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Where versus What: College Value-Added and Returns to Field of Study in Further Education*

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Abstract

Enrolling in vocational education and training programs constitutes a natural response to the current dynamics of the labour market, which is being reshaped by routinisation, automation, and outsourcing. We estimate the value-added of colleges providing vocational education and training to young and adult learners in England, and the returns to different fields of study taught at these colleges. Using a unique panel dataset that includes multiple measures of students' prior ability and background characteristics, we are able to comprehensibly account for usual threats to identification. We find moderate heterogeneity in college value-added for outcomes such as daily earnings and employment probabilities. Dispersion in value-added for academic outcomes is more pronounced. Earnings returns vary substantially across fields of study, are higher for young than for adult learners and tend to be larger for females than for males.

Keywords: Value-added, returns to education, returns to college, field of study, further education, vocational education and training

JEL Classification: : H75, I21, J24, J45

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Executive Summary

There is an increased interest in the role of education in making workers adaptable to the challenges of technological change. Enrolling in vocational education and training (VET) programs constitutes a natural response to the current dynamics of the labour market for many young and adult individuals. In England, the main providers of VET are Further Education (FE) colleges, attracting learners with different levels of experience, academic preparation and at different stages of their professional lives.

In this paper, we address the following main questions:

1. We estimate the value-added of FE colleges in England with respect to academic outcomes, and employment and earnings prospects after college for both young and adult learners.

2. We identify college characteristics that are correlated with value-added to provide insights into the mechanisms that might be driving quality.

3. We estimate the earnings returns to different fields of study for both young and adult learners.

Using the rich Longitudinal Educational Outcomes (LEO) database, in our estimates of FE college value-added and returns to fields of study we take into account the varying socio-economic characteristics, prior academic achievements and potential labour market experience of individuals when entering college.

The main findings of the FE college value-added analysis are:

- A one standard deviation increase in FE college value-added leads to an increase in daily earnings after college attendance of around 3% and 1.5% for young and adult learners, respectively, and to an increase in the probability of being employed for more than 90 days of 1.7 and 1 percentage points for young and adult learners, respectively. This effect is approximately equivalent to moving a student from a college ranked in the bottom 15 percent of the college value-added distribution to one ranked in the top 15% of the value-added distribution.

- A one standard deviation increase in college value-added increases the share of learning hours achieved by about 6.5%; and the likelihood of having achieved at least one upper secondary (level 3) qualification by 10.5% compared to the sample mean. We also find that a one standard deviation increases in college value-added increases the likelihood of attending higher education by nearly 4 percentage points, or 10% compared to the sample mean.

- Higher value-added in academic achievement is associated with higher value-added in earnings and employment probabilities. Colleges that offer a larger share of their courses in the classroom (as opposed to in the workplace or at a distance) have higher value-added in earnings for young learners. Additionally, colleges offering more competency-based assessed qualifications (as opposed to exam-assessed) show lower value-added in labour market outcomes such as earnings and employment.

The main findings of our analysis of returns to fields of study are as follows:

- There are important heterogeneities in the returns to fields of study (net of signalling effects captured by qualification, level and awarding body of qualifications enrolled in), particularly among females.

- Adult learners enrol in substantial lower number of guided learning hours, which could explain the smaller overall returns for the average adult.

- Engineering and manufacturing technology, and business administration and law are not only showing large levels of enrolment among young and adult male learners, but they are among the fields that lead to largest positive returns.

- Finally, business administration and law and health, public services and care are the fields that show high levels of enrolment and consistent positive returns for females across age groups.

Overall, variation in college value-added is relatively modest, while returns to field of study vary more widely. While we find consistently higher returns to specialisations for

females than for males, this does not mean that females overall have higher earnings post FE-college attendance. Women in our sample have consistently lower average earnings five years after FE college attendance.

We also find that many specialisations present negative returns immediately after leaving college that turn positive five years after graduation, indicating that it takes time for positive returns to be reflected in wages. The fact that the timing of measurement of labour market outcomes matters has important policy implications for the evaluation of colleges in terms of the subsequent labour market performance of their students.

1 Introduction

Many industries are being reshaped by forces like routinisation, automation, and outsourcing. The acceleration of this process since the Great Recession of the late 2000's (Hershbein and Kahn, 2018) has led to an increasing interest in the role of education in making workers adaptable to the challenges of technological change. Predictions of qualifications needed for the next decade point to a high demand for workers with intermediate skills, expected to represent about 45% of the total labour force in Europe by 2030, while only one in 10 new job openings is expected to require low skilled workers (Cedefop, 2018).

While universities play an important role in providing individuals with the skills the labour market demands, the qualifications they offer are more suitable for high skilled jobs rather than intermediate, technical and vocational skills. Additionally, for a large fraction of the population university is an unlikely option because they either lack the academic prerequisites or face financial constraints. Enrolling in vocational education and training (VET) programs therefore constitutes a natural response to the current dynamics of the labour market for many young and adult individuals.

In England, the main providers of VET are so-called further education (FE) colleges. FE colleges face a challenging mission, providing VET to learners with very different levels of experience, academic preparation and at very different stages of their professional lives. On the one hand, they enrol a comparatively high share of low-achieving individuals that recently finished compulsory schooling and want to obtain a vocational rather than academic upper secondary education. We denote this group *young learners*. On the other hand, they attract learners with substantial prior experience in the labour market, whom we denote *adult learners*. Those individuals attend FE colleges in order to retrain or upgrade their qualifications, mostly through short courses of low learning intensity.

In this study, we assess how differences in the quality of English FE colleges contribute to explaining academic and labour market outcomes for young and adult learners. First, we estimate multiple measures of institution *value-added*. We focus on analysing

value-added in terms of labour market outcomes, which is different from the extensive literature in economics of education that has focused either on returns to vocational degrees or estimations of value-added of post-compulsory institutions in terms of academic achievement.[1] As noted by Hoxby (2015), a deep understanding of value-added measures is important to evaluate the potential benefits and costs of any policy that affects individuals' decisions to attend VET. To the best of our knowledge, this study is the first in providing rigorous measures of value-added in terms of labour market outcomes for a very large set of VET institutions.[2] We also identify college characteristics that are correlated with value-added to provide insights into the mechanisms that might be driving quality. While many papers have studied the mechanisms that make some vocational institutions more or less successful for the case of the US, (Jacoby, 2006; Bailey et al., 2006; Calcagno et al., 2008; Carrell and Kurlaender, 2016), most of these analyses relate success only to academic outcomes (e.g. graduation) rather than to labour market outcomes.[3]

Second, we assess the earnings returns to different *fields of study* taught at FE colleges. The literature on returns to field of study in vocational and higher education has grown

[1] Jepsen et al. (2014), for instance, use labour market information prior to enrolling in US community colleges in Kentucky to study the returns to different degrees for individuals aged 20-60 when first enrolling and find large earnings returns for associate degrees, and smaller but significant returns to certificates. Cellini and Chaudhary (2014) use individual level panel data and find a 10% earnings return for attending for-profit institutions, the control group being high-school graduates that never attended college. Likewise, Cellini and Turner (2019) use a difference-in-difference strategy comparing graduates of for-profit colleges to those of public colleges and find that those attending for-profit colleges are 1.5 percentage points less likely to be employed and earn 11 percent less than those attending public institutions. Other studies estimating the returns to vocational degrees in the U.S. include Jacobson et al. (2005a,b); Bahr (2014); Bahr et al. (2015); Dadgar and Trimble (2015); Liu et al. (2015); Stevens et al. (2015); Zeidenberg et al. (2015); Bettinger and Soliz (2016); Xu and Trimble (2016); Belfield and Bailey (2017a); Mountjoy (2019).

[2] Andrews et al. (2016) analyse the labour market returns to attending community colleges relative to high quality four-year institutions in Texas. However, they do not study heterogeneity in institution's value-added across different community colleges. Moreover, our analysis involves estimating value-added measures across *all* Further Education Colleges in England. While, Clotfelter et al. (2013), Carrell and Kurlaender (2016) and Kurlaender et al. (2016) provide value-added estimates for community colleges in North Carolina and California, their estimates are focused on college outcomes, such as graduation probability, as they do not have access to labour market information. Moreover, the data available to adjust for differences in student intake is also more limited in the existing studies. Finally, these authors arrive to different conclusions when assessing the importance of institutions value-added, leading to a lack of consensus in the literature.

[3] An exception is Rothwell and Kulkarni (2015), who show, in the context of the US educational system, that post-secondary institutions that offer programs of study that have a high value in the labour market, those that train a higher share of individuals in STEM orientations, and those that are able to progress their students to completion within the expected time, are generating the highest economic returns for their students.

substantially in recent years.[4] However, our analysis differs from these earlier studies by estimating returns to human capital by field if study net of sheepskin effects. In particular, we base our analysis on the number of hours enrolled in each specialisation rather than the returns to obtaining a degree in a particular field. This is particularly important in our context given that many students do not complete enough hours to receive a qualification.[5]

Our empirical strategy follows two approaches. First, we estimate value-added models in a cross-sectional setting where we address the problem of selection on unobservables with the large dimensionality of our control variables. For example, we have detailed and comparable measures of primary and secondary school performance for all students in England, quality of high school attended, detailed neighbourhood characteristics, and wages pre-FE college enrolment. The identifying assumption for these models is that conditional on observable characteristics, students are randomly assigned to FE colleges and value-added estimates should not be driven by selection on unobservables. Second, we implement a student level fixed-effects strategy where we exploit within-student variation to estimate college value-added and returns to field of study. This corresponds to estimating a treatment-on-the-treated effect, where we compare average gains in the outcome variable after vocational education attendance across different colleges.[6]

In our analysis of returns to field of study, we disentangle the sheepskin effect of obtaining a further education qualification in a specific field from the returns to the human capital that is acquired while in VET. We do so by simultaneously controlling for the number of hours an individual studies towards courses related to each field of study (i.e. human capital), the number and types of qualifications obtained (i.e. sheepskin effect),

[4]See for instance Arcidiacono (2004); Arcidiacono et al. (2008); Hastings et al. (2013); Bahr (2016); Kirkeboen et al. (2016); Belfield and Bailey (2017a); Altonji et al. (2016); Altonji and Zimmerman (2018); Belfield et al. (2018); Altonji and Zhong (2019).

[5]We also recover returns to field of study by age group (young vs. adult learners), which we believe is important because it could shed light on returns to specialisation among individuals who pursue some type of off-the-job training (Lynch, 1992).

[6]Fixed-effects strategies allow us to deal with any time-invariant unobserved characteristics that might be related to potential outcomes. We also discuss and address concerns related to potential time-varying selection in Section 4. Additionally, we provide robustness checks à la Chetty et al. (2011), where we compute FE college value-added in terms of in-college outcomes in a first stage; in a second stage we estimate FE college effects on labour market outcomes using the VA estimates obtained in the first stage.

and the institution attended.[7] Moreover, the fact that many students take courses in a variety of fields allows us to identify returns not only from those who specialise in them, but also from those who only take a small number of courses in the field. For example, a student specialising in engineering and manufacturing technology may also take courses related to business administration.

Our results indicate that a one standard deviation increase in FE college value-added leads to an increase in daily earnings of around 3% and 1.5% for young and adult learners, respectively. Differences in the dispersion of value-added between young and adult learners could be driven by the fact that young learners spend more time in FE colleges (i.e. they enrol in and complete substantially more learning hours than adults), making the intensity of the treatment very different between the two groups. To put these numbers into context, Broecke (2012) shows that a one standard deviation increase in university selectivity in the UK leads to an increase in earnings of approximately 7%. Relating our findings to returns to associate degrees in the US, Jacobson et al. (2005b) find that an additional year of community college increases earnings by 9% for men and 13% for women, which is substantially larger than our value-added estimates. We conclude that our results do not indicate substantial disparities in FE college value-added in wages.[8]

In terms of effects of FE colleges on improving employment probabilities, we find that a one standard deviation increase in FE college value-added increases the probability of being employed more than 90 days in a given year by only about 1.7 and 1 percentage points for young and adult learners, respectively (this represents 2.3% and 1.2% of mean employment in the sample, respectively).

We find more heterogeneity in FE colleges' contributions to the educational attainment of their students. Compared to the mean in the population, a one standard deviation increase in college value-added increases the number of achieved learning hours by 8.1% and it increases the share of learning hours achieved by about 6.5%.[9] A one standard

[7] Bahr (2014) implements a similar approach.

[8] Belfield et al. (2018) and Hickman and Mountjoy (2019) provide an extensive analysis of returns in higher education (i.e. four year college) in the UK and in Texas.

[9] Achieved learning hours are those hours of study time measured by guided learning hours associated with qualifications that were later achieved.

deviation increase in college quality is associated with increasing the likelihood of having achieved at least one upper secondary (level 3) qualification by 10.5% compared to the sample mean. We also find that a one standard deviation increase in college value-added increases the likelihood of attending higher education by nearly 4 percentage points, or 10% compared to the sample mean.[10]

In terms of mechanisms, we find that higher value-added in academic achievement is associated with higher value-added in earnings and employment probabilities. We find little evidence that higher resources positively correlate with our labour market value-added measures. Neither higher expenditure per student nor a higher teacher-student-ratio are associated with higher value-added in either earnings or employment. Learning characteristics seem to play a more important role in explaining variations in value-added. Colleges that offer a larger share of their courses in the classroom (as opposed to in the workplace or at a distance) have higher value-added in earnings for young learners. We also find significant correlations between the curriculum offer and value-added measures, with colleges offering more competency-based assessed qualifications (as opposed to exam-assessed) showing lower value-added. Our labour market value-added measures largely show no correlation with other existing measures of institutional quality or reported student satisfaction.[11]

We find important differences in the returns to fields of study across gender and age groups, even after controlling for the type and level of qualifications. The typical young male learner who chooses engineering and manufacturing technology as his main field of study (20.6% of young males) experiences an increase in average post-FE college daily earnings of almost 7% five years after finishing education. Returns to construction qualifications (chosen by 16.6% of young males), or qualifications in health, public services and care (chosen by 8.5% of young males) have returns of just below 2.5% five years post completion for the average student in these fields. A small number of fields show negative

[10] About 37% of individuals aged 18-20 when first enrolling in FE college enrol in higher education at some point. We do not have data to observe progression to higher education for adult learners.

[11] Given that we find very little variation in value-added in labour market outcomes for adult learners across FE colleges, we are unable to identify characteristics of colleges associated with higher value-added for this sub-population of learners.

returns, with the typical young male choosing history, philosophy and theology as his main field of study having earnings that are on average 2% lower five years post-FE compared to pre-enrolment.[12]

Adult males show very small overall returns to most fields, the exception being those completing engineering and manufacturing technology and education and training qualifications, where the average learner experiences a 1.5% and 1.1% increase in daily earnings five years post-completion, respectively. The small size of the effects among adult learners are likely driven by the fact that they do not invest many hours in FE education (when compared with young learners), leading to low overall returns on average for the typical adult learner.

For young females, the highest returns are observed for arts, media and publishing, with the average female specialising in this field experiencing a 18.6% increase in post-FE daily earnings five years after leaving education. This is also a field that is chosen by many young females (11.6%). Retail and commercial enterprise, as well as business administration and law qualifications, lead to increases in daily earnings five years post-completion of around 12% on average. Finally, the average adult female learner specialising in health, public services and care and education and training qualifications yield an increase in post-FE earnings five years after completion of about 2% and 2.7%, respectively.

We believe that our findings have relevant practical implications for many students and policy-makers. First, it will allow students to get a better understanding of the variation in FE college quality and to compare the returns to different fields of study. This information is likely to be particularly important in light of the evidence suggesting that students tend to be misinformed about the labour market returns of VET qualifications. For example, Baker et al. (2017) find that only 13% of students in their sample (i.e. a subset of community colleges in California) correctly rank four broad categories of majors in terms of salary. Second, our findings on mechanisms could inform policy-makers about plausible paths to enhance the efficiency of a sector that is facing significant challenges,

[12]Overall, these findings are consistent with the literature on returns to field of study in vocational education. According to a review by Belfield and Bailey (2017a), the returns to an associate degree in a STEM-field tend to be larger than for other fields.

such as a perceived decline in quality and student performance, growing demands on their mission, and financial pressures related to increased competition for students and shrinking further education budgets.[13]

The remainder of this paper is organised as follows: Section 2 gives a brief overview of VET and the role of FE colleges in England. Section 3 describes the data and estimation samples for young and adult learners. Section 4 presents the methodology used. In Section 5 we present results on value-added measures, robustness checks and analysis of potential mechanisms. In Section 6 we present results on the returns to field of study. Section 7 concludes.

2 Institutional Background

Post-compulsory education in England. Students in England complete compulsory education at the age of 16 (at the end of Key Stage 4 (KS4), in year 11). At this age, they take a set of exams, the Graduate Certificate of Secondary Education (or GCSEs), which are largely standardised exams, in a variety of subjects. All students have to take English, maths and science exams at age 16, and they are free to choose additional subjects. After compulsory education, students in the sample period we study were free to choose to stay on in education and follow a further education programme.[14] The most popular (upper secondary) programme is the academic track, which comprises taking a set of level 3 qualifications called A-levels, which provide entry to higher education. About 45% of the students in any given cohort follow the academic track (Hupkau et al., 2017). A-levels are mainly taught at so-called Sixth Form Colleges, but FE colleges also offer them. The remainder of students in any given cohort that stays in education after

[13]Value-added estimates for colleges have attracted widespread attention in the US, following the publication of college score cards by the US Department for Education in 2012. For the first time, the score card allowed potential students to compare colleges by average costs and average earnings after degree completion, by type and subject, for around 8000 institutions (US Department for Education, 2015). However, these measures do not fully account for selection in enrolment across institutions. As we discuss later in the paper, traditional measures of FE college quality, such as college inspection reports, show a small correlation with value-added measures.

[14]From 2013 onward, young people in England had to remain in some form of education or training until their 17th birthday. Pupils turning 17 in the academic year 2014/15 had to stay on in education until their 18th birthday. This did not affect the students in our sample because the youngest cohort we study left compulsory education in the year 2006/07.

compulsory schooling chooses VET courses or a combination of vocational and academic courses (Hupkau et al., 2017).

Vocational Education and Training in England. VET in England accounts for about 4 million enrollees annually, pursuing a wide array of post-secondary qualifications (Hupkau and Ventura, 2017). More than half of them are over 25 years old, and a large fraction comes from a disadvantaged background. FE colleges are the main providers of these kind of qualifications: Over 60% of 16 to 18-year-old individuals and half of adult learners enrolled in publicly funded VET study at FE colleges.[15]

Further Education Colleges. Over the time period we study, there were around 257 General FE colleges in England.[16] In terms of student numbers, FE colleges are smaller than universities but larger than schools. FE colleges enrol around 7,000 learners pre year on average, managing an average budget of about £27 million.[17] In most cases, students do not pay for further education until the age of 19, and the government offers many state-funded courses for over 18-year-olds, provided that they have not previously completed a qualification of the same type and level. For both young and adult learners in our sample, though, all the learning undertaken is publicly funded.

FE colleges are comparable to US community colleges, performing a triple function: First, they serve young learners to advance to higher levels of either vocational or academic qualifications, the former mostly giving access to jobs and the latter giving access to university. Second, they serve as a remedial education provider to those who did not achieve a basic level of education during the compulsory stage. Third, they offer retraining and remedial education to adults. They offer courses of varying length and of a wide range of levels and fields. Courses can be at very low levels (mainly remedial

[15]Figures based on own calculations using the population data for all learning undertaken in further education in England using the Individual Learner Record for 2015, provided by the UK Department for Education.

[16]Due to mergers and closures of colleges happening over the same time period, this number varies from year to year.

[17]Own calculations for the academic year 2015/16 based on SFA and EFA (2017). These numbers refer to General FE colleges. There are other types of FE colleges (i.e. sixth form colleges). These have quite different characteristics than General FE Colleges, are generally smaller and offer mostly academic courses. These institutions are not the subject of this study.

education for students who did not achieve the basic school leaving level in English and maths), as well as at the level of lower secondary (Level 2), upper secondary (Level 3) or tertiary/higher education (Levels 4 and above).

While FE colleges are private corporations, the majority of their income comes from government grants, representing on average just under 80% of revenues in 2015/16. Income is thus generated mainly through the provision of publicly funded learning. FE colleges also generate income from tuition fees, but these only constitute a small share of their total earnings (about 14% in 2015/16). Given that the state funds most of the activities at FE colleges, the learning they provide is regulated. The bodies responsible for further education funding determine which qualifications are eligible for funding, which can change from year to year.[18]

VET Qualifications. Qualifications are designed by so-called awarding bodies, which are private, for-profit organisations that provide the curricula and frameworks for different qualifications such as diplomas in hairdressing or engineering, as well as general (academic) qualifications such as GCSEs or A-Levels. While awarding bodies are not themselves regulated by the state, qualifications are regulated and supervised by the Office of Qualifications and Examinations Regulation (Ofqual) to ensure a certain level of standards for publicly funded learning. An awarding body is an examination board which sets examinations and awards qualifications. There are many awarding bodies in the United Kingdom, specialising in different kinds of qualifications. In VET, the dominant organisations are Pearson (offering technical qualifications like Business and Technology qualifications (BTECs)), EAL (offering engineering qualifications) and City & Guilds (offering National Vocational Qualifications in fields such as hairdressing, plumbing or construction). For a qualification to be recognised as part of one of the UK qualification frameworks, it must be awarded by an awarding body that is recognised by one of the

[18]The body responsible for funding used to be the Skills Funding Agency for individuals aged 19 and above and the Education Funding Agency for individuals aged 14-18. These agencies have now merged into the Education and Skills Funding Agency (ESFA). To get an idea of the variety of learning available for young learners, the list of approved qualifications for 14 to 19-year-olds comprised 12,580 qualifications in 2019 (ESFA, 2019).

government-appointed regulatory bodies.

Qualifications themselves are characterised by a set of features. The level of the qualification, which is an indicator of depth and difficulty; the size of the qualification, typically measured by the number of guided learning hours required to complete the qualification; and the field of study. The number of guided learning hours associated with a qualification are important as they give an indication of their intensity and duration. During the period we study, guided learning hours included mainly time spent in the classroom under the supervision of a teacher or tutor. It excludes time taken for assessments and unsupervised study time.

3 Data

For our empirical analysis we use an administrative dataset from England. This covers, on the one hand, the universe of more than 2 million learners for four cohorts of school leavers. The data contains comparable measures of prior achievement from age seven up until the end of compulsory education at age 16, and demographic characteristics (age, ethnicity, language spoken, socio-economic status, neighbourhood characteristics, including measures of income and employment deprivation). On the other hand, it covers every individual who has ever enrolled in publicly funded adult learning and records detailed information on the learning undertaken. It is linked to labour market outcomes both before and after the learning spell.

Because we do not have the same measures of prior attainment and socio-economic background for all learners, we construct two different datasets for this study. The first dataset covers learners aged 16-20 (*young learners*) when first enrolling in FE colleges, the second dataset covers learners aged 25-59 (*adult learners*). Details about the dataset construction for both groups as well as the sample restrictions are outlined in the Data Appendix in Section A.1.

Tables 1 and 2 show summary statistics for young learners aged 16 to 20 (divided in two age bands), and for adults aged 25 to 59 (divided in four age bands), respectively. One of the main differences between young and adult learners is in the duration and

intensity of learning (i.e. in terms of days, total guided learning hours, but also number of courses). Young learners enrol on average in about 1050 total guided learning hours, and the average length of study time is about two years (732 days), compared to only 185 guided learning hours for adults and study duration of less than 10 months (290 days). Whereas adult learners enrol in about 2 courses on average, young learners take about 5 courses.

The type of courses studied also differ across the young and adult sample. While more than 60% of young learners enrol in at least one course of level 3, only 31% of adult learners do so. Adults are most likely to be observed in learning at level 2 (62%), and a small share (7%) is doing advanced courses (level 4), while almost none of the young learners is enrolled in such higher level courses.

Finally, we describe summary statistics for young and adult learners by gender. Appendix Tables A1 and A2 show results for young learners. While young males spend more days in further education than young females (749 and 715 days, respectively), the total number of guided learning hours enrolled is slightly smaller for males. Labour market attachment is similar across males and females prior to FE college attendance. For example, among the 18-20 age group, the percent of male and female students that had any employment experience before FE college entry are 76% and 75%, respectively. Lastly, young males show larger annual earnings than females, with males earning on average £600 more per year than females in the year of FE college entry.

Appendix Tables A5 and A6 present similar summary statistics for adult learners. The average duration of further education learning is 319 days for adult females, while for adult males it is only 257 days. Moreover, females enrol in more guided learning hours than their male counterparts (195 versus 173). We also find similar labour market participation (i.e. share employed) between males and females before FE college entry (74% for females and 73% for males). However, males show on average substantially higher annual earnings than females in the year they enrol in FE (£12681 vs. £8974). This is probably due to females both working less hours and in sectors characterised by

lower pay, among other potential reasons.[19]

4 Methodology

After an individual has decided to pursue VET at an FE college, there are two other important decisions to take: which FE institution to attend (*where*) and the main field of study or vocational specialisation (*what*). Given that our goal is to provide estimates to quantify the relative importance of these decisions for labour market outcomes, we use empirical models that will allow us to capture FE college value-added and the returns to vocational specialisations.

The main challenge for the identification of FE college value-added and returns to field of study is the problem of selection. A naive approach that just compares the earnings of students enrolled in different institutions is likely to be misleading because it can confound students' prior academic preparation with FE college inputs. Similarly, selection of students with more motivation or talent into specific fields might bias estimates of returns. To illustrate how pervasive this problem is, Figures 1 and 2 plot a measure of prior attainment and a measure of socio-economic status of college intake against raw average labour market and educational outcomes at that college for young learners. The prior attainment measure in the horizontal axis of Figure 1 is the average high school (KS4) performance for students enrolling in different FE colleges. In Figure 2 it is the share of students eligible for free school meals. As is evident from these figures, there is large heterogeneity across FE colleges in the average characteristics of their student intake. In addition, we find very large and significant correlations between FE college student intake quality and average earnings and employment levels years later, and students' academic achievement at the FE college (measured by the number and share of guided learning hours completed, and whether or not a level 3 qualification was obtained).

When considering selection into fields of study, Panel (a) of Figure 3 shows the share

[19]While we observe number of days employed, we do not observe hours worked or the sector or occupation in which individuals are employed.

of students eligible for free school meals (FSM), and Panel (b) shows the prior academic performance as given by the average KS4 standardised score by field of study chosen at FE college, for young male and female learners that did not attend higher education.[20] There are notables differences across fields in both dimensions. For instance, whereas over 17% of males specialising in information and communication technology (ICT) were FSM eligible at age 16, this figure was less than 10% for males specialising in history, philosophy and theology. In terms of prior academic performance, females choosing social sciences or arts and media are among the highest performing, and those specialising in retail are amongst the lowest performing in KS4.[21] Along both dimensions (FSM and KS4), learners with the highest share of guided learning hours in Preparation for Life and Work stand out for having high shares of students eligible for FSM and a low average KS4 score.

In summary, these empirical regularities indicate that disentangling the contribution of student characteristics from the effect of institutions and specialisations should constitute the main goal of our empirical strategy. The following subsections describe how we tackle this empirical challenge.

4.1 Value-Added Models

First, we propose a value-added model (VAM) with lagged dependent variables, following the spirit of the teacher effectiveness literature. Second, we describe a fixed-effects strategy exploiting within-individual variation over time, to recover treatment-on-the-treated effects for the FE institution attended and the field of study chosen.

4.1.1 Cross-Sectional Model with Lagged Dependent Variables

The economics literature on teacher effectiveness (Kane and Staiger (2008), Chetty et al. (2014) and Koedel et al. (2015), among many others) is mainly characterised by the estimation of value-added models with lagged dependent variables in a cross-sectional

[20] Our analysis on returns to fields of study will focus on students that did not enrol in a bachelor's degree after VET in order to ease interpretation of the findings.

[21] The KS4 score has been standardised based on the sample of individuals that include those going to higher education. This explains the negative values on most of bars in part (b) of Figure 3.

setting. The key identification assumption of these models translated to our setting is that after conditioning on lags of the dependent variable (i.e. sufficient statistics) and a large set of controls, individuals are no longer sorted into FE colleges based on unobservable determinants of the dependent variable.[22] For young learners, the richness of our data gives us confidence that we can account for a large array of confounders.

Equation (1) characterises our empirical specification. The post-FE college outcome, Y (i.e. wages, employment status, academic achievement) measured at time T (e.g. 2017 for labour market outcomes; at the end of FE college attendance for outcomes related to academic achievement) of individual i who attended FE college c, is determined as follows:

$$Y_{icT} = f_1(Y_{ict-z}) + f_2(\mathbf{X_1}_{ict-z}) + f_3(\mathbf{X_2}_{ict}) + f_4(\rho_{it}) + \pi_c + \varepsilon_{icT} \tag{1}$$

$f_1(Y_{ict-z})$ is a control function for the lagged outcome in equations that have labour market outcomes as the dependent variable, with t indicating time while at FE college. In the earnings equations, this includes earnings measured prior to FE entry, an indicator for when earnings prior to FE entry were measured, and an interaction between the pre-FE earnings measure and the timing of measurement indicator.[23] In the employment equation, this includes a series of dummies indicating whether the student had worked before FE college entry (never worked before college, worked in year of entry, worked 1 year before entry, worked 2 years before entry). These prior employment measures also appear in the earnings equations. $\mathbf{X_1}$ is a vector of characteristics measured prior to enrolling in the FE college and includes: gender, a series of dummies for ethnicity (White, Mixed, Asian/Chinese, Black), a dummy for whether English is spoken at home, a dummy for whether the student had special educational needs during compulsory education, a dummy for whether the student was eligible for free school meals in the KS4

[22] For example, Chetty et al. (2014) argue that, in the context of the teacher value-added literature, a plausible approach to estimating the impact of teachers on wages is to control for lagged wages (i.e. pre-college enrolment). However, they do not pursue this route because it is impossible to have information on pre-enrolment wages in their context.

[23] While, pre-FE college earnings are not likely to fully reflect the productivity of young learners, we still believe that they contain meaningful information about some of their unobservable characteristics.

year, the neighbourhood IDACI score based on postcode prior to joining FE college, the standardised KS4 score, the Ofsted rating of the KS4 school, the KS3 maths result, the KS3 English result, the KS2 English result and the KS2 maths result. $\mathbf{X_2}$ is a vector of variables measured at the time of FE college attendance and includes: age when first entered FE college, mode of attendance (Full-time, Full-time part-year, Part-time, Unknown/Missing), a series of dummies for the main field of specialisation, dummy variables indicating the region where the college is located (to account for different local labour market characteristics) and a series of local deprivation indicators based on the FE college's location and students' area of residence. $f_4(\rho_{it})$ is a flexible vector that includes fixed effects for the academic year that compulsory schooling was completed, a series of dummies for the last year observed in education (FE or HE), dummy variables indicating the number of years since starting FE, and a series of dummies indicating the last year observed in FE college. This is included to account for issues related to the "Ashenfelter dip". We discuss this in more detail in Section 4.1.2. π_c is the value-added of the FE college attended and ε_{icT} denotes an idiosyncratic shock.

Given that the main object of analysis in these lagged dependent variable models is π_c (i.e. institution value-added), many covariates that could operate as mediating variables ("bad controls") are excluded from our specifications (e.g. the share of guided learning hours achieved per student is a proxy for completion and constitutes an outcome of the FE college).

In terms of estimation, we follow a two-step approach following Koedel et al. (2015). In the first step, we perform an OLS regression where the institution effect (i.e. π_c) becomes part of the error term. The equation we estimate thus becomes:

$$Y_{icT} = f_1(Y_{ict-z}) + f_2(\mathbf{X_1}_{ict-z}) + f_3(\mathbf{X_2}_{ict}) + f_4(\rho_{it}) + \epsilon_{icT} \tag{2}$$

with

$$\epsilon_{icT} = \pi_c + \varepsilon_{icT}$$

In the second step, we average the residuals of the previous regression at the institution

level and then correct the variance of the FE college value-added to account for sampling error.[24] Models are estimated on the whole sample, by age group on first entering FE college, and separately for males and females.

4.1.2 Fixed-Effects Model

To further overcome the concern of possible selection on unobservables, we exploit within-individual variation by estimating individual fixed-effects models.[25]

We estimate the following model for the two samples of young and adult learners, and also separately by gender and age group:

$$Y_{ict} = f_1(\mathbf{X}_{it}) + f_2(\rho_{it}) + \zeta_i + D_{it}\pi_{ct} + \eta_{ict} \tag{3}$$

where $f_1(\mathbf{X}_{it})$ includes labour market experience up until FE college entry, dummies corresponding to the main field of specialisation, a series of dummies for the region where the FE college is located interacted with the academic year, academic year fixed effects and a second order polynomial in age.[26] $f_2(\rho_{it})$ is a flexible vector of control variables that accounts for years since starting and leaving the FE college, whether the individual is enrolled in some form of education in year t, and an indicator for the year before enrolling in the FE college. The ζ_i's represent individual fixed effects. π_{ct} denotes the effect of the FE college attended on outcome Y_{ict} in period t. Following Jepsen et al. (2014), π_{ct} is pre-multiplied by the indicator variable D_{it} (which is equal to one once an individual has finished FE education).

Note that $f_2(\rho_{it})$ is included to address potential issues arising from student's selection

[24] An alternative approach is the so-called one-step VAM, where we would include a full set of FE college indicator variables for estimating equation (2), with the coefficients on these variables representing the FE college value-added. Since our focus in this analysis is to inform the policy debate, we have decided to implement the two-step approach. This approach tends to somewhat over-correct for the context of the student because correlations between college quality and the control variables are attributed to the control-variable coefficients (see Koedel et al. (2015) for a discussion). The one-step approach on the other hand tends to under-correct, because the coefficients on the FE college indicator variables are likely to be picking up some of the effects of the control variables (i.e. everything that affects college quality and does not change over time, would be picked up by the FE college dummies).

[25] Belfield and Bailey (2017b) provide a thorough discussion of the different model specifications that have been implemented in the literature to estimate labour market returns to college education in the context of associate degrees in the US.

[26] The dummies indicating the main field of study take the value 1 from the year the learner completes FE college education, and) otherwise.

into FE education based on time-varying unobservables. For example, if a dip in wages motivates individuals to enrol in FE education, then this could lead to an upward bias of our estimates. In a similar vein, individuals may have differential returns to experience, leading to selection based on this feature.[27] To overcome these concerns we take several steps. First, the indicator on whether the individual is enrolled in some form of education accounts for the opportunity cost of students while they are enrolled. Second, the indicators representing the number of years since the individual finished attending an FE college control for any general post-schooling changes in earnings. The third set of controls are dummies representing the number of years since entering FE education, which also includes the years before enrolling. This accounts for the "Ashenfelter dip".

In terms of estimation, we also implement a two-step approach. We calculate institution value-added corresponding to the year 2017. This implies using all the years when performing the first step regression, but using only the residuals corresponding to the year 2017 to obtain the value-added estimates.

4.2 Returns to Field of Study

We propose an empirical model that allows us to capture both the returns to narrow categories of vocational specialisations, and to characterise these returns by disentangling human capital accumulation effects from possible sheepskin effects. Separating these effects is important in our context given that many students do not complete enough hours to receive a qualification. Therefore, our findings can also inform about the expected returns in different fields of study for many students that cannot complete their studies. We estimate an empirical model that considers returns to the number of guided learning hours completed in courses related to each field of study (a direct measure of human capital), while simultaneously controlling for the qualification type (i.e. BTECs, A-Levels, etc.) and the level of the qualifications the learners enrol in, the awarding body

[27] A final concern is related to the number of post-FE college outcome observations, which should should be uncorrelated with the FE institution attended. For example, if individuals in a certain specialisation are more likely to drop out of the sample, we may overstate the impact of that specialisation. However, given that the labour market information is coming from the HMRC records, we can follow individuals independently of their field of study or institution attended.

of those qualifications, and the FE college attended.

Our main specification, which is estimated separately by age group and by gender, is as follows:

$$Y_{ict} = D_{it}\mathbf{Z_{it}}\boldsymbol{\Upsilon_1} + D_{it}\mathbf{Z_{it}}\tau_t\boldsymbol{\Upsilon_2} + D_{it}\pi_c + \zeta_i + D_{it}\phi_i + D_{it}\phi_i\tau_t + D_{it}\omega_i + g(\mathbf{X}_{it}) + f(\rho_{it}) + \eta_{ict} \quad (4)$$

Y_{ict} is the outcome of interest (i.e. log daily earnings) of individual i, measured at time t, who attended college c. D_{it} is an indicator variable that denotes whether the individual has finished FE education at time t. Z_{it} is a vector representing the number of guided learning hours enrolled in each field of study.[28] This vector takes on the value of 0 prior to FE college, it is equal to the cumulative amount of guided learning hours during each academic year the learner is enrolled in FE, and is set to the total amount of guided learning hours in that given field of study for all the remaining years post-FE. τ_t indicates the number of years since leaving FE education. Υ_1 and Υ_2 represent the parameters of interest: the returns to guided learning hours by field of study and the interaction term of years since completing FE college education and guided learning hours by field of study. π_c denotes further education college fixed effects, which intend to capture the effects of college quality (note that π_c is no longer treated as a random effect as in the previous specifications). ζ_i denotes individual fixed effects. ϕ_i is a vector determining qualification type (e.g. BTEC, NVQ, etc.) and level (i.e. levels 2-4), which intends to account for sheepskin effects of qualifications obtained and selection. $\phi_i\tau_t$ captures differential returns to types of qualifications since finishing FE education. This allows us to control for differential returns to experience that may not be absorbed by individual fixed effects. ω_i denotes the awarding body of each of the different qualifications that the student has enrolled in. $g(\mathbf{X}_{it})$ includes a second order polynomial for labour market experience and age, and region fixed effects interacted with year fixed effects to account for trends in local labour markets. Finally, $f(\rho_{it})$ is a flexible vector that accounts for

[28] For example, a student can take courses in business administration and engineering. Z_{it} corresponds to a vector that contains the number of guided learning hours completed in each of these specialisations.

years since starting and leaving the FE college, whether the individual is enrolled in some form of education in year t, an indicator for the year before enrolling in the FE college and year fixed effects.

We are not aware of other studies that intend to recover returns to field of study based on hours enrolled in each of the different courses taken, while simultaneously controlling for type of qualification, FE college attended, awarding body, and individual fixed-effects. Moreover, it is important to emphasise that the returns to field of study are identified from both individuals that specialise and those that do not specialise in a given field of study, because individuals tend to complete qualifications not only in their main specialisation.[29] Therefore, concerns regarding differential returns to experience for individuals that select into a given main specialisation is less of a concern in our setting.

5 Results I: FE College Value-Added

In this section, we present results of value-added estimations for labour market and intermediate outcomes, as well as robustness checks and a discussion of plausible mechanisms. As described in Section 3, young and adult learners differ substantially in the number of guided learning hours they enrol in while in FE. This suggests that the returns to FE college education for these groups are likely to be different due to large disparities in the intensity of the treatment. We therefore present results separately by age group. The main specifications for young learners are based on the 18-20 age group, given that we observe some labour market experience for most students in this subgroup. Later in the section we also show results for broader groups of young learners. We also show results by gender due to plausible differences in the labour market trajectories of males and females. For instance, whereas we have information on the number of days worked, we do not have information on the intensive margin (i.e. hours worked). Finally, value-added

[29]Students can enrol in multiple courses in different fields, therefore for each student we observe a vector of total number of guided learning hours completed in each field of study. We rely on guided learning hours attended by each student in the different fields of study to recover the returns. For example, returns to business guided learning hours are also identified from students that specialised in social sciences, but were taking some courses in business. Tables A12 and A13 show the share of guided learning hours completed in other fields by vocational specialisation for male and female young learners, respectively.

models including lagged dependent variables are only estimated on the young learner sample. This is because we do not observe prior educational attainment for adult learners and lack other important controls relating to their socio-economic background. Due to the fact that most covariates are time invariant, this is not a concern for the individual fixed-effects strategy.

5.1 Labour Market Outcomes

We estimate college value-added in log daily earnings, log annual earnings, daily earnings in levels (including zeros for the non-employed), and whether the individual was employed for more than 90 days, all measured in 2017 (the last year for which we have labour market data). Log annual earnings condense in one measure the effect of FE college value-added on employment intensity and earnings. Daily earnings in levels allow us to incorporate those individuals that are not working after finishing FE education into the analysis, combining extensive and intensive margin effects. This will shed light on whether non-labour market participation is somehow affecting our estimates.

Results are presented in Table 3. The first three columns show results based on the lagged dependent variable specification using cross-sectional data for young learners, based on estimations of Equation (2). The last six columns report findings using the individual fixed-effects strategy with panel data for young (Columns 4 to 6) and adult learners (Columns 7 to 9), based on estimations of Equation (3).

The top panel of Table 3 shows that a one standard deviation (SD) increase in college value-added increases daily earnings by around 3% to 3.6% for young learners, depending on the estimation strategy, and by 1.5% for adult learners. As pointed out above, one of the key drivers of the differences observed between young and adult learners is likely to be the fact that young learners enrol in substantially more hours in FE education than adult learners. Estimates are very similar across model specifications for young learners, so going forward we report mainly the results based on panel estimates for this group (and those based on cross-sectional data with lagged dependent variables in parenthesis). Analysis by gender shows that college quality tends to matter more for females than for

males. A one SD increase in college value-added increases daily earnings by 4.1% (4.4%) for females, while it increases them by only 3.1% (2.6%) for males. For adult learners aged 25-59, we do not observe the same gender disparities in value-added.

In terms of log annual earnings, a one SD increase in college value-added is associated with a 4% (3.5%) increase for 18 to 20-year-olds, and with a 2% increase for 25-59-year-olds. These estimates are slightly higher than for log daily earnings, suggesting that colleges affect outcomes not only through raising wages but through raising employment intensity. Gender differences for both young and adult learners are very small and not economically meaningful when considering the panel estimates.

When focusing on daily earnings in levels, which include individuals not in employment, results provide a similar picture. A one SD increase in FE college value-added increases daily earnings for young learners by approximately £1.71 (£1.74), which corresponds to a 3.8% (3.9%) increase in mean daily earnings. Again, the estimate is slightly higher for young females (5% of mean daily earnings). For older learners, a one SD increase in value-added increases daily earnings in levels by around £1, which is equivalent to a 1.9% increase in their mean daily earnings. We observe no gender differences for this group.

Finally, we find less dispersion in terms of FE college's contribution to employment outcomes. A one SD increase in FE college value-added is associated with an increase in the probability of being employed at least 90 days in 2017 of 1.7 (0.8) percentage points for the young, and 1 percentage point for the adult sample. This corresponds to a 2.3% (1%) increase with respect to the mean for the young, and a 1.2% increase for the adult sample.

The analysis on young learners presented so far includes students who attend higher education after VET. Value-added estimates may therefore partially be picking up the effect of earning a university degree. To determine the extent to which this matters for our results, we also present VA estimates for the sample of individuals who never attended university after leaving college. This approach allows us to recover value-added estimates on a more homogeneous group of learners, which eases comparisons across

institutions. It also enables us to determine the importance of FE college value-added among those students whose final educational goal is to achieve a vocational degree, which is the case for nearly 70% of young learners. Results are shown in Table 4 and are similar to those including individuals who end up going to university (Table 3). For example, among those who never attend university, increasing FE college value-added by one standard deviation increases log daily earnings by 2.6% (3.9% in the cross-section). These estimates are comparable to their analogous ones in Table 3, where the size of the effect is 3% (3.6% in the cross-section).

In summary, two main findings emerge from the value-added analysis. First, heterogeneity in labour market returns of attending different FE colleges can be characterised as moderate. Second, the effects of college quality for adult learners are about half to one third the size of those of young learners.

5.2 Intermediate Outcomes

We analyse FE college value-added in intermediate outcomes in terms of the total number and share of guided learning hours achieved, whether at least one level 3 (upper-secondary) qualification was achieved, and whether students ever enrolled in higher education. The aim is to determine to what extent some institutions are more successful in enhancing student coursework completion and progression to higher levels of education.

Note that the dependent variables are only observed once. Therefore, we cannot implement a fixed-effects strategy or control for lags of the dependent variable. However, as for the cross-sectional labour market regressions, these regressions do include measures of prior academic performance in English and maths at Key Stage 4 (age 16), Key Stage 3 (age 14) and Key Stage 2 (age 11). This implies that we are controlling for an extensive set of variables that are proxies for ability.

Table 5 reports institution value-added results from cross-section specifications for young learners, and separately for males and females.[30]

[30]For completeness, we report analogous results for the 16-20 age sample and older learners in Table A10 in the online appendix. However, the lack of many background characteristics in the adult sample requires to interpret these coefficients with caution.

Total guided learning hours achieved give an indication of the size of the qualification obtained, similar to the number of credits that measure qualification "size" in higher education. They can therefore be interpreted as informative of the treatment intensity of the college education obtained. The first panel of Table 5 indicates that a one SD increase in institution value-added is associated with an increase in the total number of guided learning hours achieved by around 33 hours, and is very similar for males and females. This represents an 8% increase compared to the mean in this sample.

The second intermediate outcome we consider is the share of guided learning hours achieved, conditional on enrolment. Our results indicate that a one SD increase in institution value-added is associated with a 4.5 percentage points increase in the share of guided learning hours achieved, which is equivalent to an increase of about 6.5% for the mean student. Again, the results are similar across males and females.

We next consider the probability of achieving a level 3 qualification. Many learners enter FE college with qualifications at or below level 2.[31] Completing a level 3 qualification can therefore be considered as an important milestone, also because it is a requirement for entering higher education. While these qualifications are taught in FE colleges, they are not awarded by them but by specialised awarding bodies, providing a more objective and comparable measure of education progression. The third panel of Table 5 shows that a one SD increase in FE college value-added increases the probability of obtaining a level 3 qualification by approximately 4.4 percentage points, equivalent to an increase by about 10.5% for the average student, and is similar across males and females.

Finally, when analysing progression to higher education (HE), a one SD increase in college value-added raises the probability of progressing to a higher education course by nearly 4 percentage points, equivalent to an increase in the probability by 10% for the average student.

Overall, these findings suggest that disparities in FE college value-added seem to play an important role in explaining differences in intermediate outcomes across students.

[31] Achievement of a full level 2 qualification is a commonly used measure of attainment in compulsory schooling. Students in FE colleges tend to be much lower achieving than the average student.

5.3 Robustness Checks

We present a set of robustness checks to our value-added estimates. First, we provide a simple test to check whether our lagged dependent variable value-added estimates are correlated with an important observable characteristic when the latter is left out of our regressions. Second, we present an alternative approach to recover VA in earnings that follows the procedure used in Chetty et al. (2011). Third, we use a larger sample of young learners (i.e. age 16-20) instead of the 18-20 age group, in order to assess how our results change when we include a more complete universe of young students that enrol in FE colleges.

5.3.1 Omitted Variables in Value-Added Estimates

Lagged dependent variable models cannot completely rule out selection on unobservables. Therefore, a possible approach to assess whether our estimates of FE college value-added are potentially biased is to analyse to what extent they correlate with *a priori* important observable student characteristics (i.e. free school meal eligibility) that are left out from the empirical specifications. Figure 4 shows correlations of value-added measures in our earnings and employment measures with a measure of socio-economic status of the intake at the college level, defined as the share of the FE college's intake that had been eligible for free school meals (FSM) in the year they completed compulsory education. Reassuringly, our value-added estimates show no correlation with the share of free school meal eligible students at that college. In contrast, recall that in Figure 2 we saw that average raw daily earnings of graduates at FE colleges were significantly negatively correlated with the share of the intake that was eligible for free school meals.

We repeat the same test for intermediate outcomes. Figure 5 shows that none of our intermediate value-added estimates (i.e. total GLH hours achieved, share GLH completed, achieving a level 3 qualification, and higher education enrolment) significantly correlate with the share of FSM-eligible students at the college.

An analogous way to test for the importance of free school meal eligibility in deter-

mining FE value-added after including a large set of controls is to compare value-added estimates between models that include and exclude FSM. Our results show that the correlation of FE value-added between models is 0.998.

In sum, the absence of correlation between our FE value-added measures and an important variable of socio-economic background of the learner, i.e. the share of FSM-eligible intake, suggests that our findings are unlikely to be biased by unobserved student characteristics.

5.3.2 Alternative Approach

As a robustness check, we implement an alternative estimation procedure to recover the effect of FE college VA on earnings.[32] Following the spirit of Chetty et al. (2011), we first estimate FE college value-added on students' intermediate outcomes. In a second stage, we use these estimates as independent variables in log daily earnings regressions.[33] Chetty et al. (2011)'s rationale for this approach (instead of recovering VA estimates directly from the earnings regression) is that in their context they do not have access to lagged earnings, and therefore, the lack of those controls may invalidate their empirical strategy.[34] While our specific context differs from theirs (i.e. we do observe earnings before FE college, which makes our previous findings robust to problems of selection bias), we implement this alternative approach as an additional robustness check.

In a first step we recover FE college VA on intermediate outcomes as described in Section 4.1.1. Our intermediate outcomes are FE college outcomes such as total guided learning hours achieved, share of guided learning hours achieved, whether the learner achieved at least one level 3 qualification, and progression to higher education. In the second stage, we include the shrunk value-added estimates associated to these intermediate outcomes as explanatory variables in log daily earnings specifications (i.e. we run as

[32] We focus on earnings, though effects on employment are also consistent with our previous approach.

[33] Chetty et al. (2011) first recover teacher value-added on students' test scores. In a second stage, they use those value-added estimates as an independent variable in the earnings regression.

[34] Chetty et al. (2011) use family connections as an example of a potential unobserved variable that complicates the consistent estimation of teacher value added on earnings. See page 11 of Chetty et al. (2011) for a more detailed explanation on this point.

many second stages as intermediate outcomes). Each second stage specification is defined as follows:

$$Y_{ict} = f_1(\mathbf{X}_{it}) + f_2(\rho_{it}) + \zeta_i + \gamma_{o1} D_{it} \hat{\pi}_{co} + \gamma_{o2} D_{it} \hat{\pi}_{co} t + \eta_{ict} \tag{5}$$

This empirical model presents two differences with respect to Equation (3). First, it includes an estimate of π_c (i.e. $\hat{\pi}_{co}$, which is obtained in a first stage and represents the value-added of FE college c on a given intermediate outcome o).[35] Second, we allow the effects of FE college value-added to change over time following a linear time trend. To compare these results with our previous findings, we compute the effect of FE college value-added on earnings at 7.8 years after graduation (which is the average number of years since individuals have left FE college in 2017).[36] Given that this second stage involves a within-individual fixed-effect estimation, which allows us to further account for unobserved heterogeneity (i.e. ζ_i), we believe that our approach is plausibly more robust than that of Chetty et al. (2011).[37]

Table A8 presents results corresponding to five panel specifications for log daily earnings. Column (1) serves as a benchmark, reporting the effect of one standard deviation increase of FE college VA on earnings based on the estimates from Equation (3). Columns (2) to (5) show the impact of one standard deviation increase in $\hat{\pi}_{co}$ on earnings 7.8 years after graduation.[38] Each column corresponds to a different intermediate outcome. As expected, our findings based on this alternative method are somewhat smaller than those reported in column (1), though differences are not large.[39] For example, while our previous findings indicate that one standard deviation increase in FE college value-added increase log daily earnings in 2017 by 3%, this alternative approach shows that increasing FE college value-added on the intermediate outcome *achieving at least one level 3*

[35] $\hat{\pi}_{co}$ is turned on (i.e. $D_{it} = 1$) once the student has finished her studies.

[36] For comparison purposes, we also report in this section the effect of π_c from the specification in Equation (3), which are estimated for the year 2017.

[37] In Chetty et al. (2011), second-stage earnings regressions correspond to cross-section specifications.

[38] In these estimations, we do not divide the sample between males and females given that results do not vary substantially by gender.

[39] A priori smaller effects are expected because this approach captures the effect of FE college value-added on earnings only through specific channels (i.e. particular intermediate outcomes).

qualification leads to an increase in earnings of 2.5%. In summary, we find that these new estimates are highly comparable to our previous findings, further suggesting that our results are not likely to be affected by selection bias.

5.3.3 Younger Learners (Age 16-20)

Our results have focused on the 18-20 and 25-59 age groups due to the fact that younger learners (age 16-17) are less likely to have labour market experience before enrolling in FE institutions. However, leaving out from our analysis students entering FE colleges at ages 16 and 17 may compromise the external validity of our findings. To overcome this concern, Table A9 in the Appendix reports FE college value-added estimates for the 16-17 and 16-20 age groups.

Overall, our findings show similar variations in college value-added when estimated on the whole sample of young learners (16-20) compared to those reported for 18-20 year-olds. Moreover, Figure 6 shows that value-added estimates in log daily earnings across these two samples are highly correlated, suggesting that our findings using the sample of 18-20-year-olds are comparable to value-added estimates that also include younger learners.[40]

5.4 Mechanisms

In order to get a deeper understanding of what might be driving college quality, we correlate the value-added measures for each FE college with other variables, such as college inspection ratings, indicators of resources available to students (financial as well as teacher resources), measures of value-added in learning outcomes and characteristics of the curriculum taught. Given that our results show larger variation in FE college value-added among young learners, we focus the analysis of the mechanisms on this sub-group.

First, we check whether our value-added measures are correlated with two existing measures of college quality. The first one is the percentage of students stating they are satisfied with the course they are studying at the college, taken from the National Student

[40]In Table A9 we also report value-added estimates for the sample of 16-17-year-olds, and these are very similar to those computed for the 16-20-year-olds sample.

Survey (NSS) results.[41] The second measure is the average grade received from Ofsted inspections in the years between 2005 and 2010, which is roughly the period over which our sample of learners are taking their courses.[42]

Table 6 shows that the correlations between value-added in daily earnings (logs and levels) and student satisfaction are non-significant. Moreover, there is a similar lack of correlation with average Ofsted ratings.[43] A possible explanation is that existing quality measures might capture things that are not reflected by college value-added in earnings or employment, and they may not be informative of the labour market perspectives for prospective students.

When looking at the correlation between value-added in achievement of level 3 qualifications and value-added in earnings, we see a strong and significant positive relationship. A higher value-added in the share of achieved guided learning hours, a measure of course completion, is also associated with significantly higher value-added in daily earnings (both log and levels) and progression to higher education. This suggests that achievement of intermediate learning outcomes might be an important factor in adding value (i.e. monetary returns) for young learners. We discuss correlations between value-added in these FE achievement outcomes and other variables at the end of this section.

The second part of Table 6 shows coefficients from regressions of different measures of FE college value-added on variables indicating college resources. We do not find a significant association between college value-added in either earnings, employment or progression to higher education and measures of resources such as the ratio of full-time equivalent teachers to full-time equivalent students, the share of teacher salary cost over total staff cost, the average salary per teacher or per-student expenditure. While this suggests that traditional measures of college resources do not seem to be good predictors of how FE institutions contribute to labour market success, the absence of correlations

[41] Only about half of the colleges in our sample have data available in the NSS for the years of interest, which is between 2005 and 2010.

[42] Ofsted inspections are performed on a regular basis and colleges receive a grade between one and four, where four means that the college requires improvement, and one means that the college is outstanding. We recode the measure so that a four means "outstanding", and one means "requires improvement", so that the coefficients in the regressions are easier to interpret.

[43] This is consistent with Cerqua and Urwin (2017).

between these measures should not be interpreted as meaning that resources do not matter.

Lastly, we look at the characteristics of learning. A high share of distance learning is associated with significantly lower value-added in log earnings, but not in earnings in levels (which include zeros for the non-employed), though the coefficient is also negative. Colleges with a higher share of learning provided inside the classroom tend to have significantly higher value-added, while value-added of colleges where a high share of learning is delivered at the workplace is significantly lower. Overall, these results suggest that the route via which learning is typically delivered at a college seems to matter for learners.

When looking at the curriculum offer, we find some evidence that FE colleges that offer a higher overall share of National Vocational Qualifications (NVQs) - vocational qualifications awarded on the basis of individuals showing competencies in the specific occupation chosen as opposed to taking an exam - have significantly lower value-added in earnings, employment and progression to HE for young people.

A similar picture emerges in Table A11, when we look at correlations between value-added in FE college outcomes (i.e. total guided learning hours achieved, share of guided learning hours achieved, and whether the learner has achieved any Level 3 (i.e. upper secondary) qualification) and how learning is delivered at FE colleges. For instance, a high share of distance learning is associated with significantly lower value-added in the total number of guided learning hours achieved and achieving a Level 3 qualification (the latter is also true for a high share of qualifications set in the workplace).

Existing measures of FE college quality, especially in terms of student satisfaction, are positively and significantly correlated with value-added in both the total number and the share of guided learning hours achieved. Unlike other variables analysed here, student satisfaction can be directly affected by FE colleges, so this opens up a plausible channel by which FE colleges can increase students' academic performance.

Finally, correlations between variables measuring resources available to the FE colleges and value-added in these intermediate outcomes show a mixed picture: whereas better

paid teachers positively correlate with our value-added measure of total guided learning hours, total expenditure per student seems to be negatively correlated with it.

Concluding on the above, we find some indicative evidence that value-added in labour market outcomes and progression to higher education seems to be related with how learning is delivered at FE colleges, while our measures of resources (either in total per student expenditure or in terms of the number of teachers per student) do not seem to be correlated with value added (i.e. college performance after accounting for selection). It is important to highlight that these correlations (or lack thereof) do not imply a causal relationship.

6 Results II: Returns to Field of Study

When enrolling in an FE college, students typically specialise in one field of study, constituting about 50-80% of their total guided learning hours, and take additional courses in other fields.[44] As explained in Section 4, this allows us to identify returns to fields of study by using both students that do and those that do not specialise in a given field.[45]

In addition to the field of study, we know the level, type and awarding body of all courses taken and completed. The richness of the data available thus allows us to construct a measure of exposure to each field based on guided learning hours, but also to recover returns to fields' human capital net of sheepskin effects (e.g. type of qualification), helping to understand expected returns also among individuals that cannot complete their qualifications.

Tables 7 to 10 present returns to field of study for young and adult learners by gender. In the case of of young learners, we focus on the sub-sample of 18-20-year-olds that do *not* subsequently enrol in higher education. This allows us to work with a more homogeneous sample and makes the interpretation of our findings easier.[46] Each table

[44]The classification of fields of study is described in Section A.1.

[45]Tables A12 and A13 show the distribution of guided learning hours across field of study by main field of study, for males and females, respectively.

[46]Consider, for example, the case of a student who specialises in social sciences while in FE college, but subsequently enrols in a bachelor's degree in business administration at university. In such cases, it is not clear to which field of specialisation the labour market returns should be attributed.

reports results corresponding to three different specifications. The specifications differ by the extent to which we control for sheepskin effects and differential returns to experience since completing FE education by field. The dependent variable across models is log daily earnings, and the reported coefficients represent the returns to 100 guided learning hours taken in a specific field (corresponding to the parameters $\boldsymbol{\Upsilon_1}$ in Equation (4)).

Specification 1 (Column 1) represents the baseline regression, including covariates as described in the notes of each table. Specification 2 (Column 2) adds controls for the qualification type and level (e.g. BTEC at level 2), and their interactions with years since leaving FE education, as well as dummies for the awarding body of the qualifications taken. Specification 3 (Columns 3 and 4) additionally includes interactions between the number of learning hours taken in each field of specialisation and the number of years since leaving the FE college to account for the fact that the returns to fields of study could take some time to emerge. The coefficients on the interaction term (corresponding to the $\boldsymbol{\Upsilon_2}$'s in Equation (4)) are given in Column 4.

In order to provide a rough approximation of the overall mean returns to each field, we also report the average guided learning hours taken among those that specialise in a given field (Column 5) multiplied by the returns per 100 hours one and five years after leaving FE education (Columns 6 and 7, respectively). We report the share of individuals that specialises in each field in Column 8 to show how prevalent each specialisation is in our samples.

Young male learners Table 7 shows that after controlling for qualification type, and level, the estimates of the returns per 100 hours taken in each field experience important declines for most specialisations (see Column 1 versus 2). This suggests that qualifications are likely to have relevant sheepskin effects. Second, our findings indicate that the two fields of study that show largest returns are engineering and manufacturing technology and business administration and law, where the average male young learner (that specialises in these fields) experiences an increase of 6.8% and 4% in daily earnings,

respectively, five years after graduation.[47] Results also show that many specialisations present negative returns immediately after graduation that turn positive five years after graduation, indicating that it takes time for positive returns to be reflected in wages. The fact that the timing of measurement matters has important policy implications for the evaluation of colleges in terms of the labour market performance of their students. Finally, fields such as agriculture, horticulture and animal care and preparation for life and work exhibit negative returns even five years after graduation (-2%).

Adult male learners Table 8 indicates that similar to young learners, engineering and manufacturing technology is the field that leads to the largest returns five years after FE college attendance. The average adult specialising in this field show an increase in daily earnings five years after graduation of 1.5%. As noted earlier, the lower returns compared to young learners might be driven, in part, by the fact that adult learners complete a lower number of guided learning hours overall. Health, public services and care, retail and commercial enterprise and preparation for life and work lead to returns close to zero five years after completion. Fields of study such as arts, media and publishing, leisure travel and tourism, and history, philosophy, and theology lead to negative returns.

Young female learners Table 9 shows that young females experience statistically significant positive returns five years after graduation across all fields. The most popular ones (based on enrolment shares), such as health, public services and care, arts, media and publishing, retail and commercial enterprise, and business administration and law, show large positive returns for the typical female learner specialising in these fields. For example, the average female specialising in business administration and law experiences an increase in daily earnings of 11.8% five years after graduation.

It is not clear what drives the differential returns by field between males and females. A possible explanation could be gender differences in matching between FE college specialisation and occupation. For example, if females in certain fields face a lower difficulty

[47]The biggest return after 5 years is found for those specialising in Education and Training. However, they constitute a very small fraction of young male learners in the sample (0.3%).

than males to find a job that matches their specialisation, then this could explain the gender differences in the returns. An alternative explanation could also be gender differences in work intensity in the years before and after enrolling in FE college. Finally, it is worth highlighting that the enrolment of young females across fields is very different when compared with their young male counterparts. For example, while 1.2% of females have engineering and manufacturing as their main field of study, 20.6% of young males do so.

Adult female learners Table 10 shows that adult female learners mainly specialise in health, public services, and care (34.3%), business administration and law (14.8%), and education and training (12.7%). All these fields show returns between approximately 2% and 3% five years after graduation for the average learner. Those specialising in retail and commercial enterprise show negative returns five years after completion of -2.8%. Overall, returns for adult females are larger in magnitude than for adult males.

In summary, four main conclusions can be extracted from these results. First, there are important heterogeneities in the returns to fields of study, particularly among females. Second, adult learners complete a substantial lower number of guided learning hours, which could explain the smaller overall returns for the average adult student specialising in a given field. Third, sheepskin effects seem to play a relevant role in the returns to specialisations, as controlling for qualification type and level tend to reduce the estimated returns to specialisation. Fourth, engineering and manufacturing technology, and business administration and law are not only showing large levels of enrolment among young and adult male learners, but they are among the fields that lead to largest positive returns. Finally, business administration and law and health, public services and care are the fields that show high levels of enrolment and consistent positive returns for females across age groups.

Finally, while we find consistently higher returns to specialisations for females than for males, this does not mean that females overall have higher earnings post FE-college attendance. As can be seen from Tables A1 to A6 in the appendix, women have consistently

lower average earnings five years after FE college attendance.

7 Conclusions

This paper presents value-added estimates for FE colleges and estimates of the returns to different fields of study, both for young and adult learners in England. We find relatively moderate variability in college value-added in terms of earnings and employment probabilities later in life. However, there is more variation when considering completion of learning, and progression to higher levels of learning.

In our analysis of the correlates of institution value-added, we find some indicative evidence that certain characteristics of the learning provided at the FE college seem to be important: A higher share of learning delivered in the classroom is associated with higher value-added, while distance learning is negatively correlated with value-added. Existing measures of FE college quality, especially in terms of student satisfaction, show positive correlations with value-added in terms of academic achievement at the FE college. While these correlations cannot be interpreted as causal, they provide potential avenues for further research into the drivers of college value-added.

Finally, we also find important variations in returns to field of study, suggesting that *what* one studies rather than *where* one does so may be more relevant for labour market outcomes. Importantly, labour market returns to specialisations tend to materialise only several years after graduation. The fact that the timing of measurement matters has important policy implications for the evaluation of colleges in terms of the labour market performance of their students.

We believe that our findings can help prospective FE students make more informed decisions in terms of how to confront important trade-offs when making post-secondary education decisions.

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Tables

Table 1: Summary Statistics for Young Learners

	(1) 16-17	(2) 18-20	(3) Total
Students	838939	130009	968948
FE Colleges	258	255	513
Learner characteristics			
Share female	0.50	0.48	0.50
Duration of learning (days)	766.70	505.75	731.68
Total nb. of courses enrolled	5.57	2.79	5.20
Total guided learning hours enrolled	1115.30	622.16	1049.13
Maximum level enrolled is 2	0.30	0.34	0.30
Maximum level enrolled is 3	0.62	0.54	0.61
Maximum level enrolled is 4	0.00	0.01	0.00
Observed in HE at some point	0.31	0.37	0.32
Labour market characteristics			
Share employed before FEC entry	0.44	0.76	0.49
Earnings in FEC entry year	3778.53	7611.35	4824.35
Earnings before FEC entry	3407.08	6915.27	5395.07
Earnings 5 years post FEC	13264.04	14566.18	13441.45

Source: NPD, ILR, HESA and LEO.
Notes: The table shows summary statistics for young learners aged 16 to 20, enrolled in a further education college at level 2 and above and enrolling in learning between 2005 and 2010 for the first time. FEC=Further Education College. Earnings are reported in real terms (in 2015 £)).

Table 2: Summary Statistics for Adult Learners

	(1) 25-29	(2) 30-39	(3) 40-49	(4) 50-59	(5) Total
Learners	135886	293729	247086	127238	803939
FE Colleges	255	255	255	255	1020
Learner characteristics					
Share female	0.52	0.53	0.55	0.52	0.53
Duration of learning (days)	319.66	307.03	280.99	235.90	289.91
Total nb. of courses enrolled	2.28	2.17	1.98	1.78	2.07
Total guided learning hours enrolled	248.16	211.04	159.40	105.93	184.81
Maximum level enrolled is 2	0.59	0.60	0.62	0.66	0.62
Maximum level enrolled is 3	0.32	0.32	0.30	0.28	0.31
Maximum level enrolled is 4	0.08	0.08	0.07	0.06	0.07
Labour market characteristics					
Share employed before FEC entry	0.71	0.72	0.75	0.78	0.74
Earnings in FEC entry year	8436.12	9724.45	11788.86	13337.80	10713.05
Earnings before FEC entry	7891.24	9562.75	11671.04	13559.11	10560.69
Earnings 5 years post FEC	19849.84	20348.31	21086.88	20265.33	20500.61

Source: ILR and HMRC.

Notes: The table shows summary statistics for adult learners aged 25 to 59, enrolled in a further education college at level 2 and above and enrolling in learning between 2007 and 2010.

FEC=Further Education College. Earnings are reported in real terms (in 2015 £)).

Table 3: Value-Added in Labour Market Outcomes in 2017

	18-20 year olds						25-59 year olds		
	Cross-Section			Panel			Panel		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All	Male	Female	All	Male	Female	All	Male	Female
	Log daily earnings in 2017								
SD Value-Added	0.036	0.026	0.044	0.030	0.031	0.041	0.015	0.018	0.019
Observations	70,321	36,331	33,729	87,318	45,606	41,466	459,816	204,042	255,721
Nb. of colleges	227	218	224	248	242	243	252	250	252
	Log annual earnings in 2017								
SD Value-Added	0.035	0.024	0.041	0.040	0.048	0.051	0.020	0.025	0.024
Observations	70,321	36,331	33,729	87,318	45,606	41,466	459,816	204,042	255,721
Nb. of colleges	227	218	224	248	242	243	252	250	252
	Daily earnings in Levels in 2017 (incl. zeros for not employed)								
SD Value-Added (A)	1.748	2.106	1.972	1.714	1.868	1.976	0.922	1.204	0.886
Mean dep var (B)	45.273	50.316	39.839	44.842	49.758	39.472	48.760	56.487	42.270
(A)/(B)	0.039	0.042	0.050	0.038	0.038	0.050	0.019	0.021	0.021
Observations	90,033	46,602	43,260	112,700	58,861	53,678	551,440	251,708	299,732
Nb. of colleges	228	221	227	250	246	246	252	252	252
	Employed > 90 days in 2017								
SD Value-Added (A)	0.008	0.013	0.000	0.017	0.023	0.013	0.010	0.009	0.011
Mean dep var (B)	0.749	0.744	0.754	0.742	0.739	0.745	0.852	0.833	0.869
(A)/(B)	0.010	0.018	.	0.023	0.031	0.017	0.012	0.011	0.012
Observations	94,552	48,724	45,651	118,640	61,667	56,804	668,967	307,015	361,952
Nb. of colleges	228	221	221	250	246	246	252	252	252

Notes: The table shows summary statistics of value-added measures based on estimations of Equation (2) for cross-sectional data and Equation (3) for panel data. The reported standard deviations of value-added measures are adjusted for sampling error. **Estimates based on cross-sectional data for young learners** include the following controls: Earnings measured prior to FE entry, indicator for when earnings prior to entry were measured, interaction between pre-FE earnings measure and timing of measurement, series of dummies for region where FE college is located, fixed effects for academic year compulsory schooling was completed, a series of dummies for the last year observed in education (FE or HE), dummy variables indicating the number of years since starting FE, age first entered FE college, mode of attendance (Full-time, Full-time part year, Part time, Unknown/Missing), a series of dummies indicating the last year observed in FE college, a series of dummies for main field of study, gender, a series of dummies for ethnicity (White, Mixed, Asian/Chinese, Black), a dummy for whether English spoken at home, a dummy for whether student had special educational needs, dummy for whether student was eligible for free school meals in KS4 year, neighbourhood IDACI score based on postcode prior to joining FE college, standardised KS4 score, OFSTED rating of KS4 school, KS3 maths result, KS3 English result, KS2 English result, KS2 maths result, series of dummies indicating whether the student had worked before FE college (never worked before college, worked in year of entry, worked 1 year before entry, worked 2 years before entry), a series of deprivation indicators (crime, employment, health, income) based on FE college postcode and based on student's postcode based on ILR. **Estimates based on panel data for young learners** include the following controls: Individual fixed effects, series of dummies indicating the main field of study (taking the value 1 from the year of completing FE college education), series of dummies for region where FE college is located interacted with the academic year, years of work experience prior to entering FE college, age, age^2, a dummy indicating whether the individual is in any form of learning in a given academic year (FE or HE), a dummy variable indicating the year prior to FE entry, a series of dummy variables indicating the number of years since finishing further education. **Estimates based on panel data for adult learners** include the following controls: Individual fixed effects, academic year fixed effects, series of dummies indicating the main field of study (taking the value 1 from the year of completing FE college education), series of dummies for region where FE college is located interacted with the academic year, years of cumulative work experience and its square, age, age^2, dummies indicating whether learner is in school in a given year (whether observed in the Individual Learner Records or Work Based Learning collection), dummy indicating whether learner is doing an apprenticeship in that year, a dummy variable indicating the year prior to FE entry, a series of dummy variables indicating the number of years since finishing further education, and a series of dummy variables indicating the number of years since starting FE. The number of institutions changes across outcome variables and specifications due to sample restrictions (and the fact that we drop institutions with less than 30 learners).

Table 4: Value-Added in Labour Market Outcomes - Individuals never attending HE

	Cross-Section			Panel		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	Male	Female	All	Male	Female
	Log daily earnings in 2017					
SD Value-Added	0.039	0.033	0.047	0.026	0.027	0.022
Observations	42,226	22,969	18,260	53,435	29,440	23,294
Nb. of colleges	224	202	200	246	230	227
	Log annual earnings in 2017					
SD Value-Added	0.039	0.038	0.050	0.026	0.036	0.029
Observations	42,226	22,969	18,260	53,435	29,440	23,294
Nb. of colleges	224	202	200	246	230	227
	Daily earnings in Levels in 2017 (incl. zeros for not employed)					
SD Value-Added (A)	1.964	2.507	2.075	1.278	1.610	0.382
Mean dep var (B)	41.716	48.285	33.786	40.883	49.861	33.091
(A)/(B)	0.047	0.052	0.061	0.031	0.032	0.012
Observations	56,316	30,644	25,170	72,090	58,734	32,219
Nb. of colleges	226	213	215	250	246	238
	Employed > 90 days in 2017					
SD Value-Added (A)	0.007	0.012	0.013	0.012	0.017	0.011
Mean dep var (B)	0.716	0.720	0.712	0.742	0.739	0.745
(A)/(B)	0.010	0.017	0.018	0.016	0.023	0.007
Observations	58,950	31,846	26,611	118,203	61,506	56,528
Nb. of colleges	227	214	216	250	246	246

Notes: The table shows summary statistics of value-added measures based on estimations of Equation (2) for cross-sectional data and Equation (3) for panel data. The reported standard deviations of value-added measures are adjusted for sampling error. **Estimates based on cross-sectional and panel data for young learners** as defined in the notes to Table 3. Sample: Individuals aged 18-20 when first enrolling in an FE college, excluding individuals who attend higher education at some point after FE college.

Table 5: Value-Added in Intermediate Outcomes

	(1) All	(2) Male	(3) Female
	Total GLH achieved		
SD Value-Added (A)	33.454	35.013	33.624
Mean dep var (B)	412.486	417.469	407.272
(A)/(B)	0.081	0.084	0.083
Observations	94,559	48,728	45,654
Nb. of colleges	228	221	227
	Share of GLH achieved		
SD Value-Added (A)	0.045	0.049	0.044
Mean dep var (B)	0.689	0.686	0.693
(A)/(B)	0.065	0.072	0.063
Observations	94,424	48,661	45,587
Nb. of colleges	228	221	227
	Achieved 1+ Level 3 Qualification		
SD Value-Added (A)	0.044	0.048	0.043
Mean dep var (B)	0.417	0.378	0.458
(A)/(B)	0.105	0.127	0.095
Observations	94,559	48,728	45,654
Nb. of colleges	228	221	227
	Entered Higher Education^{A}		
SD Value-Added (A)	0.038	0.044	0.038
Mean dep var (B)	0.376	0.343	0.411
(A)/(B)	0.102	0.127	0.091
Observations	94,559	48,728	45,654
Nb. of colleges	228	221	227

Notes: The table shows summary statistics of value-added measures based on estimations of Equation (2) (without lagged dependent variables). The reported standard deviations of value-added measures are adjusted for sampling error. A=Enrolled in a higher education institution. **Estimates based on cross-sectional data for young learners** include the following controls: A series of dummies for region where FE college is located, fixed effects for academic year compulsory schooling was completed, a series of dummies for the last year observed in education (FE or HE), dummy variables indicating the number of years since starting FE, age first entered FE college, mode of attendance (Full-time, Full-time part year, Part time, Unknown/Missing), a series of dummies indicating the last year observed in FE college, a series of dummies for main field of study, gender, a series of dummies for ethnicity (White, Mixed, Asian/Chinese, Black), a dummy for whether English spoken at home, a dummy for whether student had special educational needs, dummy for whether student was eligible for free school meals in KS4 year, neighbourhood IDACI score based on postcode prior to joining FE college, standardised KS4 score, OFSTED rating of KS4 school, KS3 maths result, KS3 English result, KS2 English result, KS2 maths result, series of dummies indicating whether the student had worked before FE college (never worked before college, worked in year of entry, worked 1 year before entry, worked 2 years before entry), a series of deprivation indicators (crime, employment, health, income) based on FE college postcode and based on student's postcode based on ILR.

Table 6: Value-Added for Young Learners and College Characteristics

	(1) VA in Log daily earnings	(2) VA in Daily earnings$^{\$}$	(3) VA in Employed	(4) VA in Ever HE
FE College quality				
% students satisfied with course (NSS)	0.008	1.029	-0.004	0.037
	(0.021)	(1.032)	(0.011)	(0.035)
Average OFSTED rating^{a}	0.003	0.021	-0.002*	0.002
	(0.002)	(0.095)	(0.001)	(0.003)
VA in Achieved a L3 qual	0.199***	8.796***	0.015	0.229***
	(0.040)	(1.817)	(0.020)	(0.059)
VA in Share GLH achieved	0.151***	5.883***	-0.009	0.273***
	(0.038)	(1.726)	(0.018)	(0.053)
VA in Total GLH achieved	0.000**	0.005*	-0.000	0.000*
	(0.000)	(0.002)	(0.000)	(0.000)
College Resources				
FTE teachers per FTE student^{b}	0.157	0.962	-0.072	0.167
	(0.099)	(4.652)	(0.048)	(0.158)
Teacher salary cost/Total staff cost	0.046	1.036	0.000	0.056
	(0.026)	(1.183)	(0.012)	(0.041)
Average teacher salary	-0.000	-0.014	0.000	0.000
	(0.000)	(0.015)	(0.000)	(0.001)
Total expenditure over FTE students	0.000	-0.041	-0.001	-0.002
	(0.002)	(0.070)	(0.001)	(0.002)
Learning/Learner Characteristics				
Average GLH by student	0.000*	0.001	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)
% aims distance learning^{c}	-0.123**	-2.197	-0.028	-0.025
	(0.041)	(1.864)	(0.019)	(0.062)
% aims set in workplace	-0.349***	-11.055**	-0.082*	-0.313*
	(0.078)	(3.628)	(0.038)	(0.125)
% aims classroom/provider	0.091***	2.407**	0.030**	0.046
	(0.020)	(0.913)	(0.009)	(0.032)
% aims type A-levels	0.044*	1.146	-0.002	0.067*
	(0.022)	(0.962)	(0.010)	(0.032)
% aims type GCSE	0.114	2.706	0.065	-0.001
	(0.120)	(5.459)	(0.056)	(0.183)
% aims type NVQ	-0.092**	-2.737	-0.043**	-0.155**
	(0.031)	(1.397)	(0.014)	(0.048)

Notes: Table shows coefficients from OLS regressions of value-added measure specified in columns heading (using individual fixed-effects strategy for the sample of 18-20 year-olds) on college characteristic specified in first column. Standard errors in parentheses. *p<0.5 ** p<0.01 *** p<0.001. $=Including zeros for non-employed. *a*=Average between 2005 and 2010. *b*=Regression controls for share of aims from different awarding bodies, share of aims delivered at provider and average teacher salary. *c*=Excludes e-learning. GLH: Guided Learning Hours; FTE: Full-time equivalent; L3: Level 3; NSS: National Student Survey.

Table 7: Earnings Returns to Field of Study **Males** (young learners)

Field of Study	(1) Spec. 1 Υ_1	(2) Spec. 2 Υ_1	(3) Spec. 3 Υ_1	(4) Spec. 3 Υ_2	(5) Mean GLH if main field	(6) Estimated Return (Spec 3) 1 year post FE	(7) Estimated Return (Spec 3) 5 years post FE	(8) Share specialising in field
Health, Public Services and Care	0.012***	0.005**	0.003	0.000	427	0.016	0.024	8.5%
	(0.001)	(0.002)	(0.002)	(0.000)				
Science and Mathematics	0.008**	0.003	-0.005	0.002***	457	-0.013	0.023	2.2%
	(0.003)	(0.003)	(0.004)	(0.001)				
Agriculture, Horticulture and Animal Care	0.003	-0.003	-0.005	0.000	632	-0.029	-0.020	1.6%
	(0.002)	(0.003)	(0.003)	(0.001)				
Engineering and Manufacturing Technology	0.014***	0.010***	0.005***	0.001***	632	0.040	0.068	20.6%
	(0.001)	(0.001)	(0.001)	(0.000)				
Construction, Planning and the Built Environment	0.006***	0.003**	-0.001	0.001***	621	-0.001	0.023	16.6%
	(0.001)	(0.001)	(0.001)	(0.000)				
Information and Communication Technology	0.008***	0.001	-0.006**	0.002***	723	-0.029	0.020	6.9%
	(0.001)	(0.001)	(0.002)	(0.000)				
Retail and Commercial Enterprise	0.004**	0.000	0.001	-0.000	482	0.004	0.001	4.7%
	(0.002)	(0.002)	(0.003)	(0.000)				
Leisure, Travel and Tourism	0.008***	0.002	-0.008***	0.003***	586	-0.034	0.026	9.0%
	(0.001)	(0.001)	(0.002)	(0.000)				
Arts, Media and Publishing	0.004***	-0.002	-0.008***	0.002***	942	-0.064	-0.003	10.7%
	(0.001)	(0.001)	(0.002)	(0.000)				
History, Philosophy and Theology	-0.007	-0.009	-0.024**	0.004**	410	-0.083	-0.020	0.4%
	(0.006)	(0.006)	(0.008)	(0.001)				
Social Sciences	0.013	0.005	-0.011	0.004*	369	-0.027	0.028	0.3%
	(0.008)	(0.009)	(0.011)	(0.002)				
Languages, Literature and Culture	0.006	0.015	-0.008	0.005**	121	-0.003	0.023	0.8%
	(0.009)	(0.011)	(0.014)	(0.002)				
Education and Training	0.049***	0.049***	0.024	0.006*	190	0.056	0.101	0.3%
	(0.011)	(0.011)	(0.015)	(0.002)				
Preparation for Life and Work	-0.012***	-0.015***	-0.015***	0.000	136	-0.021	-0.020	9.8%
	(0.002)	(0.002)	(0.003)	(0.000)				
Business Administration and Law	0.012***	0.006***	0.001	0.001***	543	0.011	0.040	7.6%
	(0.001)	(0.002)	(0.002)	(0.000)				
Observations	286,001	286,001	286,001					
Type/level of qual. ($D_{it}\pi_c$)	No	Yes	Yes					
Type/level of qual. X Years s. compl ($D_{it}\phi_i\tau_t$)	No	Yes	Yes					
Awarding body ($D_{it}\omega_i$)	No	Yes	Yes					
GLH in field X Years s. compl. ($D_{it}\mathbf{Z_{it}}\tau_t$)	No	No	Yes					

Notes: The Υ_1**'s** are coefficients from individual fixed effects regressions of log daily earnings on the total number of guided learning hours (in '00) taken in a particular field of study (Equation 4). Υ_2 is the interaction term between guided learning hours (GLH, in '00) and years since finishing FE College education. The estimated returns reported in Columns (6) and (7) are the marginal effects (estimated using Spec. 3), one and five years after leaving the college, respectively, of choosing the field as the main field. All specifications control for college fixed effects and cumulative experience, in addition to the controls reported in the notes to Table 3 for panel data (young sample).

Table 8: Earnings Returns to Field of Study **Males** (adult learners)

Field of Study	(1) Spec. 1 Υ_1	(2) Spec. 2 Υ_1	(3) Spec. 3 Υ_1	(4) Spec. 3 Υ_2	(5) Mean GLH if main field	(6) Estimated Return (Spec 3) after 1 year	(7) Estimated Return (Spec 3) after 5 years	(8) Share specialising in field
Health, Public Services and Care	0.002**	0.001	-0.011***	0.003***	77	-0.006	0.004	19.0%
	(0.001)	(0.001)	(0.001)	(0.000)				
Science and Mathematics	-0.007***	-0.007***	-0.037***	0.007***	212	-0.062	0.000	1.1%
	(0.001)	(0.001)	(0.002)	(0.000)				
Agriculture, Horticulture and Animal Care	-0.006***	-0.008***	-0.022***	0.004***	165	-0.030	-0.005	1.5%
	(0.001)	(0.001)	(0.002)	(0.000)				
Engineering and Manufacturing Technology	0.004***	0.004***	-0.007***	0.003***	206	-0.008	0.015	18.9%
	(0.000)	(0.001)	(0.001)	(0.000)				
Construction, Planning and the Built Environment	-0.001**	-0.000	-0.010***	0.003***	279	-0.021	0.009	10.7%
	(0.000)	(0.001)	(0.001)	(0.000)				
Information and Communication Technology	-0.002**	-0.003***	-0.021***	0.005***	168	-0.028	0.006	7.9%
	(0.001)	(0.001)	(0.001)	(0.000)				
Retail and Commercial Enterprise	0.001	-0.001	-0.007***	0.002***	86	-0.005	0.001	6.9%
	(0.001)	(0.001)	(0.002)	(0.000)				
Leisure, Travel and Tourism	-0.018***	-0.019***	-0.033***	0.004***	130	-0.038	-0.019	3.7%
	(0.001)	(0.001)	(0.002)	(0.000)				
Arts, Media and Publishing	-0.006***	-0.008***	-0.022***	0.004***	336	-0.062	-0.011	2.3%
	(0.001)	(0.001)	(0.001)	(0.000)				
History, Philosophy and Theology	-0.027***	-0.026***	-0.076***	0.012***	401	-0.258	-0.072	0.5%
	(0.002)	(0.002)	(0.003)	(0.001)				
Social Sciences	-0.016***	-0.015***	-0.050***	0.008***	350	-0.146	-0.033	0.1%
	(0.003)	(0.003)	(0.005)	(0.001)				
Languages, Literature and Culture	-0.005*	-0.001	-0.007*	0.002*	110	-0.006	0.001	1.6%
	(0.002)	(0.002)	(0.004)	(0.001)				
Education and Training	0.009***	0.007***	0.002	0.001***	123	0.004	0.011	6.8%
	(0.001)	(0.001)	(0.001)	(0.000)				
Preparation for Life and Work	-0.009***	-0.005***	-0.026***	0.005***	105	-0.022	-0.001	4.7%
	(0.001)	(0.001)	(0.002)	(0.000)				
Business Administration and Law	0.006***	0.005***	0.001	0.001***	131	0.003	0.009	14.2%
	(0.001)	(0.001)	(0.001)	(0.000)				
Observations	2,686,222	2,686,222	2,686,222					
Type/level of qual. ($D_{it}\pi_c$)	No	Yes	Yes					
Type/level of qual. X Years s. compl ($D_{it}\phi_i\tau_t$)	No	Yes	Yes					
Awarding body ($D_{it}\omega_i$)	No	Yes	Yes					
GLH in field X Years s. compl. ($D_{it}\mathbf{Z_{it}}\tau_t$)	No	No	Yes					

Notes: The Υ_1**'s** are coefficients from individual fixed effects regressions of log daily earnings on the total number of guided learning hours (GLH, in '00) taken in a particular field of study (Equation 4). Υ_2 is the interaction term between guided learning hours (in '00) and years since finishing FE College education. The estimated returns reported in Columns (6) and (7) are the marginal effects (estimated using Spec. 3), one and five years after leaving the college, respectively, of choosing the field as the main field. All specifications control for college fixed effects and cumulative experience, in addition to the controls reported in the notes to Table 3 for panel data (adult sample).

Table 9: Earnings Returns to Field of Study **Females** (young learners)

Field of Study	(1) Spec. 1 Υ_1	(2) Spec. 2 Υ_1	(3) Spec. 3 Υ_1	(4) Spec. 3 Υ_2	(5) Mean GLH if main field	(6) Estimated Return (Spec 3) 1 year post FE	(7) Estimated Return (Spec 3) 5 years post FE	(8) Share specialising in field
Health, Public Services and Care	0.013***	0.006***	-0.003	0.002***	525	-0.002	0.045	25.2%
	(0.001)	(0.002)	(0.002)	(0.000)				
Science and Mathematics	0.019***	0.013***	-0.011**	0.006***	362	-0.018	0.067	2.9%
	(0.003)	(0.003)	(0.004)	(0.001)				
Agriculture, Horticulture and Animal Care	0.018***	0.014***	-0.002	0.004***	820	0.018	0.150	2.7%
	(0.002)	(0.002)	(0.003)	(0.000)				
Engineering and Manufacturing Technology	0.017***	0.015***	0.005	0.002***	576	0.045	0.102	1.2%
	(0.003)	(0.003)	(0.004)	(0.001)				
Construction, Planning and the Built Environment	0.009*	0.007	-0.005	0.003***	603	-0.012	0.063	0.8%
	(0.004)	(0.004)	(0.005)	(0.001)				
Information and Communication Technology	0.013***	0.009**	-0.006	0.004***	346	-0.008	0.047	2.9%
	(0.003)	(0.003)	(0.004)	(0.001)				
Retail and Commercial Enterprise	0.014***	0.016***	0.003	0.003***	597	0.036	0.115	23.4%
	(0.001)	(0.002)	(0.002)	(0.000)				
Leisure, Travel and Tourism	0.020***	0.015***	-0.002	0.004***	631	0.017	0.125	5.8%
	(0.001)	(0.002)	(0.002)	(0.000)				
Arts, Media and Publishing	0.021***	0.015***	-0.005**	0.005***	893	-0.001	0.186	11.6%
	(0.001)	(0.001)	(0.002)	(0.000)				
History, Philosophy and Theology	0.012*	0.010	-0.019**	0.007***	437	-0.055	0.065	1.0%
	(0.005)	(0.005)	(0.007)	(0.001)				
Social Sciences	0.042***	0.032***	0.006	0.006***	325	0.040	0.125	0.5%
	(0.008)	(0.008)	(0.010)	(0.002)				
Languages, Literature and Culture	0.007	0.002	-0.015	0.004**	135	-0.014	0.007	1.2%
	(0.007)	(0.007)	(0.009)	(0.001)				
Education and Training	0.038***	0.036***	0.030***	0.002	169	0.053	0.063	1.6%
	(0.007)	(0.007)	(0.009)	(0.001)				
Preparation for Life and Work	0.006*	-0.002	-0.022***	0.005***	153	-0.026	0.004	5.6%
	(0.003)	(0.004)	(0.005)	(0.001)				
Business Administration and Law	0.028***	0.023***	0.005*	0.005***	430	0.040	0.118	13.6%
	(0.001)	(0.002)	(0.002)	(0.000)				
Observations	226,109	226,109	226,109					
Type/level of qual. ($D_{it}\pi_c$)	No	Yes	Yes					
Type/level of qual. X Years s. compl ($D_{it}\phi_i\tau_t$)	No	Yes	Yes					
Awarding body ($D_{it}\omega_i$)	No	Yes	Yes					
GLH in field X Years s. compl. ($D_{it}\mathbf{Z_{it}}\tau_t$)	No	No	Yes					

Notes: The Υ_1**'s** are coefficients from individual fixed effects regressions of log daily earnings on the total number of guided learning hours (GLH, in '00) taken in a particular field of study (Equation 4). Υ_2 is the interaction term between guided learning hours (in '00) and years since finishing FE College education. The estimated returns reported in Columns (6) and (7) are the marginal effects (estimated using Spec. 3), one and five years after leaving the college, respectively, of choosing the field as the main field. All specifications control for college fixed effects and cumulative experience, in addition to the controls reported in the notes to Table 3 for panel data (young sample).

Table 10: Earnings Returns to Field of Study **Females** (adult learners)

Field of Study	(1) Spec. 1 Υ_1	(2) Spec. 2 Υ_1	(3) Spec. 3 Υ_1	(4) Spec. 3 Υ_2	(5) Mean GLH if main field	(6) Estimated Return (Spec 3) after 1 year	(7) Estimated Return (Spec 3) after 5 years	(8) Share specialising in field
Health, Public Services and Care	0.009***	0.008***	-0.010***	0.005***	142	-0.008	0.020	34.3%
	(0.000)	(0.000)	(0.001)	(0.000)				
Science and Mathematics	0.009***	0.007***	-0.029***	0.009***	175	-0.035	0.028	2.2%
	(0.001)	(0.001)	(0.002)	(0.000)				
Agriculture, Horticulture and Animal Care	-0.010***	-0.009***	-0.013***	0.001***	341	-0.041	-0.024	1.1%
	(0.001)	(0.001)	(0.001)	(0.000)				
Engineering and Manufacturing Technology	-0.001	0.000	-0.007**	0.002***	167	-0.008	0.004	1.2%
	(0.001)	(0.001)	(0.002)	(0.000)				
Construction, Planning and the Built Environment	0.006***	0.007***	-0.006***	0.003***	407	-0.011	0.043	0.5%
	(0.001)	(0.001)	(0.002)	(0.000)				
Information and Communication Technology	-0.004***	-0.003**	-0.023***	0.005***	134	-0.024	0.003	7.2%
	(0.001)	(0.001)	(0.001)	(0.000)				
Retail and Commercial Enterprise	-0.010***	-0.016***	-0.023***	0.002***	208	-0.045	-0.028	11.3%
	(0.000)	(0.001)	(0.001)	(0.000)				
Leisure, Travel and Tourism	-0.015***	-0.013***	-0.018***	0.001***	169	-0.029	-0.019	1.7%
	(0.001)	(0.001)	(0.002)	(0.000)				
Arts, Media and Publishing	-0.009***	-0.009***	-0.018***	0.003***	282	-0.045	-0.016	2.7%
	(0.001)	(0.001)	(0.001)	(0.000)				
History, Philosophy and Theology	0.004***	0.004***	-0.053***	0.013***	440	-0.173	0.059	1.1%
	(0.001)	(0.001)	(0.002)	(0.000)				
Social Sciences	0.002	0.001	-0.027***	0.007***	431	-0.084	0.041	0.3%
	(0.001)	(0.001)	(0.002)	(0.000)				
Languages, Literature and Culture	-0.003*	-0.001	-0.006**	0.001**	132	-0.006	0.000	2.5%
	(0.001)	(0.001)	(0.002)	(0.000)				
Education and Training	0.013***	0.012***	-0.011***	0.006***	143	-0.007	0.027	12.7%
	(0.001)	(0.001)	(0.001)	(0.000)				
Preparation for Life and Work	0.010***	0.018***	-0.020***	0.009***	137	-0.016	0.031	6.5%
	(0.001)	(0.001)	(0.001)	(0.000)				
Business Administration and Law	0.010***	0.008***	0.000	0.002***	189	0.004	0.019	14.8%
	(0.000)	(0.000)	(0.001)	(0.000)				
Observations	3,178,184	3,178,184	3,178,184					
Type/level of qual. ($D_{it}\pi_c$)	No	Yes	Yes					
Type/level of qual. X Years s. compl ($D_{it}\phi_i\tau_t$)	No	Yes	Yes					
Awarding body ($D_{it}\omega_i$)	No	Yes	Yes					
GLH in field X Years s. compl. ($D_{it}\mathbf{Z_{it}}\tau_t$)	No	No	Yes					

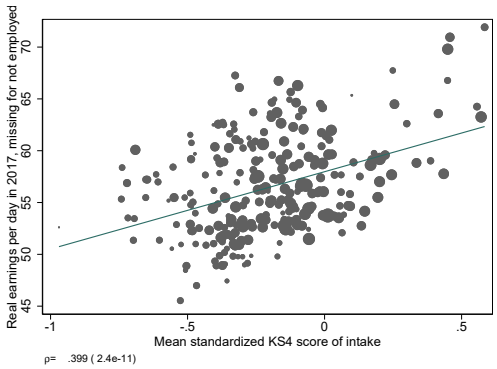
Notes: The Υ_1**'s** are coefficients from individual fixed effects regressions of log daily earnings on the total number of guided learning hours (GLH, in '00) taken in a particular field of study (Equation 4). Υ_2 is the interaction term between guided learning hours (in '00) and years since finishing FE College education. The estimated returns reported in Columns (6) and (7) are the marginal effects (estimated using Spec. 3), one and five years after leaving the college, respectively, of choosing the field as the main field. All specifications control for college fixed effects and cumulative experience, in addition to the controls reported in the notes to Table 3 for panel data (adult sample).

Figures

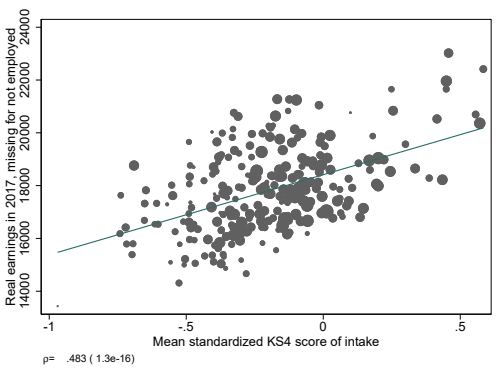
Intake Quality and Average Outcomes by College

Figure 1: Prior attainment and raw average outcomes by college

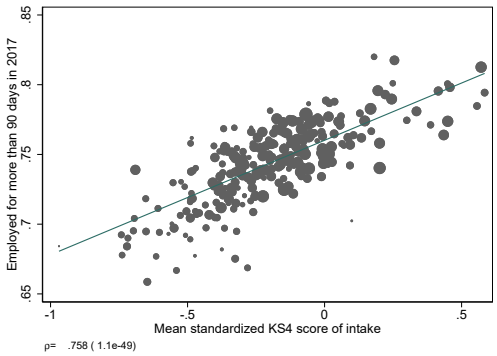
(a) Average daily earnings



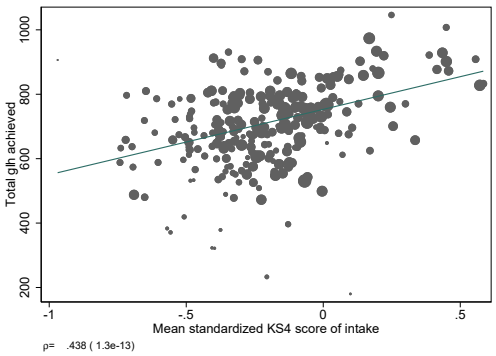
(b) Average annual earnings



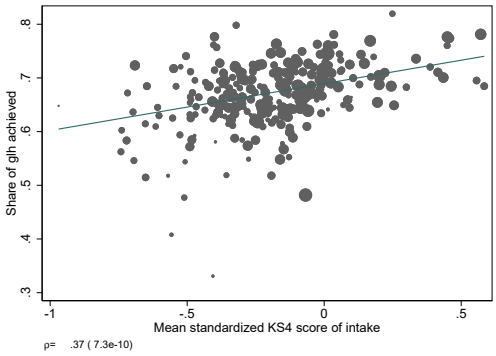
(c) Share employed



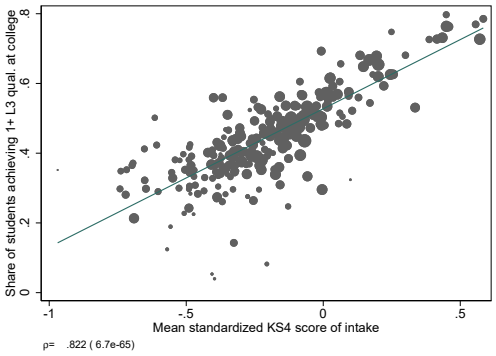
(d) Total GLH achieved



(e) Share of GLH achieved



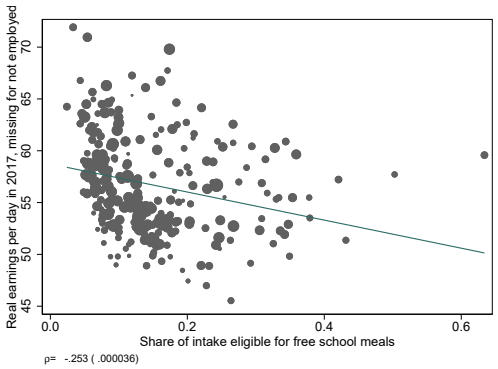
(f) Share achieving 1+ level 3 qualification



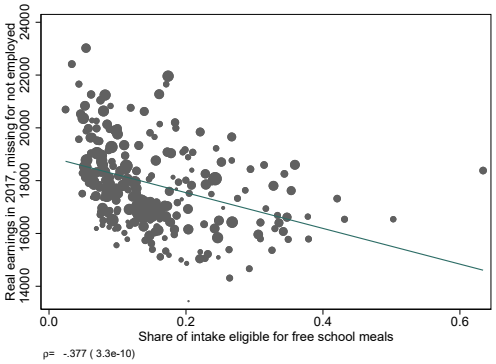
Note: The graphs plot various labour market outcomes (sub-figures (a)-(c)) and variables of educational achievement (sub-figures (d)-(f)) for students having studied at a college against the average standardised KS4 score (test score at end-of-compulsory schooling) of the intake of that college for cohorts of students having finished compulsory education between 2004 and 2007. The correlation coefficient (ρ) between the two variables is reported at the bottom left of each graph (p-value in parentheses).

Figure 2: Socio-economic status and raw average outcomes by college

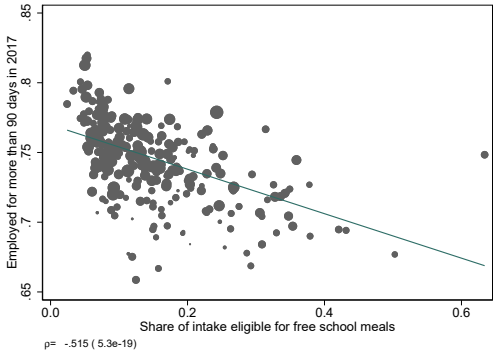
(a) Average daily earnings



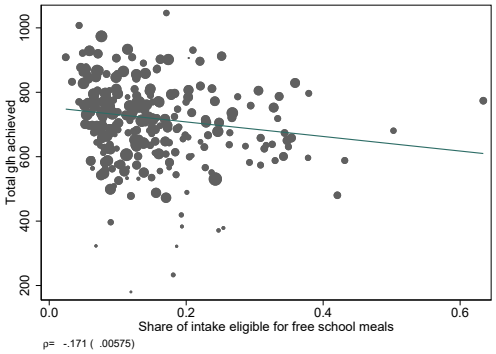
(b) Average annual earnings



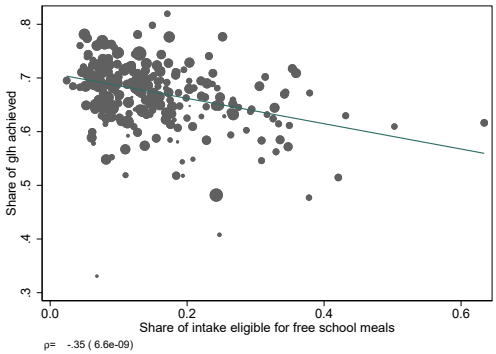
(c) Share employed



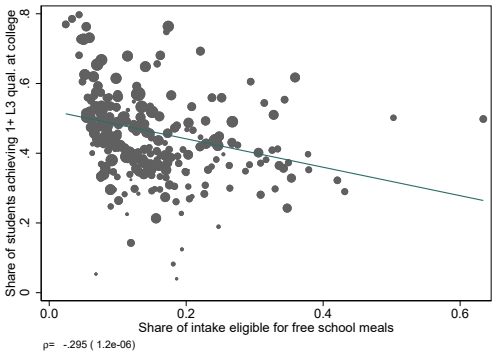
(d) Total GLH achieved



(e) Share of GLH achieved



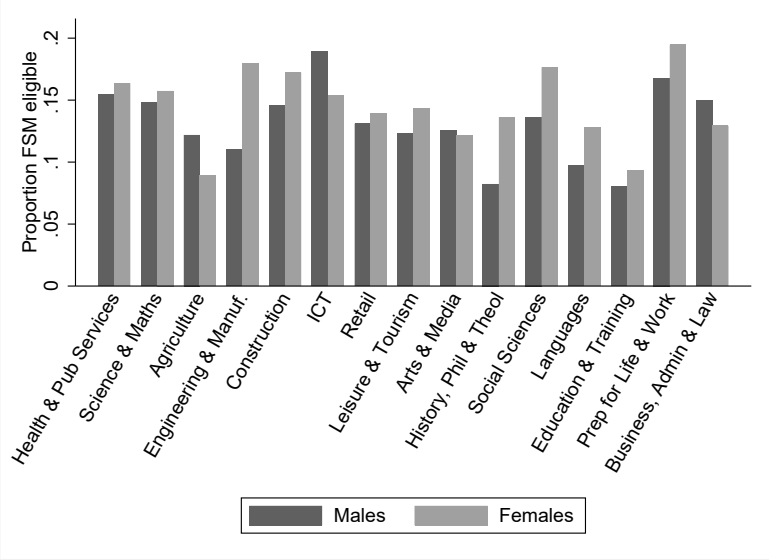
(f) Share achieving 1+ level 3 qualification



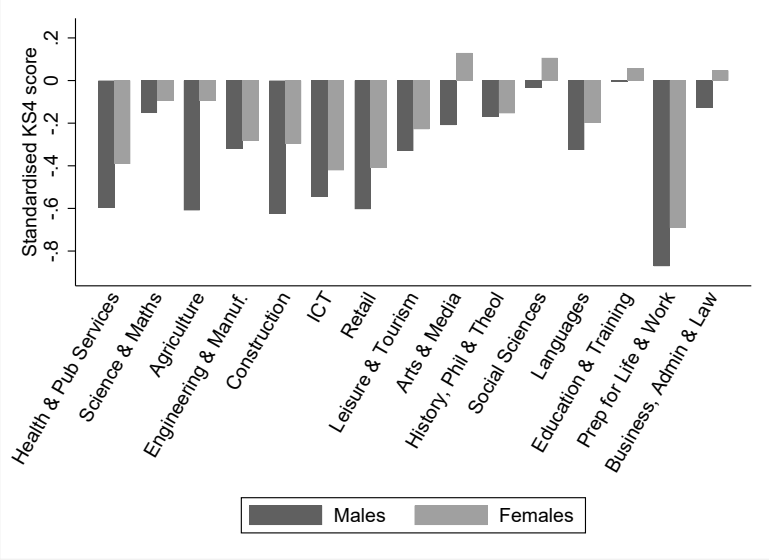
Note: The graphs plot various labour market outcomes (sub-figures (a)-(c)) and variables of educational achievement (sub-figures (d)-(f)) for students having studied at a college against the share of the intake that was eligible for free school meals during compulsory schooling for cohorts of students having finished compulsory education between 2004 and 2007. The correlation coefficient (ρ) between the two variables is reported at the bottom left of the graph (p-value in parentheses).

Figure 3: Field of study choice, socio-economics status and prior attainment

(a) Share eligible for FSM



(b) Average standardized KS4 score

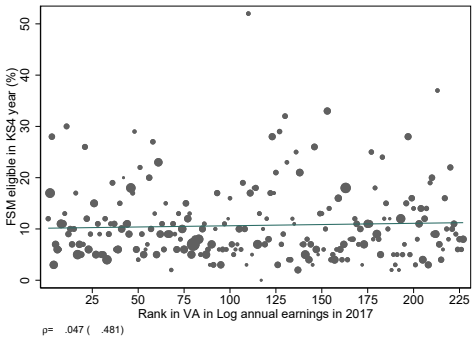


Note: The graphs plot (a) the share of students eligible for free schools meals (FSM) in compulsory education by field of study chosen and (b) the average standardised KS4 score for students choosing a particular field as the main field of study. We exclude students that progress to Higher Education.

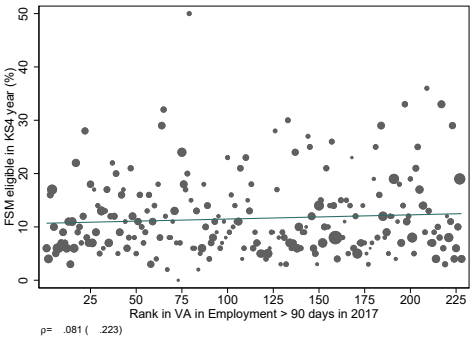
Robustness Checks I - Omitted Variables in Value-Added Estimates

Figure 4: Value-Added in Labour Market Outcomes and Socio-Economic Status

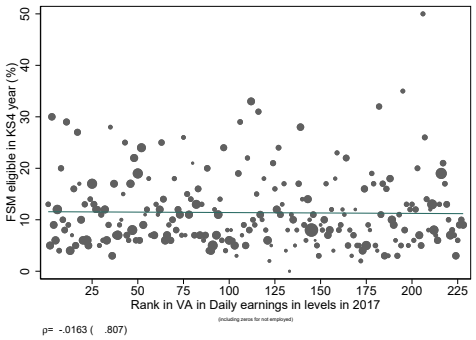
(a) VA in Log Daily Earnings



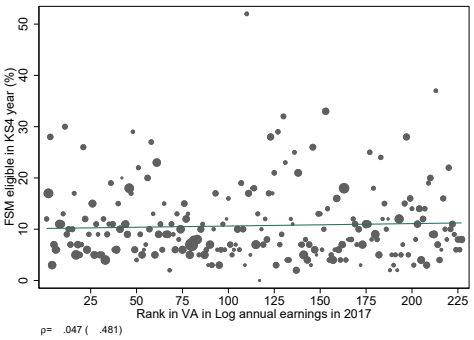
(b) VA in Employed > 90 days



(c) VA in Daily Earnings (including zeros)



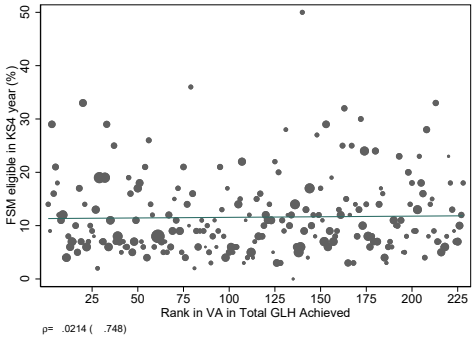
(d) VA in Log Annual Earnings



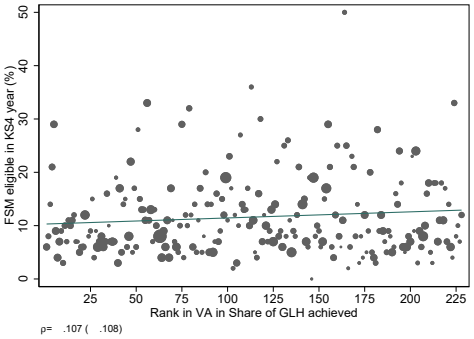
Note: The graph plots the share of students at a college having been eligible for free school meals at some point during compulsory schooling against the college's ranking in terms of value-added in different dimensions, estimated using cross-sectional data (YCS) for individuals aged 18-20 when first enrolling in the college with the same control variables as reported in Table 3, but excluding free school meal eligibility. Value-added by college is weighted by number of observations for the college. The correlation coefficient (ρ) between the two variables is reported at the bottom left of each graph (p-value in parentheses).

Figure 5: Value-Added in Intermediate Outcomes and Socio-Economic Status

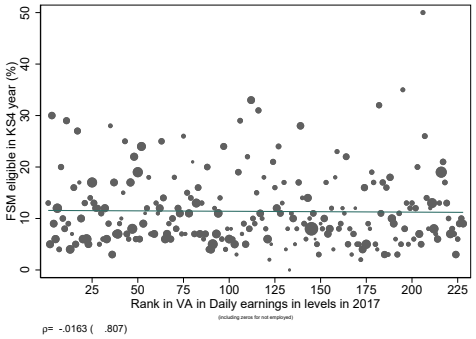
(a) VA in Total GLH achieved



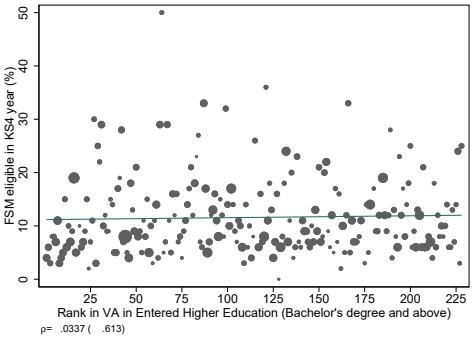
(b) VA in Share of GLH achieved



(c) VA in Achieved Level 3 Qualification



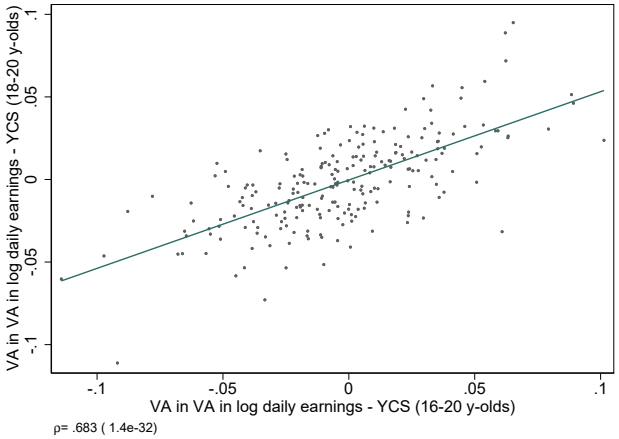
(d) VA in Entered Higher Education



Note: The graph plots the share of students at a college having been eligible for free school meals at some point during compulsory schooling against the college's ranking in terms of value-added in different dimensions, estimated using cross-sectional data (YCS) for individuals aged 18-20 when first enrolling in the college with the same control variables as reported in Table 3, but excluding free school meal eligibility. Value-added by college is weighted by number of observations for the college. The correlation coefficient (ρ) between the two variables is reported at the bottom left of each graph (p-value in parentheses).

Robustness Checks II - Correlations of VA Measures using Different Specifications

Figure 6: Value-added estimated using 16-20 year-olds (cross sectional data) versus 18-20 year-olds (cross-sectional data) with lagged dependent variables



Note: The graph plots college value-added for young learners estimated using cross sectional data (YCS) for 16-20-year-olds and 18-20 year olds with lagged dependent variables against each other for value-added in log daily earnings. The correlation coefficient (ρ) between the two variables is reported at the bottom left of the graph (p-value in parentheses).

Appendix

A.1 Data Appendix

Data for Young Learners To estimate the value-added of FE colleges and study the returns to field of study at FE colleges for young learners, we create a dataset containing family background information, characteristics of the school attended during compulsory secondary education, information on the educational attainment during compulsory schooling, information on courses taken in FE colleges, information on subsequent enrolment in university and employment histories and earnings for four cohorts of school leavers completing compulsory schooling in the academic years from 2003/2004 to 2006/2007. Except for some publicly available datasets detailed below, most data are provided by the UK Department for Education and comes from the recently created Longitudinal Educational Outcomes (LEO) administrative database. This dataset combines several sources.

Data on students' background characteristics and prior attainment comes from the National Pupil Database (NPD) and include two sources: the pupil level census and the learning outcomes data. Information on ethnicity, gender, special educational needs, free school meal eligibility status while in compulsory schooling and eight different measures of neighbourhood characteristics come from the pupil census.[48] Performance in math and English tests in Key Stages 2 to 4 come from the learning outcomes data. We add a quality measure of the KS4 secondary school attended to this data, which is publicly available from the UK Office for Standards in Education (Ofsted).

Administrative data on further education comes from the Individualised Learner Record (ILR) database, and comprises all individuals in our cohorts who attended publicly funded vocational education and training between 2004 and 2014. The ILR includes extensive information on the FE college curricula undertaken by each learner, including the learning hours per course taken, the level of the courses, the field of study of each

[48]The eight covariates of neighbourhood characteristics correspond to Income Deprivation, Employment Deprivation, Health Deprivation and Disability, Education Skills and Training Deprivation, Barriers to Housing and Services, Living Environment Deprivation, Crime and Income Deprivation Affecting Children.

course, the type of qualification, the awarding body of the different qualifications and whether the learner attended the FE college on a full- or part-time basis. We construct a variable indicating the main field of study of the learner by computing the guided learning hours in each field, and designating the field where they undertake the highest overall share of their learning as their main field of study.[49]

Higher education data are provided by the Higher Education Statistics Agency (HESA) and comprises all individuals in our Key Stage 4 cohorts observed at a higher education institution in the UK. The data contains information on when a student first enrolled in higher education, the type of degree they enrolled in, the outcome of the degree and the major chosen. We observe higher education outcomes up until individuals in our sample are aged between 25 and 29, i.e. up to nine years after leaving compulsory education for the youngest cohort, and up to 12 years after leaving compulsory education for the oldest cohort.

Finally, these datasets are linked to labour market outcomes. Earnings data comes from Her Majesty's Revenue and Customs (HMRC) records and data on employment and benefit records comes from the Department for Work and Pension (DWP). We observe employment spells (including start and end dates) and earnings for individuals of our cohorts of learners up to the tax year 2017, that is, for a minimum of 10 and a maximum of 13 years after leaving compulsory education, for the youngest and oldest cohorts, respectively. Given the panel nature of the earnings and employment dataset, we can observe many individuals both before, during and after attending FE colleges, providing us with a unique opportunity to assess returns to qualifications and FE college value-added using individual fixed-effects models.

[49]We follow the classification of specialisations given by Sector Subject Areas (Tier 1). Sector Subject Areas (also called sector subject categories) are a single framework of sectors and subjects used to categorise qualifications, developed for use across relevant education agencies and bodies in England, Wales and Northern Ireland. The 15 categories are: 1) Health, Public Services and Care, 2) Science and Mathematics, 3) Agriculture, Horticulture and Animal Care, 4) Engineering and Manufacturing Technology, 5) Construction, Planning and the Built Environment, 6) Information and Communication Technology, 7) Retail and Commercial Enterprise, 8) Leisure, Travel and Tourism, 9) Arts, Media and Publishing, 10) History, Philosophy, and Theology, 11) Social Sciences, 12) Languages, Literature and Culture, 13) Education and Training, 14) Preparation for Life and Work, 15) Business Administration and Law. We exclude qualifications in the field called *Preparation for Life and Work* in the computation of the main field of study, unless the learner only takes qualifications in that field, as these qualifications are normally taken alongside other qualifications in sectors that would constitute the main field of study.

Our labour market outcomes of interest are log daily earnings, and daily earnings in levels (including zeros for non-employed individuals), log annual earnings and annual earnings in levels, and the probability of being employed for more than 90 days in a given year.[50] We also look at intermediate outcomes, i.e. academic achievement while at FE colleges, and progression to higher education. In particular, the outcome variables of interest are the total number and the share of guided learning hours a student achieved (both measures of learning completion), whether they achieved at least one level 3 qualification (which is a measure of academic progression, since most students enter FE colleges with qualifications at level 2 or below). We also define a measure of progression to university, by creating a dummy variable indicating whether an individual was ever observed as enrolling in a bachelor's degree in higher education.

Column 2 of Table A3 shows the number of students in the cohorts of young learners we study, which range from about 570,000 in the academic year 2003/2004 to nearly 600,000 in 2006/2007. More than half of the students in each cohort choose qualifications at Level 2 or 3 at further education providers (Column 3), and the majority of them studies in FE colleges (Column 4). The last column shows the number of FE colleges (which decreases slightly over the period due to mergers among FE institutions).

To see how the population of young learners in FE colleges differs from the general population of school-leavers, Table A4 compares summary statistics for young learners enrolled at level 2 and above in FE colleges with the overall population of school leavers. Learners in further education colleges tend to be more disadvantaged, measured as having received free school meals (FSM) at some point during their compulsory schooling (13.6% versus 12.4%). They are more likely to be white (84.5% versus 83.7%), and from households where English is spoken (91.7% versus 90.7%). In terms of educational attainment, students undertaking learning in FE colleges at levels 2 and above have lower prior attainment, with only about 33% achieving 5 GCSEs with grades between A* and C, including English and maths, a commonly used measure of attainment in England.

[50] As in Cellini and Turner (2019), our measure of daily earnings in levels includes observations with zero earnings and therefore captures both employment and earnings effects, whereas the log specification captures only earnings for those who work.

This compares to 44.5% on average among the overall cohort of learners. In terms of outcomes, the bottom Panel of Table A4 shows that students in FE are 1.1 percentage points less likely to be employed for at least 90 days. This is measured in 2017, when students are between 26 and 29 years old (78.3% versus 79.4% when looking at the entire cohort of school leavers). They also have lower median annual earnings (£14,924 versus £15,740).

Data for Adult Learners The data on learning undertaken by adults in General FE Colleges comes from a version of the ILR dataset that allows identifying individuals over time. This dataset is available from the academic years 2003 to 2012. As is the case for young learners, this dataset includes information about the learners and about the different qualifications (i.e. courses) taken while in further education institutions. We use information on the level of learning and the number of guided learning hours in each of the qualifications, the field of study, the type of qualification(s) undertaken, and the awarding body certifying those qualifications. With this information, we construct a variable indicating the main field of study for each adult learner following the same methodology as for young learners.

We merge information on earnings and employment records coming from the HMRC datasets to ILR records. The information on employment spells is available from tax years 2003 to 2017, whereas information on gross annual earnings by tax year is available from 2004 to 2017. Compared to the young learners dataset, we do not have prior attainment and lack some background characteristics, such as free-school meal eligibility.

Sample Selection Our group of learners of interest are those students observed in the ILR as being enrolled in General FE (or Tertiary) colleges, in either a Level 2 or a Level 3 course, which is equivalent to lower and upper secondary education, respectively. We focus on these learners to have a relatively homogeneous group of students. As Hupkau et al. (2017) show, vocational learning in England is extremely diverse and the different types of qualifications show very different progression patterns. We focus on young learners first

enrolling in FE college between the academic years 2004/05 to 2009/10 and those who complete their FE college learning in the academic year 2015/16 or before, to ensure we have sufficient post-FE earnings and employment observations and a long enough time has passed to be able to observe them in higher education post-FE college. As seen in Table A3, Column 4, there are 1140138 young learners with these characteristics.

For young learners, we drop individuals from our sample who are not in year group 11 at age 16 (i.e., they have repeated or skipped at least one school year, which is rare in England), and who do not have at least one full GCSE entry and for whom a measure of the KS4 performance, the end of compulsory schooling exam in England, is missing. We also cannot consider students that are not observed in the student census (i.e. with missing demographic data) and those observed in further education data whose mode of attendance is missing (i.e. we do not have information on whether they attend FE in a full or part-time basis). We also drop individuals for whom we cannot identify the main field of study in the FE college, because data on the field of study of their qualifications is missing. Finally, we drop all institutions with less than 30 learners. After these steps, we are left with 85% of the initial group of interest.

A key feature of the VET sector is that a large proportion of individuals show some labour market experience before enrolling in FE colleges. For example, Tables 1 and 2 shows that between 44% and 76% (71% and 78%) of young (adult) learners have worked at least 3 months within the three years before enrolling in FE education.[51] This characteristic of the data will allow us to implement two different empirical strategies to estimate FE college value-added and the returns to different fields of study in vocational education.

Among the young learners, we focus our main analysis on those aged between 18 and 20 at the time they first enrolled in an FE college, to ensure that we have a relatively homogeneous sample with a large share of individuals with pre-FE college earnings and employment data. Our baseline sample comprises 130,009 individuals. We also perform

[51]For young learners, this includes the two years prior to enrolling in an FE college for the first time, and the year of enrolment. For adult learners, this includes all three years prior to joining an FE college, and the year of enrolment.

robustness checks using the entire sample of young learners in Section 5.3. Finally, for individuals that are observed in more than one college we only consider the institution in which they did most of the learning.[52]

Similar restrictions apply for adult learners. We additionally restrict the sample to those who first enrolled in an FE college between the academic years 2006/07 and 2009/2010. This is because we want to observe adult learners several periods before and after they first enrol in an FE college during the period of data availability. Moreover, given that we cannot link higher education data for adult learners, we restrict our sample of adults to those aged 25 to 59 when they first enrol in further education. This is because the majority of learners that start some type of learning in FE colleges after age 25 are very unlikely to be observed in higher education institutions afterwards.

We apply a series of other sample restrictions for the adult learner sample. Similar to young learners, for those individuals that are observed in more than one FE college, we only consider their main institution in terms of learning.[53] In line with the restrictions applied for young learners, we focus our attention on individuals whose maximum level of learning observed at the FE college is Level 2 or above. Finally, we drop all institutions with less than 30 learners. In total, we have a baseline sample of 803,939 adult learners.

Since not all learners have earnings and employment information available, the final sample for both value-added regressions and for estimating the returns to specialisations will depend on the outcome measure considered.

[52] About 78% of young learners in the dataset only attend one college.
[53] About 81% of adult learners in the dataset only attend one college.

A.2 Additional Tables

Table A1: Summary Statistics for Young Learners - Males

	(1) 16-17	(2) 18-20	(3) Total
Students	416637	67041	483678
FE Colleges	258	255	513
Learner characteristics			
Duration of learning (days)	782.82	535.57	748.55
Total nb. of courses enrolled	5.35	2.81	5.00
Total guided learning hours enrolled	1100.98	641.70	1037.32
Maximum level enrolled is 2	0.33	0.35	0.33
Maximum level enrolled is 3	0.56	0.51	0.55
Maximum level enrolled is 4	0.00	0.01	0.00
Observed in HE at some point	0.28	0.34	0.29
Labour market characteristics			
Share employed before FEC entry	0.42	0.75	0.47
Earnings in FEC entry year	4028.91	8028.21	5111.75
Earnings before FEC entry	3619.49	7292.44	5704.69
Earnings 5 years post FEC	14210.82	15857.72	14441.62

Source: NPD, ILR, HESA and LEO.
Notes: The table shows summary statistics for young male learners aged 16 to 20, enrolled in a further education college at level 2 and above and enrolling in learning between 2005 and 2010 for the first time. FEC=Further Education College. Earnings are reported in real terms (in 2015 £)).

Table A2: Summary Statistics for Young Learners - Females

	(1) 16-17	(2) 18-20	(3) Total
Students	422302	62968	485270
FE Colleges	258	255	513
Learner characteristics			
Duration of learning (days)	750.79	474.00	714.87
Total nb. of courses enrolled	5.80	2.76	5.40
Total guided learning hours enrolled	1129.43	601.36	1060.91
Maximum level enrolled is 2	0.26	0.33	0.27
Maximum level enrolled is 3	0.67	0.58	0.66
Maximum level enrolled is 4	0.00	0.01	0.00
Observed in HE at some point	0.34	0.40	0.34
Labour market characteristics			
Share employed before FEC entry	0.46	0.76	0.50
Earnings in FEC entry year	3493.08	7146.71	4498.71
Earnings before FEC entry	3161.53	6475.21	5035.27
Earnings 5 years post FEC	12294.42	13151.35	12407.72

Source: NPD, ILR, HESA and LEO.

Notes: The table shows summary statistics for young female learners aged 16 to 20, enrolled in a further education college at level 2 and above and enrolling in learning between 2005 and 2010 for the first time. FEC=Further Education College. Earnings are reported in real terms (in 2015 £)).

Table A3: Number of Students and General/Tertiary FE Colleges

(1) Year completion compulsory schooling	(2) Number of students (cohort size)	(3) L2/L3+ in ILR	(4) of which: in FE College	(5) # of FE Colleges
2003/2004	572,513	333,659	273,501	261
2004/2005	575,789	336,729	276,284	260
2005/2006	585,973	348,752	287,068	255
2006/2007	597,763	367,274	303,285	250
Total	2,332,038	1,386,414	1,140,138	

Source: NPD and ILR.

Note: Column (1) shows the academic year in which the student completed compulsory schooling (at age 16). Column (2) shows the total number of students reported in the NPD pupil level census completing compulsory schooling in a given academic year. Column (3) shows the number of students enrolled in L2/L3+ in ILR, which includes students enrolled in any qualifications above Level 2 in General/Tertiary FE colleges or Sixth Form colleges, that were in year group 11 by the end of KS4, with data on KS4 performance and appearing in the pupil level census. Column (4) shows the subset of those in Column (3) that are enrolled in FE colleges. Column (5) shows the number of General/Tertiary FE colleges.

Table A4: Summary Statistics: All Students and our Population of Interest

	(1) All school leavers	(2) L2/L3+ in FE colleges
Demographics and education		
Male	0.504	0.511
Eligible for Free School Meals (FSM)	0.124	0.136
White ethnicity	0.837	0.845
English Spoken at Home	0.907	0.917
Special Educational Needs (SEN)	0.160	0.173
5 or more GCSEs at A*-C incl. English & Maths	0.445	0.333
Ever enrolled in a Bachelor Degree	0.371	0.257
Labour market outcomes		
Employed for more than 90 days$^{\$}$	0.794	0.783
Median annual earnings$^{\$}$ (£)	15,740	14,924
Number of students	2,332,038	1,140,138

Source: NPD, ILR, HESA and LEO.
Notes: Column (1) shows summary statistics for all four cohorts of school leavers (2003/04-2006/07). Column (2) shows summary statistics for students enrolled in L2/L3+ in FE, which includes students enrolled in any qualifications above Level 2 in General/Tertiary FE colleges, who were in year group 11 by the end of KS4, with data on KS4 performance and appearing in the pupil level census.
$ = Measured in 2017, when individuals were 26-29 years old.

Table A5: Summary Statistics for Adult Learners - Males

	(1) 25-29	(2) 30-39	(3) 40-49	(4) 50-59	(5) Total
Learners	65501	138450	111983	61207	377141
FE Colleges	255	255	255	255	1020
Learner characteristics					
Duration of learning (days)	294.75	271.54	244.08	205.44	256.69
Total nb. of courses enrolled	2.31	2.14	1.96	1.78	2.06
Total guided learning hours enrolled	240.43	194.87	146.82	99.39	173.02
Maximum level enrolled is 2	0.64	0.63	0.63	0.63	0.63
Maximum level enrolled is 3	0.28	0.29	0.31	0.32	0.30
Maximum level enrolled is 4	0.07	0.07	0.07	0.05	0.07
Labour market characteristics					
Share employed before FEC entry	0.72	0.71	0.73	0.76	0.73
Earnings in FEC entry year	9279.74	11787.31	14392.86	15210.91	12681.08
Earnings before FEC entry	8737.09	11633.73	14482.92	15702.50	12636.98
Earnings 5 years post FEC	22719.40	24512.45	25734.77	23809.90	24473.66

Source: ILR and HMRC.
Notes: The table shows summary statistics for male adult learners aged 25 to 59, enrolled in a further education college at level 2 and above and enrolling in learning between 2007 and 2010.
FEC=Further Education College. Earnings are reported in real terms (in 2015 £)).

Table A6: Summary Statistics for Adult Learners - Females

	(1) 25-29	(2) 30-39	(3) 40-49	(4) 50-59	(5) Total
Learners	70385	155279	135103	66031	426798
FE Colleges	255	255	255	255	1020
Learner characteristics					
Duration of learning (days)	342.84	338.68	311.59	264.14	319.26
Total nb. of courses enrolled	2.26	2.20	2.00	1.77	2.08
Total guided learning hours enrolled	255.35	225.46	169.84	112.00	195.23
Maximum level enrolled is 2	0.55	0.57	0.62	0.70	0.60
Maximum level enrolled is 3	0.36	0.35	0.30	0.24	0.32
Maximum level enrolled is 4	0.09	0.08	0.08	0.06	0.08
Share employed before FEC entry	0.70	0.72	0.76	0.80	0.74
Earnings in FEC entry year	7651.04	7885.15	9630.49	11601.53	8974.00
Earnings before FEC entry	7104.08	7716.22	9340.36	11572.31	8725.97
Earnings 5 years post FEC	17186.99	16971.27	17729.62	17145.53	17290.87

Source: ILR and HMRC.
Notes: The table shows summary statistics for female adult learners aged 25 to 59, enrolled in a further education college at level 2 and above and enrolling in learning between 2007 and 2010.
FEC=Further Education College. Earnings are reported in real terms (in 2015 £)).

Table A7: Value-Added in Labour Market Outcomes in 2017

	16-20 year olds						18-20 year olds					
	Cross-Section			Panel			Cross-Section			Panel		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	All	Male	Female	All	Male	Female	All	Male	Female	All	Male	Female
	Log daily earnings in 2017											
SD Value-Added	0.036	0.033	0.043	0.029	0.027	0.036	0.036	0.026	0.044	0.030	0.031	0.041
Observations	521,057	265,142	255,874	668,473	342,769	325,704	70,321	36,331	33,729	87,318	45,606	41,466
Nb. of colleges	238	237	237	259	259	259	227	218	224	248	242	243
	Log annual earnings in 2017											
SD Value-Added	0.040	0.037	0.047	0.037	0.038	0.045	0.035	0.024	0.041	0.040	0.048	0.051
Observations	521,057	265,142	255,874	668,473	342,769	325,704	70,321	36,331	33,729	87,318	45,606	41,466
Nb. of colleges	238	237	237	259	259	259	227	218	224	248	242	243
	Daily earnings in Levels in 2017 (incl. zeros for not employed)											
SD Value-Added	1.972	2.244	2.074	1.823	1.853	2.100	1.748	2.106	1.972	1.714	1.868	1.976
Mean dep var (B)	44.916	50.324	39.388	44.305	49.749	38.674	45.273	50.316	39.839	44.842	49.758	39.472
(A)/(B)	0.044	0.045	0.053	0.041	0.037	0.054	0.039	0.042	0.050	0.038	0.038	0.050
Observations	664,768	336,031	328,711	859,096	436,770	422,289	90,033	46,602	43,260	112,700	58,861	53,678
Nb. of colleges	238	237	238	260	259	259	228	221	227	250	246	246
	Employed > 90 days in 2017											
SD Value-Added	0.010	0.015	0.011	0.019	0.023	0.017	0.008	0.013	.	0.019	0.023	0.017
Mean dep var (B)	0.754	0.755	0.753	0.748	0.751	0.745	0.749	0.744	0.754	0.748	0.751	0.745
(A)/(B)	0.014	0.020	0.014	0.026	0.031	0.023	0.010	0.018	.	0.026	0.031	0.023
Observations	696,098	349,731	346,339	900,882	455,128	445,712	94,552	48,724	45,651	900,882	455,128	445,712
Nb. of colleges	238	237	238	260	259	259	228	221	227	260	259	259

Notes: The table shows summary statistics of value-added measures based on estimations of Equation (2) for cross-sectional data and Equation (3) for panel data. The reported standard deviations of value-added measures are adjusted for sampling error. **Estimates based on cross-sectional and panel data for young learners** as defined in the notes to Table 3.

Table A8: Value-Added in Log Daily Earnings in 2017: One-stage versus Two-stage Methods

	(1)	(2)	(3)	(4)	(5)
SD	0.030	0.017	0.011	0.025	0.026
γ_{o1}	-	-0.112 (0.029)	0.0001 (0.0000)	-0.311 (0.034)	-0.629 (0.045)
γ_{o2}	-	0.062 (0.006)	0.0000 (0.0000)	0.112 (0.008)	0.168 (0.010)
Intermediate Outcome	-	Share GLH achieved	Total GLH achieved	Achieved at least 1 L3+	Enter HE
One stage estimation (equation 3)	✓				
Two stage estimation (equation 5)		✓	✓	✓	✓

Notes: The table shows estimates of a one standard deviation (SD) increase in FE college value added on earnings. Column 1 obtains VA estimates from a one stage procedure as in Equation 3, and as such is a measure of total FE college value-added. Columns 2 to 5 obtain value added in a two stage procedure, with a first stage estimating VA in terms of one intermediate outcome at a time, and a second stage in which log daily earnings are regressed against VA in those intermediate outcomes (i.e. each result comes from a separate second stage). Thus, each column in 2-5 provides an estimate of FE college value-added for each intermediate outcome. Also, to compare these results with our previous findings, we compute the effect of FE college value-added on earnings at 7.8 years after graduation in columns 2-5 (7.8 is the average number of years since individuals have left FE college in 2017). Controls used to estimate γ_{o1} and γ_{o2} are as those described for panel regressions for young learners in the notes of Table 3. Bootstrapped standard errors shown.

Table A9: Value-Added in Labor Market Outcomes in 2017

	16-20 year olds Cross-Section			16-17 year olds Cross-Section			18-20 year olds Cross-Section			Panel		
	(1) All	(2) Male	(3) Female	(4) All	(5) Male	(6) Female	(7) All	(8) Male	(9) Female	(10) All	(11) Male	(12) Female
Log daily earnings in 2017												
SD Value-Added	0.036	0.033	0.043	0.037	0.034	0.043	0.036	0.026	0.044	0.030	0.031	0.041
Observations	521,057	265,142	255,874	450,629	228,566	222,025	70,321	36,331	33,729	87,318	45,606	41,466
Nb. of colleges	238	237	237	235	234	234	227	218	224	248	242	243
Log annual earnings in 2017												
SD Value-Added	0.040	0.037	0.047	0.041	0.038	0.048	0.035	0.024	0.041	0.040	0.048	0.051
Observations	521,057	265,142	255,874	450,629	228,566	222,025	70,321	36,331	33,729	87,318	45,606	41,466
Nb. of colleges	238	237	237	235	234	234	227	218	224	248	242	243
Daily earnings in Levels in 2017 (incl. zeros for not employed)												
SD Value-Added	1.972	2.244	2.074	2.022	2.324	2.068	1.748	2.106	1.972	1.714	1.868	1.976
Mean dep var (B)	44.916	50.324	39.388	44.861	50.330	39.319	45.273	50.316	39.839	44.842	49.758	39.472
(A)/(B)	0.044	0.045	0.053	0.045	0.046	0.053	0.039	0.042	0.050	0.038	0.038	0.050
Observations	664,768	336,031	328,711	574,618	289,213	285,349	90,033	46,602	43,260	112,700	58,861	53,678
Nb. of colleges	238	237	238	235	234	234	228	221	227	250	246	246
Employed > 90 days in 2017												
SD Value-Added	0.010	0.015	0.011	0.011	0.016	0.012	0.008	0.013	.	0.019	0.023	0.017
Mean dep var (B)	0.754	0.755	0.753	0.755	0.757	0.752	0.749	0.744	0.754	0.748	0.751	0.745
(A)/(B)	0.014	0.020	0.014	0.015	0.021	0.016	0.010	0.018	.	0.026	0.031	0.023
Observations	696,098	349,731	346,339	601,425	300,785	300,611	94,552	48,724	45,651	900,882	455,128	445,712
Nb. of colleges	238	237	238	235	234	227	228	221	227	260	259	259

Notes: The table shows summary statistics of value-added measures based on estimations of Equation (2) for cross-sectional data and Equation (3) for panel data. The reported standard deviations of value-added measures are adjusted for sampling error. **Estimates based on cross-sectional and panel data for young learners** as defined in the notes to Table 3.

Table A10: Value-Added in Intermediate Outcomes

	16-20 year olds			25-59 year olds		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	Male	Female	All	Male	Female
			Total GLH achieved			
SD Value-Added (A)	60.037	64.807	58.953	22.052	23.518	23.570
Mean dep var (B)	726.618	706.500	746.966	120.115	107.928	130.257
(A)/(B)	0.083	0.092	0.079	0.184	0.218	0.181
Observations	696,171	349,770	346,373	627,193	284,313	342,722
Nb. of colleges	238	237	238	254	250	254
			Share of GLH achieved			
SD Value-Added (A)	0.046	0.052	0.043	0.053	0.061	0.053
Mean dep var (B)	0.687	0.680	0.694	0.721	0.715	0.726
(A)/(B)	0.067	0.077	0.062	0.074	0.085	0.074
Observations	695,828	349,571	346,229	617,786	280,020	337,569
Nb. of colleges	238	237	238	254	249	254
			Achieved 1+ Level 3 Qualification			
SD Value-Added (A)	0.039	0.043	0.039	0.057	0.076	0.055
Mean dep var (B)	0.484	0.434	0.534	0.301	0.301	0.301
(A)/(B)	0.081	0.099	0.074	0.191	0.254	0.182
Observations	696,171	349,770	346,373	627,193	284,313	342,722
Nb. of colleges	238	237	238	254	250	254
			Entered Higher Education^{A}			
SD Value-Added (A)	0.038	0.038	0.038			
Mean dep var (B)	0.329	0.300	0.359			
(A)/(B)	0.114	0.128	0.106			
Observations	696,171	349,770	346,373			
Nb. of colleges	238	237	238			

Notes: The table shows summary statistics of value-added measures based on estimations of Equation (2) (without lagged dependent variables). The reported standard deviations of value-added measures are adjusted for sampling error. A=Enrolled in a higher education institution. **Estimates based on cross-sectional data for young learners** as defined in the notes to Table 3. **Estimates based on cross-sectional data for adult learners** include the following controls: Series of dummies for region where FE college is located, academic year first entered FE College, age first entered FE college, mode of attendance (Full-time, Full-time part year, Part time, Unknown/Missing), ever entered apprenticeship, a series of dummies for main field of study, gender, a series of dummies for ethnicity (White, Mixed, Asian/Chinese, Black), a set of dummies indicating learning difficulties (unknown, some learning difficulty), a series of dummies indicating prior attainment (No qualifications, Level 1 or below, Full level 2, Full level 3 or above, unknown), dummies indicating whether employed in the three years before FE College entry (Worked in year of entry, worked 1 year before entry, worked 2 years before entry, worked 3 years before entry).

Table A11: Value-Added in Intermediate Outcomes for Young Learners and College Characteristics

	(1) Total GLH achieved	(2) Share GLH achieved	(3) Achieved a L3 qual
FE College quality			
% students satisfied with course (NSS)	102.344***	0.077*	0.067
	(26.372)	(0.038)	(0.036)
Average OFSTED rating[a]	6.059*	0.006	-0.003
	(2.743)	(0.004)	(0.004)
College Resources			
FTE teachers per FTE student[b]	-221.604	-0.099	-0.011
	(136.083)	(0.189)	(0.172)
Teacher salary cost/Total staff cost	29.018	-0.063	0.004
	(35.664)	(0.048)	(0.045)
Average teacher salary	1.088*	-0.000	0.001*
	(0.450)	(0.001)	(0.001)
Total expenditure over FTE students	-5.605**	-0.002	-0.000
	(2.024)	(0.003)	(0.003)
Learning/Learner Characteristics			
Average GLH by student	0.074*	-0.000	0.000*
	(0.030)	(0.000)	(0.000)
% aims distance learning[c]	-189.201***	-0.092	-0.220**
	(52.902)	(0.073)	(0.067)
% aims set in workplace	-84.140	0.027	-0.361**
	(110.583)	(0.150)	(0.137)
% aims classroom/provider	25.008	-0.031	0.062
	(27.945)	(0.038)	(0.035)
% aims type Alevel	19.237	-0.047	0.003
	(27.784)	(0.038)	(0.035)
% aims type GCSE	190.114	-0.211	0.188
	(159.324)	(0.216)	(0.201)
% aims type NVQ	68.828	0.053	-0.024
	(42.434)	(0.058)	(0.054)

Notes: Table shows coefficients from OLS regressions of value-added measure specified in columns heading (using cross-sectional data for the sample of 18-20 year-olds) on college characteristic specified in first column. Standard errors in parentheses. *p<0.5 ** p<0.01 *** p<0.001. $=Including zeros for non-employed. *a*=Average between 2005 and 2010. *b*=Regression controls for share of aims from different awarding bodies, share of aims delivered at provider and average teacher salary. *c*=Excludes e-learning. FTE: Full-time equivalent; L3: Level 3; NSS: National Student Survey; GLH: Guided Learning Hours.

Table A12: Distribution of guided learning hours by main field of study and age group - Females

Main Field	Field	Share of total GLH (%) 18-20 year olds	Share of total GLH (%) 16-20 year olds
Health, Public Services & Care	Health, Public Services & Care	76.792	73.053
	Science & Mathematics	0.258	0.786
	Agriculture, Horticulture & Animal Care	0.129	0.095
	Engineering & Manufacturing Technology	3.917	2.643
	Construction & Planning	3.133	2.600
	Information & Communication Technology	0.353	0.792
	Retail and Commercial Enterprise	0.322	0.322
	Leisure, Travel and Tourism	1.116	2.493
	Arts, Media and Publishing	0.169	0.440
	History, Philosophy & Theology	0.081	0.097
	Social Sciences	0.064	0.156
	Languages, Literature & Culture	0.181	0.718
	Education & Training	0.055	0.056
	Preparation for Life & Work	10.186	11.167
	Business Administration & Law	0.458	0.615
Science & Mathematics	Health, Public Services & Care	0.596	0.874
	Science & Mathematics	70.961	56.327
	Agriculture, Horticulture & Animal Care	0.214	0.417
	Engineering & Manufacturing Technology	1.990	4.527
	Construction & Planning	0.773	1.221
	Information & Communication Technology	1.546	4.165
	Retail and Commercial Enterprise	0.070	0.197
	Leisure, Travel and Tourism	0.439	1.927
	Arts, Media and Publishing	2.049	3.069
	History, Philosophy & Theology	1.416	1.688
	Social Sciences	2.085	3.414
	Languages, Literature & Culture	4.084	5.117
	Education & Training	0.030	0.061
	Preparation for Life & Work	7.417	7.651
	Business Administration & Law	2.140	3.712
Agriculture, Horticulture & Animal Care	Health, Public Services & Care	0.513	0.790
	Science & Mathematics	0.145	0.520
	Agriculture, Horticulture & Animal Care	83.267	78.593
	Engineering & Manufacturing Technology	1.944	1.979
	Construction & Planning	2.304	1.544
	Information & Communication Technology	0.570	0.523
	Retail and Commercial Enterprise	0.004	0.187
	Leisure, Travel and Tourism	0.668	0.636
	Arts, Media and Publishing	0.649	0.594
	History, Philosophy & Theology	0.000	0.067

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Table A12 – *Continued from previous page*

Main Field	Field	Share of total GLH (%) 18-20 year olds	Share of total GLH (%) 16-20 year olds
	Social Sciences	0.059	0.080
	Languages, Literature & Culture	0.149	0.162
	Education & Training	0.044	0.025
	Preparation for Life & Work	6.517	10.679
	Business Administration & Law	0.095	0.277
Engineering & Manufacturing Technology	Health, Public Services & Care	0.362	0.669
	Science & Mathematics	0.276	0.452
	Agriculture, Horticulture & Animal Care	0.120	0.101
	Engineering & Manufacturing Technology	87.762	82.351
	Construction & Planning	1.661	1.777
	Information & Communication Technology	0.300	0.769
	Retail and Commercial Enterprise	0.199	0.159
	Leisure, Travel and Tourism	0.291	0.368
	Arts, Media and Publishing	0.285	0.386
	History, Philosophy & Theology	0.018	0.033
	Social Sciences	0.038	0.055
	Languages, Literature & Culture	0.090	0.253
	Education & Training	0.143	0.049
	Preparation for Life & Work	5.732	8.816
	Business Administration & Law	0.241	0.320
Construction & Planning	Health, Public Services & Care	0.624	0.867
	Science & Mathematics	0.110	0.226
	Agriculture, Horticulture & Animal Care	0.141	0.153
	Engineering & Manufacturing Technology	1.880	2.141
	Construction & Planning	85.699	79.663
	Information & Communication Technology	0.377	0.556
	Retail and Commercial Enterprise	0.110	0.152
	Leisure, Travel and Tourism	0.245	0.463
	Arts, Media and Publishing	0.224	0.371
	History, Philosophy & Theology	0.021	0.023
	Social Sciences	0.012	0.042
	Languages, Literature & Culture	0.094	0.174
	Education & Training	0.050	0.029
	Preparation for Life & Work	7.052	11.117
	Business Administration & Law	0.352	0.260
Information & Communication Technology	Health, Public Services & Care	0.398	0.589
	Science & Mathematics	0.739	1.543
	Agriculture, Horticulture & Animal Care	0.047	0.072
	Engineering & Manufacturing Technology	1.533	1.970
	Construction & Planning	0.892	0.996
	Information & Communication Technology	80.749	74.547
	Retail and Commercial Enterprise	0.221	0.266

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Table A12 – *Continued from previous page*

Main Field	Field	Share of total GLH (%) 18-20 year olds	Share of total GLH (%) 16-20 year olds
	Leisure, Travel and Tourism	0.187	0.531
	Arts, Media and Publishing	1.089	1.603
	History, Philosophy & Theology	0.068	0.136
	Social Sciences	0.053	0.222
	Languages, Literature & Culture	0.617	1.035
	Education & Training	0.067	0.045
	Preparation for Life & Work	8.351	10.532
	Business Administration & Law	1.220	1.854
Retail and Commercial Enterprise	Health, Public Services & Care	1.082	1.165
	Science & Mathematics	0.183	0.280
	Agriculture, Horticulture & Animal Care	0.060	0.070
	Engineering & Manufacturing Technology	2.165	1.517
	Construction & Planning	2.122	0.988
	Information & Communication Technology	0.503	0.683
	Retail and Commercial Enterprise	84.425	81.082
	Leisure, Travel and Tourism	0.506	0.807
	Arts, Media and Publishing	0.396	0.721
	History, Philosophy & Theology	0.041	0.032
	Social Sciences	0.010	0.040
	Languages, Literature & Culture	0.141	0.196
	Education & Training	0.054	0.040
	Preparation for Life & Work	5.442	8.678
	Business Administration & Law	0.797	0.667
Leisure, Travel and Tourism	Health, Public Services & Care	1.123	1.711
	Science & Mathematics	0.279	0.865
	Agriculture, Horticulture & Animal Care	0.119	0.063
	Engineering & Manufacturing Technology	2.084	1.517
	Construction & Planning	0.967	1.420
	Information & Communication Technology	0.311	0.741
	Retail and Commercial Enterprise	0.417	0.372
	Leisure, Travel and Tourism	85.175	78.948
	Arts, Media and Publishing	0.366	0.485
	History, Philosophy & Theology	0.028	0.074
	Social Sciences	0.020	0.150
	Languages, Literature & Culture	0.251	0.724
	Education & Training	0.035	0.060
	Preparation for Life & Work	5.112	8.001
	Business Administration & Law	0.583	0.663
Arts, Media and Publishing	Health, Public Services & Care	0.165	0.447
	Science & Mathematics	0.261	1.207
	Agriculture, Horticulture & Animal Care	0.112	0.099
	Engineering & Manufacturing Technology	0.663	1.249

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Table A12 – *Continued from previous page*

Main Field	Field	Share of total GLH (%) 18-20 year olds	16-20 year olds
	Construction & Planning	0.366	0.743
	Information & Communication Technology	0.855	1.783
	Retail and Commercial Enterprise	0.104	0.271
	Leisure, Travel and Tourism	0.247	0.531
	Arts, Media and Publishing	85.785	79.493
	History, Philosophy & Theology	0.087	0.307
	Social Sciences	0.128	0.380
	Languages, Literature & Culture	0.579	1.247
	Education & Training	0.048	0.035
	Preparation for Life & Work	5.529	7.295
	Business Administration & Law	0.440	0.722
History, Philosophy & Theology	Health, Public Services & Care	0.933	0.920
	Science & Mathematics	3.976	7.534
	Agriculture, Horticulture & Animal Care	0.000	0.272
	Engineering & Manufacturing Technology	1.638	3.076
	Construction & Planning	1.380	0.983
	Information & Communication Technology	0.708	3.050
	Retail and Commercial Enterprise	0.009	0.137
	Leisure, Travel and Tourism	0.703	1.629
	Arts, Media and Publishing	2.218	5.552
	History, Philosophy & Theology	74.838	47.368
	Social Sciences	2.054	5.291
	Languages, Literature & Culture	2.449	6.462
	Education & Training	0.155	0.170
	Preparation for Life & Work	4.309	6.234
	Business Administration & Law	2.281	6.331
Social Sciences	Health, Public Services & Care	0.136	0.485
	Science & Mathematics	4.409	8.562
	Agriculture, Horticulture & Animal Care	0.244	0.959
	Engineering & Manufacturing Technology	0.516	2.021
	Construction & Planning	1.571	0.602
	Information & Communication Technology	1.128	4.162
	Retail and Commercial Enterprise	0.190	0.100
	Leisure, Travel and Tourism	1.063	1.890
	Arts, Media and Publishing	4.452	4.845
	History, Philosophy & Theology	3.477	4.654
	Social Sciences	57.531	43.121
	Languages, Literature & Culture	5.602	5.712
	Education & Training	0.180	0.094
	Preparation for Life & Work	6.967	6.805
	Business Administration & Law	7.668	9.505
Languages,	Health, Public Services & Care	0.632	0.587

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Table A12 – *Continued from previous page*

Main Field	Field	Share of total GLH (%) 18-20 year olds	Share of total GLH (%) 16-20 year olds
	Science & Mathematics	4.474	6.643
	Agriculture, Horticulture & Animal Care	0.000	0.258
	Engineering & Manufacturing Technology	3.263	3.222
	Construction & Planning	0.819	1.290
	Information & Communication Technology	1.841	2.777
	Retail and Commercial Enterprise	0.000	0.267
	Leisure, Travel and Tourism	0.425	1.183
	Arts, Media and Publishing	1.805	4.111
	History, Philosophy & Theology	0.750	2.256
	Social Sciences	1.753	2.825
	Languages, Literature & Culture	70.465	57.301
	Education & Training	0.483	0.133
	Preparation for Life & Work	8.445	9.816
	Business Administration & Law	2.998	3.392
Education & Training	Health, Public Services & Care	2.103	2.999
	Science & Mathematics	0.589	1.497
	Agriculture, Horticulture & Animal Care	0.000	0.000
	Engineering & Manufacturing Technology	1.093	1.790
	Construction & Planning	1.125	0.679
	Information & Communication Technology	1.123	1.400
	Retail and Commercial Enterprise	0.000	0.000
	Leisure, Travel and Tourism	0.000	0.243
	Arts, Media and Publishing	1.194	1.546
	History, Philosophy & Theology	0.009	0.413
	Social Sciences	0.165	0.737
	Languages, Literature & Culture	0.251	1.123
	Education & Training	79.184	68.245
	Preparation for Life & Work	11.007	14.798
	Business Administration & Law	1.551	3.025
Preparation for Life & Work	Health, Public Services & Care	2.477	1.948
	Science & Mathematics	0.526	2.665
	Agriculture, Horticulture & Animal Care	0.076	0.281
	Engineering & Manufacturing Technology	8.629	8.472
	Construction & Planning	6.374	6.087
	Information & Communication Technology	1.009	3.300
	Retail and Commercial Enterprise	0.533	0.542
	Leisure, Travel and Tourism	0.779	2.137
	Arts, Media and Publishing	0.663	2.834
	History, Philosophy & Theology	0.330	1.239
	Social Sciences	0.372	1.739
	Languages, Literature & Culture	0.491	1.983
	Education & Training	0.142	0.079
	Preparation for Life & Work	75.319	60.431

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Table A12 – *Continued from previous page*

Main Field	Field	Share of total GLH (%) 18-20 year olds	Share of total GLH (%) 16-20 year olds
	Business Administration & Law	0.851	3.087
Business Administration & Law	Health, Public Services & Care	0.431	0.572
	Science & Mathematics	0.894	2.659
	Agriculture, Horticulture & Animal Care	0.057	0.056
	Engineering & Manufacturing Technology	2.105	1.742
	Construction & Planning	0.744	0.830
	Information & Communication Technology	1.184	3.659
	Retail and Commercial Enterprise	0.417	0.470
	Leisure, Travel and Tourism	0.384	1.057
	Arts, Media and Publishing	0.711	1.171
	History, Philosophy & Theology	0.093	0.484
	Social Sciences	0.465	1.155
	Languages, Literature & Culture	0.615	1.561
	Education & Training	0.045	0.050
	Preparation for Life & Work	4.872	8.378
	Business Administration & Law	83.926	71.916

Sample: Young learners who did not attend higher education after FE college.

Table A13: Distribution of guided learning hours by main field of study and age group - Females

Main Field	Field	Share of total GLH (%) 18-20 year olds	Share of total GLH (%) 16-20 year olds
Health, Public Services & Care	Health, Public Services & Care	86.338	79.212
	Science & Mathematics	0.559	1.152
	Agriculture, Horticulture & Animal Care	0.124	0.081
	Engineering & Manufacturing Technology	0.061	0.106
	Construction & Planning	0.076	0.058
	Information & Communication Technology	0.213	0.446
	Retail and Commercial Enterprise	1.484	1.232
	Leisure, Travel and Tourism	0.370	0.744
	Arts, Media and Publishing	0.366	0.624
	History, Philosophy & Theology	0.147	0.124
	Social Sciences	0.081	0.266
	Languages, Literature & Culture	0.362	0.898
	Education & Training	0.160	0.168
	Preparation for Life & Work	6.303	9.679
	Business Administration & Law	0.398	0.635
Science & Mathematics	Health, Public Services & Care	1.723	2.294
	Science & Mathematics	73.807	57.875
	Agriculture, Horticulture & Animal Care	0.209	0.539
	Engineering & Manufacturing Technology	0.108	0.321
	Construction & Planning	0.000	0.016
	Information & Communication Technology	1.303	1.882
	Retail and Commercial Enterprise	0.783	0.799
	Leisure, Travel and Tourism	0.368	1.277
	Arts, Media and Publishing	1.375	3.908
	History, Philosophy & Theology	0.820	1.691
	Social Sciences	2.231	5.046
	Languages, Literature & Culture	4.005	6.671
	Education & Training	0.313	0.229
	Preparation for Life & Work	8.190	7.404
	Business Administration & Law	1.470	4.456
Agriculture, Horticulture & Animal Care	Health, Public Services & Care	1.220	1.080
	Science & Mathematics	0.221	0.767
	Agriculture, Horticulture & Animal Care	86.720	82.106
	Engineering & Manufacturing Technology	0.152	0.177
	Construction & Planning	0.009	0.092
	Information & Communication Technology	0.189	0.479
	Retail and Commercial Enterprise	0.364	0.619
	Leisure, Travel and Tourism	0.905	0.560
	Arts, Media and Publishing	0.632	0.678
	History, Philosophy & Theology	0.050	0.054

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Table A13 – *Continued from previous page*

Main Field	Field	Share of total GLH (%) 18-20 year olds	16-20 year olds
	Social Sciences	0.016	0.138
	Languages, Literature & Culture	0.170	0.254
	Education & Training	0.349	0.111
	Preparation for Life & Work	5.541	8.882
	Business Administration & Law	0.473	0.437
Engineering & Manufacturing Technology	Health, Public Services & Care	1.140	2.080
	Science & Mathematics	0.787	0.927
	Agriculture, Horticulture & Animal Care	0.415	0.289
	Engineering & Manufacturing Technology	83.748	77.732
	Construction & Planning	0.189	0.679
	Information & Communication Technology	0.296	0.752
	Retail and Commercial Enterprise	1.004	1.521
	Leisure, Travel and Tourism	0.921	1.041
	Arts, Media and Publishing	0.630	1.016
	History, Philosophy & Theology	0.000	0.124
	Social Sciences	0.000	0.249
	Languages, Literature & Culture	0.303	0.520
	Education & Training	0.009	0.063
	Preparation for Life & Work	6.558	8.599
	Business Administration & Law	0.711	0.773
Construction & Planning	Health, Public Services & Care	0.887	2.437
	Science & Mathematics	0.491	0.583
	Agriculture, Horticulture & Animal Care	0.098	0.256
	Engineering & Manufacturing Technology	1.213	0.978
	Construction & Planning	84.441	76.663
	Information & Communication Technology	0.088	0.481
	Retail and Commercial Enterprise	0.986	1.226
	Leisure, Travel and Tourism	0.155	0.554
	Arts, Media and Publishing	1.351	1.281
	History, Philosophy & Theology	0.000	0.039
	Social Sciences	0.000	0.051
	Languages, Literature & Culture	0.098	0.345
	Education & Training	0.025	0.010
	Preparation for Life & Work	7.449	10.725
	Business Administration & Law	0.236	0.552
Information & Communication Technology	Health, Public Services & Care	1.794	2.200
	Science & Mathematics	0.729	1.915
	Agriculture, Horticulture & Animal Care	0.207	0.220
	Engineering & Manufacturing Technology	0.178	0.170
	Construction & Planning	0.055	0.069
	Information & Communication Technology	81.064	70.778
	Retail and Commercial Enterprise	0.928	1.233

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Table A13 – *Continued from previous page*

Main Field	Field	Share of total GLH (%) 18-20 year olds	Share of total GLH (%) 16-20 year olds
	Leisure, Travel and Tourism	0.330	0.751
	Arts, Media and Publishing	0.745	1.397
	History, Philosophy & Theology	0.000	0.160
	Social Sciences	0.199	0.587
	Languages, Literature & Culture	0.505	1.305
	Education & Training	0.113	0.130
	Preparation for Life & Work	7.743	11.313
	Business Administration & Law	3.786	4.266
	Health, Public Services & Care	2.273	2.199
	Science & Mathematics	0.122	0.281
	Agriculture, Horticulture & Animal Care	0.104	0.064
	Engineering & Manufacturing Technology	0.087	0.109
	Construction & Planning	0.045	0.037
	Information & Communication Technology	0.174	0.319
Retail and Commercial Enterprise	Retail and Commercial Enterprise	86.404	81.437
	Leisure, Travel and Tourism	0.427	0.609
	Arts, Media and Publishing	0.619	0.811
	History, Philosophy & Theology	0.063	0.061
	Social Sciences	0.028	0.085
	Languages, Literature & Culture	0.150	0.235
	Education & Training	0.104	0.072
	Preparation for Life & Work	5.304	8.808
	Business Administration & Law	0.601	0.951
	Health, Public Services & Care	1.280	2.116
	Science & Mathematics	0.343	1.030
	Agriculture, Horticulture & Animal Care	0.106	0.075
	Engineering & Manufacturing Technology	0.361	0.313
	Construction & Planning	0.001	0.027
	Information & Communication Technology	0.308	0.532
Leisure, Travel and Tourism	Retail and Commercial Enterprise	1.676	1.694
	Leisure, Travel and Tourism	83.220	77.487
	Arts, Media and Publishing	0.382	0.699
	History, Philosophy & Theology	0.007	0.099
	Social Sciences	0.133	0.215
	Languages, Literature & Culture	0.861	1.623
	Education & Training	0.149	0.077
	Preparation for Life & Work	6.117	8.136
	Business Administration & Law	0.759	1.212
	Health, Public Services & Care	0.517	1.056
	Science & Mathematics	0.438	1.648
	Agriculture, Horticulture & Animal Care	0.046	0.141
	Engineering & Manufacturing Technology	0.164	0.214

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Arts, Media and Publishing

Table A13 – *Continued from previous page*

Main Field	Field	Share of total GLH (%) 18-20 year olds	16-20 year olds
	Construction & Planning	0.106	0.103
	Information & Communication Technology	0.204	0.559
	Retail and Commercial Enterprise	0.931	1.292
	Leisure, Travel and Tourism	0.155	0.531
	Arts, Media and Publishing	87.473	79.417
	History, Philosophy & Theology	0.142	0.403
	Social Sciences	0.236	0.703
	Languages, Literature & Culture	0.636	2.048
	Education & Training	0.098	0.066
	Preparation for Life & Work	4.351	6.416
	Business Administration & Law	0.423	1.072
History, Philosophy & Theology	Health, Public Services & Care	1.782	2.566
	Science & Mathematics	2.584	8.007
	Agriculture, Horticulture & Animal Care	0.005	0.177
	Engineering & Manufacturing Technology	0.007	0.227
	Construction & Planning	0.029	0.066
	Information & Communication Technology	0.413	1.283
	Retail and Commercial Enterprise	1.462	1.279
	Leisure, Travel and Tourism	0.196	0.678
	Arts, Media and Publishing	1.414	4.723
	History, Philosophy & Theology	79.594	54.855
	Social Sciences	0.364	4.684
	Languages, Literature & Culture	2.365	6.649
	Education & Training	0.355	0.301
	Preparation for Life & Work	5.505	5.976
	Business Administration & Law	1.236	3.749
Social Sciences	Health, Public Services & Care	1.247	2.139
	Science & Mathematics	5.498	11.297
	Agriculture, Horticulture & Animal Care	1.071	0.559
	Engineering & Manufacturing Technology	0.000	0.299
	Construction & Planning	0.000	0.058
	Information & Communication Technology	0.120	1.466
	Retail and Commercial Enterprise	0.456	0.619
	Leisure, Travel and Tourism	1.096	1.097
	Arts, Media and Publishing	2.137	5.418
	History, Philosophy & Theology	2.658	3.469
	Social Sciences	64.147	44.419
	Languages, Literature & Culture	4.749	8.338
	Education & Training	0.547	0.310
	Preparation for Life & Work	6.320	6.397
	Business Administration & Law	5.044	7.871
Languages,	Health, Public Services & Care	1.181	1.253

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Table A13 – *Continued from previous page*

Main Field	Field	Share of total GLH (%) 18-20 year olds	Share of total GLH (%) 16-20 year olds
	Science & Mathematics	3.185	8.276
	Agriculture, Horticulture & Animal Care	0.144	0.154
	Engineering & Manufacturing Technology	0.000	0.296
	Construction & Planning	0.322	0.077
	Information & Communication Technology	1.129	1.584
	Retail and Commercial Enterprise	1.179	0.786
	Leisure, Travel and Tourism	0.152	0.779
	Arts, Media and Publishing	2.735	6.562
	History, Philosophy & Theology	0.814	2.421
	Social Sciences	1.602	4.542
	Languages, Literature & Culture	73.460	54.809
	Education & Training	0.964	0.241
	Preparation for Life & Work	9.483	8.465
	Business Administration & Law	1.746	5.048
Education & Training	Health, Public Services & Care	2.860	3.324
	Science & Mathematics	0.616	1.283
	Agriculture, Horticulture & Animal Care	0.000	0.000
	Engineering & Manufacturing Technology	0.251	0.250
	Construction & Planning	0.002	0.005
	Information & Communication Technology	0.549	0.793
	Retail and Commercial Enterprise	0.206	0.544
	Leisure, Travel and Tourism	0.205	0.342
	Arts, Media and Publishing	0.090	0.239
	History, Philosophy & Theology	0.227	0.254
	Social Sciences	0.085	0.287
	Languages, Literature & Culture	0.670	1.141
	Education & Training	88.826	81.787
	Preparation for Life & Work	3.829	7.048
	Business Administration & Law	1.131	1.461
Preparation for Life & Work	Health, Public Services & Care	3.403	3.793
	Science & Mathematics	1.134	6.951
	Agriculture, Horticulture & Animal Care	0.102	0.377
	Engineering & Manufacturing Technology	0.473	0.518
	Construction & Planning	0.055	0.208
	Information & Communication Technology	0.646	2.159
	Retail and Commercial Enterprise	1.883	3.132
	Leisure, Travel and Tourism	0.238	1.729
	Arts, Media and Publishing	1.305	6.571
	History, Philosophy & Theology	0.981	2.369
	Social Sciences	1.024	5.389
	Languages, Literature & Culture	1.273	6.628
	Education & Training	0.105	0.120
	Preparation for Life & Work	83.934	48.851

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Table A13 – *Continued from previous page*

Main Field	Field	Share of total GLH (%) 18-20 year olds	Share of total GLH (%) 16-20 year olds
	Business Administration & Law	1.746	6.251
Business Administration & Law	Health, Public Services & Care	0.802	1.462
	Science & Mathematics	0.440	2.240
	Agriculture, Horticulture & Animal Care	0.014	0.118
	Engineering & Manufacturing Technology	0.176	0.101
	Construction & Planning	0.023	0.066
	Information & Communication Technology	1.860	3.460
	Retail and Commercial Enterprise	1.091	1.380
	Leisure, Travel and Tourism	0.192	0.732
	Arts, Media and Publishing	0.536	1.130
	History, Philosophy & Theology	0.079	0.359
	Social Sciences	0.200	0.926
	Languages, Literature & Culture	0.514	1.728
	Education & Training	0.204	0.123
	Preparation for Life & Work	4.356	7.723
	Business Administration & Law	86.707	74.377

Sample: Young learners who did not attend higher education after FE college.