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# Settling the counterfactual debate: Is there a preferable counterfactual when estimating the returns to vocational qualifications?

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# Settling the counterfactual debate: Is there a preferable counterfactual when estimating the returns to vocational qualifications?

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## Abstract

Using information from the Longitudinal Education Outcomes (LEO) data set, it is now possible to compare the characteristics and estimates for learners with different qualifications encompassing both types of counterfactuals used in the extant literature: learners in possession of qualifications at the 'level-below' and learners enrolling in similar vocational qualifications but failing to achieve ('non-achievers'). In this analysis we adopt a Propensity Score Matching (PSM) method to assess whether it is possible to identify an 'optimal' counterfactual based on observable characteristics. In order to do that, we pool together the observations in the 'non-achievers' and 'level-below' counterfactual groups and compare the composition of the combined counterfactual group pre-match with the composition of the same group post-match. If neither group is preferable, then the breakdown of the matched counterfactual group should be in proportion to the relative sample sizes pre-match. If this is not the case, and one group is relatively over-represented post-matching, then there is a preference for that particular control group in terms of observable characteristics only. We find that, for both males and females, the non-achiever group is generally overrepresented for qualifications at Level 2 and above. That is, non-achievers are generally closer in their observable characteristics to the achievers, than are individuals who only complete the qualification at the level below. Finally, earnings differentials estimated using the 'non-achievers' group tend to be smaller than differentials estimated using the 'level-below' group, and this is especially true for male individuals.

**JEL Classification:** I26, J21, J31, J64

**Keywords:** Vocational education, Administrative data, Returns to education

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## **Executive Summary**

Historically, when estimating the returns to vocational qualifications in the UK, two main counterfactuals have been used: in a number of studies, predominantly using survey data such as the Labour Force Survey (LFS), researchers have estimated the differential labour market outcomes achieved by similar individuals with adjacent levels of qualification attainment. On the other hand, using information from matched administrative data, researchers have estimated the labour market differences between individuals achieving qualifications at specific levels compared to those that failed to achieve or complete the qualification at that level.

These differences in the counterfactual used have been driven by the type of information available, as the LFS only gathers information on qualifications achieved and the matched administrative data (until recently) only covered learners enrolling in a Further Education aim at some stage. Using information from the Longitudinal Education Outcomes (LEO) data set, it is now possible to compare the characteristics and findings for learners with different qualifications encompassing both types of counterfactuals used in the extant literature.

The analysis is divided in two different sections: in the first section we present the characteristics of the different treatment and counterfactual groups and adopt a Propensity Score Matching (PSM) method to assess whether it is possible to identify an ‘optimal’ counterfactual based on observable characteristics. In order to do that, we pooled together the observations in the ‘non-achievers’ and ‘level-below’ counterfactual groups and compared the composition of the combined counterfactual group pre-match with the composition of the same group post-match. If neither group is preferable, then the breakdown of the matched counterfactual group should be in proportion to the relative sample sizes pre-match. If this is not the case, and one group is relatively over-represented post-matching, then there is a preference for that particular control group. However, whilst this identifies the most similar individuals in terms of their observable characteristics, it cannot address the problem of unobservable differences (such as ability or motivation) between the treatment and control groups.

This paper finds that, for both males and females, the non-achiever group is generally overrepresented for qualifications at Level 2 and above. That is, non-achievers are closer in their observable characteristics to the achievers, than are individuals who only complete the qualification at the level below. This is particularly true for apprenticeships (both Advanced and Intermediate), NVQs at Levels 2 and 3, and BTECs at Level 3. For the remaining

qualifications the difference pre- and post-matching is limited, and the non-achievers group is noticeably smaller in size compared to the level-below group.

In the second section we add to the existing literature on earnings differentials and present results using ‘non-achievers’ as the counterfactual group, as well as findings from the PSM approach. The estimated differentials are then compared with existing estimates using the individuals with qualifications at the level below (all qualifications at the level below, or vocational qualifications only).

The findings indicate that estimates of earnings differentials using the non-achievers group are positive for men in possession of vocational qualifications at Levels 3 and 2, although the magnitude is (often considerably) smaller than the earnings differentials estimated using achievement at the level below as counterfactual (the exception are individuals holding BTECs). For females, the estimated differentials are also positive for all vocational qualifications at Levels 3 and 2, but there is not such a strong pattern in terms of magnitude relative to the estimates using the level-below group as the counterfactual. Results from PSM are generally in line with the earnings differentials estimated using the level below group (although with some exceptions).

## 1. Introduction

Estimates of the returns to vocational qualifications have long been plagued by the difficulty of constructing an appropriate control group, and the debate amongst researchers with respect to what this should be. The existing literature has used two main approaches: researchers using survey data typically compare achievers at adjacent qualification levels, whilst researchers using administrative data sources compare completers with non-completers at the same education level. The choice between them has historically been data driven (as non-achievers are not available in survey datasets and the administrative data only included those engaging with Further Education), but recent advances mean that both approaches are now possible with the newly available Longitudinal Education Outcomes (LEO) data. This paper aims to contribute to the debate by evaluating whether the observable characteristics of those in each of the possible counterfactual groups indicate that one is more suitable than the other. However, we obviously cannot make any comment on how they compare in terms of unobservable characteristics (such as innate ability, motivation etc.); it may be the case that the group which provides a closer resemblance in terms of observables is actually further apart in terms of unobservables.

Whilst the ideal counterfactual for this type of analysis would consist of those same individuals in the absence of the qualification in question, it is clearly impossible to observe these individuals' wages in both scenarios simultaneously. As a result, a control group must be constructed consisting of those individuals who have not acquired the qualification of interest, but who have 'similar' personal and socioeconomic characteristics. If this control group differs from those in possession of the qualification in question in terms of observable or unobservable characteristics, then the estimates will be subject to bias.

Each of the most commonly used counterfactuals in the returns literature are expected to result in estimates of the rates of return which are afflicted with some sort of bias. In the case of comparing achievers at a given level with achievers at the level below<sup>1</sup>, it is very likely that there is some unobservable factor, such as ability, which determines whether individuals progress to a higher level. The comparison of completers and non-completers within the same level will arguably address, at least partially, the issue of ability, since all students will have met the pre-requisite criteria. However, this approach introduces a new source of bias in the

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<sup>1</sup> Levels here refer to those according to the Regulated Qualification Framework (RQF), a nine-point scale where 0 corresponds to entry level qualifications and 8 is the highest level of achievement (doctoral degrees).

form of motivation and any other factor which may influence the completion of the qualification, such as long-term illness or job offers available to the learner – factors which also affect future labour market outcomes.

However, whilst these sources of bias undoubtedly exist, these two possible counterfactual groups also differ on observable characteristics. Hence, this paper does not seek to address the problem of bias in the estimates of the rates of return, but merely seeks to discover which of the two counterfactual groups more closely matches based purely on observable characteristics.

The rest of the paper is constructed as follows: the following section sets out the background and existing literature. The data utilised is outlined in Section 3, while Section 4 explains the methodological approach. The results of the Propensity Score Matching (PSM) exercise to determine over- or under-representation (meaning that this group counts for a larger/smaller share of the pooled control group post-matching than it did pre-matching)<sup>2</sup> of each comparison group are presented in Section 5, and Section 6 presents the earnings differentials corresponding to each of the available counterfactuals. Finally, the conclusions and next steps are covered in Section 7.

## **2. Background and existing literature**

Whilst there has been a vast amount of literature since the 1990s estimating the wage ‘returns’ associated with attaining vocational qualifications, in the absence of a clear strategy to deal with the bias introduced by unobservable characteristics, the methodology typically utilised does not allow the inference of the causal impact of qualification attainment on earnings. Thus, the methodology employed in these studies actually provides estimates of the conditional correlations between qualifications and earnings, rather than the causal impact of acquiring higher levels of qualifications. Furthermore, it should be noted that most studies do not actually estimate rates of return (most notably because it ignores costs) and in reality, the estimates would be more appropriately referred to as wage or earnings ‘differentials’. For the purposes of reviewing the literature, the terms ‘returns’ will be used in accordance with the vocabulary

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<sup>2</sup> For example, if the control group was comprised of 70% level-below achievers and 30% non-achievers before matching, and the matched control group was 60% level-below achievers and 40% non-achievers, then the non-achiever counterfactual group would be overrepresented post-matching (and, conversely, the level-below group is underrepresented post-matching).

employed by previous researchers, but this should be interpreted as synonymous with wage or earnings differentials, the latter of which will be utilised throughout the subsequent sections.

Moreover, existing estimates of qualification differentials differ across survey and administrative data sources for a variety of reasons: differences in the counterfactuals used (typically level-below versus non-achievers); differences in the dependent variables (derived hourly wage based on survey responses versus daily earnings derived from administrative sources<sup>3</sup>) and differences in the set of explanatory variables available (with survey data gathering information on various personal and job characteristics, while administrative data are typically scarce on these characteristics, but richer on the educational journey). These various inconsistencies mean that estimates using survey and administrative data are not necessarily comparable and likely to be affected by different biases (in terms of unobservable characteristics, measurement error etc.)<sup>4</sup>.

### *2.1 Trends in the literature*

An overview of the estimates found, as well as the methodological approach and dataset(s) used, in the key papers published in this field from around 2000 onwards are presented in Table 1. The papers are displayed in chronological order<sup>5</sup>, with colour coding according to the choice of counterfactual adopted in the particular study. Hence it is clear to see how the literature has shifted over time from a control group of no qualifications at all, to adjacent levels of qualification attainment, and more recently to non-completers. Some authors have also used multiple counterfactuals, or numerous data sources using the same counterfactual, which provides some indication of how the estimates are affected by these factors.

Returns to qualifications can be estimated as either average or marginal returns<sup>6</sup>. The average returns estimate is derived using an approach including all qualifications held by individuals in the equation: this will comprise of a mixture of those for whom the qualification is their highest level of achievement and those who also achieved at higher levels. In this approach the qualification variables are not mutually exclusive and the estimate should be interpreted

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<sup>3</sup> Thus, when reporting LFS estimates (or other estimates using survey data) it is appropriate to refer to ‘wage differentials’, as the typical measure used is derived hourly wage, while when discussing estimates from the matched administrative data ‘earnings differentials’ is more appropriate, as the measure is constructed from HMRC records on earnings and days of employment during the tax year (daily earnings).

<sup>4</sup> For a comprehensive discussion of the differences between survey and administrative datasets see Conlon et al. (CVER DP009 (2017)).

<sup>5</sup> Alphabetical order is used in the case of multiple papers published in the same year.

<sup>6</sup> For more information on average and marginal returns see McIntosh and Morris (CVER DP002 (2016)).



relative to individuals not in possession of the specific qualification (holding constant all other qualifications held).

If the qualification achieved is an individual's highest achieved qualification, and this is true for all learners included in the model (including those in the counterfactual group), then the estimates will be the marginal returns to that qualification. In this approach qualifications entered in the model are mutually exclusive and the estimates can be interpreted relative to the omitted category (e.g. individuals with highest qualification at the level below or with no qualifications at all).

Traditionally the returns to vocational qualifications were estimated by comparing the wages of those that have achieved a qualification at a given level, such as a BTEC at Level 2, with the wages of those who have not achieved any qualifications at all. However, the use of individuals with no formally recognised qualifications as a control group is problematic as these individuals are unlikely to have similar unobservable characteristics as those who have gained a qualification. This is particularly true as the achievement level rises, since the unobserved ability and motivation levels of the two groups will become more divergent. There have also been a few papers that considered individuals who have not achieved the qualification of interest as a control group, irrespective of what they have achieved (although these other qualifications are controlled for). This group will consequently be formed of individuals who have achieved at higher levels as well as those at lower levels and no achievement at all, which is equally questionable.

In an attempt to address these issues, researchers began to move towards comparing a given qualification with all qualifications achieved at lower levels. Whilst this arguably improves the comparison as both groups will have had the motivation required to achieve a qualification, this level of motivation may vary by qualification level. Additionally, ability bias remains an issue. For example, at Level 2, the comparison group would consist of Entry level and Level 1 qualifications, which are potentially close enough together that the ability levels of the two groups may be similar on average. However, at Level 4, the comparison group is comprised of all levels below this, including Entry level, which is unlikely to be comprised of comparable individuals in terms of innate ability. In order to combat this, researchers moved to restricting the control group to those who had achieved a qualification a single level below that of the qualification of interest. The idea is that those at adjacent levels (i.e. the smallest gap between qualifications possible) are more likely to closely resemble each other in terms of unobserved

ability. However, there may still be some unobservable reason why some learners do not go on to the higher level, such as ability, which also affects future labour market earnings, and so may lead to a bias in the estimates.

The relatively recent availability of the Individualised Learner Record (ILR), which can be matched to HM Revenue and Customs (HMRC) information on wages and employment, has allowed for the estimation of returns using individuals who enrolled in the same qualification level, but failed to complete the course. This had not previously been possible using datasets such as the LFS, since they do not provide start and end dates of learning spells or completion and attainment data. Although the availability of non-completers as a counterfactual group may, at least partially, combat the ability bias problem, as both the treatment and the control group will have met the entry criteria, it may introduce a new source of bias if unobserved elements such as motivation are responsible for individuals dropping out. This approach does not take account of all of the reasons why learners do not complete their course (such as long-term illness or the availability of a job offer).

Finally, whilst the results vary significantly across counterfactuals, some care must be taken over how comparable these results are: even when the counterfactual used is identical, there will be other differences such as the data source used, the time period covered, the type of dependent variable used (wages or earnings), the age at which the outcome measure is measured, and the other explanatory variables which are controlled for in the regressions. In particular survey data typically gather information on a large variety of personal and job characteristics (e.g. marital status, number of children, disability, public/private sector worker, whether working for a large business), while the administrative data only reports information on a restricted number of personal characteristics gathered by school or FE colleges, but is richer in terms of information on education enrolment and attainment.

## *2.2 Summary of estimates using average returns*

Average returns report the estimated wage return including all qualifications held by individuals in the wage equation (whether as their highest or not). The average return estimates should be interpreted as the wage differential between all those with the qualification and those without (holding constant all other qualifications held). Papers estimating average returns most commonly use the ‘no qualifications’ control group, and the single paper to use the non-completers counterfactual (BMG and IES 2013b) only provides aggregate estimates for Level 1 and Entry level qualifications (2-11% and 0-21% respectively). In the one paper that provides

overall estimates for each level using the ‘no qualifications’ counterfactual, Dickerson (2005) estimates that the returns to Level 2 and below Level 2 qualifications are negative compared to those with no formally recognised qualifications, and surprisingly that the returns to Level 2 qualifications are worse than for those at below Level 2, ranging from -5% to -3% and -4% to -2% respectively. Furthermore, the estimates for below Level 2 are much smaller than those estimated by the non-completer approach. The returns for qualification attainment at Levels 3 to 5 are more as expected, as they are all positive and increase as the level of the qualification rises.

Breaking down the levels into their respective qualification types reveals that these negative findings may result from the strongly negative returns to Level 1 and 2 National Vocational Qualifications (NVQs): all authors provide estimates between -11% to -7%, and -7% to -6% respectively (Dearden et al. 2000; McIntosh 2004a; Greenwood et al 2007), and this is the case irrespective of the control group adopted. At Levels 3-5, despite returns becoming positive (5-8%), NVQs still perform relatively poorly compared to, say, BTECs.

Dearden et al (2000) employ a comparable approach on three different data sources – the National Child Development Study (NCDS), the International Adult Literacy Survey (IALS) and the LFS – to compare the differences in the average returns using the ‘no qualifications at all’ counterfactual group. They find that the data sources themselves can bring about significant variation in results despite the use of an identical methodology: for example, for Level 3 City and Guilds (C&G) qualifications, estimates range from 4.1% (NCDS) to 6.9% (LFS) and as high as 35.6% (IALS).

On the whole, estimates of wage returns using the ‘not that qualification’ control group (i.e. those that have not acquired the qualification of interest irrespective of other achievements) are smaller in magnitude than those for the ‘no qualifications at all’ counterfactual, and are more often negative. The ‘adjacent levels’ comparison undertaken by London Economics (2011a) produces estimates somewhere in between the two, and only reports negative returns in the case of NVQs at Level 2 and below Level 2, which is consistent with the other approaches.

### *2.3 Summary of estimates using marginal returns*

Marginal returns identify the wage differentials accruing to an individual’s highest qualification compared with lower level qualifications. In the literature, marginal effects have been computed using as the comparison category all individuals with qualifications at the level

immediately below, with qualifications at any level below, with no qualification at all and also looking at individuals before acquiring the qualification. Additionally, some researchers have looked at learners aggregated by level (e.g. all Level 2 vocational qualifications), while others have disaggregated each level into the different qualifications (e.g. NVQs and BTECs).

In terms of the relative magnitude of estimated returns, the ‘before/after’ methodology simply compares earnings of individuals who have achieved a qualification to themselves before they undertook the qualification and finds the highest returns (London Economics 2011b). However, it is important to note that this methodology is only possible for learners who have already spent some time in the labour market (and hence they are more likely to be adult learners than is the case for the other comparison groups).

After this, the results with the next highest estimates of earnings returns come from the ‘no qualifications at all’ comparison group, followed by the non-completer group, and finally the adjacent levels counterfactual. However, the ranking varies for specific qualifications, for example in the case of BTECs and NVQs, the pattern depends a little on the level being looked at: for Level 2 qualifications, the estimates for the non-completer group are typically larger than for those for BTECs, whilst the opposite is true at Level 3.

The closest examples of truly comparable results are provided by London Economics (2011b), and McIntosh and Morris (2016), who each investigate different counterfactuals whilst keeping the data source and measurement period exactly the same so that the difference in estimates should only result from the choice of control group. London Economics (2011b) find that there is no clear pattern in how the results are affected. At the aggregate level, the estimates are greater in magnitude for the non-completers counterfactual compared to the adjacent levels counterfactual at Level 2, but the opposite is true at Level 3, and at Level 4 and above the range for estimates using the non-completer counterfactual encapsulates that of adjacent levels. In contrast, McIntosh and Morris (2016) estimate higher rates of return for the ‘no qualifications at all’ control group compared to the ‘level below’ counterfactual at all levels irrespective of qualification type. However, this is relatively unsurprising given the smaller ‘gap’ between, for example, Level 3 achievers compared to Level 2 achievers, rather than Level 3 achievers compared to those with no achievement at all.

Looking at apprenticeships, returns seem to be sizeable across different counterfactual groups and data sources. For example, London Economics (2011b) finds that an Advanced Apprenticeship (Level 3) produces returns of 19-25% using the non-completer counterfactual

approach, and that the adjacent levels approach results in higher estimates of 23-30%. However, McIntosh (2007) estimates the returns to be 18% using the adjacent levels methodology, which is more in line with the estimate for the non-completer approach.

In the most recent paper available, Patrignani, Conlon and Hedges (2017) estimate the wage differentials for all qualifications at varying levels, including apprenticeships, using the ‘level below’ counterfactual group and find particularly strong and positive associations between qualification achievement and earnings for Level 4 vocational qualifications, apprenticeships, and National Vocational Qualifications at Levels 2 and 3.

### 3. Data

The dataset used in this analysis is constructed from a combination of five data sources. Information regarding vocational qualifications is derived from the **Individualised Learner Record (ILR)**, which is a register of all publicly funded Further Education (FE) courses, and includes details of the characteristics of the learners enrolled in these qualifications. This dataset is supplemented with more comprehensive information on the courses themselves from the **Learning Aims Reference Service (LARS)**.

Educational history from primary and secondary schooling is taken from the **National Pupil Database (NPD)**, which documents all school enrolment and achievement in national tests undertaken as part of compulsory schooling. There is also additional information on pupil characteristics, such as eligibility for Free School Meals (FSM) and Special Educational Needs (SEN).

The last education dataset used is the **HESA** collection covering higher education records and including returns from all higher education institutions.

Outcome measures in the labour market are taken from **HM Revenue and Customs (HMRC)**. Employment spells, covering start and end dates, are identified from **P45** records and annual earnings, as collected via Pay As You Earn (PAYE), are available in the **P14** dataset<sup>7</sup>. Finally, information on benefits spells is provided by the **Department for Work and Pensions (DWP)**.

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<sup>7</sup> Employers are required to operate PAYE as part of their payroll unless none of their employees are paid £113 or more a week, get expenses and benefits, have another job or get a pension, see <https://www.gov.uk/pay-for-employers>. Although this may result in some individuals with very low earnings not appearing in the dataset in a given year, this is unlikely to have

These datasets can be combined via anonymous reference numbers, and collectively form the **Longitudinal Education Outcomes (LEO)** database. The analysis in this paper focuses on a cohort of learners completing compulsory schooling (Key Stage 4 (KS4), i.e. GCSEs) in 2002/03, and the robustness of the findings are checked utilising the cohorts immediately preceding and following this (i.e. KS4 leavers in 2001/02 and 2003/04 respectively).

#### 4. Methodology

The Individualised Learner Record provides qualification information at the aims level, meaning that a learner can have any given number of learning aims. In order to transform the data from the aim level to the learner level, individuals were classified according to their highest achievement or non-completion level. Hence, in what follows, the marginal returns are estimated rather than the average returns. In the case of drop-outs and non-achievers, individuals are only retained in this group if this is also their highest level of participation, and they have not achieved any other qualification at the same (or higher) level. This is to ensure that the earnings differentials are not confounded by returns to alternative qualifications achieved at the same level<sup>8</sup>.

Three potential counterfactual groups were considered:

- Non-achievers (i.e. drop-outs and those that complete the course but fail to achieve the qualification)<sup>9</sup>;
- Individuals with any qualification at the RQF level below (held as highest);
- Individuals with any vocational qualification at the RQF level below (held as highest).

The first phase of this paper involves a comparison of the characteristics of the treatment and each counterfactual group to determine whether one more closely resembles the treatment group in terms of observable characteristics. For each characteristic, such as KS2 maths test

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a significant impact (as PAYE records are required for all employees if any employee earns above the threshold or is in receipt of benefits etc.).

<sup>8</sup> This is also to ensure greater comparability across different counterfactuals.

<sup>9</sup> We also looked separately at drop-outs and those completing but failing to achieve, but the groups tend to be similar in characteristics and are generally too small to be considered independently.

score, t-tests are utilised to test whether the difference in the average between the treatment and each counterfactual group is statistically significant.

Secondly the analysis employs PSM techniques in order to investigate which counterfactual is selected as most preferable. PSM involves matching an individual from the treatment group with a similar individual (or individuals) from the counterfactual group on the basis of a propensity score (an indicator of the probability of being in the treatment group given a set of observable characteristics<sup>10</sup>). The method chosen here is nearest neighbour matching with replacement<sup>11</sup>, as not allowing replacement would result in treatment individuals matching with counterfactual individuals who are not necessarily their *nearest* neighbour.

In essence, both the level-below counterfactual group and the non-achievers counterfactual group will be pooled into one pooled counterfactual group<sup>12</sup>. If both level-below and non-achievers are equally suitable as comparators for the treatment group, then observations would be expected to match from each group in relation to their relative proportions in the pooled group (and the proportions pre-and-post match in each group will be roughly similar). However, if one counterfactual is preferable to the other, then the proportions matched from each group will differ and the over-represented group in the matched sample (as compared to the pooled counterfactual) indicates a preference for that group.

## 5. Comparing counterfactuals

### 5.1 Comparison of characteristics

The difference between the treatment group and each counterfactual group was tested for each qualification using t-tests of the difference in means for a variety of characteristics, and separately for men and women. In all cases, there are a large number of significant differences between the treatment and possible counterfactual groups, suggesting that none of these groups is an appropriate counterfactual without further refinement. However, it is important to note

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<sup>10</sup> Variables used for matching were KS2 maths score, KS2 English score, KS4 points score, time since left education, ethnicity, eligibility for Free School Meals (FSM), Special Education Needs (SEN) and Income Deprivation Affecting Children Index (IDACI score). One potential weakness is that almost all of these variables are school or childhood measures.

<sup>11</sup> Individuals in the treatment group are matched with the one individual from the counterfactual group who has the closest propensity score (within a caliper of 0.1), but the individual from the counterfactual group may be re-used. In other words, many individuals from the treatment group may match with the same individual from the counterfactual group.

<sup>12</sup> In general the non-achiever group is a subset of the level-below group, since many non-achievers have their highest level of achievement at the level below. However there are a number of cases where, non-achievers do not hold qualifications at the level below, so the overlap is only partial. Those who appear in both groups are classed as non-achievers.

that, due to the large sample sizes, the likelihood of finding a statistically significant difference is high, even when the magnitude of the difference itself is small.

Interestingly, in terms of differences in means, the most similar counterfactual group does not differ by gender, but it does vary both between and within levels. Mean values are shown in Table 2 for males and Table 3 for females. For Level 4 qualifications, the level-below counterfactual group (row 3) most closely represents the achiever group (row 1) for both men and women. For Level 3 qualifications, the most similar comparison group depends on the type of qualification undertaken: for NVQs and ‘Level 3 other vocational’ qualifications, the level-below group (row 11 and row 23 respectively) is the most comparable to the achiever group (row 9 and row 21 respectively), while for BTECs and ‘other full Level 3 vocational’ qualifications it is the non-achiever group (row 14 compared to row 13 for BTECS and row 18 compared to row 17 for other full Level 3 vocational) which displays the closest resemblance.

At Level 2, the level-below group is the closest comparator in all cases other than for GNVQs, where the non-achiever group (row 34) is most similar. NVQs at Level 1, as well as ‘other Level 1 vocational’ qualifications also most closely match the level-below group (row 51 and 63 respectively), while non-achievers prevail for GNVQs and BTECs (row 54 and 58 respectively). Finally, entry level qualifications, as well as apprenticeships at both Intermediate and Advanced level, can be best compared to the non-achiever group (rows 66, 26 and 6 respectively).

Interestingly, NVQs at all levels favour the level-below counterfactual group, while BTECs lean towards the non-achiever group in all cases other than at Level 2. Other than this, based solely on a comparison of means, there is no clear pattern in terms of which counterfactual group might most closely resemble the treatment group.

## *5.2 Propensity Score Matching and coarsened exact matching*

Results from the Propensity Score Matching exercise are displayed in Table 4<sup>13</sup>. For males, in almost all cases the non-achiever group (consisting of both those who dropped out from the qualification in question and those who completed but did not achieve the required pass) is over-represented in the matched group. This indicates that non-achievers are a preferable counterfactual group than the level-below group, although the degree of over-representation is

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<sup>13</sup> PSM using 1:1 nearest neighbour matching with replacement within a caliper of 0.1. Similar results were found during robustness checks not allowing for replacement.



typically relatively low (particularly considering that individuals were matched with replacement). The exception to this is for NVQs and GNVQs at Level 1, where the level-below group is slightly over-represented.

For females, the non-achiever group is preferred in roughly half of the cases, notably at Level 3 and above (with the exception of ‘Level 3 other vocational’ qualifications where there is no change in breakdown). The level-below group is slightly over-represented at Level 2 for GNVQs and BTECs, and for all Level 1 qualifications other than GNVQs.

Looking simply at the means of the possible counterfactual groups, the indication is that the level below group would provide a better comparison for many qualifications. However, in most cases for men, and higher level RQF cases for women, the non-achiever group stands out as preferable following the PSM exercise. It should be noted that the level below group is typically more heterogeneous as it also includes individuals with academic qualifications but no interaction with the FE system, while the group ‘level below – vocational only’ (restricting the attention to those with vocational qualifications at the lower level only) typically show the largest gap in terms of means of observable characteristics.

## **6. Earnings differentials using the different counterfactual groups**

In this section we present the earnings differentials using only ‘non-achievers’ as the counterfactual group and also the differentials obtained when using the counterfactual produced using PSM. These findings are also compared to the earnings differentials estimated using as the counterfactual individuals with their highest qualification at the level below of the RQF (as presented in Patrignani et al. (2017, CVER Discussion Paper 007)).

### Non-achievers

In Table 5 we present results using the ‘non-achievers’ counterfactual and the three different specifications: a **baseline specification** with basic controls only (ethnic background, time elapsed since the learner left education, and cohort dummies); an **augmented specification** including Key Stage 2 test scores and Key Stage 4 control variables (eligibility for Free School Meals, Special Education Needs status and IDACI score); and an **augmented-plus specification** that included a robustness check by adding in additional controls for academic qualifications achieved at the same or lower level (2+ A levels and 5 GCSEs A\*-C or A\*-G)

and controls for the secondary school attended. Estimated differentials are generally positive for both males and females at Levels 4, 3 and 2, while they drop to zero for Level 1 when controlling for GCSE results (augmented specification)<sup>14</sup>.

In particular, when looking at men who hold Level 4 or Level 3 qualifications, earnings differentials are positive across all specifications and are particularly high for Advanced Apprenticeships (20%), while they range between 5% and 10% for BTECs, NVQs and Level 4 qualifications (estimates refer to the ‘augmented plus’ specification). For women the estimates range between 5% (‘Level 3 other’) and 11% (Level 4 and BTECs) compared with the group enrolling in similar qualifications but failing to achieve. Furthermore, the earnings differentials associated with apprenticeships (both Advanced Apprenticeships and Intermediate Apprenticeships) are lower for women than for men. This is consistent with the findings from other CVER publications (see CVER Discussion papers 002, 007, 009 and 010).

For male individuals in possession of Level 2 qualifications, estimates range between 6% (‘other full Level 2 vocational’) and 11% (NVQs) and are in excess of 13% for Intermediate Apprenticeships. For females, the earnings differentials are particularly high for Level 2 NVQs (15%) and Level 2 BTECs (11%) and range between 6% and 9% for all other qualifications at Level 2.

For Level 1 qualifications, estimates are typically positive and large in the augmented specification, but turn insignificant once we control for GCSE results in the augmented-plus specification. Due to the peculiar characteristics of this group (high proportion having 5 GCSEs A\*-G and high incidence of SEN in the group without GCSEs), we will explore in further detail earnings differentials for individuals with Level 1 vocational qualifications in a separate briefing note.

### Propensity Score Matching

The estimated average treatment effects on the treated (ATT) from PSM (Table 6) are in line with the OLS estimates using the level below counterfactuals presented in CVER DP007 and confirm the presence of very large earnings differentials for men in possession of Level 4 qualifications and Advanced Apprenticeships, (in excess of 30%), NVQs at Level 3 (20%),

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<sup>14</sup> These findings for Level 1 vocational qualifications are consistent with the evidence presented in CVER DP007, and we will explore in more detail the differentials for the Level 1 group in a separate briefing note.

Intermediate Apprenticeships and NVQs at Level 2 (15%)<sup>15</sup>. On the other hand, estimated ATTs turn negative for BTECs and ‘other vocational qualifications’ at Level 3.

For females, the ATTs are also quite large for Level 4 vocational qualifications (24%), Advanced Apprenticeships (14%), Intermediate Apprenticeships and BTECs and GNVQs at Level 2 (9%-10%) and are also positive for the other qualifications at Levels 2 and 3 (although occasionally not statistically significant).

In Table 6 we also report a series of robustness checks for the matching approach: we also implemented the PSM without replacement (so that each observation in the counterfactual group may only be selected once), entered the independent variables in discrete form (according to quintiles) and ran a Coarsened Exact Matching algorithm<sup>16</sup>. All ATTs from the other specifications are in line with the ATTs discussed for the main specification (PSM with replacement based on independent variables entered in continuous form, columns 1 and 6).

#### Comparing earnings differentials using different counterfactual groups

Table 7 compares the estimated earnings differentials across four different groups:

- Estimates using the ‘level below-all’ qualifications counterfactual;
- Estimates using the ‘level below-vocational’ qualifications counterfactual;
- Estimates using the ‘non-achievers’ counterfactual;
- Estimated ATTs from the PSM exercise;

The table reports the raw regression coefficient and refers to the ‘augmented-plus’ specification, while in the text we refer to the percentage differentials<sup>17</sup>.

For males, the estimates using ‘non-achievers’ as the counterfactual group are (often considerably) lower than the level below estimates for Level 4 vocational (dropping from 36% to 9%), Advanced Apprenticeships (from 38% to 20%)<sup>18</sup>, NVQs at Level 3 and 2 (18% to 8%

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<sup>15</sup> Results refer to the first and sixth column of Table 6.

<sup>16</sup> The Coarsened Exact Matching method is described in Blackwell et al. (2009) and is based on three steps: Temporarily coarsen each control variable in X (the vector of pre-treatment control variables), for the purposes of matching; sort all units into strata, each of which has the same values of the coarsened X; prune from the data set the units in any stratum that do not include at least one treated and one control unit.

<sup>17</sup> Calculated as  $\exp(\beta)-1$ .

<sup>18</sup> For Advanced Apprenticeships, the estimates using non-achievers and Intermediate Apprenticeships are considerably closer than when using the ‘level below-all’ counterfactual.

and 15% to 11% respectively), Intermediate Apprenticeships (21% to 13%) and also ‘other vocational qualifications’ at Levels 3 and 2, while they are larger for BTECs at Levels 3 and 2 (moving from nil to 5% and 7% respectively).

For females the picture is more varied as the ‘non-achievers’ differentials are below the other estimates for a number of qualifications (e.g. Level 4 vocational, Advanced Apprenticeships and BTECs at Levels 3 and 2, etc.) but in line with or even larger than the other estimates for some qualifications (e.g. NVQs at Levels 3 and 2, Intermediate Apprenticeships etc.). In addition, the difference in the estimates is not as large as it is for males.

## **7. Conclusions**

Differences in the existing estimates of the returns to vocational qualifications arise for three main reasons. Firstly there are differences in the counterfactuals used, typically from a choice of either achievers compared to non-achievers, or achievers compared to those whose highest achievement is at the level below. Secondly, there are also fundamental differences in the dataset used. This choice of data affects whether the dependent variable is specified as a measure of wages or earnings, and also affects the availability of observable covariates which can be controlled for. Finally, there are differences in the unobservable characteristics, and thus the bias, which cannot be accounted for in any study (including this one).

This paper compares different counterfactuals while holding the dataset constant (using administrative data only, and so looking at earnings differentials with relatively few covariates on personal and job characteristics). In the first stage of the analysis we compared the relative weight of the ‘level below’ and ‘non-achievers’ group in the counterfactual group before and after running a Propensity Score Matching approach. This exercise indicates that the non-achiever group is generally overrepresented (i.e. relatively favoured based on observable characteristics) for qualifications at Level 2 and above, and this is true irrespective of gender. In particular, a substantial difference is observed for BTECs at Level 3, as well as for NVQs at Level 2, and apprenticeships at both levels (Intermediate and Advanced). Changes in composition of the pooled control group between that pre- and post-matching are limited for the remainder of the qualifications.

In the second stage we estimated earnings differentials using different counterfactuals and found that the estimates of earnings differentials after Propensity Score Matching are, on

average, closer to the level-below counterfactual estimates rather than the non-achievers counterfactual estimates. This is due to the fact that the ‘non-achiever’ group is quite small for some of the qualification aims, meaning that they still represent a small share of the matched counterfactual used in the PSM ATT calculations. Earnings estimates using the non-achiever group are generally smaller than estimates using learners with qualifications at the level below.

It is likely the case that the choice of counterfactual should be tailored to suit the research question of interest and the type of data available. In fact, different groups are likely to be affected by different unobservable biases, such as innate ability, motivation, and propensity to choose the vocational route. For example, the ‘level below – all’ group also includes individuals not engaging at all in further education (i.e. it does not take into account self-selection into the vocational route), while the ‘level below – vocational’ group is likely to be formed of individuals with lower ability and/or motivation. On the other end, the approach using ‘non-achievers’ group takes into account self-selection to the extent possible, but does not explain why some individuals enrol in vocational courses but fail to achieve, e.g. they are less able/motivated, they experience a negative (e.g. illness) or positive shock (receive a suitable job offer).

It is important to note that this exercise only focuses on optimality regarding observable characteristics; unobservables are still an issue since the counterfactuals will differ in these factors. Additionally, it remains difficult to compare these estimates with survey-based estimates due to differences in both the datasets used as well as any unobservable characteristics.

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## Tables and Figures

**Table 1: Summary of the literature**

Reference	Method		Results					Data		Earnings measure
	Counterfactual	M/A	< Level 2	Level 2	Level 3	Level 4+	App	Data	Period	
<b>Robinson (1997)</b>	No qualifications at all	M	GCSE < C: 17-21pp RSA: 8pp C&G: 5-9pp Other: 19-20pp	GCSE: 35-38pp RSA: 28pp C&G: 21-27pp	A-level: 55-57pp BTEC: 43-45pp RSA: 35pp C&G: 26-31pp	HE Dip: 45-67pp HNC/D: 54-58pp RSA: 44pp Other: 51-59pp	17-25pp	LFS	1993-1995	20 years PC
<b>Dearden et al (2000)</b>	No qualifications at all	A	-	-	RSA L2/3: (-20.6%) C&G: 4.1% ONC/TEC/BEC: 7-8%	-	-	NCDS	1965, 1969, 1974, 1981, 1991	Age 33
			-	-	C&G: 35.6%	HNC/HND: 22.2%	(-49.6%)	IALS	1995	1994
			NVQ: (-11.1) - (-8.7)% RSA: (-9.5) - 1.6%	NVQ: (-7.4) - (-5.7)% C&G: 6.9%	NVQ3-5: 5.4-5.9% RSA: 11.9% C&G: 6.9% ONC/OND: 7.8-9.6%	HNC/HND: 9.1-15.0%	-	LFS	1998	1998
		M	NVQ: 4.5%		NVQ: 6-9%	NVQ L4: 13.1-13.8%; L5: 18.9-23.7%		NCDS	1965, 1969, 1974, 1981, 1991	Age 33
			NVQ: 21.3%	NVQ: 38%	NVQ: 26.1-33.3%	NVQ L4: 47.4-58.6%; L5: 61.1-65.4%	(-43.1%)	IALS	1995	1994
			NVQ: 11.3-11.9%	NVQ: 19.4-22.4%	NVQ: 32.5-35.8%	NVQ L4: 55.6-59.4%; L5: 79.0-89.1%	12.6%	LFS	1998	1998
<b>Conlon (2001)</b>	No qualifications at all	M	5.2%	16.4%	27.9%	41.4- 45.4%	-	LFS	1993-1998	Overall
			-	8.4%	14.2%	28%	-	NCDS	1991	Age 33 (M)
<b>Dearden et al. (2004)</b>	Not that qualification	A	NVQ:(-13.1)% C&G: (-5.3)%	NVQ:(-8.5%)-(-7.4%) C&G:(-6.9%) RSA: (-13.8%) - 5.7%	ONC/OND: 7.1-8.9% C&G:6.8%	HE DIP: 5.4-7.9% HNC/HND: 6.8%	10.1%	BCS70	1970-2000	Age 30
	No qualifications at all	M	-	NVQ: 3-5%	-	-	-	BCS70	1970-2000	Age 30
			-	NVQ: (-0.2%) - 3.3%	-	-	-	LFS	1996-2002	All



Reference	Method		Results					Data		Earnings measure
	Counterfactual	M/A	< Level 2	Level 2	Level 3	Level 4+	App	Data	Period	
	All levels below		-	NVQ: (-4.4%) - (-6.3%)	-	-	-	BCS70	1970-2000	2000 (age 30)
			-	NVQ: (-0.8%) - (-5.4%)	-	-	-	LFS	1996-2002	All
<b>McIntosh (2004a)</b>	No qualifications at all	A	NVQ: (-8.3%)- (-7.6%) RSA: 0 - 10.6%	NVQ: (-7.4%) - (-5.8%) C&G: 0 - 6.7%	NVQ3-5: 6.9 - 8.1% ONC/D: 11.5-16.1% C&G: 6.0 - 7.4% RSA: 0 - 12.1%	HND/HNC: 23.5-30.1%	(-3.8%)-5.7%	LFS	1993-2002	All
<b>McIntosh (2004b)</b>	No qualifications at all	M	-	-	-	37.5-47.6%	-	LFS	1996, 1999, 2002	Ages 23-25
<b>McIntosh (2004c)</b>	Not that qualification	A	-	-	-	-	5-7%	LFS	1996-2002	All
<b>Dickerson (2005)</b>	No qualifications at all	A	(-3.9) - (-2.1)%	(-4.6) - (-3.2)%	2.6-5.8%	L4: 13.7-18.1% L5: 22.0-25.8%	-	LFS	2000-2004	All
	No qualifications at all	A	NVQ: (-7.4)% C&G: (-2.7)%	NVQ: (-7.2)% BTEC: 3.7 - 4.3%	C&G: 3.6% ONC/OND: 9.4% RSA: 5.9% BTEC: 7.7% GNVQ/GSVQ: 2.8%	Voc. degree: 45.1% NVQ L4: 11.74%; L5: 14.5% BTEC: 6.8% HNC/HND: 12.9%	All: 7.8% MA: 6.0% FA: 9.2%	LFS	1997-2006	All
<b>Greenwood et al. (2006)</b>	All levels below	M	-	BTEC: 13.3% C&G: 6.8% RSA: 16.1% NVQ/SVQ: 1.9%	BTEC: 17.5% C&G: 17.5% GNVQ/GSVQ: 6.8% RSA: 16.4% NVQ/SVQ: 11.4% ONC/OND: 25.5%	-	L3: 11.6%	LFS	1997-2006	All
	No qualifications at all	M	-	C&G: 7.0% RSA: 19.6% NVQ/SVQ: 3.7%	-	-	L2: 45.1%	LFS	1997-2006	All
<b>McIntosh (2007)</b>	1 Level below	M	-	-	NVQ: 1.9%	-	L3: 18%	LFS	1996-2005	2004/2005
	All levels below	M	-	NVQ: (-6.6%)	-	-	L2: 16%	LFS	1996-2005	2004/2005
<b>London Economics (2010)</b>	No qualifications at all	M	RSA: 17.9% C&G: 9.1% BTEC: 16.9%	RSA: 38.4% C&G: 15.6% BTEC: 13.1%	RSA: 33.5% C&G: 24.6%	-	-	LFS	1996-2009	All

Reference	Method		Results					Data		Earnings measure
	Counterfactual	M/A	< Level 2	Level 2	Level 3	Level 4+	App	Data	Period	
			NVQ: 0%	NVQ: 0%	BTEC: 34.2% NVQ: 15.1%					
	1 Level below	M	-	RSA: 18.5% C&G: 9.2% BTEC: 7.8% NVQ: 1.5%	RSA: 9.7% C&G: 11.7% BTEC: 14.3% NVQ: 4.6%	-	-	LFS	1996-2009	All
	Not that qualification	A	RSA: 3.0% C&G: 0% BTEC: 4.2% NVQ: (-6.0%)	RSA: 6.9% C&G: 4.3% BTEC: 4.4% NVQ: (-5.1%)	RSA: 8.4% C&G: 11.1% BTEC: 13.8% NVQ: (-6.0%)	-	AMA: 13.3% FMA: 7.9% TA(3): 6.7% TA(2): 4.2%	LFS	1996-2009	All
London Economics (2011a)	1 Level below	M	-	BTEC: 12% RSA: 16% NVQ: 1%	BTEC: 20% RSA: 16% NVQ: 10%	-	AMA: 13% FMA: 8%	LFS	1996-2009	All
		A	RSA: 3.0% BTEC: 4.2% NVQ: (-6.0)%	RSA: 6.9% C&G: 4.3% BTEC: 4.4% NVQ L2: (-5.1)%	RSA: 8.4% C&G: 11.1% BTEC: 13.8% NVQ: 4.6%	-	-	LFS	1996-2009	All
		A	-	NVQ: (-5.9)% (2000)	BTEC: 9.7% (2004)	-	Trade app: 9.4% (2000); 9.3% (2004)	BCS70	1970-2004	Age 30 (2000) and 34 (2004)
London Economics (2011b)	1 Level below	M	-	All: (-4.3)-1.4% NVQ: (-2.3)-0% BTEC: (-26.6)-0% C&G: 8.3-14.0%	All: (-0.03)-9.3% NVQ: 0-11.4% BTEC: 6.9-10.6% C&G: 19.7-34%	19.5-28.9%	AMA 23.2-30.1%	ILR: 2002/03-2005/06; HMRC: 2003/04-2009/10		1-7 years PC
	Before/after	M	20.0-30.0%	All: 25.0-36.6% NVQ: 25.4-41.6% BTEC: 41.3-60.0% C&G: 30.0-46.5%	All: 34.4-39.8% NVQ: 43.9-52.5% BTEC: 83.9-91.6% C&G: 42.9-63.1%	47.4-58.1%	-	ILR: 2002/03-2005/06; HMRC: 2003/04-2009/10		2-4 years PC
	Non-completers	M	1.9-3.1%	All: (-0.9)-5.7% NVQ: 5.2-14.0% BTEC: (-15.0%)-11.4% C&G: 0-7.8%	All: (-1.3)-7.6% NVQ: (-3.1)-14.3% BTEC: (-11.7)-10.3% C&G: 4.4-7.8%	11.3-34.6%	AMA: 19.1-25.4% FMA: 12.0-24.1%	ILR: 2002/03-2005/06; HMRC: 2003/04-2009/10		1-7 years PC

Reference	Method		Results					Data		Earnings measure
	Counterfactual	M/A	< Level 2	Level 2	Level 3	Level 4+	App	Data	Period	
<b>BMG and IES (2013a)</b>	No qualifications at all	Marginal	-	10%	21%	36%	25%	APS	2011-2012	Ages 22-25
<b>BMG and IES (2013b)</b>	Non-completers	A	Entry Level: 0-21% (age 19-24); 0-3% (age 25+) Level 1: 5-11% (age 19-24); 2-3% (age 25+)	-	-	-	-	ILR: 2005/06; HMRC: 2007/08-2010/11		1-4 years PC
<b>Buscha and Urwin (2013)</b>	Non-completers	M	4.7-5.6%	1.5-2.1% FL2: 14.3-18.5%	1.9-5.4% FL3: 5.3-11.1%	6.0-6.7%	-	ILR-HMRC 2002-2011		1-4 years PC
<b>London Economics (2013)</b>	Non-completers	M	2.7-4.0%	2.3-5.0% NVQ: 7.5-12% BTEC: 0-22.3% C&G: 2.6-7.7%	0-6.5% NVQ: 2.8-15% BTEC: 0-15.0% C&G: 0-6.1%	3.9-11.9%	-	ILR: 2002/03-2005/06; HMRC: 2003/04-2009/10		1-7 years PC
<b>Bibby et al (2014)</b>	Non-completers	Marginal	1.9%	1.3% FL2: 11.3%	3.3% FL3: 8.5%	8.4%	-	ILR: 2002-2011; HMRC: 2004/05-2011/12		1,3,4,5 years PV
<b>McIntosh and Morris (2016)</b>	Not that qualification	A	BTEC: 2.3% C&G: (-3.0%)	BTEC: 1.3% NVQ: (-7.4%)	BTEC: 6.9% RSA: 2.9% C&G: 5.1% NVQ: (-1.2%) GNVQ: 3.5%	BTEC HNC/D: 13.2% RSA: 5.0% NVQ L5: 9.7%; L4: 9.0%	9.0%	LFS	1997-2015	All
	No qualifications at all	M	BTEC: 18.8% C&G: 4.2%	BTEC: 19.0% RSA: 19.2% C&G: 11.5% NVQ: 5.4% GNVQ: 14.8%	BTEC/ONC/D: 39.3% RSA: 27.8% C&G: 30.3% NVQ: 26.1% GNVQ: 35.5%	BTEC/HNC/D: 57.6% RSA: 34.2% NVQ L5: 49.9%; L4: 50.4%	22.0%	LFS	1997-2015	All
	Level below (and vocational only in [ ])	M	-	BTEC: 7.8% [8.3%] RSA: 10.8% [12.1%] C&G: 2.5% [5.9%] NVQ: -4.7% [(-3.4%)]	BTEC: 24.0% [28.9%] RSA: 19.4% [24.2%] C&G: 17.0% [20.2%] NVQ: 12.7% [17.4%] GNVQ: 18.4% [23.7%]	BTEC: 14.0% [19.3%] RSA: 38.3% [7.0%] NVQ L5: 9.9% [15.4%] L4: 10.7% [16.7%]	-	LFS	1997-2015	All

Reference	Method		Results					Data		Earnings measure
	Counterfactual	M/A	< Level 2	Level 2	Level 3	Level 4+	App	Data	Period	
<b>Patrignani et al. (2017)</b>	Level below (and vocational only in [ ] )	M	BTEC: 0-8% [0-9%] NVQ: 9-10% [10-12%] GNVQ: 5-20% [8-20%] L1 other: 7-13% [9-11%] 5 GCSEs A*-G: 14-23% [12-23%] Entry: -6-0%	BTEC: 0-10% [3-18%] NVQ: 9-16% [15-20%] GNVQ: 3-13% [6-19%] Other FL2: 7-9% [12-13%] L2 other: 0-4% [3-9%] 5 GCSEs A*-C: 14-25% [13-23%]	BTEC: 2-17% [3-21%] NVQ: 11-19% [14-20%] Other FL3: 7-11% [8-15%] L3 other: 7-12% [9-16%] 2+ A levels: 11-31% [8-20%] 1 A level: 5-17% [0%]	All: 26-37% [33-38%]	Adv app: 21-40% [15-25%] Int app: 12-22% [19-28%]	ILR: 2002-2015; HMRC: 2012/13 – 2013/15	Age 26	
	1 level below									
	All Levels below									
	Before and After									
	Non Completers									
	No Qualifications at all									
	Not that Qualification									

Note: M=Marginal; A=Average; FA: Foundation Apprenticeship; MA Modern Apprenticeship; AMA Advanced Modern Apprenticeship; FMA Foundation Modern Apprenticeship

PC Post completion; FL Full Level

**Table 2: Descriptive statistics - males**

			English KS2 Test Scores	Maths KS2 Test Scores	% 5 GCSEs A*-C	Number of GCSEs A*-C	% 5 GCSEs A*-G	Number of GCSEs A*-G	KS4 points (old classification)	% white British	% eligible for FSM	% with SEN (any type)	IDACI score	N
<b>1</b>		<b>Achievers</b>	58.7	63.8	78%	6.8	99%	9.8	48.9	93%	6%	8%	0.16	8,249
<b>2</b>	<b>Level 4</b>	<b>Non-achievers</b>	56.3	59.7	59%	5.3	97%	9.4	42.4	88%	10%	12%	0.19	6,147
<b>3</b>	<b>vocational</b>	<b>Level below</b>	57.4	60.3	67%	6.1	98%	9.7	45.8	85%	10%	12%	0.19	132,511
<b>4</b>		<b>Level below (vocational)</b>	52.7	55.2	48%	4.5	97%	9.5	39.4	85%	11%	17%	0.20	43,164
<b>5</b>		<b>Achievers</b>	53.3	57.5	47%	4.4	98%	9.2	40.1	96%	6%	13%	0.17	45,650
<b>6</b>	<b>Advanced</b>	<b>Non-achievers</b>	51.4	53.5	30%	3.1	94%	8.6	33.9	94%	10%	18%	0.20	22,772
<b>7</b>	<b>Apprenticeship</b>	<b>Level below</b>	49.4	51.1	36%	3.0	88%	8.2	31.2	86%	17%	26%	0.24	118,977
<b>8</b>		<b>Level below (vocational)</b>	48.0	50.0	19%	2.2	91%	8.2	29.9	95%	12%	23%	0.22	46,614
<b>9</b>		<b>Achievers</b>	49.3	52.5	35%	3.5	94%	8.7	35.5	91%	11%	23%	0.21	6,126
<b>10</b>	<b>NVQ level 3</b>	<b>Non-achievers</b>	47.2	47.7	18%	2.1	88%	7.9	28.3	88%	15%	27%	0.23	2,875
<b>11</b>		<b>Level below</b>	49.4	51.1	36%	3.0	88%	8.2	31.2	86%	17%	26%	0.24	118,977
<b>12</b>		<b>Level below (vocational)</b>	44.6	45.4	7%	1.3	82%	7.4	24.0	85%	20%	33%	0.26	82,554
<b>13</b>		<b>Achievers</b>	53.0	56.6	50%	4.6	97%	9.7	39.9	84%	12%	16%	0.20	31,106
<b>14</b>	<b>BTEC level 3</b>	<b>Non-achievers</b>	52.6	56.6	35%	3.5	95%	9.1	35.4	82%	16%	18%	0.22	16,207
<b>15</b>		<b>Level below</b>	49.4	51.1	36%	3.0	88%	8.2	31.2	86%	17%	26%	0.24	118,977
<b>16</b>		<b>Level below (vocational)</b>	44.6	45.4	7%	1.3	82%	7.4	24.0	85%	20%	33%	0.26	82,554
<b>17</b>		<b>Achievers</b>	54.6	50.7	53%	4.9	97%	9.2	40.8	90%	10%	14%	0.18	5,932
<b>18</b>	<b>Other full level</b>	<b>Non-achievers</b>	53.5	50.7	35%	3.5	95%	8.7	36.2	89%	13%	19%	0.21	7,635
<b>19</b>	<b>3 vocational</b>	<b>Level below</b>	49.4	51.1	36%	3.0	88%	8.2	31.2	86%	17%	26%	0.24	118,977
<b>20</b>		<b>Level below (vocational)</b>	44.6	45.4	7%	1.3	82%	7.4	24.0	85%	20%	33%	0.26	82,554
<b>21</b>		<b>Achievers</b>	50.7	52.5	35%	3.4	93%	8.9	34.7	84%	14%	21%	0.22	17,236
<b>22</b>	<b>Level 3 other</b>	<b>Non-achievers</b>	47.3	47.5	14%	1.9	88%	8.0	27.7	83%	18%	28%	0.24	7,948
<b>23</b>	<b>vocational</b>	<b>Level below</b>	49.4	51.1	36%	3.0	88%	8.2	31.2	86%	17%	26%	0.24	118,977
<b>24</b>		<b>Level below (vocational)</b>	44.6	45.4	7%	1.3	82%	7.4	24.0	85%	20%	33%	0.26	82,554
<b>25</b>		<b>Achievers</b>	48.0	50.0	19%	2.2	91%	8.2	29.9	95%	12%	23%	0.22	46,614
<b>26</b>	<b>Intermediate</b>	<b>Non-achievers</b>	45.0	45.2	7%	1.1	81%	7.0	22.5	93%	17%	33%	0.24	31,088
<b>27</b>	<b>Apprenticeship</b>	<b>Level below</b>	44.1	43.7	0%	0.9	89%	7.2	22.5	87%	20%	34%	0.25	143,001
<b>28</b>		<b>Level below (vocational)</b>	39.5	38.8	0%	0.5	64%	5.5	15.8	84%	27%	48%	0.29	43,206
<b>29</b>		<b>Achievers</b>	44.4	45.5	12%	1.5	82%	7.3	24.4	91%	18%	33%	0.26	27,876
<b>30</b>	<b>NVQ level 2</b>	<b>Non-achievers</b>	41.4	40.6	0%	0.5	70%	6.0	17.3	89%	23%	43%	0.27	8,709
<b>31</b>		<b>Level below</b>	44.1	43.7	0%	0.9	89%	7.2	22.5	87%	20%	34%	0.25	143,001

32		Level below (vocational)	39.5	38.8	0%	0.5	64%	5.5	15.8	84%	27%	48%	0.29	43,206
33	GNVQ level 2	Achievers	47.2	44.5	8%	1.7	95%	9.3	28.7	72%	21%	25%	0.25	6,875
34		Non-achievers	46.6	43.4	0%	0.8	88%	7.7	23.8	64%	27%	30%	0.28	3,377
35		Level below	44.1	43.7	0%	0.9	89%	7.2	22.5	87%	20%	34%	0.25	143,001
36		Level below (vocational)	39.5	38.8	0%	0.5	64%	5.5	15.8	84%	27%	48%	0.29	43,206
37	BTEC level 2	Achievers	44.0	46.4	6%	1.3	86%	8.0	24.4	76%	21%	35%	0.25	7,809
38		Non-achievers	44.1	46.6	0%	0.7	78%	6.8	19.9	74%	25%	38%	0.27	3,142
39		Level below	44.1	43.7	0%	0.9	89%	7.2	22.5	87%	20%	34%	0.25	143,001
40		Level below (vocational)	39.5	38.8	0%	0.5	64%	5.5	15.8	84%	27%	48%	0.29	43,206
41	Other full Level 2 vocational	Achievers	45.3	47.3	12%	1.6	88%	7.9	26.9	86%	19%	29%	0.24	13,203
42		Non-achievers	42.8	43.5	0%	0.6	76%	6.5	19.5	85%	22%	39%	0.27	7,645
45		Level below	44.1	43.7	0%	0.9	89%	7.2	22.5	87%	20%	34%	0.25	143,001
44		Level below (vocational)	39.5	38.8	0%	0.5	64%	5.5	15.8	84%	27%	48%	0.29	43,206
45	Level 2 other vocational	Achievers	44.1	44.2	0%	0.8	75%	6.6	20.7	85%	23%	37%	0.27	26,791
46		Non-achievers	40.8	39.4	0%	0.5	63%	5.5	15.6	83%	27%	47%	0.28	10,528
47		Level below	44.1	43.7	0%	0.9	89%	7.2	22.5	87%	20%	34%	0.25	143,001
48		Level below (vocational)	39.5	38.8	0%	0.5	64%	5.5	15.8	84%	27%	48%	0.29	43,206
49	NVQ level 1	Achievers	37.7	35.8	0%	0.4	66%	5.7	15.9	88%	26%	52%	0.28	4,574
50		Non-achievers	33.1	30.5	0%	0.1	0%	1.6	3.3	87%	35%	74%	0.34	1,598
51		Level below	35.1	34.4	0%	0.1	0%	1.4	3.1	87%	32%	67%	0.31	50,892
52		Level below (vocational)	30.7	28.6	0%	0.0	0%	1.2	2.5	84%	36%	77%	0.32	15,257
53	GNVQ level 1	Achievers	38.7	35.4	0%	0.3	77%	6.5	16.5	62%	31%	47%	0.30	2,329
54		Non-achievers	35.9	33.6	0%	0.1	0%	2.0	4.2	57%	38%	60%	0.34	474
55		Level below	35.1	34.4	0%	0.1	0%	1.4	3.1	87%	32%	67%	0.31	50,892
56		Level below (vocational)	30.7	28.6	0%	0.0	0%	1.2	2.5	84%	36%	77%	0.32	15,257
57	BTEC level 1	Achievers	32.6	29.7	0%	0.3	53%	4.6	11.0	68%	31%	66%	0.29	856
58		Non-achievers	30.0	29.8	0%	0.0	0%	1.4	2.7	64%	49%	70%	0.39	173
59		Level below	35.1	34.4	0%	0.1	0%	1.4	3.1	87%	32%	67%	0.31	50,892
60		Level below (vocational)	30.7	28.6	0%	0.0	0%	1.2	2.5	84%	36%	77%	0.32	15,257
61	Other level 1 vocational	Achievers	40.0	39.7	0%	0.5	63%	5.5	15.9	85%	27%	47%	0.29	35,447
62		Non-achievers	33.0	32.2	0%	0.0	0%	1.3	2.6	84%	36%	72%	0.33	5,425
63		Level below	35.1	34.4	0%	0.1	0%	1.4	3.1	87%	32%	67%	0.31	50,892
64		Level below (vocational)	30.7	28.6	0%	0.0	0%	1.2	2.5	84%	36%	77%	0.32	15,257
65	Entry/Other Level	Achievers	30.7	28.6	0%	0.0	0%	1.2	2.5	84%	36%	77%	0.32	15,257
66		Non-achievers	33.8	33.6	0%	0.0	0%	1.2	2.4	87%	37%	71%	0.34	4,798
67		Level below	36.9	36.7	0%	0.1	0%	1.5	3.4	88%	30%	63%	0.30	35,635
68		Level below (vocational)	na	na	na	na	na	na	na	na	na	na	na	Na

**Table 3: Descriptive statistics - females**

			English KS2 Test Scores	Maths KS2 Test Scores	% 5 GCSEs A*-C	Number of GCSEs A*-C	% 5 GCSEs A*-G	Number of GCSEs A*-G	KS4 points (old classification)	% white British	% eligible for FSM	% with SEN (any type)	IDACI score	N
<b>1</b>		<b>Achievers</b>	62.4	60.4	77%	7.2	99%	9.8	50.9	91%	8%	5%	0.18	5,341
<b>2</b>	<b>Level 4</b>	<b>Non-achievers</b>	59.4	55.4	57%	5.4	96%	9.3	42.9	87%	12%	9%	0.22	4,489
<b>3</b>	<b>vocational</b>	<b>Level below</b>	59.8	55.4	66%	6.2	98%	9.7	46.5	87%	11%	8%	0.20	142,766
<b>4</b>		<b>Level below (vocational)</b>	55.3	50.7	49%	4.7	97%	9.5	40.9	89%	13%	11%	0.21	56,735
<b>5</b>		<b>Achievers</b>	57.2	53.0	48%	4.7	98%	9.3	41.4	94%	10%	8%	0.20	24,168
<b>6</b>	<b>Advanced</b>	<b>Non-achievers</b>	54.3	48.7	33%	3.5	94%	8.8	35.6	93%	13%	13%	0.23	17,508
<b>7</b>	<b>Apprenticeship</b>	<b>Level below</b>	53.7	48.2	41%	3.6	91%	8.6	34.6	88%	19%	17%	0.25	90,063
<b>8</b>		<b>Level below (vocational)</b>	52.6	47.1	24%	2.7	93%	8.5	32.6	94%	14%	14%	0.23	39,571
<b>9</b>		<b>Achievers</b>	53.8	48.9	38%	3.8	96%	9.1	37.7	91%	13%	12%	0.21	21,079
<b>10</b>	<b>NVQ level 3</b>	<b>Non-achievers</b>	51.4	44.4	19%	2.3	91%	8.3	30.8	90%	18%	18%	0.25	5,367
<b>11</b>		<b>Level below</b>	53.7	48.2	41%	3.6	91%	8.6	34.6	88%	19%	17%	0.25	90,063
<b>12</b>		<b>Level below (vocational)</b>	48.2	41.7	9%	1.6	86%	7.9	26.6	87%	23%	24%	0.27	58,143
<b>13</b>		<b>Achievers</b>	56.3	53.5	56%	5.3	98%	9.8	42.7	86%	13%	10%	0.21	24,120
<b>14</b>	<b>BTEC level 3</b>	<b>Non-achievers</b>	55.3	52.8	39%	3.9	96%	9.2	37.2	85%	18%	13%	0.24	9,896
<b>15</b>		<b>Level below</b>	53.7	48.2	41%	3.6	91%	8.6	34.6	88%	19%	17%	0.25	90,063
<b>16</b>		<b>Level below (vocational)</b>	48.2	41.7	9%	1.6	86%	7.9	26.6	87%	23%	24%	0.27	58,143
<b>17</b>		<b>Achievers</b>	56.0	48.2	54%	5.1	99%	9.6	42.8	90%	12%	9%	0.21	11,536
<b>18</b>	<b>Other full level</b>	<b>Non-achievers</b>	56.7	48.0	39%	3.9	96%	8.9	38.2	91%	17%	11%	0.23	7,712
<b>19</b>	<b>3 vocational</b>	<b>Level below</b>	53.7	48.2	41%	3.6	91%	8.6	34.6	88%	19%	17%	0.25	90,063
<b>20</b>		<b>Level below (vocational)</b>	48.2	41.7	9%	1.6	86%	7.9	26.6	87%	23%	24%	0.27	58,143
<b>21</b>		<b>Achievers</b>	55.4	49.1	42%	4.1	95%	9.1	38.0	87%	14%	12%	0.22	16,452
<b>22</b>	<b>Level 3 other</b>	<b>Non-achievers</b>	51.4	44.1	18%	2.3	88%	8.0	29.4	88%	20%	19%	0.25	6,361
<b>23</b>	<b>vocational</b>	<b>Level below</b>	53.7	48.2	41%	3.6	91%	8.6	34.6	88%	19%	17%	0.25	90,063
<b>24</b>		<b>Level below (vocational)</b>	42.7	35.7	0%	0.6	68%	5.9	17.4	86%	30%	38%	0.31	26,040
<b>25</b>		<b>Achievers</b>	52.6	47.1	24%	2.7	93%	8.5	32.6	94%	14%	14%	0.23	39,571
<b>26</b>	<b>Intermediate</b>	<b>Non-achievers</b>	49.1	42.1	10%	1.4	83%	7.3	24.5	93%	21%	22%	0.27	24,637
<b>27</b>	<b>Apprenticeship</b>	<b>Level below</b>	47.6	40.3	0%	1.1	91%	7.5	24.1	87%	25%	25%	0.28	91,245
<b>28</b>		<b>Level below (vocational)</b>	42.7	35.7	0%	0.6	68%	5.9	17.4	86%	30%	38%	0.31	26,040
<b>29</b>		<b>Achievers</b>	48.8	42.8	16%	2.0	88%	7.9	28.1	90%	20%	22%	0.26	23,972
<b>30</b>	<b>NVQ level 2</b>	<b>Non-achievers</b>	45.4	37.8	0%	0.7	75%	6.4	19.3	89%	28%	31%	0.30	8,793
<b>31</b>		<b>Level below</b>	47.6	40.3	0%	1.1	91%	7.5	24.1	87%	25%	25%	0.28	91,245

32		Level below (vocational)	42.7	35.7	0%	0.6	68%	5.9	17.4	86%	30%	38%	0.31	26,040
33	GNVQ level 2	Achievers	49.8	41.2	8%	1.8	94%	9.2	29.5	77%	23%	19%	0.28	5,320
34		Non-achievers	49.4	40.5	0%	1.0	88%	7.6	24.3	76%	28%	24%	0.30	2,169
35		Level below	47.6	40.3	0%	1.1	91%	7.5	24.1	87%	25%	25%	0.28	91,245
36		Level below (vocational)	42.7	35.7	0%	0.6	68%	5.9	17.4	86%	30%	38%	0.31	26,040
37	BTEC level 2	Achievers	46.3	42.9	8%	1.5	87%	8.1	25.3	80%	25%	27%	0.27	5,362
38		Non-achievers	45.7	42.7	0%	0.7	76%	6.8	20.1	81%	30%	29%	0.31	1,848
39		Level below	47.6	40.3	0%	1.1	91%	7.5	24.1	87%	25%	25%	0.28	91,245
40		Level below (vocational)	42.7	35.7	0%	0.6	68%	5.9	17.4	86%	30%	38%	0.31	26,040
41	Other full Level 2 vocational	Achievers	47.4	40.2	9%	1.6	92%	8.4	28.3	88%	22%	23%	0.26	7,616
42		Non-achievers	45.4	37.7	0%	0.7	79%	6.8	20.8	87%	29%	31%	0.29	3,311
43		Level below	47.6	40.3	0%	1.1	91%	7.5	24.1	87%	25%	25%	0.28	91,245
44		Level below (vocational)	42.7	35.7	0%	0.6	68%	5.9	17.4	86%	30%	38%	0.31	26,040
45	Level 2 other vocational	Achievers	48.0	40.6	0%	1.1	78%	7.0	22.9	87%	25%	27%	0.28	15,873
46		Non-achievers	44.6	36.9	0%	0.6	64%	5.7	16.5	86%	30%	35%	0.30	5,381
47		Level below	47.6	40.3	0%	1.1	91%	7.5	24.1	87%	25%	25%	0.28	91,245
48		Level below (vocational)	42.7	35.7	0%	0.6	68%	5.9	17.4	86%	30%	38%	0.31	26,040
49	NVQ level 1	Achievers	40.6	33.4	0%	0.5	70%	6.0	16.6	90%	30%	42%	0.30	4,376
50		Non-achievers	36.6	29.2	0%	0.0	0%	1.6	3.1	88%	43%	57%	0.36	1,014
51		Level below	40.0	33.2	0%	0.1	0%	1.4	3.2	87%	37%	52%	0.33	30,136
52		Level below (vocational)	33.5	26.1	0%	0.1	0%	1.1	2.4	84%	38%	67%	0.33	8,278
53	GNVQ level 1	Achievers	40.4	31.7	0%	0.3	78%	6.5	16.6	75%	36%	40%	0.33	1,679
54		Non-achievers	40.3	31.7	0%	0.1	0%	1.7	3.5	77%	45%	52%	0.37	254
55		Level below	40.0	33.2	0%	0.1	0%	1.4	3.2	87%	37%	52%	0.33	30,136
56		Level below (vocational)	33.5	26.1	0%	0.1	0%	1.1	2.4	84%	38%	67%	0.33	8,278
57	BTEC level 1	Achievers	35.8	29.9	0%	0.3	55%	4.9	12.1	77%	34%	57%	0.31	783
58		Non-achievers	34.2	29.5	0%	0.1	0%	1.4	2.9	77%	51%	62%	0.37	142
59		Level below	40.0	33.2	0%	0.1	0%	1.4	3.2	87%	37%	52%	0.33	30,136
60		Level below (vocational)	33.5	26.1	0%	0.1	0%	1.1	2.4	84%	38%	67%	0.33	8,278
61	Other level 1 vocational	Achievers	43.7	36.7	0%	0.7	67%	5.9	17.9	86%	30%	36%	0.31	19,202
62		Non-achievers	36.2	29.3	0%	0.1	0%	1.2	2.5	88%	42%	62%	0.35	2,437
63		Level below	40.0	33.2	0%	0.1	0%	1.4	3.2	87%	37%	52%	0.33	30,136
64		Level below (vocational)	33.5	26.1	0%	0.1	0%	1.1	2.4	84%	38%	67%	0.33	8,278
65	Entry/Other Level	Achievers	33.5	26.1	0%	0.1	0%	1.1	2.4	84%	38%	67%	0.33	8,278
66		Non-achievers	37.9	30.9	0%	0.1	0%	1.2	2.6	90%	42%	56%	0.36	2,930
67		Level below	42.3	35.7	0%	0.1	0%	1.5	3.4	89%	36%	47%	0.33	21,858
68		Level below (vocational)	na	na	na	na	na	na	na	na	na	na	na	na



**Table 4: Results of propensity score matching**

	Males				Females			
	Pre-match		Post-match		Pre-match		Post-match	
	Level below	Non-achievers	Level below	Non-achievers	Level below	Non-achievers	Level below	Non-achievers
Level 4 vocational (including Higher App)	97.0%	3.0%	95.5%	<b>4.5%</b>	98.3%	1.7%	97.2%	<b>2.8%</b>
Advanced Apprenticeship	84.6%	15.4%	75.5%	<b>24.5%</b>	84.6%	15.4%	74.7%	<b>25.3%</b>
NVQ level 3	98.0%	2.0%	97.6%	<b>2.4%</b>	94.4%	5.6%	91.7%	<b>8.3%</b>
BTEC level 3	83.5%	16.5%	74.0%	<b>26.0%</b>	84.5%	15.5%	78.8%	<b>21.2%</b>
Other full level 3 vocational	94.7%	5.3%	94.3%	<b>5.7%</b>	91.7%	8.3%	89.7%	<b>10.3%</b>
Level 3 other vocational	93.6%	6.4%	92.8%	<b>7.2%</b>	92.2%	7.8%	92.2%	7.8%
Intermediate Apprenticeship	77.8%	22.2%	62.1%	<b>37.9%</b>	71.7%	28.3%	55.0%	<b>45.0%</b>
NVQ level 2	94.5%	5.5%	90.7%	<b>9.3%</b>	90.8%	9.2%	86.4%	<b>13.6%</b>
GNVQ level 2	97.6%	2.4%	95.6%	<b>4.4%</b>	97.3%	2.7%	<b>98.0%</b>	2.0%
BTEC level 2	98.4%	1.6%	95.1%	<b>4.9%</b>	96.5%	3.5%	<b>97.5%</b>	2.5%
Other full Level 2 vocational	95.0%	5.0%	92.6%	<b>7.4%</b>	96.0%	4.0%	94.9%	<b>5.1%</b>
Level 2 other vocational	92.2%	7.8%	88.4%	<b>11.6%</b>	93.6%	6.4%	91.0%	<b>9.0%</b>
NVQ level 1	97.5%	2.5%	<b>98.3%</b>	1.7%	97.7%	2.3%	<b>98.8%</b>	1.2%
GNVQ level 1	99.1%	0.9%	<b>99.3%</b>	0.7%	99.3%	0.7%	98.8%	<b>1.2%</b>
BTEC level 1	99.5%	0.5%	99.2%	<b>0.8%</b>	99.6%	0.4%	<b>100.0%</b>	0.0%
Other level 1 vocational	89.1%	10.9%	86.9%	<b>13.1%</b>	92.0%	8.0%	<b>93.1%</b>	6.9%
Entry/Other Level	88.5%	11.5%	83.9%	<b>16.1%</b>	91.3%	8.7%	88.1%	<b>11.9%</b>

Note: PSM based on 1:1 nearest neighbour matching with replacement within a caliper of 0.1. Robustness checks without replacement were very similar.

Non-achievers here are a combination of drop outs and those that complete but fail to achieve the qualification.

**Table 5: Earnings Regressions, Non achievers**

	Males			Females		
	Baseline	Augmented	Augmented plus	Baseline	Augmented	Augmented plus
<b>Highest qualification</b>						
Level 4 vocational	0.131*** (0.013)	0.107*** (0.012)	0.086*** (0.012)	0.162*** (0.017)	0.133*** (0.016)	0.108*** (0.017)
Advanced Apprenticeship	0.215*** (0.006)	0.202*** (0.006)	0.185*** (0.006)	0.143*** (0.009)	0.116*** (0.009)	0.092*** (0.009)
NVQ Level 3	0.109*** (0.016)	0.094*** (0.016)	0.075*** (0.016)	0.135*** (0.013)	0.112*** (0.013)	0.078*** (0.013)
BTEC Level 3	0.095*** (0.008)	0.079*** (0.008)	0.052*** (0.008)	0.150*** (0.011)	0.129*** (0.011)	0.102*** (0.011)
Other full Level 3 vocational	0.070*** (0.015)	0.051*** (0.015)	0.024 (0.015)	0.132*** (0.014)	0.120*** (0.014)	0.085*** (0.015)
Level 3 other vocational	0.086*** (0.010)	0.062*** (0.010)	0.038*** (0.010)	0.148*** (0.013)	0.102*** (0.013)	0.051*** (0.013)
Intermediate Apprenticeship	0.174*** (0.006)	0.150*** (0.006)	0.125*** (0.006)	0.169*** (0.009)	0.127*** (0.009)	0.089*** (0.009)
NVQ Level 2	0.150*** (0.011)	0.130*** (0.011)	0.104*** (0.011)	0.224*** (0.014)	0.192*** (0.014)	0.139*** (0.014)
GNVQ Level 2	0.105*** (0.017)	0.092*** (0.017)	0.064*** (0.018)	0.126*** (0.027)	0.108*** (0.027)	0.070** (0.027)
BTEC Level 2	0.099*** (0.018)	0.090*** (0.017)	0.068*** (0.018)	0.166*** (0.030)	0.145*** (0.030)	0.110*** (0.030)
Other full Level 2 vocational	0.114*** (0.012)	0.091*** (0.012)	0.061*** (0.012)	0.140*** (0.022)	0.118*** (0.022)	0.079*** (0.023)
Level 2 other vocational	0.064*** (0.011)	0.037*** (0.010)	0.007 (0.010)	0.123*** (0.018)	0.096*** (0.017)	0.055*** (0.017)
NVQ Level 1	0.168*** (0.030)	0.096*** (0.031)	0.034 (0.033)	0.208*** (0.052)	0.181*** (0.054)	0.078 (0.056)
GNVQ Level 1	0.226*** (0.054)	0.203*** (0.056)	0.080 (0.063)	0.210** (0.094)	0.165* (0.093)	0.066 (0.101)
BTEC Level 1	0.069 (0.083)	-0.011 (0.084)	-0.015 (0.095)	0.135 (0.137)	0.097 (0.156)	0.046 (0.169)
Other Level 1 vocational	0.178*** (0.016)	0.107*** (0.016)	0.020 (0.017)	0.213*** (0.036)	0.137*** (0.036)	0.023 (0.037)
Entry/Other Level	0.011 (0.020)	0.035* (0.020)	0.035* (0.020)	0.085** (0.036)	0.074** (0.037)	0.076** (0.037)

Note: Significance levels: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Dependent variable: log daily earnings.

Baseline specification: basic controls only (ethnic background, time elapsed since the learner left education, and cohort dummies)

Augmented specification: basic controls plus Key Stage 2 test scores and Key Stage 4 control variables (eligibility for Free School Meals, Special Education Needs status and IDACI score)

Augmented-plus specification: Augmented specification plus additional controls for academic qualifications achieved at the same or lower level (2+ A levels and 5 GCSEs A\*-C or A\*-G) and controls for the secondary school attended.

**Table 6: Earnings differentials: Propensity Score Matching and Coarsened Exact Matching**

	Males					Females				
	PSM				CEM	PSM				CEM
	Continuous		Discrete		-	Continuous		Discrete		-
	Replacement	No replacement	Replacement	No replacement	-	Replacement	No replacement	Replacement	No replacement	-
Level 4 vocational (including Higher App)	0.282***	0.284***	0.374***	0.302***	0.325***	0.215***	0.220***	0.231***	0.234***	0.252***
Advanced Apprenticeship	0.275***	0.276***	0.312***	0.278***	0.271***	0.136***	0.128***	0.132***	0.134***	0.144***
NVQ level 3	0.185***	0.169***	0.163***	0.167***	0.150***	0.063***	0.061***	0.052	0.067***	0.063***
BTEC level 3	-0.045***	-0.058***	-0.042	-0.041***	-0.044***	0.053***	0.051***	0.021	0.063***	0.049***
Other full level 3 vocational	-0.072**	-0.070**	-0.088**	-0.047*	-0.032	0.037	0.044**	0.013	0.039**	0.032**
Level 3 other vocational	0.028*	0.036***	0.050**	0.048***	0.056***	0.088***	0.078***	0.059*	0.073***	0.086***
Intermediate Apprenticeship	0.141***	0.150***	0.165***	0.164***	0.167***	0.082***	0.056***	0.051	0.058***	0.071***
NVQ level 2	0.145***	0.148***	0.164***	0.155***	0.163***	0.035*	0.044***	0.026	0.058***	0.046***
GNVQ level 2	-0.005	-0.008	-0.043	-0.017	-0.017	0.096**	0.101***	0.051	0.056*	0.095***
BTEC level 2	-0.067*	-0.069**	-0.069	-0.064**	-0.035*	0.098**	0.094***	0.043	0.047	0.064**
Other full Level 2 vocational	0.012	0.015	0.043	0.025*	0.039***	0.017	0.037*	0.008	0.021	0.042**
Level 2 other vocational	-0.016	-0.015	-0.041	-0.027**	-0.020**	0.029	0.033*	-0.024	0.006	0.034**
NVQ level 1	0.075	0.065	0.040	0.086***	-0.008	-0.064	-0.028	-0.046	-0.014	-0.065
GNVQ level 1	-0.023	0.017	-0.026	0.030	-0.010	0.039	0.015	0.125	0.176**	0.099
BTEC level 1	-0.073	-0.070	0.015	-0.077	-0.007	0.033	0.022	0.103	0.041	0.087
Other level 1 vocational	-0.013	-0.065***	-0.005	-0.005	-0.046***	-0.036	-0.045	-0.016	0.036	-0.018
Entry/Other Level	-0.050*	-0.050**	-0.063	-0.070***	-0.056***	0.048	0.003	0.049	-0.026	0.078*

Note: Significance levels: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. PSM: ATT from nearest neighbour Propensity Score Matching; CEM: ATT from Coarsened Exact Matching.

Replacement: One-to-one nearest neighbour matching with replacement, using a caliper of 0.1.

No replacement: One-to-one nearest neighbour matching without replacement, using a caliper of 0.1.

Continuous: One-to-one nearest neighbour matching using variables expressed as a continuous measure (excluding naturally categorical variables).

Discrete: One-to-one nearest neighbour matching with all variables entered as discrete measures (for example, using quintiles).

**Table 7: Earnings differentials: comparison of estimates using different counterfactuals**

	Males				Females			
	Level below (all)	Level below (vocational)	Non-achievers	ATT from PSM	Level below (all)	Level below (vocational)	Non-achievers	ATT from PSM
Level 4 vocational (including Higher App)	0.304***	0.308***	0.086***	0.282***	0.226***	0.254***	0.108***	0.215***
Advanced Apprenticeship	0.326***	0.215***	0.185***	0.275***	0.157***	0.119***	0.092***	0.136***
NVQ level 3	0.162***	0.156***	0.075***	0.185***	0.083***	0.093***	0.078***	0.063***
BTEC level 3	0.005	-0.002	0.052***	-0.045***	0.130***	0.152***	0.102***	0.053***
Other full level 3 vocational	0.058***	0.052***	0.024	-0.072**	0.068***	0.088***	0.085***	0.037
Level 3 other vocational	0.068***	0.067***	0.038***	0.028*	0.101***	0.108***	0.051***	0.088***
Intermediate Apprenticeship	0.191***	0.235***	0.125***	0.141***	0.084***	0.146***	0.089***	0.082***
NVQ level 2	0.138***	0.175***	0.104***	0.145***	0.065***	0.121***	0.139***	0.035*
GNVQ level 2	0.036***	0.059***	0.064***	-0.005	0.117***	0.163***	0.070**	0.096**
BTEC level 2	-0.007	0.026***	0.068***	-0.067*	0.096***	0.164***	0.110***	0.098**
Other full Level 2 vocational	0.084***	0.119***	0.061***	0.012	0.052***	0.102***	0.079***	0.017
Level 2 other vocational	0.005	0.026***	0.007	-0.016	0.046***	0.081***	0.055***	0.029
NVQ level 1	0.040	0.089**	0.034	0.075	0.023	-0.006	0.078	-0.064
GNVQ level 1	0.009	0.055	0.080	-0.023	0.053	-0.032	0.066	0.039
BTEC level 1	-0.011	0.090	-0.015	-0.073	-0.017	-0.017	0.046	0.033
Other level 1 vocational	-0.010	0.017	0.020	-0.013	0.006	-0.003	0.023	-0.036
Entry/Other Level	-0.043***	n/a	0.035*	-0.050*	-0.010	n/a	0.076**	0.048

Note: All differentials refer to the *augmented plus* specification. Non-achievers are a combination of drop outs and those that complete but fail to achieve the qualification. For Advanced Apprenticeships the level below (vocational) counterfactual is represented by individuals in possession of Intermediate Apprenticeships as highest qualification. Significance levels: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

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