Sheffield Economic Research Paper Series

SERP Number: 2010007

ISSN 1749-8368

Andy Dickerson and Steven McIntosh

The Impact of Distance to Nearest Education Institution on the Post–Compulsory Education Participation Decision

March 2010

Department of Economics
University of Sheffield
9 Mappin Street
Sheffield
S1 4DT
United Kingdom
www.shef.ac.uk/economics

Abstract:

This paper uses data sources with the unique capacity to measure distances between home addresses and education institutions, to investigate, for the first time, the effect that such distance has on an individual's post–compulsory education participation decision. The results show that there is no overall net effect. However, when attention is focussed on young people who are on the margin of participating in post–compulsory education (according to their prior attainment and family background) and when post–compulsory education is distinguished by whether it leads to academic or vocational qualifications, then greater distance to nearest education institution is seen to have a significant impact on the decision to continue in full–time post–compulsory education. This finding has relevance for education participation in rural areas relative to urban areas.

Key words: post-compulsory education participation, travel distance

JEL codes: J24; I20

Acknowledgments:
This paper is based in part on a research project funded by the Department for Environment, Food and Rural Affairs (Defra) (project number CTX 0808 002). The data from the Youth Cohort Study (YCS) and the Longitudinal Study of Young People in England (LSYPE) were made available by the ESRC Data Archive at the University of Essex. We are also extremely grateful to Clare Baker, Michael Greer and Helen Wood at DCSF, and Pippa Gibson at Defra for their help in creating the distance variables.

Address for correspondence: Steven McIntosh, Department of Economics, University of Sheffield, 9 Mappin Street, Sheffield S1 4DT. E: s.mcintosh@sheffield.ac.uk

The Impact of Distance to Nearest Education Institution on the Post–Compulsory Education Participation Decision

1. Introduction

The decision to participate in education after it is no longer compulsory[1] is argued to be affected by three groups of interdependent factors: objectives; opportunities; and constraints (Haveman and Wolfe, 1995). Objectives are set at a national level in terms of funding for education versus competing demands, and also at the family level with respect to the value placed on education, and the benefits that it can bring. Opportunities to partake in education depend on the availability of local institutions delivering the desired programme of study. Opportunities to engage in alternative activities, principally working, also influence the education participation decision. Finally, constraints to engaging in post–compulsory education include aptitude and ability, as well as financial constraints.

A considerable literature exists that examines the various factors that influence the decision to participate in post–compulsory education, many of which fit into this objectives/opportunities/constraints framework. Repeated studies have found that the biggest influences on this participation decision are prior attainment and family background. In terms of prior attainment, success in public examinations at the completion of compulsory schooling has been shown many times to be strongly and positively related to the likelihood of continuing into post–compulsory education. McIntosh (2001) and McVicar and Rice (2001) offer time series evidence on the positive relationship between the rate of success in GCSE examinations and the post–compulsory participation rate. Cross–sectional evidence at the individual level for the same relationship is provided, *inter alia,* by Ashford *et al*. (1993), Gray *et al.* (1993), Lenton (2005), Payne (1998) and Rice (1999). Since success in examinations in compulsory schooling is seen as 'qualifying' for the next stage, particularly when following the academic route in further education, then higher attainment can be seen as creating more opportunities for post–compulsory participation.[2] Similarly, being raised in families with greater socio-economic advantage (whether measured by household income, parental occupation or parental education), can raise expectations and aspirations of young people to attain a higher level of education, generate opportunities to study further, and to remove

[1] In England, young people can legally leave full–time education at the end of the academic year in which they turn 16.

[2] There is a possibility of reverse causality in this relationship, whereby those young people who intend to continue in post–compulsory education put more effort into their earlier years of study and so achieve higher grades at the end of compulsory schooling. The opposite would be true for those young people who had no intention of remaining in full–time education.

constraints. Many of the same studies as cited above have revealed a positive relationship between socio-economic advantage in family background and the likelihood of remaining in post–compulsory education. The intergenerational mobility literature is also relevant to this relationship, showing a positive influence of parental education and income on children's post–compulsory participation rates (Chevalier, 2004; Micklewright, 1989).

One opportunity/constraint that has never been investigated in the literature, however, as far as we are aware, is the proximity to an institution providing post–compulsory education. Individuals' decisions regarding remaining in education may be influenced by the availability of nearby educational institutions, so that for example, young people in rural areas who live further from education institutions on average, may be less likely to undertake post-compulsory education than their counterparts in urban areas. Greater travelling distances to the nearest institution will increase the cost of staying in education, in financial terms through travel costs, in temporal terms through the lost time spent commuting, and also possibly in psychological terms caused by the inconvenience and possibly unpleasantness of a lengthy commute every day. If participation in post–compulsory education is an investment decision to be undertaken when the present value of the future benefits outweighs the current costs as suggested by human capital theory (Becker, 1993, *inter alios*), then an increase in such costs can reduce the likelihood of undertaking the investment. We would not expect this distance effect to dominate the other key drivers of post–compulsory participation discussed above, namely prior attainment and family background. However, at the margin, when a young person is just undecided (or indifferent) between participating or not, distance to travel may just tip the balance one way or the other. Another reason for studying the impact of distance on the post–compulsory education participation decision is that it is more amenable to immediate policy influence than the main determinants of participation, prior attainment and family background.[3] For example, improved public transport or subsidised travel could both cut down on the costs of travelling to a place of learning.

Our paper is, in part, also motivated by the announced future increase in the compulsory participation age, which is to be raised to age 17 by 2013, and to age 18 by 2015.[4] If greater distance is seen to act as a significant deterrent or constraint on participation in post-compulsory education by young people, perhaps particularly for those living in more remote

[3] This is not to say that these effects can never be influenced by policy. For example, the introduction of the GCSE examination at the end of compulsory schooling in the UK in 1988 led to an immediate rise in the number of age 16 qualifications acquired, which in turn increased the post–compulsory participation rate (see Ashford *et al.,* 1993).

[4] The raising of the participation age (RPA) policy also covers post-16 training, so the additional compulsory years will not necessarily need to be spent in full–time education.

rural areas, then further intervention may be needed in order to achieve the ambition of full participation at age 17 or 18.

The remainder of the paper is structured as follows. The following section describes the two data sets that we use to analyse the impact of distance on post-compulsory education participation, and the methodology used. The results of the analysis are presented in Section 3, while a final section concludes.

2. Data and Methodology

In order to analyse the impact of distance on the post–compulsory participation decision, we use data from two recent cohorts of young people in England, namely Cohort 12 of the Youth Cohort Study (YCS), and the Longitudinal Study of Young People in England (LSYPE).

2.1 Youth Cohort Study

The YCS was designed primarily to provide information on young people's transitions from compulsory education to further and higher education, and/or the labour market. The YCS is a continuing series of representative cohort surveys which started with Cohort 1 in 1985, and has now reached Cohort 13 which was first interviewed in 2007. Each cohort is surveyed by postal questionnaire on a number of occasions (called 'sweeps'), with the first sweep in the spring of the year following completion of compulsory education. Individuals are therefore aged 16 or 17 when they first respond to the YCS. They are then re–interviewed on an annual or biennial cycle, with most cohorts interviewed three times in total. Coverage for Cohorts 1 to 12 is England and Wales, though we use data for England only, for reasons explained below.

We use the latest available full data set, which is Cohort 12 (YCS12). Survey participants were interviewed annually in 2004, 2005, 2006 and 2007. We focus mainly on Sweep 1 which was carried out in Spring 2004 for individuals who completed their compulsory education 8 months earlier (i.e. were eligible to leave school for the first time in summer 2003). The YCS collects data on education and labour market activity, qualifications gained and sought, details on current employment, as well some background socio–economic information about families and their attitudes. YCS12 sweep 1 was the first YCS sweep designed with the intention of collecting most Year 11 (i.e. GCSE) attainment information from administrative sources rather than asking the survey respondents themselves. Individuals were matched with their records in the National Pupil Database (NPD) which

provides information on individuals' attainment.[5] Since this administrative data source is only available for England, and the coverage of our other data set described below also covers England only, we restrict our attention to YCS respondents in England only.

2.2 Longitudinal Study of Young People in England

LSYPE is also focussed on young people's transitions from education into the world of work. It is a single cohort study (which is still ongoing), tracking a sample of young people from age 13/14 (Year 9) in Spring or Summer 2004 in order to better understand their development from their early teens while still in education (as compared to the YCS which only starts post–16). Interviews (known as 'waves') are taking place annually. We primarily focus on wave 3 conducted in 2006 to obtain data on the explanatory variables about the young people and their families. At this point, the respondents were (mostly) aged 16, and were coming towards the end of their compulsory education, or in some cases had just completed it. The post–compulsory education participation variable in LSYPE was derived from information on respondents' current activity in wave 4 of the survey, conducted in 2007, around one year after the end of their compulsory schooling.

The LSYPE questionnaires cover a broader range of topics than the (shorter) YCS questionnaire.[6] Thus, in addition to the areas covered in YCS, LSYPE also includes: attitudes to school and involvement in education; parental expectations and aspirations; risk factors (absences, truancy, police contact, bullying) and a range of parental questions. As with the latest YCS, individuals can be matched with administrative data sources, such as the NPD, which provides Key Stage test results as well as GCSE attainment etc.

The above descriptions of the two data sets to be used make clear that they are from two different points in time, being three education years apart – 2004 for YCS12 and 2007 for LSYPE. Various education policies were introduced or changed during these three years[7], meaning that the education system faced by respondents in LSYPE is not exactly the same as that faced by respondents in YCS12. Such differences must be borne in mind throughout

[5] The linking of respondents to their individual attainment records in the NPD serves to reduce respondent burden as well as to increase the accuracy of the information in the YCS.
[6] See http://www.esds.ac.uk/longitudinal/access/lsype/L5545.asp for further information.
[7] For example: the introduction of the Education Maintenance Allowance (EMA) which pays young people from poorer families a weekly sum of money if they remain in full–time education; Entry to Employment (E2E), which is designed for 16–18 year old young people who are not ready to undertake a full apprenticeship; re–launched apprenticeships; and the abolition of GNVQs, which were occupation–related qualifications which could be taken at different levels covering both compulsory and post–compulsory education..

this study, and could potentially explain some of the different results found across the two data sets as reported below.

2.3 Methodology

The dependent variable used in the first specification to be estimated is a dichotomous variable indicating simply whether an individual is participating in full–time education[8] at the time that they reply to the survey, during the year following their completion of compulsory schooling. The relationship is therefore estimated using a simple probit equation.

We also have information in both surveys on the qualification for which the respondents are studying. These various qualifications were classified into either academic or vocational qualifications, in order to examine whether the determinants of post–compulsory participation vary by type of qualification being studied.[9] In order to jointly estimate the likelihood of undertaking each of these types of post–compulsory education, in the second specification a multinomial logit model was estimated. The dependent variable in this case took one of three values, indicating academic study, vocational study and no post–compulsory education. The latter formed the reference category.

A range of explanatory variables is available in both data sets used. These include measures of respondents' prior attainment which is indicated by whether they have achieved 5 or more GCSEs at grade C or above at the completion of compulsory schooling, and also whether these 5 or more successes included Maths and English. Standard demographic controls are available in both data sets, as well as indicators of family background such as type of housing tenure, parental occupation and parental education. Attitudes to schooling and education are measured by whether respondents report a history of truancy, or have ever been suspended or expelled from a school.[10] The only school characteristic observed in the

[8] This definition of post–compulsory education as full–time education therefore excludes part–time education participation, apprenticeships or workplace training.

[9] In England, the 'academic' route is followed by those studying for A Levels, usually in three or more subjects that are examined at age 18 after 2 years of study in secondary school 'sixth forms', Sixth Form Centres or colleges of Further Education. The range of 'vocational' qualifications is much wider (examples include National Vocational Qualifications, City and Guilds qualifications and Business and Technology Education Council (BTEC) qualifications), and can be taken in a wider variety of settings, such as in colleges of Further Education or in the workplace. Since we are only concerned here with full–time education, most vocational study we observe will be in the former setting.

[10] We acknowledge that the relationship between prior truancy and post–compulsory education is unlikely to be causal, with both being influenced by unobserved characteristics of the young person. There is also the possibility of reverse causality, whereby individuals who anticipate that they will not participate in post–compulsory education are less engaged during the compulsory years.

YCS data set is whether the young person attended an independent or grammar school in their last year of compulsory schooling. The LSYPE data set, with matched in administrative data, contains considerably more information about the school(s) attended and the respondents' peer groups, such as the proportion of pupils in the school who achieve 5 or more good GCSEs, the proportion of pupils in receipt of free school meals, as an indicator of socio–economic background of the school's intake, and the unauthorised absence rate. There are other variables available in LSYPE but not in the YCS, in particular derived from a parental questionnaire asking about their attitudes to their children's education.

The main contribution of this paper is the analysis of the impact of distance to nearest education institution on the post–compulsory participation decision. This relationship has not been investigated in the literature before, presumably because of a lack of data. In our case, distance variables were created by using information on individuals' home location based on their full postcodes. This information was combined with postcode information for all institutions providing post–compulsory education in England. The postcode information for individuals and institutions was then converted to grid references based on the centre of each postcode using GeoConvert[11]. Finally, ArcGIS[12] was used to calculate the distance 'as the crow flies' for each individual from their home to their nearest education institution.

Table 1 provides descriptive statistics for all of the variables used in the analysis. The first row shows that the participation rate at the time that the two surveys were undertaken was 75% in the YCS and 72% in LSYPE. The fact that the participation rate is lower in LSYPE which is the later survey does not imply that the participation rate is falling (indeed, it is marginally increasing over this period).[13] One explanation is that most LSYPE respondents are surveyed in July or August, whilst most YCS respondents are surveyed in March. LSYPE respondents are therefore surveyed around four months later in the year than YCS respondents, thus allowing more time for course completion or dropout, and so creating a lower participation rate in LSYPE.[14]

[11] http://geoconvert.mimas.ac.uk/
[12] http://www.esri.com/software/arcgis/index.html
[13] The latest (2008) official figures for proportions of young people in full–time education are 81.5% of 16 year olds and 67.6% of 17 year olds (Source: http://www.dcsf.gov.uk/rsgateway/DB/SFR/s000849/index.shtml). Our samples contain both 16 and 17 year olds.
[14] Given that A–levels have a two year duration, so that respondents in neither data set will have completed such courses during the first year of post–compulsory schooling, we might expect this difference in participation rates between surveys to disappear when we focus exclusively on participation in A–level study. This is exactly what is observed, with the A–level participation rate in LSYPE actually slightly higher than the equivalent rate in YCS (47.6% in LSYPE versus 47.0% in YCS).

The remaining rows in Table 1 show that the background characteristics of the two cohorts of young people are very similar. The distances they live from their nearest educational institutions are also very similar, on average. The prior attainment rates show slightly higher achievement amongst the LSYPE respondents. This is consistent with the general rise in GCSE attainment over the period spanned by our two datasets.[15]

3. Results

3.1 Participation in Post–Compulsory Education – YCS

Before beginning the econometric analysis of the YCS data, a simple bivariate analysis of the relationship between post–compulsory participation and distance to nearest education institution was undertaken. The results showed that the average distance to nearest institution did not differ significantly between participants and non-participants. However, if participation is distinguished by whether individuals are studying for either academic or vocational qualifications, with education institutions similarly distinguished by the type of education offered, then there are some interesting differences. In particular, participants in academic post-compulsory education live, on average, 400m closer to an academic institution than do non-participants, and this difference is statistically significant at the 5% significance level. The difference in distance to nearest vocational institution between vocational education participants and non-participants was however statistically insignificant. This dichotomy in type of education will be investigated further in the next sub–section.

Of course, many other factors also affect the participation decision, and hence we now turn to an analysis that includes these other covariates. Table 2 reports the marginal effects from a probit equation analysing the factors associated with participation in post–compulsory education in the YCS. The first row reveals a small and statistically insignificant effect of distance to nearest education institution on the decision to participate in post–compulsory full–time education. Across the whole sample, distance does not seem to have a significant impact on the decision to participate in post–compulsory education.

The marginal effects of the other control variables mostly accord with the existing literature. The key determinant of post–compulsory participation is prior attainment in GCSE examinations at the end of compulsory schooling. Young people who achieve 5 or more GCSEs at grade C or above are 13 percentage points more likely to participate in post–

[15] See http://www.dcsf.gov.uk/rsgateway/DB/SFR/s000826/SFR02_2009_Final_Amended160109.pdf, Chart 1.

compulsory education. There is an additional impact of almost the same size again if individuals hold Maths and English amongst their 5 or more good GCSEs, showing the importance of those two subjects for progression. The importance of family background is shown by the positive and statistically significant marginal effects observed for the parental education and occupation variables.[16] Even after controlling for the young person's own family background, there is an additional effect of living in more deprived neighbourhoods, as shown by the strong negative marginal effect on the regional index of local deprivation variable.[17] In terms of individual characteristics, females and young people from ethnic minorities are significantly more likely to participate in post–compulsory education after controlling for other factors, as is usually observed in the literature, by 4 and 10 percentage points relative to males and non–ethnic minority individuals, respectively. Finally, as expected, a history of truancy or exclusion from schools is associated with a significantly lower likelihood of post–compulsory participation.

3.2 Participation in Post–Compulsory Education, by Type of Education – YCS

The previous sub–section showed that, overall, there is negligible effect of distance on participation. However, post–compulsory education comprises very different types of learning, and can be distinguished in particular by academic[18] or vocational pathways. It is possible that the influences on the participation decision vary by type of learning. To date, very few studies in the literature have considered how the likelihood of post–compulsory participation varies by type of education, with Clark (2002), Conlon (2005) and Lenton (2005) being exceptions.[19] This paper adds to this small literature on the distinction between academic and vocational participation, with the focus being on distance to education institution.

---

[16] After controlling for these other parental variables, parental employment surprisingly attracts negative and statistically significant marginal effects. The raw correlation between parental employment and child's post–compulsory participation takes the more anticipated positive effect.

[17] The IMD is a weighted average of 7 'domains' or separate indicators of deprivation (income deprivation; employment deprivation; health deprivation and disability; education, skills and training deprivation; barriers to housing and services; living environment deprivation; and crime). See http://www.communities.gov.uk/communities/neighbourhoodrenewal/deprivation/deprivation07/ for further details.

[18] Note that the academic pathway is here defined to be taking post-compulsory, Level 3 academic qualifications (i.e. A Levels in England). The relatively small number of individuals who are re-taking academic Level 2 qualifications (i.e. GCSEs in England) that they failed to obtain during compulsory education are likely to be very different people making different choices, and so should not be included in the same category.

[19] This is in contrast to the large literature which examines the differences in the wage (and employment) returns to academic and vocational qualifications (see, for example, Dearden *et al.,* 2002; McIntosh, 2006).

Two variables were created, one measuring the distance to the nearest institution offering 'academic' qualifications, and the other measuring the distance to the nearest institution offering 'vocational' qualifications. Note that all types of institution offer academic qualifications. In classifying education institutions, it was assumed that only Further Education Colleges and Sixth Form Centres offer vocational education, in addition to academic qualifications. Thus, for every individual, the distance to the nearest institution offering vocational education must be greater than or equal to the distance to the nearest institution offering academic education. As a consequence of this, on average, individuals live further from an institution offering vocational qualifications than from an institution offering academic qualifications. The average distance from an academic institution is 2.29 kilometres in both data sets (with a standard deviation of 2.5 in both data sets), while the average distance from a vocational institution is 5.96 kilometres in the YCS and 5.63 kilometres in LSYPE (with a standard deviation of 5.8 in the YCS and 5.2 in LSYPE).

The results of the multinomial logit analysis of the YCS data are displayed in Table 3. The first row shows that the further individuals live from an institution offering academic qualifications, the less likely they are to undertake post–compulsory academic study, with each kilometre in distance reducing the likelihood of participating in education focussed on obtaining academic qualifications by 1.5 percentage points. A one standard deviation increase in distance to institutions offering academic qualifications is therefore associated with a 3.75 percentage point reduction in the probability of participation. By contrast, the further individuals live from an institution offering academic qualifications only, the more likely they are to undertake study of vocational subjects, by 0.9 percentage points per kilometre distance (or by 2.25 percentage points for a one standard deviation increase in distance). Interpreting these effects for a fall in distance, it is therefore the case that if an individual lives nearer an institution that offers only academic qualifications, then they are more likely to pursue academic, and less likely to pursue vocational, qualifications, presumably to avoid a costly commute. In contrast, if the institution offering academic qualifications is further away (thus implying that no institution is close) then some individuals switch to vocational study. Given the overall participation rates (approximately one–half of 16/17 year olds engaged in study for academic qualifications, one–quarter in study for vocational qualifications and one–quarter not participating in post–compulsory education), and the average distances involved to institutions as reported in the previous paragraph, then the marginal effects per kilometre distance in Table 3 are not large. At the margin, the absence of a local institution providing academic qualifications will persuade a small number of individuals to switch to vocational study. The idea of the marginal individual being influenced by distance will be developed further in the following sub–section. Note that the distance to an institution offering vocational

qualifications does not seem to have any effect on the decision to participate in any form of post-compulsory education.

Briefly considering the other marginal effects in Table 3, those characteristics that were statistically significantly related to overall participation are also related to academic participation, with the same sign but a larger effect in most cases. Thus, those young people who acquire 5 or more good GCSEs are 45 percentage points more likely to participate in post–compulsory academic study, with an additional 30 percentage point effect if their GCSEs include Maths and English. These are very large effects, and clearly a cut-off in access to academic post-compulsory education still exists for individuals who fail to achieve this standard. The marginal effects on the parental education and occupation variables similarly remain positive and are larger in size than before. An additional effect, not found in the overall participation results in Table 2 is that, over and above any distance effect, young people in urban areas are less likely to participate in academic post–compulsory education, and more likely to participate in vocational post–compulsory education, relative to similar individuals in rural areas.[20]

The coefficient for living in an urban area is just one example of an interesting pattern, whereby many of the variables in the estimated multinomial logit equation have opposite signed marginal effects on academic and vocational study. It might have been expected that the effects would have the same sign when explaining both types of post–compulsory education (with perhaps the academic effects being larger in size if such qualifications are considered to be the more desirable). Recall that the effects are measured relative to the omitted category, which in this case is not participating in post–compulsory education at all. So we might have expected a person with, say, good GCSEs to be much more likely to study for further academic qualifications than not to study at all, but also to be at least somewhat more likely to study for vocational qualifications than not to study at all. However, the results show that this is not the case, with individuals holding good GCSEs being *less* likely to undertake post–compulsory vocational education than to not participate in further education at all. The pattern of results is similar for those young people who attended a grammar/independent school, or who have well–educated parents or parents in high skill occupations. It therefore seems that the hierarchy of choice in post–compulsory education for young people with good GCSEs or from families with higher socio–economic status is: first,

[20] Omitting the urban indicator reduces the absolute size of the academic distance coefficient, since both longer distances and a greater propensity for academic study are found in rural areas. The distance coefficient remains statistically significant however. Other results throughout the paper are similarly robust to the exclusion of the urban variable.

academic study; then second, no post–compulsory education; and only then, last of all, participating in vocational study.

In order to further understand such results and this observed attractiveness of leaving full–time education relative to full–time vocational study, it should be remembered that not participating in full–time education does not necessarily mean doing nothing at all, and that young people no longer participating in full-time education may be in employment or engaged in other forms of learning. Examination of the YCS data shows that, of those young people not participating in full–time education in the year after the completion of compulsory education, 32% are in full–time employment, 13% in part–time employment and 25% engaged on an apprenticeship. As for the remainder, 20% are unemployed, 8% economically inactive and 2% do not report their economic status. Full–time employment rates do vary positively, and unemployment rates negatively, with the number of GCSEs obtained by the end of compulsory schooling, consistent with the findings in the previous paragraph that leaving education for the labour market is relatively more attractive than full–time vocational study amongst those with better GCSEs who have decided against further study for academic qualifications.

3.3 Participation in Post–Compulsory Education by Marginal Students, by Type of Education – YCS

It was suggested in both the Introduction and in the previous sub–section that distance might have a greater impact on the marginal individual, who is almost indifferent between participating in post–compulsory education or not, or between undertaking academic or vocational study. The question remains, however, how to identify the marginal individuals in our analysis.

Table 4 splits each of the datasets into four groups according to the number of GCSEs achieved at the completion of compulsory schooling. The proportion falling within each category shows that these GCSE groups are not equal in size. The key column is that showing the participation rate in academic post–compulsory education. Amongst those young people with 7 or more good GCSEs (grades A*–C), the academic participation rate is 80–86%, depending on data set. By contrast, 11–12% of individuals with 1–3 good GCSEs, and only 3–4% of individuals with no good GCSEs, undertake academic qualifications post–16. Thus, the vast majority of those with 7 or more good GCSEs appear to automatically follow the academic route, whilst this route appears closed to all but a few young people with 3 or fewer good GCSEs. However, those with 4–6 good GCSEs appear quite evenly split between undertaking academic post–compulsory education or not. It would appear that our

marginal individual will therefore be found in this group. The hypothesis to be tested is therefore that the distance effect will be greater for young people in the 4–6 GCSE group, than in any other GCSE group. Note that any variation in distance effect size will not be driven by different distances in the various groups[21], since average distance to the nearest education institution is very similar across all GCSE groups, in both data sets.

Table 5 reports the coefficients on the distance measures for four sub-groups of the cohort defined by GCSE performance, in order to test the hypothesis proposed in the previous paragraph. There is clear evidence in support of the hypothesis. Amongst young people with either 0 or 1–3 good GCSEs, distance to nearest institution has no impact on their participation, in either academic or vocational study. For these groups, their participation is low, particularly for academic qualifications which are more affected by distance effects in general as shown in Table 3 above. In most cases they have already decided not to participate in academic post–compulsory study, and the presence of a nearby academic institution is not going to change their minds. For individuals with 4–6 or 7+ good GCSEs, distance to nearest institution offering academic qualifications does affect their likelihood of participating in post–compulsory education. The marginal effects are statistically significantly larger for individuals in the marginal group with 4–6 good GCSEs however. Thus, for each kilometre that this group live distant from an institution offering academic qualifications, their probability of undertaking post–compulsory academic study falls by 2.1 percentage points (or a 5.25 percentage point fall in participation for a one standard deviation increase in distance), while their probability of undertaking post–compulsory vocational study increases by 1.4 percentage points (or by 3.5 percentage points for a one standard deviation increase in distance). Thus, for these 'marginal' participants, distance is an important determinant of their participation decision.

Table 6 considers alternative definitions of 'marginal' participants in post–compulsory participation, this time in terms of their family background. It is well known that post–compulsory participation is higher amongst families with higher income. For example, Machin and Vignoles (2005) report a staying–on rate of 90% amongst children living in families in the top quintile of household income in 2000, a proportion which is almost certainly even higher now given the growth in participation. Our marginal participants will therefore not be found in the richest households. Table 6 splits families by, respectively, parental education (Panel A),

[21] Distance to nearest school might have varied with GCSE achievement, if for example, those living nearest schools achieve better grades due to spending less time commuting, or if families with high achieving children deliberately locate nearer schools. There is no evidence for such effects in Table 4.

parental occupation (Panel B) and type of housing tenure (Panel C). The negative impact of distance on academic post–compulsory participation is greater amongst the young people from less socio-economic advantaged families, with lower–education versus graduate parents, and for council–owned tenure versus other forms of home ownership. The largest distance effect observed in the three panels of Table 6 is for young people whose parents only achieved a low level of education, for whom each additional kilometre distance from an academic institution reduces their likelihood of post–compulsory participation by 2.5 percentage points (or a 6.25 percentage point fall in participation for a one–standard deviation increase in distance).

3.4 Participation in Post–Compulsory Education, by Type of Education – LSYPE

Table 7 reports the results from a similar multinomial logit equation as was estimated in Table 3, but now using the LSYPE rather than the YCS data. As the list of variables in Table 1 makes clear, LSYPE contains considerably more information with which to control for other factors that might influence post–compulsory participation. In particular, there is much more information on the schools attended by respondents whilst in compulsory education, as well as more information on the attitudes to education of their parents. The results presented in this section are therefore a robustness check on the key results obtained above with the YCS, to determine whether the same results are obtained when these additional controls for school quality and parental attitudes are included.

The results in Table 7 show that this greatly expanded list of control variables does not significantly affect the size of the distance impact on participation.[22] In LSYPE, each additional kilometre distance from an institution providing academic qualifications reduces respondents' likelihood of participating in academic post–compulsory education by 1 percentage point (a 2.5 percentage point fall for a one standard deviation increase in distance), while increasing their likelihood of participating in vocational post–compulsory education by 0.9 percentage points (a 2.25 percentage point increase for a one standard deviation increase in distance).[23] In addition, there is a disincentive effect of living at a greater distance from vocational education provision on vocational education participation in LSYPE that was not observed in the YCS, of 0.5 percentage points per kilometre distance (or 2.6 percentage points for a one standard deviation increase in distance).

[22] The probit results considering any type of post–compulsory participation were also qualitatively the same using LSYPE as those obtained with the YCS data and reported in Table 2 above. As the distance effect is statistically insignificant in this specification, the LSYPE probit results are not reported here.

[23] These are similar in magnitude to the results reported in Table 3 for the YCS data.

The inclusion of the additional control variables available in LSYPE does not affect the results found for the standard control variables, with prior attainment and family background continuing to be the most important correlates of post–compulsory participation as before. Of the new variables added, the characteristics of respondents' former schools and average attainment levels of their pupils individually have, at best, only a small role to play in explaining post–compulsory participation, although they are jointly statistically significant.[24] Amongst the new parental attitude variables, attending parents' evenings, paying for private tuition and parental desire for their child to continue in post-compulsory education all have positive and statistically significant effects, and with the latter particularly strongly associated with a higher likelihood of the young person participating in post–compulsory education.

Table 8 splits the LSYPE sample by prior attainment at GCSE level. The results are even more striking than the YCS results (compare Table 5) in that it is clearly only the marginal group with 4–6 good GCSEs where distance has any role in explaining post–compulsory participation. The marginal effects for this group are larger than those observed in Table 5 with the YCS. Each kilometre increase in the distance an individual with 4–6 good GCSEs has to travel to an institution offering academic qualifications reduces their likelihood of participating in academic post–compulsory education by 3.8 percentage points (or by 9.5 percentage points for a one standard deviation increase in distance), while raising their likelihood of participating in vocational post–compulsory education by 2.4 percentage points (or by 6 percentage points for a one standard deviation increase in distance). Table 8 also shows a smaller, but statistically significant, negative effect of distance to nearest institution offering vocational education on the likelihood of undertaking vocational post–compulsory learning for this marginal GCSE group.

3.5 Non–linear Effects of Distance

So far the effect of distance on post–compulsory participation has been assumed to be linear. However, the effect may be non–linear, such that the negative influence of distance may have an increasingly larger effect the greater the distances involved, or may only have any impact at all for large distances. Thus, an extra kilometre may not influence the participation decision much when short distances are involved (i.e. whether an individual lives 1 or 2 kilometres from an education institution does not greatly affect their decision to remain in post–compulsory education), but at further distances, an extra kilometre may just tip the balance in the decision not to participate (i.e. living 7 kilometres away rather than 6

[24] The negative marginal effect for independent schools on academic post–compulsory participation is somewhat surprising, though it emerges only after controlling for all of the other characteristics of schools and their pupil intakes.

does have more of an effect on the staying–on decision). To investigate whether there are such non–linear effects, the continuous distance measures used so far were replaced with dummy variables indicating 2–8 kilometres from the nearest education institution and more than 8 kilometres from the nearest education institution (with the base category being individuals who live less than 2 kilometres away), separately for institutions providing academic and vocational qualifications.[25] The marginal effects for the new distance variables are shown in Table 9 for YCS and LSYPE specifications that continue to control for the same other covariates as above. The full sample results in Panel A show significantly lower academic participation rates amongst those who live more than 8 kilometres distance from an academic institution relative to those who live less than 2 kilometres distance, by around 10 percentage points in both data sets. When the sample is split by level of GCSE attainment as in Panel B, the statistically significant effects are again clearly clustered amongst the marginal participation group with 4–6 good GCSEs. The effects are also very large in absolute size. Those young people who live more than 8 kilometres distance from an academic institution are 18 percentage points (YCS) to 27 percentage points (LSYPE) less likely to participate in academic post–compulsory education, compared to those who live less than 2 kilometres distance. Given that Table 4 reported that the academic post–compulsory participation rate of this group was 47% (YCS) or 38% (LSYPE), these marginal effects are clearly very large. In addition, in the LSYPE results only, there is a negative effect of living more than 8 kilometres from an institution offering vocational qualifications on the likelihood of post–compulsory vocational participation amongst the marginal (4–6 good GCSE) group, by 15 percentage points relative to those who live less than 2 kilometres distance.

4. Conclusions

This paper has used the unique provision of distance information to investigate, for the first time in the literature, the impact of distance to one's nearest education institution, on the probability of participating in post–compulsory education. For many individuals, distance is not an issue, as they live within easy (walking or cycling) distance of their nearest education institution. In addition, many young people have their post–16 lives already clearly mapped out, in terms of further academic study if they have achieved good results in their GCSE examinations, or leaving full–time education if they have obtained few or no GCSEs. There is

[25] The choice of cut–offs at 2 kilometres and 8 kilometres is essentially arbitrary, although 2 kilometres is the mean distance across all individuals in the two data sets, and less than 2 kilometres seemed to represent a 'walking distance' category. 8 kilometres was chosen as it represents an 'extreme' distance that is relevant to 5% of all respondents. A higher cut–off point would therefore have been relevant to too few individuals. However, we did experiment with changing these cut–off points, and the results were not qualitatively affected.

however a group of young people who are on the margin between participating in post–compulsory education or not. The results presented above show that, whether we define the marginal participant in terms of having a mid–level of prior attainment (4–6 good GCSEs), or in terms of coming from a relatively socio-economically disadvantaged background, we consistently find that distance to nearest institution can affect the decision to partake in post–compulsory education. These results are robust across two separate data sets. Some of the effects of distance become very large, with the biggest effect suggesting that those who live more than 8 kilometres distance from an academic institution are 27 percentage points less likely to participate in academic post–compulsory education, compared to those who live less than 2 kilometres distance (Table 9, LSYPE). Since only a small minority of young people live at such distances from their nearest education institution, and the result only applies to marginal students living at such distances, this result is clearly not widely applicable. However, for those individuals affected, distance to the nearest education institution is an important aspect to take into consideration when trying to decide whether to participate in post–compulsory education.

As far as policy implications are concerned, the analysis cannot identify the cause of the distance effect. Thus, it is not known whether greater distances reduce the incentive to participate because of financial travel costs, or time and psychological (boredom) costs of frequent long commutes. If the former turns out to be the cause, then subsidised travel for those participating in post–compulsory education would be an effective policy. If the latter is the cause, then one policy response would be to improve the frequency of travel services and reduce travel time. Since distance affected only marginal students, making any such policies universally applicable would involve considerable deadweight. Targeted policies on those individuals whose decisions are influenced by distance would therefore be the most effective. Clearly it would be easier to target financial travel subsidies than general travel services. It would also be difficult to justify targeting subsidised travel specifically on the group with 4–6 GCSEs. The other definitions of the marginal participant, in terms of family background will therefore be more useful, with subsidised travel for students from less well–off families being an appropriate policy response.

Finally, from an econometric methodology point of view, the results presented here have relevance for any empirical field where an instrument is required for education or qualifications acquired, for example in the returns to education literature. Given the effect of distance on participation, and assuming family household location is judged to be exogenous as far as the future earnings of the children is concerned, then distance to nearest institution at age 16 appears to be a good instrument for education participation.

REFERENCES

Ashford, S., Gray, J. and Tranmer, M. (1993). 'The introduction of GCSE exams and changes in post–16 participation.' Employment Department Research Series, Youth Cohort Report no. 23.

Becker, G S (1993, 3rd edition) *Human Capital*, University of Chicago Press, NBER.

Clark, D. (2002). 'Participation in post–compulsory education in England: what explains the boom and bust?' Centre for the Economics of Education Discussion Paper 24.

Chevalier, A. (2004) 'Parental education and child's education: a natural experiment,' Centre for Economics of Education Discussion Paper 40.

Conlon, G. (2005). 'The determinants of undertaking academic and vocational qualifications in the United Kingdom.' *Education Economics*, 13, 299–313.

Dearden, L., McIntosh, S., Myck, M. and Vignoles, A. (2002). 'The returns to academic and vocational qualifications in Britain,' *Bulletin of Economic Research*, 54, 249–274.

Gray, J., Jesson, D. and Tranmer, M. (1993). 'Boosting post–16 participation in full–time education. A study of some key factors.' Employment Department Research Series, Youth Cohort Report no. 20.

Haveman, R. and Wolfe, B. (1995). 'The determinants of children's attainments: A review of methods and findings.' *Journal of Economic Literature*, 33, 1829–1878.

Lenton, P. (2005). 'The school–to–work transition in England and Wales.' *Journal of Economic Studies*, 32, 88–113.

Machin, S. and Vignoles, A. (2005). *What's the Good of Education?* New Jersey: Princeton University Press.

McIntosh, S. (2001). 'The demand for post–compulsory education in four European countries.' *Education Economics*, 9, 69–90.

McIntosh, S. (2006). 'Further analysis of the returns to academic and vocational qualifications,' *Oxford Bulletin of Economics and Statistics*, 68, 225–251.

McVicar, D. and Rice, P. (2001). 'Participation in further education in England and Wales: an analysis of post–war trends.' *Oxford Economic Papers*, 53, 47–66.

Micklewright, J. (1989). 'Choice at sixteen.' *Economica*, 56, 25–39.

Payne, J. (1998). 'Routes at sixteen. Trends and Choices in the Nineties.' Department for Education and Employment Research Report 55.

Rice, P. (1999). 'The impact of local labour markets on investments in further education: evidence from the England and Wales Youth Cohort Studies.' *Journal of Population Economics*, 12, 287–312.

Table 1: Descriptive Statistics

Variable description	YCS	LSYPE
PANEL A: Common specification		
% participating in full–time education	74.7	71.7
% participating in full–time academic education[1]	47.0	47.6
% participating in full–time vocational education[1]	28.3	26.6
A1. Young person characteristics variables		
% female	49.4	49.3
% respondent from ethnic minority	13.0	12.9
5+ A*–C GCSEs or equivalent	54.2	57.8
% 5+ A*–C GCSEs including Maths and English	44.3	45.8
% has health problem or disability	4.0	3.3
% played truant in Year 11	32.7	25.0
% expelled or suspended in Years 10 or 11	10.1	7.3
A2. School variables		
% at grammar/independent school in Year 11	10.7	11.0
A3. Family background variables		
% live in owner–occupied house	80.1	72.5
% lives in a council house	12.7	21.9
% live with father only	5.6	2.8
% live with mother only	16.1	23.2
% live with neither parent	3.9	1.1
% only mother employed	11.6	18.7
% only father employed	15.8	14.9
% both parents employed	59.3	51.3
% father's occupation in SOC 1–3	34.6	31.8
% mother's occupation in SOC 1–3	26.7	28.2
% at least one parent with a degree[2]	26.1	17.9
% at least one parent with A–levels[2]	20.5	24.5
A4. Spatial variables		
distance from academic institution in km	2.29	2.29
distance from vocational institution in km	5.96	5.63
index of local deprivation	0.21	0.22
PANEL B. Additional variables available in LSYPE		
B1. Young person characteristics variables		
key stage 3 average points score[3]		33.9
% parent mentions child has special needs		10.1
% child currently has statement of special needs		4.2
% had work experience place while at school		37.2
% whether has a job during term time		30.3
% whether has caring responsibilities		5.9
attitude to school[4]		32.3
B2. School variables		
% independent school		7.2
% foundation school		15.5
% voluntary aided/controlled school		13.4
% of 15 year olds at school with SEN		14.3
% reaching Level 2 at school		55.1
KS3–GCSE value added at school[5]		991.4
% unauthorised absence rate at school		1.2
% eligible for free meals at school		14.1
% at school first language not English		8.6
B3. Family background variables		
% father not present		24.4
% mother not present		4.0
% father in professional/managerial job		31.8

Variable description	YCS	LSYPE
% father in intermediate job		20.4
% father in routine job		14.5
% mother in professional/managerial job		28.2
% mother in intermediate job		20.0
% mother in routine job		21.6
% mother has a degree		10.4
% mother has other HE		11.6
% mother has A–levels		12.5
% father has a degree		10.3
% father has other HE		7.6
% father has A–levels		12.3
% high family income[6]		54.3
% lives with both natural parents		62.0
% lives in a single parent family		24.5
number of siblings living in household		1.4
number of risk factors faced[7]		1.5
B4. Parental attitude variables		
% whether attend parents' evenings		83.2
% arranged special meetings with teachers		27.0
% parent very / fairly involved in child's school life		75.4
% whether paid for private tuition in last year		14.1
% parent wants child to continue in post–comp. education		79.5
% parents will pay expenses of post–comp. education		86.7

Notes to Table 1

1. The proportions participating in academic and vocational education do not sum to the proportion participating in full-time education overall, because a small number individuals report undertaking both academic and vocational qualifications (which is perfectly possible), while a small number of others report being in full-time education but do not report which qualification they are studying for, and so cannot be classified as either academic or vocational. The first effect is numerically more important in this case, since the proportions in the separate streams sum to more than the proportion in full-time education overall. In the empirical analysis of Section 3.3 and 3.4 where type of education is distinguished, those studying both types of qualification are classified as academic, whilst those who do not report their type are omitted from the analysis.
2. The qualifications held by parents are measured as their highest qualification. The reason for the higher level of parental qualification in the YCS is not clear. The YCS question does include step–parents, whilst the LSYPE question refers to just parents, potentially giving more people amongst whom to find a higher qualification in the YCS.
3. The average Key Stage 3 score variable has a minimum value of 15 and maximum value of 53 in the data, with a standard deviation of 6.8.
4. The 'attitude to school' variable is derived from the responses to a series of statements in LSYPE, with which respondents are asked whether they agree or disagree. Examples of the statements include 'I am happy when I am at school', 'school is a waste of time for me', 'school work is worth doing', 'I work as hard as I can at school' etc. The variable has a minimum value of 0 and a maximum value of 48 in the data, with a standard deviation of 8.4.
5. The value added 'score' for each pupil is the difference between their GCSE/GNVQ total point score and the median GCSE/GNVQ point score for all pupils with a similar average Key Stage 3 score. These are then aggregated to give a 'score' for the school. This indicates the value the school has added, on average, for those pupils between Key Stage 3 and GCSE/GNVQ. In the data the variable has a minimum value of 930.4 and a maximum value of 1063.9, with a standard deviation of 18.0
6. 'High family income' is defined as above the median income. However, because the family income data is grouped into 13 bands, and the median falls part way into one band, then some individuals in this particular band are classed as 'high income' when in fact their unknown precise family income will lie just below the median. This gives an overall proportion of 54% reporting above median family income, rather than the anticipated 50%.
7. The 'number of risk factors' variable counts the number of risk factors the young person has experienced from a range of variables relating to cigarette, alcohol, cannabis usage and experience of graffiti, vandalism, shoplifting or fighting. It has a minimum value of 0 and a maximum value of 8 in the data, with a standard deviation of 1.7.

Table 2: Determinants of Participation in Post–Compulsory Education – YCS

Covariates	ME	(SE)
distance from nearest institution in km	–0.002	(0.002)
lives in an urban area	–0.006	(0.010)
female	0.040	(0.006)**
belongs to ethnic minority	0.102	(0.006)**
5+ A*–C GCSEs or equivalent	0.128	(0.012)**
5+ A*–C GCSEs including maths and English	0.112	(0.011)**
has health problem or disability	0.014	(0.015)
played truant in year 11	–0.074	(0.008)**
expelled or suspended in years 10 or 11	–0.109	(0.015)**
at grammar/independent school in year 11	0.079	(0.009)**
live in owner–occupied house	0.015	(0.013)
lives in a council house	0.003	(0.014)
live with father only	–0.003	(0.014)
live with mother only	0.011	(0.010)
live with neither parent	–0.069	(0.021)**
only mother employed	–0.038	(0.015)*
only father employed	–0.014	(0.013)
both parents employed	–0.030	(0.011)**
father's occupation in SOC 1–3	0.014	(0.007)
mother's occupation in SOC 1–3	0.028	(0.007)**
at least one parent with degree	0.050	(0.008)**
at least one parent with A level	0.029	(0.007)**
index of local deprivation	–0.093	(0.023)**
Observations	12,139	

Notes to Table 2
1. Table presents marginal effects (ME) on the probability of participation.
2. Standard errors (SE) in parentheses.
3. * significant at 5%; ** significant at 1%.

Table 3: Multinomial Logit for Participation in Post–Compulsory Education, by Type of Education – YCS

	Academic study		Vocational study	
Covariates	ME	(SE)	ME	(SE)
distance from nearest academic institution in km	–0.015	(0.003)**	0.009	(0.002)**
distance from nearest vocational institution in km	–0.000	(0.001)	–0.001	(0.001)
lives in an urban area	–0.056	(0.020)**	0.028	(0.013)*
female	0.043	(0.012)**	0.004	(0.008)
belongs to ethnic minority	0.224	(0.020)**	–0.038	(0.012)**
5+ A*–C GCSEs or equivalent	0.452	(0.020)**	–0.215	(0.013)**
5+ A*–C GCSEs including maths and English	0.298	(0.015)**	–0.168	(0.011)**
has health problem or disability	-0.013	(0.033)	0.015	(0.020)
played truant in year 11	–0.090	(0.013)**	0.009	(0.009)
expelled or suspended in years 10 or 11	–0.127	(0.027)**	0.018	(0.017)
at grammar/independent school in year 11	0.279	(0.026)**	–0.161	(0.021)**
live in owner–occupied house	0.027	(0.025)	–0.009	(0.016)
lives in a council house	–0.033	(0.031)	0.022	(0.018)
live with father only	–0.002	(0.028	–0.004	(0.018)
live with mother only	0.017	(0.020)	–0.005	(0.013)
live with neither parent	–0.057	(0.036)	–0.013	(0.023)
only mother employed	–0.023	(0.027)	–0.010	(0.017)
only father employed	0.019	(0.026)	–0.021	(0.016)
both parents employed	–0.006	(0.023)	–0.017	(0.014)
father's occupation in SOC 1–3	0.068	(0.014)**	–0.040	(0.009)**
mother's occupation in SOC 1–3	0.057	(0.015)**	–0.019	(0.010)
at least one parent with degree	0.127	(0.016)**	–0.048	(0.011)**
at least one parent with A level	0.062	(0.015)**	–0.018	(0.010)
index of local deprivation	–0.097	(0.047)*	–0.013	(0.029)
Constant	–0.266	(0.043)	0.146	(0.027)
Observations	11,381			

Notes to Table 3

1. Table presents marginal effects (ME) on the probability of participation.
2. Standard errors (SE) in parentheses.
3. * significant at 5%; ** significant at 1%.

Table 4: Average Distance and Participation Rates, by GCSE Achievement

YCS

Number of A*-C GCSEs	Sample share (%)	Average distance (km)	Participation[1]		
			Academic study (%)	Vocational study (%)	Non-participation (%)
0	24	2.2	4	31	54
1–3	19	2.2	12	45	36
4–6	15	2.2	47	36	23
7+	42	2.4	86	17	6
total/mean	100	2.3	47	28	25

LSYPE

Number of A*-C GCSEs	Sample share (%)	Average distance (km)	Participation[1]		
			Academic study (%)	Vocational study (%)	Non-participation (%)
0	21	2.1	3	30	58
1–3	17	2.2	11	39	46
4–6	15	2.2	38	31	32
7+	47	2.4	80	21	9
total/mean	100	2.3	48	27	28

Notes to Table 4

1. For an explanation of why the proportions participating in academic study, vocational study, and not-participating do not sum to exactly 100%, see note 1 to Table 1.

Table 5: Multinomial Logit for Participation in Post–Compulsory Education, by Type of Education and Number of GCSEs – YCS

Covariates	Academic study ME	(SE)	Vocational study ME	(SE)
0 GCSEs at grade A*–C				
distance from nearest academic institution in km	–0.000	(0.003)	0.012	(0.008)
distance from nearest vocational institution in km	–0.000	(0.001)	–0.003	(0.003)
1–3 GCSEs at grade A*–C				
distance from nearest academic institution in km	–0.005	(0.005)	0.004	(0.007)
distance from nearest vocational institution in km	0.000	(0.002)	–0.006	(0.003)
4–6 GCSEs at grade A*–C				
distance from nearest academic institution in km	–0.021	(0.007)**	0.014	(0.006)*
distance from nearest vocational institution in km	0.000	(0.002)	0.000	(0.002)
7+ GCSEs at grade A*–C				
distance from nearest academic institution in km	–0.005	(0.001)**	0.003	(0.001)**
distance from nearest vocational institution in km	–0.000	(0.001)	0.000	(0.000)

Notes to Table 5

1. Table presents marginal effects (ME) on the probability of participation.
2. Standard errors (SE) in parentheses.
3. * significant at 5%; ** significant at 1%.
4. All control variables shown in Table 3 are also included here.

Table 6: Multinomial Logit for Participation in Post–Compulsory Education, by Type of Education and Parents' Education, Occupation and Housing Tenure – YCS

Covariates	Academic study		Vocational study	
Panel A: By Parents' Education	ME	(SE)	ME	(SE)
Graduate parents				
distance from nearest academic institution in km	–0.003	(0.003)	0.002	(0.002)
distance from nearest vocational institution in km	0.001	(0.001)	–0.001	(0.001)
A level parents				
distance from nearest academic institution in km	–0.012	(0.006)*	0.008	(0.004)*
distance from nearest vocational institution in km	0.001	(0.002)	–0.001	(0.002)
Low education parents				
distance from nearest academic institution in km	–0.025	(0.005)**	0.015	(0.004)**
distance from nearest vocational institution in km	–0.001	(0.002)	–0.001	(0.001)
Panel B: By Parents' Occupation				
High-skill occupation parent				
distance from nearest academic institution in km	–0.009	(0.002)**	0.005	(0.002)**
distance from nearest vocational institution in km	0.000	(0.001)	–0.000	(0.001)
Low-skill occupation parent				
distance from nearest academic institution in km	–0.017	(0.004)**	0.011	(0.003)**
distance from nearest vocational institution in km	–0.001	(0.002)	–0.001	(0.001)
Panel C: By Housing Tenure				
Home owner				
distance from nearest academic institution in km	–0.013	(0.003)**	0.008	(0.002)**
distance from nearest vocational institution in km	–0.001	(0.001)	0.000	(0.001)
Council–owned				
distance from nearest academic institution in km	–0.020	(0.012)	0.008	(0.011)
distance from nearest vocational institution in km	0.012	(0.004)*	–0.014	(0.005)**
Other renting				
distance from nearest academic institution in km	–0.016	(0.013)	0.009	(0.010)
distance from nearest vocational institution in km	0.003	(0.006)	–0.001	(0.004)

Notes to Table 6

1. Table presents marginal effects (ME) on the probability of participation.
2. Standard errors (SE) in parentheses.
3. * significant at 5%; ** significant at 1%.
4. All control variables shown in Table 3 are also included.

Table 7: Multinomial Logit for Participation in Post–Compulsory Education, by Type of Education – LSYPE

	Academic study		Vocational study	
Covariates	ME	(SE)	ME	(SE)
distance from nearest academic institution in km	–0.010	(0.004)*	0.009	(0.003)**
distance from nearest vocational institution in km	0.005	(0.002)	–0.005	(0.002)**
Individual characteristics				
female	0.065	(0.016)**	–0.027	(0.012)*
belongs to ethnic minority	0.197	(0.025)**	–0.063	(0.018)**
5+ A*–C GCSEs or equivalent	0.270	(0.023)**	–0.163	(0.017)**
5+ A*–C GCSEs including maths and English	0.161	(0.022)**	–0.112	(0.018)**
key stage 3 average points score	0.039	(0.002)**	–0.021	(0.002)**
parent mentions child has special needs	–0.056	(0.047)	0.071	(0.030)*
whether child has statement of special needs	0.006	(0.080)	0.025	(0.050)
ever suspended or excluded from school	–0.163	(0.045)**	0.082	(0.029)**
played truant in last year	0.004	(0.025)	0.014	(0.018)
health not very good or not good at all	–0.149	(0.046)**	0.068	(0.034)*
had work experience	0.010	(0.016)	–0.025	(0.012)*
has term time job	–0.048	(0.018)**	0.014	(0.014)
has caring responsibilities	–0.033	(0.033)	0.031	(0.023)
attitude to school	0.010	(0.001)**	–0.002	(0.001)**
School characteristics				
independent school	–0.172	(0.067)*	0.114	(0.052)*
foundation school	0.063	(0.023)**	–0.056	(0.018)**
voluntary aided/controlled school	0.047	(0.024)	–0.034	(0.018)
proportion of 15 year olds at school with SEN	–0.000	(0.001)	0.000	(0.001)
proportion reaching Level 2 at school	0.001	(0.001)	–0.001	(0.001)
KS3–GCSE value added at school	–0.002	(0.001)*	0.001	(0.000)
unauthorised absence rate at school	0.014	(0.007)*	–0.010	(0.005)
% eligible for free meals at school	–0.001	(0.001)	0.001	(0.001)
% at school whose first language not English	0.002	(0.001)**	–0.001	(0.000)*
Family characteristics				
live in owner–occupied house	–0.072	(0.037)	0.038	(0.027)
lives in a council house	–0.096	(0.040)*	0.044	(0.028)
father not present	0.025	(0.049)	–0.014	(0.035)
mother not present	–0.003	(0.050)	–0.010	(0.036)
father in professional/managerial job	0.026	(0.033)	–0.008	(0.024)
father in intermediate job	–0.029	(0.032)	0.012	(0.023)
father in routine job	–0.040	(0.032)	0.030	(0.023)
mother in professional/managerial job	–0.012	(0.027)	–0.009	(0.020)
mother in intermediate job	–0.041	(0.026)	0.017	(0.019)
mother in routine job	–0.054	(0.025)*	0.021	(0.018)
mother has degree	0.075	(0.033)*	–0.033	(0.027)
mother has other HE	0.032	(0.026)	0.013	(0.020)
mother has A–levels	0.000	(0.025)	0.030	(0.018)
father has degree	0.147	(0.035)**	–0.048	(0.028)
father has other HE	0.038	(0.031)	–0.036	(0.025)
father has A–levels	–0.002	(0.025)	–0.005	(0.019)
High family income	–0.050	(0.020)*	0.027	(0.015)
lives with both natural parents	0.071	(0.026)**	–0.029	(0.019)
lives in a single parent family	–0.010	(0.046)	0.032	(0.033)
number of siblings living in household	–0.000	(0.007)	0.001	(0.005)
number of risk factors faced	–0.033	(0.007)**	0.003	(0.005)

Parental attitudes				
whether attend parents' evenings	0.059	(0.025)*	–0.004	(0.018)
parent arranged special meetings with teachers	–0.021	(0.019)	0.006	(0.014)
parent very or fairly involved in child's school life	0.015	(0.020)	–0.012	(0.014)
whether paid for private tuition in last year	0.135	(0.023)**	–0.039	(0.017)*
parent wants child to continue in post-comp ed	0.415	(0.030)**	–0.120	(0.021)**
parents will pay expenses for post-comp ed	0.030	(0.028)	0.027	(0.019)
Spatial characteristics				
lives in an urban area	0.001	(0.028)	0.004	(0.022)
index of local deprivation	–0.169	(0.066)*	0.069	(0.048)
Constant	–0.231	(0.542)	0.287	(0.443)
Observations		8,708		

Notes to Table 7

1. Table presents marginal effects (ME) on the probability of participation.
2. Standard errors (SE) in parentheses.
3. * significant at 5%; ** significant at 1%.

Table 8: Multinomial Logit for Participation in Post–Compulsory Education, by Type of Education and Number of GCSEs – LSYPE

	Academic study		Vocational study	
Covariates	ME	(SE)	ME	(SE)
0 GCSEs at grade A*–C				
distance from nearest academic institution in km	–0.000	(0.001)	–0.004	(0.010)
distance from nearest vocational institution in km	–0.001	(0.001)	–0.003	(0.005)
1–3 GCSEs at grade A*–C				
distance from nearest academic institution in km	0.000	(0.005)	0.012	(0.009)
distance from nearest vocational institution in km	0.004	(0.002)	–0.010	(0.004)*
4–6 GCSEs at grade A*–C				
distance from nearest academic institution in km	–0.038	(0.0115**	0.024	(0.009)**
distance from nearest vocational institution in km	0.006	(0.004)	–0.008	(0.004)*
7+ GCSEs at grade A*–C				
distance from nearest academic institution in km	–0.001	(0.002)	0.002	(0.002)
distance from nearest vocational institution in km	0.001	(0.001)	–0.000	(0.001)

Notes to Table 8

1. Table presents marginal effects (ME) on the probability of participation.
2. Standard errors (SE) in parentheses.
3. * significant at 5%; ** significant at 1%.
4. All control variables shown in Table 7 are also included.

Table 9: Multinomial Logit for Participation in Post–Compulsory Education, by Type of Education: Distance Categories

Covariates	YCS				LSYPE			
	Academic		Vocational		Academic		Vocational	
PANEL A: Full sample	ME	(SE)	ME	(SE)	ME	(SE)	ME	(SE)
distance to academic institution 2–8km	–0.067	(0.015)**	0.041	(0.010)**	–0.038	(0.021)	0.042	(0.015)**
distance to academic institution >8km	–0.099	(0.034)**	0.062	(0.022)**	–0.103	(0.046)*	0.086	(0.035)*
distance to vocational institution 2–8km	0.021	(0.016)	–0.014	(0.010)	0.020	(0.019)	–0.030	(0.014)*
distance to vocational institution >8km	0.012	(0.020)	–0.021	(0.013)	0.056	(0.028)*	–0.051	(0.021)*
PANEL B: By GCSE attainment								
0 GCSEs at grade A*–C								
distance to academic institution 2–8km	–0.017	(0.014)	0.086	(0.036)*	0.001	(0.021)	0.055	(0.044)
distance to academic institution >8km	–0.011	(0.025)	0.055	(0.081)	–0.000	(0.065)	–0.004	(0.118)
distance to vocational institution 2–8km	–0.004	(0.011)	0.009	(0.036)	–0.001	(0.005)	–0.044	(0.041)
distance to vocational institution >8km	0.001	(0.015)	–0.047	(0.049)	–0.005	(0.009)	–0.001	(0.064)
1–3 GCSEs at grade A*–C								
distance to academic institution 2–8km	–0.022	(0.023)	–0.020	(0.034)	–0.007	(0.023)	0.055	(0.044)
distance to academic institution >8km	0.010	(0.056)	–0.007	(0.079)	–0.030	(0.060)	0.130	(0.101)
distance to vocational institution 2–8km	0.027	(0.022)	–0.014	(0.034)	–0.010	(0.019)	–0.024	(0.041)
distance to vocational institution >8km	0.019	(0.029)	–0.045	(0.044)	0.034	(0.030)	–0.092	(0.060)
4–6 GCSEs at grade A*–C								
distance to academic institution 2–8km	–0.100	(0.033)**	0.071	(0.028)**	–0.126	(0.045)**	0.064	(0.039)
distance to academic institution >8km	–0.183	(0.082)*	0.111	(0.067)	–0.269	(0.115)*	0.198	(0.096)*
distance to vocational institution 2–8km	0.040	(0.034)	–0.029	(0.029)	0.032	(0.040)	–0.073	(0.035)*
distance to vocational institution >8km	0.026	(0.045)	–0.042	(0.038)	0.111	(0.060)	–0.152	(0.054)**
7+ GCSEs at grade A*–C								
distance to academic institution 2–8km	–0.021	(0.007)**	0.012	(0.005)*	0.000	(0.011)	0.010	(0.008)
distance to academic institution >8km	–0.035	(0.014)*	0.025	(0.010)*	–0.016	(0.022)	0.021	(0.017)
distance to vocational institution 2–8km	0.004	(0.008)	–0.005	(0.006)	0.003	(0.011)	–0.003	(0.009)
distance to vocational institution >8km	0.002	(0.010)	–0.006	(0.007)	0.009	(0.014)	–0.000	(0.011)

Notes to Table 9

1. Table presents marginal effects (ME) on the probability of participation.
2. Standard errors (SE) in parentheses.
3. * significant at 5%; ** significant at 1%.
4. All control variables shown in Tables 3 and 7 for YCS and LSYPE respectively are also included.