European Union Labour Force Survey (EU-LFS). Bassanini et al. (2007) confirm this trend by using data from the European Community Household Panel (ECHP).

A well-known methodological challenge when comparing vocational and general education and their labour market outcomes is the potential endogeneity in the choice of schooling curricula. Existing research has shown that the take-up of academic and vocational subjects at school varies by gender and social class of origin (Iannelli et al., 2016; van den Werfhorst, Sullivan and Cheung, 2003). Hence, not taking this issue into account may lead to biases in the estimation of workplace training participation. Existing empirical research on the effects of education types on labour market outcomes has tackled this challenge in diverse ways. A few studies have used exogenous policy changes to control for self-selection and found no statistically significant differences in the labour market outcomes associated with education types. For example, Pischke and von Wachter (2008), used the gradual adoption of a one year increase in compulsory schooling in the lowest schooling track in Germany between the 1950s and the 1970s to investigate changes in long-term wages, but did not find an effect. In the UK, using data from the 1991 sweep of the National Child Development Study (NCDS) and the 1998 Labour Force Survey, Dearden, Mcintosh, Myck and Vignoles (2002), investigated the labour market returns to academic and vocational qualifications. They found that the wage premia associated to academic qualifications are typically higher compared to vocational ones. However, this gap is somewhat reduced after controlling for the time required to achieve different qualifications. This is particularly important for vocational courses, which generally take shorter time to be completed.

In the analysis of training determinants, it is worth noticing that training has two main roles. On the one hand, it can be considered as an accumulation of human capital undertaken to enhance the skills gained through formal education. On the other, it can be seen as a way to bridge the gap existing between the skills possessed by the employees and those demanded on the job (Van Smoorenburg & Van Der Velden, 2000). These functions can be linked to two theoretical perspectives: the human capital (Becker,1964) and the job matching theory (Jovanovic, 1979), respectively. Although these two perspectives do not discuss the distinction by education types, their logic will be extended to formulate the working hypotheses of this paper.

The human capital theory considers education and training as investments and it maintains that individuals undertake these if the expected benefits overcome the expected costs. One important determinant of training costs is the time needed to acquire new skills. This is assumed to be lower for those with better learning abilities. Whether there is a distinction between vocational or general education holders and which one is an indicator of better learning abilities is, however, contingent on the context and will be discussed later. In contrast, the job matching theory predicts that the match between the skills possessed and those required on the job has implications in terms of individuals' productivity and wages: variations in the combination between such skills lead to differences in the need for workplace training (Barron, Black & Loewenstein, 1989). Specifically, whilst a good combination between possessed and required skills results in a lower necessity of training, a mismatch leads to a greater need for that. This perspective is extended to explain differences across types of qualifications. For example, especially in vocationally oriented educational systems, vocational competencies positively influence the chances of being matched to an occupation inside one's own domain (Heijke et al., 2013). As such, it is reasonable to expect

vocationally educated to possess ready-to-work skills; therefore, they should require less training on the job. The opposite should be expected for those who have attained a general qualification. General qualifications provide individuals with skills which are by nature wide and generic; therefore, they may need further training to become operative.

The argument that individuals holding a vocational qualification are less likely to participate in training compared to general education holders because of their better job match has, however, some limitations. In fact, it may be valid when considering early career workers, but it may be less convincing for mid-career and older ones (also part of this study). As workers progress in their working life, the advantages deriving from an initial better job match may disappear and differences in initial skills might be overcome by working experience. In addition, the advantages of vocational versus general education have been shown to decline with age (Hanushek et al., 2015; Roosmaa, Martma & Saar, 2019). For this reason, the validity of this argument will be tested empirically by conducting separate analyses by age groups.

Educational and labour market systems in Germany and England

In the comparative literature, Germany and England are usually compared because they represent two different types of economies as well as skill production regimes (Estevez-Abe et al., 2001; Soskice, 1999). Whilst Germany represents a coordinated market economy with a welfare state which tends to bring forward a specific skills regime, England is an example of a liberal market economy which focuses on the production of general skills (Estevez-Abe et al., 2001).

In countries with a strong vocational training component (such as Germany), companies and vocational schools do not provide education and training in isolation from one

another, but the courses offered are co-ordinated in terms of content. Employers have, in fact, a major role in the design, delivery and assessment of training programs. This cooperation assures a similarity in standards and skills certifications at the industry level thus also ensuring that trainees receive occupational skills directly relevant for the occupation for which they are trained. In particular, Germany has a well-known vocational training system which involves training both in a company and in a vocational training school (see Franz & Soskice, 1995; Wolter & Ryan, 2011). The skills acquired in the vocational tracks are in high demand in the German labour market (Quintini, 2011). Nevertheless, despite the high request, vocational qualifications are seen as a marker of low school achievements (UNESCO, 2012). Participation in workplace training among employees is somewhat lower in Germany than in the UK, possibly because of a system which focuses heavily on the provision of vocational skills. However, it is still slightly above the OECD average (OECD, 2012).

Conversely, in countries with a more general education system (such as the UK), there exists no coherent system of training curricula. Each body of training providers has a different system of consulting with the industry on the content of training and different methods of assessment (Hillmert, 2006; West & Steedman, 2003). As a consequence of the lack of standardization of such programmes and the low quality of the vocational courses provided, job-relevant skills are expected to be learned at the workplace and employers select individuals because of their trainability rather than thanks to their skills. In addition, for the same reasons, employers tend to prefer general skills and do not highly value formal vocational education (Dieckhoff, 2008). Similarly to Germany, vocational qualifications often signal low academic ability and more disadvantaged social circumstances (Iannelli & Duta, 2018; Solga, 2002). However, the English labour market system – as opposed to the German one - is unregulated in terms of precondition for job access. It is, therefore, possible

to enter many jobs without particular qualifications and it is common to enter employment without a particular type of competence. Because of the weaker connection between education and labour market, young people's school-to-work transitions tend to be more haphazard; this leads to higher early job mismatches (Gangl & Mueller, 2003). Nevertheless, this system is also thought to provide greater labour market flexibility and better opportunities to receive training later in life compared to systems which emphasize occupational specific vocational education (Hanushek et al., 2015).

The two countries also represent two different models of skills production, where the main difference is in the width of the occupational field of the skills provided. In Germany, vocational education is designed to provide a multitude of occupational and personal competences. Vocational education prepares trainees for different contexts in a highly diversified industry. The qualification is an important condition for labour market entry and serves as an assurance that the holder has acquired a certain level of skills and knowledge. The breadth of these competencies in Germany is broader than in the UK which, in contrast, conforms to the 'skills-based model' of narrow specialisation. In the UK, vocational education has been characterised by on-the-job learning of specific skills usually in a single employer context, with minimal underpinning knowledge (Clarke & Winch, 2006). By being oriented towards specific employer needs, the system has promoted the narrowing down and fragmentation of skills and knowledge (Green, 1998).

In the discussion on training participation and its determinants across countries, it is also worth considering that training increases with the skill-intensity of occupations (Bassanini et al., 2007). The intensity and the nature of the skills required by firms can vary substantially depending on the productive structure and technology level of a country. For instance, if a

country has several firms that produce and adopt new technologies, a greater number of workers with adequate skills will be needed. This may affect the demand for workplace training on the job, as employees' skills may need more frequent updates. This might affect the association between qualifications and workplace training participation.

The description of the educational and vocational training systems above suggests that the skills regime models may influence the shape of workplace training participation in each country in a diverse way. Therefore, the working hypotheses of this paper are formulated separately for Germany and England. If training is considered a form of investment, individuals with better learning abilities are expected to be more likely to participate in workplace training to reduce the associated costs. Given the focus of England on the provision of general qualifications as well as the lower value associated to vocational ones, it is reasonable to argue that general qualification holders are thought to have greater learning abilities. Therefore, they are expected to be more likely to participate in training than vocational ones. The direction of the hypothesis remains the same if training is regarded as a way to offset a gap in skills: general skills, by definition, are broader and generic; hence, more workplace training may be necessary to compensate for the lack of work-specific knowledge of general qualification holders. In sum, in England, general qualification holders are expected to be more likely to participate in training compared to vocational ones, for either training functions (H1, England). The direction of the hypothesis is the same in Germany, but the motivation differs. In Germany, vocational qualifications are also associated with poor abilities and achievements; hence, if training is considered as an investment, this study assumes that general qualifications are expected to be associated with more training. This holds also if training is used to 'bridge skills'. Since vocational qualifications supply individuals with work-related competencies, this study expects

vocational qualification holders to require less training to match employers' skills demand (H2, Germany).

Analytical strategy

Data and sample

This paper uses data from the Programme of International Assessment of Adult Competencies (PIAAC), a large scale comparative survey conducted under the auspices of the OECD. Two elements make this dataset particularly suitable for this study. First, it provides cross-national comparable information on workplace training and on a wide range of background characteristics. Second, it includes an assessment of cognitive skills in three domains: literacy, numeracy, and problem solving in technology-rich environments, which is rarely available in existing social surveys. The design and implementation of the PIAAC survey was guided by technical standards and guidelines developed to ensure that the survey yielded high-quality and internationally comparable data (PIAAC, 2011). To maximise the comparability of results, participating countries were expected to meet stringent standards relating to the target population, sample design, sample selection response rates, and non-response bias analysis. Previous comparative studies on workplace training incidence have discussed the problem of discrepancy in the measurement of training across different surveys and concluded that it was necessary to be particularly careful when trying to document cross-country variations in training (e.g. Bassanini et al., 2007). The design of the PIAAC study overcomes this problem: the availability of the same survey question on training participation ensures comparability of training results across countries.

The analysis conducted in this paper is based on the year 2012 and the sample includes individuals aged 18-65 who are employed at the time of the survey and who have attained a secondary school certificate as highest level of qualification. In principle, students can leave secondary education at any time after the end of compulsory education. In practice,

there are two main exit points, at the end of compulsory education (that in many countries coincides with the completion of ISCED 2), and at the end of upper-secondary education (or after one or two additional years of postsecondary non-tertiary education, ISCED 3 or 4). In this paper, both groups of individuals are considered, because they have both achieved a secondary level qualification. As training opportunities for employed individuals are different from self-employed, the latter have been excluded. Also students and those in paid apprenticeship have been dropped to rule out training forms that are not work-related. These selection rules reduce the final sample to 1378 observations for Germany and 3073 for England and Northern Ireland (hereafter, for brevity, referred to as England. PIAAC does not include information on Wales and Scotland). In this study, estimations on PIAAC data are weighted throughout.

Table 1 shows the descriptive statistics of the sample under analysis. From the observation of the table it is worth noticing a few patterns. First, England and Germany have similar levels of training participation, whereas they have a different distribution of educational qualifications. Second, the level of numeracy skills is higher in Germany compared to England.

[Table 1 near here]

The exclusion from this investigation of individuals educated to the tertiary level may have some implications in light of the cross-country comparison performed in this paper. In details, the difference in the proportion of individuals educated to the tertiary level between the two countries may lead to a disproportion in the share of the population analysed. In Germany, the popularity of the vocational training system is associated with a comparatively low rate of tertiary education (OECD, 2012). In the country, individuals who do not enter

university usually have a more vocational background and this might also influence their chances to take part in workplace training. In England, instead, the share of individuals educated to the tertiary level is comparatively higher (Eurostat, 2018) and individuals who do not enter university may represent a particular group (e.g. who cannot afford to pay university fees or attend university in general). This may affect their chances to be hired in jobs where workplace training is offered. The rather low popularity of vocational qualifications in England may also explain the high number of item non-response in the variable indicating the attainment of a vocational qualification in the PIAAC data.

Variables

The dependent variable is a measure of workplace training participation. Workplace training is defined as a training session organized in the workplace or provided by their supervisors or colleagues in the 12 months prior the interview. According to the PIAAC definition, training sessions should be characterized 'by planned periods of training, instruction or practical experience, using the normal methods of work' and include 'training or instruction courses organized by the directors, managers or colleagues to help the respondent to do their job better or to familiarize them with their new tasks' (PIAAC survey questionnaire). The framing of the question suggests that training responses should be interpreted as more formal courses of instruction, rather than informal on-the-job training (OECD, 2013). In addition, the definition is likely to capture a specific form of training.

As discussed in the background section, training may play different roles which correspond to different theoretical perspectives. PIAAC does not offer detailed information on training roles, hence, this distinction cannot be addressed in the paper. The human capital approach also emphasizes a key distinction between 'general' versus 'specific' training,

based on who finances training. As general training may be of use to current as well as future employers, the latter are expected to finance it. In contrast, specific training is meant to be of use only to the current employer who is, in turn, also expected to bear the cost. PIAAC data include information on training funding. However, some respondents report that there are no costs involved in training participation presumably neglecting the costs borne by the employers (e.g. in foregone production). To correct for this, the variable has been recoded and the category 'there were no costs' has been incorporated into the employer financed category 'yes, totally' (because it is assumed that costs borne by the employers are fully borne by them). After recoding, the percentage of training totally financed by the employer adds to over 90% in both countries. This variable does not have enough variation to be informative and to allow for a distinction between employer- and employee-financed training (corresponding to specific and general training, respectively). Hence, the possibility to narrow the training definition and perform separate analyses for specific and general training has been discarded.

The key independent variable is a measure of secondary level qualification. However, the distinction between types and level of qualifications is problematic within the German context. In the country, whilst it is correct that Hauptschule and Realschule are vocationally oriented school types, and Gymnasium is the school preparing for university, these different types of qualifications represent also different levels thereby being highly correlated with ability. In fact, they are associated with different numbers of school years: Hauptschule qualification holders graduate after 9 years, Realschule qualification holders after 10 years and Gymnasium qualification holders after 12 years. This represents a serious limitation for the study of differences among education types in Germany. Moreover, it does not permit a direct comparison of vocational versus general qualifications, as in England. This paper faces

this issue by considering a wider set of qualifications in Germany, to show the large spectrum of qualifications available in the country and the heterogeneity amongst individuals with secondary qualifications. In details, the categorization of German qualifications available in PIAAC data is as follows: Hauptschule, Realschule, Polytechnische Schule (the latter refers to the certificate attained at the end of the 10th grade - PIAAC definition) and Gymnasium certificate. It is worth mentioning that in Germany most individuals enter an apprenticeship before accessing the labour markets, thus gaining some sort of vocational skills. However, in PIAAC it is not possible to identify whether those who attained these qualifications have also gone through any apprenticeships before accessing the labour market. For England, PIAAC contain information which indicates whether individuals have received a vocational qualification at the end of secondary school. This is used to distinguish between vocational and general qualifications.[1]

Control variables which may affect participation in workplace training are included. Models control for demographic characteristics such as gender and age (in its linear and quadratic form, the latter as an indicator of the diminishing marginal utility of age). To account for employment characteristics as well as diverse training needs across occupations, occupation dummies are added (occupations have been grouped into four categories: 1. professionals and managers; 2. clerks, technicians, sales and services workers; 3. trade, manufacturing and agriculture workers; 4. elementary and machine workers).

At last, information on skills level is added. Skills level measures are reported on a 500-point scale, with higher scores indicating greater proficiency of the skill domain in question. Following from Hanushek, Schwerdt, Woessmann and Widerhold (2003), who

[1] Despite this variable is affected by a very high number of item non-response -to avoid losing an excessive number of cases- missing values have been recoded into a binary indicator (labelled 'missing').

argue that numeracy skills are more comparable internationally, only information on numeracy skills is included in this paper. However, sensitivity tests indicate that results are robust to different skill levels specifications (i.e. literacy and problem solving).[2] The availability of this measure is particularly relevant within this study. As discussed, vocational and general qualifications do not only represent different types of competencies, but also different levels of abilities and school achievements, which may affect the probability to receive training. A measure of numeracy levels is included in the models to correct for differences in ability levels between vocational and general qualification holders, thus partially tackling the potential endogeneity bias. However, it is worth noticing that the inclusion of this information might not fully overcome the issue if vocational and general qualification holders differ on other unobserved characteristics.

Method

Logistic regression analysis is performed in this paper to model the probability to participate in workplace training as a function of personal and employment characteristics. The logistic regression takes the following form:

$$\text{Logit (p)} = \log\left(\frac{\text{p}}{1-\text{p}}\right) = \alpha + \beta_1 X\text{i} \qquad (1)$$

where p is the probability of participation in workplace training and X_i is a vector of covariates indicating individuals' information, as described above. The coefficients in equation (1) express the influence of the independent variables on the log odds of the dependent variable. However, to ease the interpretation of the estimates, this paper uses odds ratios ($OR=e^{\beta}$).

[2] Results available from the author upon request.

Two sets of models are estimated: Model 1 includes all control variables described above, whereas Model 2 adds a control for numeracy skills level available in the PIAAC data. Any difference between the two models indicates the potential effect of endogeneity on the estimates of training participation.

Results

Descriptive results are presented in Figure 1 and reveal the presence of an association between types of education and training. In Germany, the share of those who participate in training is higher among Gymnasium (general) qualifications holders compared to trainees with Hauptschule (vocational) ones (52.43% versus 34.23%, p-value of $\chi 2$ test < 0.05). Realschule qualifications lie in the middle of this vocational qualifications spectrum and do not differ significantly from other educational groups. In England, there is no difference in training participation between general or vocational qualifications (45.93% versus 48.25%; p-value of $\chi 2$ test > 0.05). In Germany, the association is in line with the hypothesis developed for the country. In contrast, descriptive results do not support the hypothesis for England thereby providing an additional reason to explore this further in a multivariate analysis.

[Figure 1 near here]

Table 2 shows training participation coefficients from logistic regression models for Germany and England. The table includes two models: Model 1 includes a full set of control variables whereas in Model 2 a measure of numerical ability is added to address potential endogeneity issues. In Germany, results show a statistically significant association between secondary level qualifications and training participation. More specifically, Gymnasium qualification holders have 1.45 times greater odds to participate in training compared to those with Hauptschule (reference category), those with a Realschule qualification have 1.34 times greater odds, and those with Polytechnische have 1.48 larger odds. This result is in line with the hypothesis formulated for Germany (H2), according to which general education holders are more likely to participate in training. After controlling for differences in numeracy levels in Model 2, however, differences across qualifications reduce in size and lose statistical

significance at conventional levels for most qualifications apart from Polytechnische (although only significant at 10% level). This finding is quite relevant as it indicates the importance of controlling for endogeneity in the choice to enter a general or vocational track when estimating labour market outcomes of vocational versus general qualification holders. In addition, this finding is in line with existing literature which finds no evidence of differences between general and vocational qualifications when taking endogeneity bias into account (e.g. Pischke & von Wachter, 2008). When looking at control variables, it is worth noticing some patterns. First, we can observe that in Germany training participation varies by individuals' socio-demographic characteristics. In particular, men are more likely to participate in training compared to women; moreover, the likelihood to participate increases with age, but at a decreasing rate (as shown by the squared age term). The likelihood to participate in training also varies by occupation: managers or professionals have larger odds of participating in training compared to the odds of those employed in machine or elementary occupations (reference category). This latter finding may indicate, as discussed in the background section, that managers and professionals are more knowledge intensive occupations and are, therefore, likely to require more training to remain up-to-date. The variable indicating numeracy skills is positive and significant, indicating that an increase in numerical skills increases the likelihood to take part in workplace training.

[Table 2 near here]

Table 3 shows results for England. In England, vocational qualification holders have greater odds to participate in training; however, differences do not reach significance at conventional levels. This indicates that the likelihood to participate in training does not vary by educational qualification. This result does not change after controlling for numeracy skills level in Model 2. Overall, findings for England do not support the hypothesis of this paper according to

which in England general qualification holders are expected to be more likely to participate in training than those with vocational qualifications (H1). In England, control variables show a different pattern as compared to Germany. In details, both coefficients of age and gender do not reach significance at conventional levels indicating that there is no variation in training participation on the basis of employees' demographic characteristics. Occupational categories, instead, behave as in Germany: being employed in more skilled occupations such as managers and professionals predicts a higher level of participation in training. As in Germany, the variable indicating numeracy skills is positive and significant.

In all, results only partly confirm the expectations of this paper. In Germany, findings show variations across educational qualifications in the likelihood to participate in training. However, they lose significance after controlling for differences in ability levels. Moreover, we observe differences by gender, age and occupational categories. In contrast, in England differences in educational qualifications and demographic characteristics do not reach significance at conventional levels. Although surprising, the lack of significant differences across educational as well as demographic characteristics in England can be motivated by reflecting on the institutional setting of the country. In internal labour markets, such as the UK, a substantial amount of training is expected to take place on the job to provide employees with work-specific skills. Therefore, it is plausible that employees participate in training independently from their socio-demographic characteristics (e.g. educational background, gender and age). Participation varies, instead, according to employment characteristics, such as they type of occupation.

[Table 3 near here]

Sensitivity tests

As discussed in the background section, the argument that vocational qualifications provide a better job match - hence, less need for training - may only hold for younger workers and be less valid for older ones. This because older workers benefit from longer working experience, which may offset the benefits deriving from an initial better job match. To test this argument and identify any age-varying patterns in the likelihood to participate in workplace training across qualifications, additional models have been estimated. Tables A1 and A2 include results of models with an interaction term between educational qualification and age groups (18-35, 36-50, 51-65) for Germany and England, respectively. Findings from this analyses show evidence of age patterns in the association between educational attainments and workplace training in Germany, but not in England. In the former, results indicate that the likelihood to participate in training for individuals with different types of qualification varies by age. Results show that individuals are more likely to participate in training at older ages rather than younger ones. In particular, individuals aged 36-50 across all education groups (apart from Gymnasium) are more likely to take part in training compared those who are younger and with a vocational background. This suggests that the lower need for training of vocational education holders (due to, potentially, a better job match) only holds valid at a young age and varies then across individuals' working careers. In England, sensitivity tests by age do not reveal any significant effect. This indicates that the association between educational qualifications and training hold valid across individuals' working lives and does not vary along the years. Because of the lack of significant differences, results for England are not discussed further.

Conclusions

This study has explored the association between educational attainments at the secondary level and workplace training participation in Germany and England. The comparative design has shed further lights on how institutional settings may influence this association.

Overall, the results of this study suggest that the link between qualifications and the probability to participate in workplace training is shaped by the context. Findings differ between Germany and England and this difference is likely to reflect the function workplace training is likely to play in the two countries; whether it is considered as an investment in human capital or as a 'bridge' between the skills possessed by employees and those demanded on the job. This article has argued that vocational education holders are less likely to participate in workplace training compared to their general counterparts in both countries. The results partially support this hypothesis. In Germany, Gymnasium qualification holders (indicating general qualifications) are more likely to participate in training compared to Hauptschule ones (indicating vocational qualifications). This finding aligns with the hypotheses of this paper drawn from the human capital and job matching theories. In fact, on the one hand, individuals with a Gymnasium qualification are thought to have greater learning abilities compared to their Hauptschule counterparts and, on the other, they possess competencies which are by nature wide and generic and require further training to become operative. However, differences between qualifications reduce after controlling for numeracy skills level. This finding highlights the relevance of tackling potential endogeneity bias in the estimation of labour market outcomes of general and vocational qualifications. Additional tests indicate that in Germany the association between education and training also varies by age.

In contrast, in England there is no evidence of differences between vocational and general qualifications. This result offers no support to the hypothesis on England. In addition, individuals show no difference in training participation on the basis of their demographic characteristics, age and gender, but only by occupation. Although surprising, these results can be motivated by reflecting on the model of skills formation present in England. In liberal labour markets, individuals finish school with mostly general knowledge and are expected to be trained at the workplace. This is likely to reduce the relevance of individuals' characteristics in terms of educational background, age and gender.

Overall, the evidence provided suggests the context sensitivity of the labour market outcomes of vocational and general education. In fact, the distinction between vocational and general education is deeply embedded in the countries' national production, labour market, and relations across industrial partners. This indicates that the national context has to be taken into account in the exploration of the association between secondary level qualifications and training participation. Results also reveal that in Germany the type of secondary qualification attainment has implications for the likelihood to participate in training at the workplace. This evidence has important policy implications, as it suggests that skills investments during schooling years have effects also on later labour market outcomes. Therefore, policies aimed at increasing workers' skills should focus not only on the expansion of training opportunities on the job, but also pay a wider attention to the system of skills formation which takes place during formal school years.

The analyses performed in this paper also present some limitations. First, the structure of the German educational systems does not allow a neat distinction between general and vocational qualifications; instead, a larger number of qualifications had to be been considered. Second,

coefficients might be biased due to endogeneity in the choice of vocational or general education paths. Although this paper has attempted to address this problem, it is acknowledged that including a measure of numeracy skills level might not fully overcome the problem. Nevertheless, this approach is a step in that direction when using cross-sectional data.

References

Barron, J. M., Black, D. A. & Loewenstein, M. A. (1989). Job Matching and on-the-Job Training. *Journal of Labor Economics*, 7 (1).

Bassanini, A., Booth, A., Brunello, G., De Paola, M. & Leuven, E. (2007). Workplace training in Europe. In: G. Brunello, P. Garibaldi, and E. Wasmer, (Ed.). *Education and Training in Europe, Chap. 8-13*. Oxford: Oxford University Press.

Becker, G. (1964). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education. New York: Columbia University Press.

Belzil, C., Hansen, J. & Kristensen, N. (2008). Estimating Complementarity between Education and Training. *IZA Discussion Paper n. 3882*.

Blundell, R., Dearden, L. & Meghir, C. (1996). The Determinants of Work-Related Training in Britain. *Institute for Fiscal Studies Working Paper*.

Breen, R. & Buchmann, M. (2002). Institutional Variation and the Position of Young People: A Comparative Perspective. *The Annals of the American Academy of Political and Social Science, 580(1): 288-305*.

Brunello, G. (2004). On the Complementarity between Education and Training in Europe. In D. Checchi, & C. Lucifora, (Ed.) *Education, Training and Labour Market Outcomes in Europe*. New York: Palgrave McMillan.

Brunello, G. & Rocco, L. (2017). The effects of Vocational Education on Adult Skills, Employment and Wages: What can we learn from PIAAC? *SERIEs, 8(4): 315–343*.

Clarke, L. & Winch, C. (2006). A European Skills Framework? – but what are Skills? Anglo-Saxon versus German Concepts. *Journal of Education and Work, 19(3): 255-269*.

Conlon, G. (2001). The Differential in Earnings Premia between Academically and Vocationally Trained Males in the United Kingdom. *Centre for Economics of Education Discussion Paper No.11.*

Corvers, F., Heijke, H., Kriechel, B. & Pfeifer, H. (2010). High and Steady or Low and Rising? – Vocational Versus General Education in Life-Cycle Earnings. *Working Paper Maastricht University*.

Dearden, L., Mcintosh, S., Myck, M. & Vignoles, A. (2002). The Returns to Academic and Vocational Qualification in Britain. *Bulletin of Economic Research, 54(3): 249-274*.

Dieckhoff, M., Jungblut, J. M. & O' Connell, P. J. (2007). Job-Related Training in Europe. Do Institutions Matter? In: D. Gallie (Ed.): *Employment Regimes and the Quality of Work* (77-104). Oxford: Oxford University Press.

Dieckhoff, M (2008). Skills and Occupational Attainment: A comparative study of Germany, Denmark and the UK. *Work, Employment and Society, 22(1): 89–108*.

Estevez-Abe, M., Iversen, T. & Soskice, D. (2001). Social Protection and the Formation of Skills: A Reinterpretation of the Welfare State. In: P. A., Hall, and D. Soskice (Ed.): *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage* (145-183), Oxford: Oxford University Press.

Eurostat (2018). Education and training in EU – facts and figures. Eurostat online publication. Retrieved on September 20, 2018, from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Tertiary_education_statistics

Eurostat (2019).Your key to European statistics. Retrieved October 2, 2019, from https://ec.europa.eu/eurostat/web/products-datasets/product?code=tps00065.

Franz, W. & Soskice, D. (1995). The German Apprenticeship System. In: F. Buttler, W. Franz, R. Schettkat and D. Soskice (Ed.): *Institutional Frameworks and Labor Market Performance*. London: Routledge.

Gangl, M. & Mueller, W. (2003). Transitions from Education to Work in Europe - the Integration of Youth into the Labour Markets. Oxford: Oxford University Press.

Green, A. (1998). Core Skills, Key Skills and General Culture: In Search of the Common Foundation in Vocational Education. *Evaluation and Research in Education, 12(1): 23-43*.

Hanushek, E. A., Schwerdt, G., Woessmann, L. & Wiederhold, S. (2003). Returns to Skills around the World: Evidence from PIAAC. *OECD Education Working Paper No. 101*.

Hanushek, E. A., Woessmann, L. & Zhang, L. (2015). General Education, Vocational Education, and Labour-Market Outcomes over the Life-Cycle. *The journal of Human Resources, 52(1).*

Heijke, H., Meng, C. & Ris, C. (2013). Fitting to the Job: The Role of Generic and Vocational Competencies in Adjustment and Performance. *Labour Economics, 10: 215-229*.

Hillmert, S. (2006). Skill formation in Britain and Germany: Recent developments in the context of traditional differences. *CES Germany & Europe Working Papers 06.1*.

Iannelli, C., Smyth, E., & Klein, M. (2016). Curriculum differentiation and social inequality in higher education entry in Scotland and Ireland. *British Educational Research Journal*, *42(4): 561–581*.

Iannelli, C. & Duta, A. (2018). Inequalities in school leavers' labour market outcomes: do school subject choices matter? *Oxford Review of Education, 44 (1): 56-74*.

Jovanovic, B. (1979). Job Matching and the Theory of Turnover. *Journal of Political Economy, 87(5): 972-990*.

Karasiotou, P. (2004). General Education Versus Vocational Training: How Do They Affect Individual Labour Market Performance? Research project 'Universities and firms: a comparative analysis of the interaction between market processes, organisational strategies and governance'.

Kilpi-Jaconen, E., Vono de Vilhena, D., & Blossfeld, H. P., (2015). Adult Learning and Social Inequalities: Processes of Equalisation or Cumulative Disadvantage? *International Review of Education, 61(4)*.

Lynch, L. (1992). Private Sector Training and Its Impact on the Earnings of Young Workers. *American Economic Review, 82(1): 299-312*.

O'Connell, P.J. & Byrne, D. (2012). The Determinants and Effects of Training at Work: Bringing the Workplace Back in. *European Sociological Review, 28(3).*

OECD (1999). Chapter 3: Training of Adult Workers in OECD Countries: Measurement and Analysis. Employment Outlook. Paris: OECD Publishing.

OECD (2003). Employment outlook. Paris: OECD Publishing.

OECD (2012). Equity and Quality in Education: Supporting Disadvantaged Students and Schools. Paris: OECD Publishing.

OECD (2013). The Survey of Adult Skills: Reader's Companion. Paris: OECD Publishing.

Oosterbeek, H., (1998). Unravelling Supply and Demand Factors in Work-Related Training, *Oxford Economic Papers, 50(2): 266-83*.

Pischke, J. S. & von Wachter (2008). Zero Returns to Compulsory Schooling in Germany: Evidence and Interpretation. *The Review of Economics and Statistics*, *90: 592-598*.

PIAAC (2011). PIAAC Technical Standards and Guidelines, OECD Programme for the International Assessment of Adult Competencies. www.oecd.org/site/piaac/PIAAC-NPM(2010_12)PIAAC_Technical_Standards_and_Guidelines.pdf

Quintini, G. (2011). Over-qualified or Under-skilled: A Review of Existing Literature. *OECD Social, Employment and Migration Working Papers, No. 121.* Paris: OECD Publishing.

Roosmaa, E-L., Martma, L., & Saar, E. (2019). Vocational Upper-Secondary Education and Participation in Non-Formal Education: A Comparison of European Countries. *International Journal of Lifelong Education, 38(3): 268 – 286*.

Shavit, Y. & Mueller, W. (1998). The Institutional Embeddedness of the Stratification Process. In: Y. Shavit and W. Mueller (Ed.): *From School to Work. A Comparative Study of Educational Qualifications and Occupational Destinations.* Oxford: Oxford University Press.

Shavit, Y. & Mueller, W. (2000). Vocational Secondary Education. Where Diversion and Where Safety Net? *European Societies, 2(1): 29-50*.

Schomann, K. & Becker, R. (2002). Access to Training for the Unemployed in Germany. In: K. Schomann and P. J. O'Connell (Ed.) *Education, Training and Employment Dynamics. Transitional Labour Markets in the European Union*. Cheltenham: Edward Elgar.

Solga, H. (2002). Stigmatization by negative selection. Explaining Less-educated People's Decreasing Employment Opportunities. *European Sociological Review, 18(2), 159-178*.

Soskice, D. (1999). Divergent production regimes: coordinated and uncoordinated market economies in the 1980s and 1990s. In: H. Kitschelt, P. Lange, G. Marks and J. D. Stephens (Ed.): *Continuity and Change in Contemporary Capitalism (101-134)*. Cambridge: Cambridge studies in comparative politics.

UNESCO (2012). Education for All: Youth and Skills – Putting Education to Work. Unesco Global Monitoring Report 2012.

Van Smoorenburg, M. S. M. & Van Der Velden, R. K. W. (2000). The Training of School-Leavers: Complementarity or Substitution? *Economics of Education Review, 19: 207-217*.

Verhaest, D. & Omey, E. (2013). The Relation between Formal Education and Skill Acquisition in Young Workers' First Job. *The Manchester School, 81(4): 638–659*.

Walker, I. & Zhu, Y. (2007). The Labour Market Effects of Qualifications. Futureskills Scotland report.

van De Werfhorst, H. G., Sullivan, A., & Cheung, S. Y. (2003). Social Class, Ability and Choice of Subject in Secondary and Tertiary Education in Britain. *British Educational Research Journal, 29: 41–62*.

West, J. & Steedman, H. (2003). Finding Our Way: vocational education in England. London: Skills for Life Report No. 5. London: Centre of Economic Performance LSE.

Wolbers, M. H. (2005). Initial and Further Education: Substitutes or Complements? Differences in Continuing Education and Training over the Life-Course of European Workers. *International Review of Education, 51: 459-478*.

Wolter S. C., Ryan P. (2011). Apprenticeship. In: R. Hanushek, S. Machin, L. Woessman (Ed.): *Handbook of Economics of Education, vol. 3*. Amsterdam: Elsevier.

Table 1. Descriptive statistics, Germany and England. PIAAC 2012.

England			Germany		
Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.
Workplace training	40.23		Workplace training	45.28	
General qualification	40.00		Haupschule	28.23	
Vocational qualification	13.00		Realschule	35.99	
Missing	46.00		Fachhochschule	22.57	
			Gymnasium	13.21	
Numeracy skills	254.43	44.16	Numeracy skills	274.58	41.63
Females	53.32		Females	55.08	
Males	46.68		Males	44.92	
Age	42.04	12.18	Age	43.11	9.95
Occupations			Occupations		
Managers&Professionals	13.54		Managers&Professionals	6.39	
Technicians&Clerks	51.95		Technicians&Clerks	62.48	
Agriculture&Trade	12.50		Agriculture&Trade	14.22	
Machine&Elementary	22.01		Machine&Elementary	16.91	

Table 2. Logistic regression coefficients of workplace training participation. PIAAC 2012, Germany

	Model 1 OR		Model 2 OR	
(Hauptschule)				
Realschule	1.345	*	1.227	
	(0.222)		(0.207)	
Polytechnische	1.482	**	1.366	*
	(0.256)		(0.239)	
Gymnasium	1.450	*	1.207	
	(0.320)		(0.280)	
Male	2.119	***	1.962	***
	(0.303)		(0.286)	
Age	1.178	***	1.171	***
	(0.055)		(0.055)	
Age^2	0.813	***	0.820	***
	(0.045)		(0.046)	
(Machine&Elementary)				
Managers&Professionals	3.580	***	3.009	***
	(1.068)		(0.923)	
Technicians&Clerks	3.014	***	2.723	***
	(0.550)		(0.510)	
Agriculture&Trade	1.438		1.348	
	(0.336)		(0.313)	
Numeracy			1.004	***
			(0.002)	
Pseudo R-Squared	0.061		0.066	
Sample Size	1378		1378	

Exponentiated coefficients, standard errors in parentheses.

Significance level: p< * 0.1, p< ** 0.05 p< *** 0.01

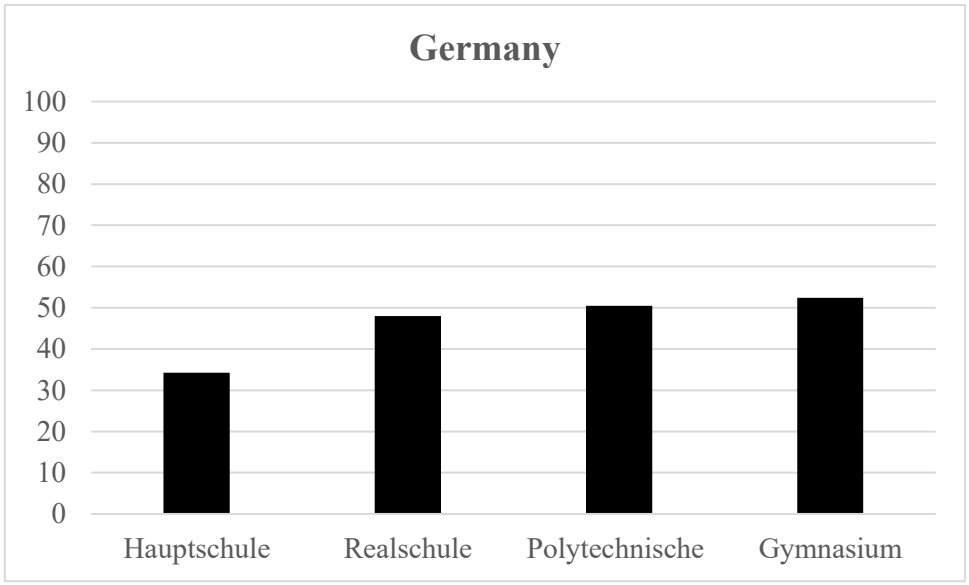
Table 3. Logistic regression coefficients of workplace training participation. PIAAC 2012, England

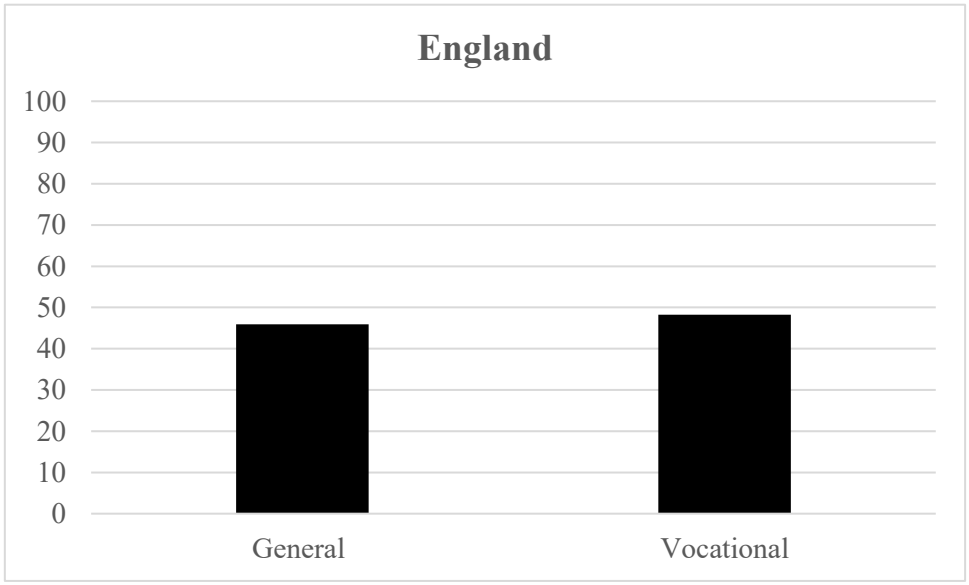
	Model 1 OR		Model 2 OR	
(General qualification)				
Vocational qualification	1.171		1.229	
	(0.233)		(0.244)	
Missing information	1.247	*	1.343	**
	(0.144)		(0.158)	
Male	1.003		0.925	
	(0.119)		(0.112)	
Age	1.038		1.033	
	(0.031)		(0.031)	
Age2	0.956		0.963	
	(0.034)		(0.035)	
(Machine&Elementary)				
Managers&Professionals	2.000	***	1.571	**
	(0.350)		(0.294)	
Technicians&Clerks	1.781	***	1.555	***
	(0.261)		(0.232)	
Agriculture&Trade	1.744	**	1.490	*
	(0.383)		(0.334)	
Numeracy skills			1.005	***
			(0.001)	
Pseudo R-Squared	0.014		0.023	
Sample Size	3073		3073	

Exponentiated coefficients, standard errors in parentheses.

Significance level: p< * 0.1, p< ** 0.05, p< *** 0.01

Figure 1. Participation in workplace training by educational attainment (%). PIAAC 2012, Germany and England





Appendix

Table A1. Logistic regression coefficients of workplace training participation, by age groups. PIAAC 2012, Germany

	Model 1 OR		Model 2 OR	
(Hauptschule)				
Realschule	2.104	**	1.922	*
	(0.793)		(0.721)	
Polytechnische	2.304	*	2.039	
	(1.062)		(0.953)	
Gymnasium	2.435	**	1.997	
	(1.098)		(0.905)	
(Age: 18-35)				
36-50	1.933	*	1.888	*
	(0.715)		(0.690)	
51-65	1.256		1.245	
	(0.491)		(0.482)	
Realschule*age 36-50	0.561		0.552	
	(0.244)		(0.239)	
Realschule*age 51-65	0.826		0.822	
	(0.410)		(0.406)	
Polytechnische*age 36-50	0.653		0.667	
	(0.336)		(0.345)	
Polytechnische*age 51-65	0.528		0.589	
	(0.292)		(0.330)	
Gymnasium*age 36-50	0.507		0.509	
	(0.269)		(0.266)	
Gymnasium*age 51-65	0.811		0.859	
	(0.557)		(0.592)	
Male	2.068	***	1.916	***
	(0.295)		(0.279)	
(Machine&Elementary)				
Managers&Professionals	3.792	***	3.194	***
	(1.136)		(0.984)	
Technicians&Clerks	3.002	***	2.718	***
	(0.553)		(0.516)	
Agriculture&Trade	1.442		1.350	
	(0.340)		(0.317)	
Numeracy			1.004	**
			(0.002)	
Pseudo R-Squared	0.058		0.062	
Sample Size	1378		1378	

Table A2. Logistic regression coefficients of workplace training participation, by age groups. PIAAC 2012, England

	Model 1 OR		Model 2 OR	
(General qualification)				
Vocational qualification	0.985		0.998	
	(0.369)		(0.374)	
Missing	1.206		1.288	
	(0.243)		(0.264)	
(Age: 18-35)				
36-50	1.041		1.063	
	(0.223)		(0.230)	
51-65	1.041		1.057	
	(0.261)		(0.264)	
Vocational* age 36-50	0.746		0.769	
	(0.375)		(0.385)	
Vocational* age 51-65	1.863		1.994	
	(0.919)		(0.979)	
Missing* age 36-50	1.207		1.202	
	(0.324)		(0.326)	
Missing* age 51-65	0.870		0.911	
	(0.268)		(0.281)	
Male	1.003		0.924	
	(0.119)		(0.112)	
(Machine&Elementary)				
Managers&Professionals	2.000	***	1.562	**
	(0.351)		(0.293)	
Technicians&Clerks	1.765	***	1.538	***
	(0.259)		(0.230)	
Agriculture&Trade	1.720	**	1.466	*
	(0.377)		(0.327)	
Numeracy			1.005	***
			(0.001)	
Pseudo R-Squared	0.018		0.027	
Sample Size	3073		3073	

Notes to tables A1 and A2: Exponentiated coefficients, standard errors in parentheses.

Significance level: p< * 0.1, p< ** 0.05, p< *** 0.01