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The Effect of College Mergers on Student Dropout Behaviour: Evidence from the UK

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The Effect of College Mergers on Student Dropout Behaviour: Evidence from the UK

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Abstract

This paper investigates the effect of college merger on the probability of students dropping out of college. In addition we assess whether this effect persists over time and whether there is variation in the risk of drop out by programme area. To answer these questions we use a large administrative data set relating to the population of students enrolled in the further education sector for multiple cohorts of students (i.e. 2002-03 to 2007-08 cohorts). We employ the propensity score matching methods and difference-in-differences methods to overcome the fundamental evaluation problem and to remove the effect of unobserved student (and college) heterogeneity. Our evidence suggests that the risk of drop out has varied over time (by cohort), reducing the risk by about 1-2 percentage points for earlier cohorts, which contrasts with positive effects for later cohorts, which were as high as 5 percentage points. We also show that the effects of merger persisted for 1-2 years and that there was variation in the effect of a merger by programme area. Our results raise important implications for policy makers insofar as mergers cannot be unanimously assumed to be either negative or positive. The effect probably varies with the nature of the merger (voluntary versus involuntary) and by programme area regardless of the type of merger.

Keywords: Dropout, mergers, matching models.
JEL Classification: I20, I21, I28.

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1 Introduction

Dropping out of college implies a high cost for both individual students and for society as a whole. Young people risk entering unemployment and economic inactivity (so-called NEET - Not in Education, Employment or Training) if they terminate college before they have achieved a qualification. This may have serious long-term consequences on their future labour market outcomes, such as reduced earnings and further spells of NEET. Since the publication of the Foster Report in 2005 there has been a clear commitment by the British Government to create incentives for Further Education colleges to focus on the achievement *and* progression of their students, and hence to reducing drop out rates.[1] The Foster Report created strong incentives for colleges to merge to enable them to exploit both economies of scale and of scope (Foster, 2005) and there is some evidence that merger activity did increase after the publication of the report.

The management sciences literature has investigated the effects of college mergers on college finances, efficiency or organisation (Goedegebuure, 1992; Lang, 2002), however, the effect of mergers on student outcomes, such as drop out rates, has been neglected. Payne (2008) and Lang (2002) show that there are two main reasons for colleges to merge. On the one hand, there are the economic and financial reasons related to the concept of productive efficiency. This rationale is mainly related to the opportunity for merged institutions to exploit economies of scale both in teaching and service provision. However, as noted by Lang (2002), mergers can also be motivated by government financial incentives. Another reason for merger is that they can create greater opportunities for the diversification of courses and for the provision of a wider range of services to students. This can be true for both small and large institutions involved and may have the effect of reducing drop out rates and increasing student attainment. There are, however, potential downsides to merger, such as the disruptive effect it may have on student life. This could be due to initial organisational difficulties, or because mergers increase college size and therefore increase the 'distance' between students and college management. Consequently, individual students in merged colleges may feel more alienated, which reduces attainment and increases the risk of drop out. Clearly, whether college mergers have a positive or a negative effect on student drop out behaviour is an empirical question. This paper therefore seeks to investigate the effect of college mergers, which have the effect of increas-

[1] Further Education colleges comprise that sector of the education system in the UK which sits between compulsory schooling and Higher Education. Students in the sector are typically aged between 16-19 and colleges may be General, Specialist (e.g. Drama, Art and Design, Agricultural) or Sixth Form colleges. The latter tend to focus on academic courses of study whereas the other types of college also offer vocational courses.

ing the size of the merged institution, on the probability of drop out. We stop short of claiming a causal relationship between college mergers and student dropout behaviour, because we are unable to control fully for the biases that arise from the selection of colleges into the treatment group, although our difference-in-differences methodology does go some way to mitigate this bias. It is, nevertheless, important from a policy perspective to understand the interdependencies between mergers and student behaviour.

It is also possible that there is heterogeneity in the effect of mergers on student dropout behaviour insofar as different programme areas within a college are more, or less, able to realise the benefits of economies of scale and scope. Mergers could have positive effects in programme areas requiring laboratories, since the merger may potentially lead to sharing of more facilities, and contrasting negative effects where the discipline requires a low pupil-teacher ratio (e.g. the humanities). A second objective of this paper is to investigate heterogeneity in the impact of mergers between programme, or subject, areas.

The effects of mergers could also vary over time. Dropout rates could increase immediately following a merger, due to initial organisational difficulties, but they may decline once these initial problems have been resolved. A third objective of this paper is therefore to investigate both the short and medium term effects of college mergers on drop out rates.

To address these issues we use administrative data provided by the Learning Skills Council (LSC). These data cover the population of students enrolled in colleges of Further Education in England. Specifically, we use the Individualised Learner Record data set, and for our purposes we use six cross-sections of student data referring to the years from 2002-03 to 2007-08. Our econometric methodology combines propensity score matching methods, making use of the nearest neighbour algorithm, with a difference-in-differences approach. This approach allows us to find a suitable control group with whom to compare the treated group - students in merged colleges - and we are able to difference out unobserved fixed pupil and college characteristics in the difference-in-differences approach. Clearly, this may not be sufficient to fully remove the bias which might arise from the fact that merged colleges are not a random subset of all colleges.

Our estimates suggest that for earlier cohorts, enrolling in a merged Further Education college implies a decrease in the probability of dropping out of 1-2 percentage points and these effects tended to persist for at least 1 or 2 years. However, for later years we find that enrolling in merged colleges increases the probability of dropping out, and these effects were quite large and persistent over time. This is consistent with the possibility that mergers following the publication of the Foster report were largely involuntary. Hence the student experience may have been negatively affected, which led to a higher drop out rate. Finally, there is also clear evidence of heterogeneous effects

by programme area insofar as mergers benefit most students in scientific and technical areas.

The remainder of this paper is structured as follows. In the next section we briefly describe several models of dropout behaviour, which act as a framework for interpreting our results, and also reviews the extensive literature on the determinants of dropout behaviour. This is followed in Section 3 by a discussion of our data and describe the ways in which we trim the sample so that we obtain comparable treatment and control groups. Section 4 discusses our econometric methodology, which combines matching methods with a difference-in-differences approach. The results of our analysis of the impact of mergers then follow, focussing initially on the cross-sectional matching estimates, which give a baseline view of the impact of mergers on student drop out behaviour, followed by the discussion of the difference-in-differences estimates for colleges and programme areas. We end with our conclusions and implications for policy.

2 Models and Previous Literature

The literature on student dropout behaviour is extensive and is mainly based on US studies of high school and university students. There is very little work on the determinants of dropout behaviour in the UK further education sector (an exception is Bradley and Lenton (2007)).

The traditional theoretical model of drop out behaviour is the human capital model, however, interesting extensions to this model have recently been developed which introduce behavioural factors into the analysis of the decision making process. For instance, Oreopoulos (2007) presents an inter-temporal model of dropout behaviour which incorporates the possibility of disutility of attending school and non-monetary utility derived from education. In this model a student drops out if the sum of the earnings forgone and the disutility of education (i.e. the non-pecuniary psychological costs) exceeds the difference in expected income arising from continued study versus expected income if they drop out. Uncertainty about future earnings is also introduced into the model, which has the effect of making continued study even less appealing. A drawback of the model is that it is essentially static insofar as students do not update their expectations as a result of continued learning.

An alternative model, which builds on that by Oreopoulos (2007), is that proposed by Stinebrickner and Stinebrickner (2012) where dropout behaviour arises from a learning process. In their model, students amend their expectations of expected lifetime utility of an extra year of education by taking into

account the earnings of people with a college education versus those without. The model incorporates uncertainty because the student is unsure about how much human capital will be accumulated in an extra year of study, which makes it difficult for the student to judge their own ability. The dropout decision can then be seen as an optimal decision from the individuals point of view, since students evaluate their match with their course of study and update their expectations regarding net expected lifetime utility; if this is negative then they drop out.

There are numerous studies of the determinants of dropout behaviour which can be broadly divided in various categories depending on their focus on the effects of personal, family, college and peer characteristics and labour market conditions. Many of these studies are descriptive rather than causal in nature.

In terms of personal characteristics, females and younger students are less likely to drop out (Johnes and McNabb, 2004; Evans and Schwab, 1995; Smith and Naylor, 2001; Chuang, 1997; Fielding et al., 1998). Lofstrom (2007) also shows that about half of the gap in the dropout probability between white and hispanics and one third of the gap between whites and blacks can be explained by economic disadvantage. However, controlling for family background, Cameron and Heckman (2001) show that students from ethnic minorities are more likely to graduate than whites. Bradley and Lenton (2007) show that the probability of dropping out for all ethnic minorities is lower than for white students when ability and a set of family and socio-economic factors are taken into account. Ability, or more specifically prior attainment, has been identified in the literature as one of the main determinants of dropout behaviour. Eckstein and Wolpin (1999) find that higher ability students are less likely to dropout. Heckman et al. (2006) suggest that the most recent work on the topic, including their own analyses, show that both cognitive and non-cognitive ability play an important role in determining the probability of dropping out from High School. However, they also show that non-cognitive ability has a much bigger effect on dropping out than cognitive ability.

The debate about the effect of family characteristics and socio-economic indicators has been extensive. Its main starting point is the recognition that income could be endogenous to the schooling and drop out decisions due to the existence of unobserved family characteristics which could contemporaneously affect income and dropout behaviour. However, a recent paper by Bratti (2007) on the relationship between parental income and their childs dropout behaviour shows that there are large effects of parental variables other than income, such as social class and education. In contrast, Behrman et al. (2005) and Bingley et al. (2008) find no effect of parental education on drop out behaviour when using twins data in an attempt to deal with the endogeneity issue.

In terms of labour market effects, Eckstein and Wolpin (1999) examine whether working while in High School influences attainment and dropout, concluding that it actually reduces student performance. Higher rates of youth unemployment may increase the likelihood of dropping out, however, there are contrasting findings in the literature - some find no effect (Warren and Lee, 2003; Mocetti, 2008), others a negative relationship (Rees and Mocan, 1997; Peraita, 2000) and others a positive relationship (Smith and Naylor, 2001; Bickel and Papagiannis, 1988). What we can conclude from this literature is that the relationship between unemployment and dropout is a complex one.

One factor which is often associated with student outcomes is the existence of peer effects. Evans et al. (1992) investigates whether peer effects play a role in predicting student dropout behaviour. They find that peer effects affect the decision to drop out of school, however, if the endogeneity of peer group formation with respect to dropout decision is taken into account these effects disappear.

The effect of college and institutional characteristics on student dropout behaviour have been investigated less frequently. Bryk and Thum (1989) and Rumberger and Palardy (2005) find that social and academic climate-related factors are significantly related to dropout behaviour. McNeal (1997) and Rumberger (1995) find that there is no effect of academic climate on dropout behaviour. McNeal (1997) and Rumberger and Palardy (2005) find that the student/teacher ratio is a positive and significant determinant of dropout behaviour even when student background characteristics and other factors are taken in consideration. Finally, there is no consensus in the literature about the effect of school size on dropout behaviour. Bryk and Thum (1989) find that school size has no direct effect on these two measures of student outcomes. Similar evidence is found for the UK HE sector (Smith and Naylor (2001)), however some early work by Rumberger (1995) finds a significant positive relationship between school size and dropout behaviour. More recently, Rumberger and Thomas (2000) using the same data also find a positive significant relationship between size and dropout even after controlling for school resources, attendance level and characteristics of the student body.

Thus, there is a long tradition of research into the determinants of student dropout behaviour, however, the evidence is mixed and, as far as we are aware, there has been no study of the effects of college merger on drop out behaviour.

3 The Data

We use a large administrative student dataset provided by the Learning Skills Council, and specifically the Individual Learner Record (ILR). These cross-section data provide detailed information about the population of students

enrolled in Further Education colleges in England between the years 2002 to 2009. We imposed various restrictions on the data insofar as our sample refers only to full-time, full year, non-working students because students enrolled in part-time or in a short courses are likely to behave differently with respect to their decision to drop out or not (Montmarquette et al., 2007; Warren and Lee, 2003). Similarly, our sample of students refers to those aged 16-24, since drop out rates have been shown to be much higher for adult students. Students enrolled on Basic Skills only programmes, involving literacy and numeracy revision, are excluded for similar reasons. Lastly, we exclude students who transferred to other courses - these constitute a small proportion of the student population (i.e. less than 0.2%) - since we do not know the courses they transferred to. These restrictions on the sample will ensure that our treatment and control groups are more comparable. More generally, as Mueser et al. (2007) notes, the use of administrative data to obtain propensity score matching estimates of the average treatment effect on the treated can be a very effective.

Given the focus of our paper, Table 1 shows the number of mergers between (mainly two) colleges over the period of our study, 2002-2009. The number of mergers has been small, as one might expect, reaching a peak in 2007-08 at 14 mergers which affected nearly 5% of the total Further Education student population. When looked at on a cumulative basis, however, the number of mergers over the period is 77, including 32 that occured between 1998-2001.[2] Viewed on a cumulative basis, college mergers impacted almost 160,000 students which is substantial.

Tables 2 and 3 shows the size of our final samples for all the cross-sections as well as the proportions of students that dropped out by merged and non-merged colleges. We can see from the Table 2 that the number of students enrolled in Further Education colleges has steadily increased over time, reflecting the rising staying-on rate, suggesting that more 'marginal' students may well be entering college towards the end of the study period. What this Table also shows is that the dropout rate is quite large but is almost always higher in merged colleges than in non-merged colleges. Moreover, the dropout rate tends to increase towards the end of the study period; in fact, for the 2006-07 cohort the dropout rate in merged colleges reaches a peak at 15.5%, compared to around 10.5% for non-merged colleges. Table 3 differs to Table 2 insofar as it indicates whether the student was enrolled in a college which had gone through a merger at any point in time between 1997 and 2008. By analysing the effect of mergers from 1997 up to say, 2002, we are able to investigate the medium term effects of merger, whereas looking at the in-year mergers 2002-03 (Table 2) we are only able to assess the short term effects of

[2]Since we do not have student data for this time period we do not refer to them in Table 1, however, we do investigate the impact of these mergers on later student cohorts.

mergers. Similar trends in dropout rates are apparent from Table 3. Finally, Table 4 shows how the risk of dropping out varies by personal characteristics and in the foot of the Table by the number of colleges in the local Learning Skills Council (LLSC) area.

Table 5 goes a step further in exploring the variation in drop out rates by merged and non-merged colleges and shows the raw difference-in-differences estimates. This Table tells a very different story with respect to the effect of mergers on student drop out behaviour. For the early cohorts (up to the 2005 cohort), mergers reduce drop out rates by between 0.5-4 percentage points and these effects persist insofar as the lagged responses continue to be negative. For instance, the first block of estimates which refer to mergers in 2004 shows that the raw difference-in-differences estimate of the drop out rate for the treated group is 1 percentage point lower than for the control group, whereas two years later this has risen to -1.7 percentage points. Especially from 2006 onwards, however, the raw difference-in-differences estimates are positive, large and statistically significant. This implies that the mergers arising in this period may well have been qualitatively different when compared to those that occurred in the earlier period. One possible reason for this is that the Government report produced by Foster in 2005 did encourage mergers in the sector as a means of increasing efficiency and effectiveness amongst colleges, and there is evidence of increased merger activity in that year (see Table 1). These may have therefore been involuntary mergers with consequential negative effects on drop out rates. We explore whether there has been a shift in merger behaviour and student drop out rates in more depth in our econometric modelling.

4 Econometric Methodology

Estimating the effect of college merger on a student probability of dropping out implies that we are able to analyse the counterfactual situation in which those same students attended a non-merged college. Since it is impossible for the same student to be observed in both the treated and control group at the same time, it is necessary to develop methods for solving the so-called 'fundamental evaluation problem'. Furthermore, it is possible in our context that selection bias may influence our estimates. This can arise insofar as students attending a merged college differ in systematic ways from their counterparts in non-merged colleges even in the absence of treatment.

We therefore use propensity score matching coupled with difference-in-differences analysis to try to overcome the evaluation problem and mitigate selection bias. The parameter that we estimate in our analysis is the average treatment effect on the treated, 'ATT', which is defined as

$$\tau_{ATT} = E(\tau|D=1) = E(Y(1)|D=1) - E(Y(0)|D=1) \quad (1)$$

Therefore the ATT is equal to the difference between the expected outcome of treated students who have actually been treated and the expected outcome of treated students who had not been treated. The task here is to define a mechanism that describes the process of assignment into treatment. Matching methods involve the selection of a group of non-treated students similar to the treated in all the relevant pre-treatment characteristics (X). Therefore, the difference in outcomes between those students and the treated ones will be attributable to the treatment. Following Rosenbaum and Rubin (1983) we use a *balancing score* to ensure that at each of the values the distribution of X for the treated and untreated students is the same. The propensity score (PS) is one of the possible balancing scores and corresponds to the conditional probability of receiving the treatment, given the pre-treatment variables.

A key assumption of the matching approach is the conditional independence assumption which suggests that matching is based on observable characteristics. Rosenbaum and Rubin (1983) also shows that the conditional independence assumption remains valid if, after controlling for p(X), instead of X, the treatment and potential outcomes are independent such that:

$$Y(1), Y(0) \perp D|p(X) \quad (2)$$

As noted by Imbens (2004), if condition 2 holds, conditioning on the propensity score removes all biases due to observable characteristics, X. This is equivalent to stating that all existing selection bias is assumed to be determined by the observable characteristics. It is not possible to test this condition directly therefore one can only conduct a sensitivity analysis for the existence of unobserved heterogeneity or hidden bias. Alternatively, one can combine matching methods with a difference-in-differences methodology which is our preferred approach.

A second key assumption of the matching approach is the overlap or common support condition:

$$0 < P(D=1|X) < 1 \quad (3)$$

The basic intuition behind this assumption is that there has to be at least one similar student in the counterfactual state for each treated student. In other words, for every single value of X the probability of finding a treated and a control student must be greater than 0 (Heckman et al., 1999).

Given assumptions 2 and 3, the matching estimator for the ATT is:

$$\tau_{ATT} = E_{p(X)|D=1}\{E[Y(1)|D=1, p(X)] - E[Y(0)|D=0, p(X)]\}$$

Thus, computing the ATT entails taking the mean outcome of treated and control students, comparing them for each given value of p(X) in the common support and finally weighting them for the propensity score distribution.

All matching estimators can be seen as a special case of the following where the weights W_{ij} take different forms:

$$\tau_{ATT} = \sum_{i \in T} (Y_i - \sum_{j \in C} W_{ij} Y_j) w_i \tag{4}$$

T and C indicate, respectively, the treatment and control students, W_{ij} denotes the weights assigned to the control group when matching with the treated group, and w_i represent a re-weighting needed to re-build the outcome distribution for the treated.

4.1 Matching with Difference-in-Differences Estimation

As suggested above, the estimation of an average treatment effect on the treated using propensity score matching relies heavily on the validity of the conditional independence assumption. Therefore, it only estimates a causal effect in the absence of selection on unobservables. Rather than simply test for the presence of hidden bias, a more robust method for removing such bias is to combine propensity score matching with difference-in-differences methods. The difference-in-differences approach does allow for unobservables to affect treatment participation as long as this bias is constant over time (Heckman et al., 1998; Blundell and Costa Dias, 2009).

To perform matching with difference-in-differences we need at least one pre- and one post-treatment period. Moreover, we need to identify four different groups of students - one of which refer to the treated students and the remaining three groups are made up of students in control groups. Recall that treatment in this context refers to the event of college merger. Thus, we observe T_0 and C_0 which represent the treated and control groups in the pre-treatment period, whilst T_1 and C_1 are the treated and control group in the post-treatment period. As pointed out by Blundell and Costa Dias (2009) we can write our matching with difference-in-differences estimator as:

$$\tau_{ATT}^{DID} = \sum_{i \in T_1} \{ [Y_{it_1} - \sum_{j \in T_0} \tilde{W_{ijt_0}^T} Y_{it_0}] - [\sum_{j \in C_1} \tilde{W_{ijt_1}^C} Y_{it_1} - \sum_{j \in C_0} \tilde{W_{ijt_0}^C} Y_{it_0}] \} w_i \tag{5}$$

where $\tilde{W_{ijt}^C}$ denote the weights assigned to student j in group C at time t when matching with the treated student i. $\tilde{W_{ijt}^T}$ refers to the same weight for students in group T. Finally, w_i represents a re-weighting needed to re-build the outcome distribution for the treated.

5 Econometric results

5.1 Baseline estimates

In this section of the paper we present our cross-sectional matching estimates of the effect of college merger on student drop out behaviour for the period 2002-08. These estimates are useful insofar as they provide a baseline view of the effect of college merger, however, it is important to note that these estimates do not control for the effects of unobserved heterogeneity. Thus, for each cohort we estimate the propensity of a student to enrol in a merged college conditional on a set of pre-treatment characteristics using a probit model. The pre-treatment characteristics we have chosen to include in our propensity score specification are gender, age (mature students), ethnicity, disability, prior attainment and the number of colleges in the Local Learning Skills Council. Following the suggestion of Rubin and Thomas (1996) and Heckman et al. (1998), these covariates were chosen on the basis of the existence of a well known relationship with the outcome of interest, but also because they are likely to be important predictors of treatment. As Table A.1 in Appendix A shows all of these variables are statistically significant, and the estimates are largely consistent over time.

The estimates in Table 6 are split into three panels - Panel A which can be seen as in-year effects of mergers on the probability of drop out, Panel B reports short run lagged effects and finally, Panel C reports medium term lagged effects to capture the persistence of mergers on drop-out behaviour. Unlike the descriptive statistics presented earlier, the matching estimates for the in-year effects of merger (Panel A) are far more consistent and show that merger increases the probability of drop out by around 1 percentage point, the exception being cohort 2006-07 where the estimates rise substantially to 4.5 percentage points post-matching. As Panel B shows these effects do not tend to persist for earlier cohorts, whereas for later cohorts (2005 onwards) there is some evidence that college merger can increase drop out rates for future cohorts (1-3 years after the merger event). Towards the end of the study period these effects become quite large - 3-6 percentage points - and so the cross-sectional matching evidence is consistent with the raw data, discussed above. Panel C provides further evidence that mergers can have lasting adverse effects on drop out rates - increasing the probability of drop out by around 1 percentage point.

We also explored gender differences in the effect of merger on the probability of drop out. Although there are occasional differences in the risk of drop out, the results for males and females are similar and follow the pattern reported for the aggregated estimates discussed in the previous paragraph. We therefore do not disaggregate by gender in the analysis that follows.

Finally, in this section we briefly discuss the common support condition and the issue of hidden bias. One of the two key assumptions for the validity of propensity score matching estimation is the overlap or common support condition. This assumption implies that treated and control students should have a positive probability of enrolling in a merged college, as reflected by their propensity score. Table A.2 reports evidence using the min-max method whereby we discard from our analysis the treated observations that lie outside of the region of common support. This method entails finding the minima and maxima of the propensity score distribution for both treated and untreated students and then defining a region by selecting the highest of the two minima (maxmin) and the lowest of the two maxima (minmax). It is clear from Table A.2 that the region of common support in three of the six cross-sections corresponds perfectly. In the remaining three cross-sections we still have a very good overlap. As a consequence, we can conclude that our estimated effects can be considered very representative.

When implementing propensity score matching it is also importance to check for the quality of the matching. In practical terms, this means checking for covariate balance in the matched sample. Obtaining good covariate balance implies that the marginal distribution of each covariate is very similar for treated and untreated individuals. The most widely used method for checking the covariates balance is the so called standardised bias, or standardised difference in means. This method proposed by Rosenbaum and Rubin (1985) entails comparing the standardised difference in means for each of the covariates, between treated and untreated students before and after matching. A reduction in the standardised bias after matching demonstrates that covariate balance is improved by the matching procedures. Figure 1 in Appendix A shows that we achieve levels of the standardised bias which are well under the threshold considered as acceptable by Rosenbaum and Rubin (1985).

In the following section we seek to reduce the bias in our estimates caused by the presence of unobserved heterogeneity, and hence we estimate matching models in conjunction with difference-in-differences models.

5.2 Difference-in-differences estimates of the effect of college merger

The estimates from this analysis follow a similar pattern to those for the cross-sectional matching models insofar as the signs of the estimates are consistent, however, the estimated effects are now larger in magnitude.[3] In-year effects for the early cohorts suggest that mergers reduce the risk of drop out by around 1-2 percentage points, however, the short run lagged effects, which

[3]Note that we cannot estimate models for college mergers occurring 1997-2001 because we do not have data for this time period.

imply some persistence in the effect of merger, are larger in magnitude and imply a decrease in the risk of drop out by between 2-4 percentage points. For instance, mergers that occurred in 2004 have larger effects on the risk of drop out in 2005, reducing this by about 4 percentage points, and 2006, reducing this by 2.4 percentage points. This suggests that these mergers quickly re-organised and the 'student experience' was protected, hence the reduction in the risk of drop out. However, mergers in later years (i.e. from around 2006 onwards) suggest that the probability of drop-out as a result of merger were positive and large for in year effects and persisted for at least 1 or 2 years.

The exception to the findings above is for the 2006-07 cohort where the risk of drop out for in-year effects is increased by 5.2 percentage points and the short run (1 year) lagged effect is increased to 6.8 percentage points. As suggested in the previous section, this may have been because mergers in the later time period were different to those in the earlier period. To test whether there has been a structural break in the effect of merger on student drop-out behaviour we estimate a difference-in-differences model where we combine data for the early time period (2002-2003) with the later time period (2005-2007). Table 8 reports the results of this analysis and, interestingly, suggest that between these two time periods college mergers had the effect of increasing the risk of student drop out by about 1 percentage point. This implies that mergers post the Foster Report were different to those prior to the publication of the report, and it is likely that this finding is influenced substantially by the estimates for the 2006-07 cohort. It could therefore also be the case that 2006-07 cohort is somehow different to other cohorts pre- and post-Foster Report implementation.

5.3 The effect of college mergers on drop out rates by programme area

In this section we estimate models for students enrolled in one of six different programme areas: Science, Humanities, Technical (agriculture, construction and engineering), Business, Services to People and Basic Skills. We estimate Equation 5 for each programme area but data limitations mean that we can only do this for 2004 and 2005, the earlier time period. Table 9 provides the results of this analysis and there are clear differences by programme area and by year. For 2004 we observe for all programmes a reduction in the probability of drop out, ranging from around 10 percentage points for technical and business programmes, falling to 2 percentage points for other subjects. However, for mergers taking place in 2005 there is greater diversity in the effect on drop out behaviour, ranging from a reduction in Science by 4 percentage points to an increase of 6 percentage points for Business programmes. It is unclear why this variation over time should occur, however, it would appear to be

the case that college mergers have greater benefits for students in technical and scientific subjects, insofar as the risk of drop out tends to fall, perhaps because they are better able to exploit economies of scale and scope.

6 Concluding Remarks

This paper investigates the effect of college mergers on the risk of student drop out using administrative data obtained from the former Learning Skills Councils for the period 2002-2008. Our data refer to the population of students enrolled in further education colleges and sixth forms in England. This is the first study of the effect of college mergers on dropout behaviour. We address several questions or issues. First, what is the effect of college merger on student drop out behaviour? Second, is there any evidence that the effect of merger persists into the future? And, finally, is there evidence of variation in the effect of merger by programme area? To address these issues we combine matching methods with the estimation of difference-in-differences models.

We find that there is evidence that mergers affecting earlier cohorts of students reduced the risk of drop out and these effects tended to persist for at least 1 or 2 years. However, in later years when the government was encouraging more colleges to merge for reasons of cost efficiency and effectiveness, we actually find that the risk of drop out increased and the effect was quite large. This implies that mergers in the latter time period my have been involuntary and hence had adverse effects on the students experience, leading to a higher drop out rate. Again these effects persisted. There is also clear variation in the effect of mergers by programme area with technical and scientific programmes benefiting most insofar as drop out rates typically fall.

Our findings are important from a policy persepctive because the FE sector is currently facing budget cuts which is creating consiferable uncertainty in the sector. There are several ways that the sector could respond, for instance by trying to enter new areas of activity or by seeking to recruit fee paying international students or to engage in forms of transnational education. Clearly, the raising of the school leaving age from 16 to 17 in England will add further pressure on FE and sixth form colleges. For those colleges that struggle in this turbulent environment there appear to be two other possible outcomes - one is to simply cease operations as some colleges have done over time, and the other option is to merge to share resources. If this were to happen on a substantial scale then it is likely that student drop out rates will increase further. Policy makers should therefore take notice of our findings. Equally, those colleges that do engage in a merger, voluntarily or otherwise, need to

carefully consider how to protect the student expereince. Ignoring students would in our view be very counter-productive.

Table 1: Number of merged colleges and students involved for each year.

Years	*No. of merged colleges*	*Proportion of students affected*	*Cumulative no. of merged colleges*	*Cumulative student population affected*
2002/2003	4	1.81	36	43,868
2003/2004	5	2.09	41	61,141
2004/2005	7	2.14	48	77,572
2005/2006	6	1.15	54	88,287
2006/2007	4	1.77	58	106,726
2007/2008	14	4.64	72	134,016
2008/2009	5	1,89	77	159,742

Table 2: Dropout rates by Merged and Non-merged colleges, 2002-09.

		College Status		
		Non merged	*Merged*	*All*
Year 2002/2003	Completers	383,542	6,908	390,450
		(90.30)	(88.11)	(90.26)
	Dropouts	41,211	932	42,143
		(9.70)	(11.89)	(9.74)
	Total	424,753	7,840	432,593
Year 2003/2004	Completers	423,687	8,985	432,672
		(90.71)	(90.11)	(90.69)
	Dropouts	43,407	986	44,393
		(9.29)	(9.89)	(9.31)
	Total	467,094	9,971	477,065
Year 2004/2005	Completers	435,931	9,424	445,355
		(91.17)	(89.95)	(91.14)
	Dropouts	42,242	1,053	43,295
		(8.83)	(10.05)	(8.86)
	Total	478,173	10,477	488,650
Year 2005/2006	Completers	499,500	5,780	505,280
		(91.68)	(91.33)	(91.68)
	Dropouts	45,311	549	45,860
		(8.32)	(8.67)	(8.32)
	Total	544,811	6,329	551,140
Year 2006/2007	Completers	541,228	9,204	550,432
		(89.42)	(84.47)	(89.33)
	Dropouts	64,047	1,692	65,739
		(10.58)	(15.53)	(10.67)
	Total	605,275	10,896	616,171
Year 2007/2008	Completers	544,498	26,679	571,177
		(89.89)	(90.62)	(89.93)
	Dropouts	61,212	2,761	63,973
		(10.11)	(9.38)	(10.07)
	Total	605,710	29,440	635,150
Year 2008/2009	Completers	595,592	11,071	606,663
		(90.58)	(87.39)	(90.52)
	Dropouts	61,906	1,598	63,504
		(9.42)	(12.61)	(9.48)
	Total	657,498	12,669	670,167

a) Column percentage in brackets.

Table 3: Dropout rates by Merged and Non-merged colleges, 2002-2009. Cumulative mergers.

		College Status		
		Non merged	*Merged*	*All*
Year 2002/2003	Completers	334,710	41,454	376,164
		(90.46)	(88.85)	(90.28)
	Dropouts	35,310	5,200	40,510
		(9.54)	(11.15)	(9.72)
	Total	370,020	46,654	416,674
Year 2003/2004	Completers	367,151	53,105	420,256
		(90.89)	(89.49)	(90.71)
	Dropouts	36,815	6,237	43,052
		(9.11)	(10.51)	(9.29)
	Total	403,966	(59,342	463,308
Year 2004/2005	Completers	379,275	66,080	445,355
		(91.48)	(89.26)	(91.14)
	Dropouts	35,346	7,949	43,295
		(8.52)	(10.74)	(8.86)
	Total	414,621	74,029	488,650
Year 2005/2006	Completers	402,459	78,241	480,700
		(91.99)	(90.13)	(91.68)
	Dropouts	35,044	8,572	43,616
		(8.01)	(9.87)	(8.32)
	Total	437,503	86,813	524,316
Year 2006/2007	Completers	426,285	93,879	520,164
		(89.64)	(87.73)	(89.29)
	Dropouts	49,250	13,130	62,380
		(10.36)	(12.27)	(10.71)
	Total	475,535	107,009	582,544
Year 2007/2008	Completers	424,992	116,018	541,010
		(90.37)	(88.63)	(89.99)
	Dropouts	45,306	14,880	60,186
		(9.63)	(11.37)	(10.01)
	Total	470,298	130,898	601,196
Year 2008/2009	Completers	471,860	142,421	614,281
		(90.95)	(89.16)	(90.53)
	Dropouts	46,941	17,321	64,262
		(9.05)	(10.84)	(9.47)
	Total	518,801	159,742	678,543

a) Column percentage in brackets.

b) Cumulative mergers since 1998.

Table 4: Dropout rates by pupil characteristics and year.

Covariates	*2002-03*	*2003-04*	*2004-05*	*2005-06*	*2006-07*	*2007-08*	*2008-09*
Age≤20	9.41	8.98	8.58	8.02	10.27	9.71	9.07
Age>20	13.68	13.39	12.61	12.59	16.60	15.56	15.24
Male	10.54	9.88	9.38	8.64	10.75	10.21	9.45
Female	8.99	8.77	8.37	8.02	10.60	9.95	9.49
Disability	9.64	9.39	8.62	8.04	9.93	10.08	9.23
No Disability	9.75	9.30	8.87	8.34	10.72	10.07	9.49
Ethnic origin:							
Bangladeshi	9.38	9.67	7.96	8.00	9.27	8.47	9.35
Black African	9.62	8.62	7.80	7.09	9.01	8.86	9.44
Black Caribbean	14.04	12.58	11.62	11.12	13.50	12.67	12.39
Black Other	14.93	13.28	12.67	11.73	15.14	13.58	13.42
Chinese	5.89	5.25	5.62	4.08	4.81	4.64	4.49
Indian	5.90	5.93	5.67	5.01	6.39	6.23	6.15
Pakistani	8.81	8.26	7.64	6.57	9.30	8.62	8.42
Asian Other	9.25	8.83	7.47	7.33	9.26	9.02	9.09
Other	10.37	10.65	9.03	8.46	9.26	11.10	10.51
White	9.75	9.32	8.95	8.43	11.16	10.17	9.41
Prior qualification: [a]							
None	11.22	10.49	11.53	11.29	10.78	13.67	12.74
<level 1	14.02	12.18	7.12	9.56	14.88	13.96	12.55
level 1	12.69	11.56	11.08	10.41	14.03	13.13	11.95
level 2	7.35	6.93	6.84	6.34	13.51	7.65	7.27
level 3	7.54	6.43	5.80	6.64	8.05	7.16	7.31
level 4 *or* 5	10.86	6.54	9.80	7.62	7.37	6.82	7.65
level unknown	10.84	10.87	10.30	10.00	11.78	12.53	11.57

Number of colleges in the local area (LLSC)	*Mean*	*Stand. Dev.*	*Min*	*Max*
2002-03	10.978	6.074	1	25
2003-04	10.697	5.716	1	25
2004-05	9.980	5.322	1	24
2005-06	10.707	5.742	1	25
2006-07	10.723	5.890	1	24
2007-08	10.939	5.300	2	23
2008-09	11.330	5.207	2	22

[a]The level of prior attainment corresponds to the NVQ classification used by the Institutional Learners Record data set.

Table 5: Descriptive statistics for dropout by cohort comparison groups

	Proportion of Dropouts			
	Treated (s.e.)	*Controls (s.e.)*	*Difference (s.e.)*	*N*
Mergers in 2004				
2004 cohort	0.112	0.092	0.020	354,286
	(0.003)	(0.000)	(0.003)	
2002 cohort	0.134	0.104	0.030	317,228
	(0.004)	(0.001)	(0.003)	
DiD			-0.010	671,514
			(0.000)	
Mergers in 2004, lagged effect on 2005 cohort				
2005 cohort	0.097	0.088	0.009	401,620
	(0.003)	(0.000)	(0.003)	
2002 cohort	0.134	0.104	0.030	317,228
	(0.003)	(0.001)	(0.003)	
DiD			-0.021	718,848
			(0.000)	
Mergers in 2004, lagged effect on 2006 cohort				
2006 cohort	0.124	0.111	0.013	445,289
	(0.003)	(0.000)	(0.003)	
2002 cohort	0.134	0.104	0.030	317,228
	(0.004)	(0.001)	(0.003)	
DiD			-0.017	762,517
			(0.000)	
Mergers in 2005				
2005 cohort	0.094	0.088	0.006	398,724
	(0.004)	(0.000)	(0.004)	
2002 cohort	0.115	0.104	0.011	314,763
	(0.004)	(0.001)	(0.004)	
DiD			-0.005	713,487
			(0.000)	
Mergers in 2005, lagged effect on 2006 cohort				
2006 cohort	0.084	0.111	-0.026	441,554
	(0.003)	(0.000)	(0.004)	
2002 cohort	0.115	0.104	0.011	314,763
	(0.004)	(0.001)	(0.004)	
DiD			-0.037	756,317
			(0.000)	

	Treated *(s.e.)*	*Controls* *(s.e.)*	*Difference* *(s.e.)*	*N*
Mergers in 2005, lagged effect on 2007 cohort				
2006 cohort	0.125	0.106	0.019	452,536
	(0.004)	(0.000)	(0.004)	
2002 cohort	0.115	0.104	0.011	314,763
	(0.004)	(0.001)	(0.004)	
DiD			0.008	756,317
			(0.000)	
Mergers in 2006				
2006 cohort	0.167	0.111	0.056	444,406
	(0.004)	(0.000)	(0.003)	
2002 cohort	0.124	0.104	0.020	315,677
	(0.004)	(0.001)	(0.004)	
DiD			0.036	760,083
			(0.000)	
Mergers in 2006, lagged effect on 2007 cohort				
2007 cohort	0.180	0.106	0.075	455,240
	(0.004)	(0.000)	(0.003)	
2002 cohort	0.124	0.104	0.020	315,677
	(0.004)	(0.001)	(0.004)	
DiD			0.055	770,917
			(0.000)	
Mergers in 2007				
2007 cohort	0.103	0.106	-0.002	472131
	(0.002)	(0.000)	(0.002)	
2002 cohort	0.099	0.104	-0.005	324,401
	(0.002)	(0.001)	(0.003)	
DiD			0.036	796,532
			(0.000)	

Table 6: The ATE of college merger on the dropout rate of students. Propensity score matching estimation.

	ATT	*(s.e.)*	*Observations*	
			Controls	*Treated*
PANEL A. In Year Effect				
2002/03				
Unmatched	0.022***	(0.003)	424,753	7,840
Matched	0.012***	(0.005)	424,753	7,840
2003/04				
Unmatched	0.006***	(0.003)	467,094	9,971
Matched	0.012***	(0.004)	467,094	9,971
2004/05				
Unmatched	0.012***	(0.003)	478,173	10,477
Matched	0.005	(0.004)	478,173	10,477
2005/06				
Unmatched	0.004	(0.003)	544,811	6,329
Matched	-0.008	(0.005)	544,811	6,328
2006/07				
Unmatched	0.049***	(0.003)	605,275	10,896
Matched	0.045***	(0.005)	605,275	10,896
2007/08				
Unmatched	-0.007***	(0.002)	605,710	29,440
Matched	-0.011***	(0.002)	605,710	29,440
2008/09				
Unmatched	0.018***	(0.002)	657,898	20,645
Matched	0.009***	(0.003)	657,898	20,645
PANEL B. Short-term Effects, Lagged 1-3 Years				
2003/04, treatment in 2002-03				
Unmatched	0.009***	(0.003)	468,782	8,283
Matched	-0.003	(0.004)	468,782	8,283
2004/05, treatment in 2002-03				
Unmatched	0.009***	(0.003)	480,263	8,387
Matched	0.004	(0.004)	480,263	8,387
2005/06, treatment in 2002-03				
Unmatched	0.009***	(0.003)	542,074	9,066

			Controls	*Treated*
Matched	0.004	(0.004)	542,074	9,066
2004/05, treatment in 2003-04				
Unmatched	0.017***	(0.003)	477,159	11,491
Matched	-0.001	(0.004)	477,159	11,491
2005/06, treatment in 2003-04				
Unmatched	0.012***	(0.003)	538,965	12,175
Matched	0.010***	(0.004)	538,965	12,175
2006/07, treatment in 2003-04				
Unmatched	0.015***	(0.003)	603,159	13,012
Matched	0.013***	(0.004)	603,159	13,012
2005/06, treatment in 2004-05				
Unmatched	0.005*	(0.003)	541,367	9,773
Matched	-0.006	(0.004)	541,367	9,773
2006/07, treatment in 2004-05				
Unmatched	0.011***	(0.003)	604,183	11,988
Matched	0.006	(0.004)	604,183	11,988
2007/08, treatment in 2004-05				
Unmatched	0.001	(0.003)	623,388	11,762
Matched	-0.004	(0.004)	623,388	11,762
2006/07, treatment in 2005-06				
Unmatched	-0.031***	(0.003)	608,372	7,799
Matched	-0.033***	(0.005)	608,372	7,799
2007/08, treatment in 2005-06				
Unmatched	0.016***	(0.003)	627,670	7,480
Matched	0.011***	(0.005)	627,670	7,480
2008/09, treatment in 2005-06				
Unmatched	0.031***	(0.003)	661,751	8,416
Matched	0.031***	(0.005)	661,751	8,416
2007/08, treatment in 2006-07				
Unmatched	0.062***	(0.003)	624,939	10,211
Matched	0.056***	(0.005)	624,939	10,211
2008/09, treatment in 2006-07				
Unmatched	0.059***	(0.003)	658,235	11,932
Matched	0.059***	(0.004)	658,235	11,932
2008/09, treatment in 2007-08				
Unmatched	0.001	(0.002)	637,929	32,238
Matched	-0.008***	(0.002)	637,929	32,238

			Controls	*Treated*
PANEL C. Medium-term Effects (Mergers from 1998-99)				
2002/03, treatment between 1998-99 and 2002-03				
Unmatched	0.019***	(0.001)	388,725	43,868
Matched	0.010***	(0.002)	388,725	43,868
2003/04, treatment between 1998-99 and 2003-04				
Unmatched	0.014***	(0.001)	415,924	61,141
Matched	0.010***	(0.002)	415,924	61,141
2004/05, treatment between 1998-99 and 2004-05				
Unmatched	0.020***	(0.001)	411,078	77,572
Matched	0.014***	(0.002)	411,078	77,572
2005/06, treatment between 1998-99 and 2005-06				
Unmatched	0.017***	(0.001)	462,853	88,287
Matched	0.011***	(0.001)	462,853	88,287
2006/07, treatment between 1998-99 and 2006-07				
Unmatched	0.020***	(0.001)	509,445	106,726
Matched	0.011***	(0.001)	509,445	106,726
2007/08, treatment between 1998-99 and 2007-08				
Unmatched	0.018***	(0.001)	496,462	138,688
Matched	0.011***	(0.001)	496,462	138,688
2008/09, treatment between 1998-99 and 2008-09				
Unmatched	0.018***	(0.001)	518,801	159,742
Matched	0.009***	(0.001)	518,801	159,742

* p < 0.1, ** p< 0.05, *** p< 0.01

Table 7: Difference-in-differences estimates of the effect of college merger on the risk of student drop out.

Cohort	*ATT* *(s.e.)*	*Treated*	*Controls*	*N*
Mergers in 2004				
2004	0.010	9,189	345,095	354,286
	(0.005)			
2002	0.032	7,793	309,435	317,228
	(0.005)			
DiD	-0.022			671,514
	(0.000)			
Mergers in 2004, lagged effect on 2005 cohort				
2005	-0.008	8,529	393,091	401,620
	(0.005)			
2002	0.032	7,793	309,435	317,228
	(0.005)			
DiD	-0.040			718,848
	(0.000)			
Mergers in 2004, lagged effect on 2006 cohort				
2006	0.008	10,755	434,534	445,289
	(0.004)			
2002	0.032	7,793	309,435	317,228
	(0.005)			
DiD	-0.024			762,517
	(0.000)			
Mergers in 2005				
2005	-0.006	5,633	393,091	398,724
	(0.006)			
2002	0.006	5,328	309,435	314,763
	(0.006)			
DiD	-0.012			713,487
	(0.000)			

Cohort	*ATT*	*Treated*	*Controls*	*N*
	(s.e.)			
Mergers in 2005, lagged effect on 2006 cohort				
2006	-0.029	7,020	434,534	441,554
	(0.005)			
2002	0.005	5,328	309,435	314,763
	(0.006)			
DiD	-0.034			756,317
	(0.000)			
Mergers in 2005, lagged effect on 2007 cohort				
2006	0.019	6,735	445,801	452,536
	(0.005)			
2002	0.007	5,328	309,435	314,763
	(0.006)			
DiD	0.012			756,317
	(0.000)			
Mergers in 2006				
2006	0.050	9,872	434,534	444,406
	(0.005)			
2002	-0.002	6,242	309,435	315,677
	(0.006)			
DiD	0.052			760,083
	(0.000)			
Mergers in 2006, lagged effect on 2007 cohort				
2007	0.066	9,439	445,801	455,240
	(0.005)			
2002	-0.002	6,242	309,435	315,677
	(0.006)			
DiD	0.068			770,917
	(0.000)			
Mergers in 2007				
2007	-0.007	26,330	445,801	472,131
	(0.003)			
2002	-0.005	14,966	309,435	324,401
	(0.003)			
DiD	-0.002			796,532
	(0.000)			

Table 8: Difference-in-differences estimates of the effect of college merger on the risk of student drop out, post-Foster Report.

		Observations		
Cohort	*ATT* *(s.e.)*	*Treated*	*Controls*	*N*
Mergers in 2005-2007				
2005-2007	0.007 (0.002)	41,835	1,273,426	1,315,261
2002-2003	-0.003 (0.002)	58,416	648,977	707,393
DiD	0.010 (0.000)			2,022,654

Table 9: Difference-in-differences estimates of the effect of college merger on the risk of student drop out by programme area.

Programme Area	*Mergers in 2004*			*Mergers in 2005*		
	2004	*2002*	*DiD*	*2005*	*2002*	*DiD*
Science						
ATT	0.008	0.028	-0.020	-0.027	0.013	-0.040
	(0.012)	(0.012)	(0.000)	(0.014)	(0.013)	(0.000)
Treated	1,462	1,381		748	1,056	
Controls	68,426	65,703		44,000	65,703	
N	69,888	67,084		44,749	66,759	
Technical Areas[4]						
ATT	-0.022	0.073	-0.096	-0.008	-0.009	0.001
	(0.017)	(0.025)	(0.000)	(0.022)	(0.021)	(0.000)
Treated	858	504		608	564	
Controls	20,326	14,272		17,648	14,292	
N	21,184	14,776		18,258	14,856	
Arts & Humanities						
ATT	0.030	0.031	-0.001	-0.003	0.010	-0.013
	(0.009)	(0.007)	(0.000)	(0.011)	(0.008)	(0.000)
Treated	2,457	4,399		1,114	2,637	
Controls	124,863	171,955		107,759	171,955	
N	127,320	176,354		108,873	174,592	
Business						
ATT	-0.047	0.055	-0.102	0.062	0.004	0.058
	(0.029)	(0.030)	(0.000)	(0.047)	(0.033)	(0.000)
Treated	232	347		129	229	
Controls	11,595	13,230		7,459	13,230	
N	11,830	13,577		7,588	13,459	
Services to People						
ATT	-0.016	0.004	-0.021	-0.048	-0.048	-0.000
	(0.010)	(0.015)	(0.000)	(0.012)	(0.015)	(0.000)
Treated	2,117	1,174		1,178	787	
Controls	47,224	34,115		39,129	34,115	
N	49,342	35,289		40,308	34,902	
Basic Skills						
ATT	0.021	0.035	-0.014	-0.001	-0.029	0.028
	(0.013)	(0.042)	(0.000)	(0.014)	(0.064)	(0.000)
Treated	1,279	57		1,107	34	
Controls	47,465	5,284		42,534	5,284	
N	48,747	5,341		43,643	5,318	

5) Agriculture, Construction and Engineering.

A Appendix

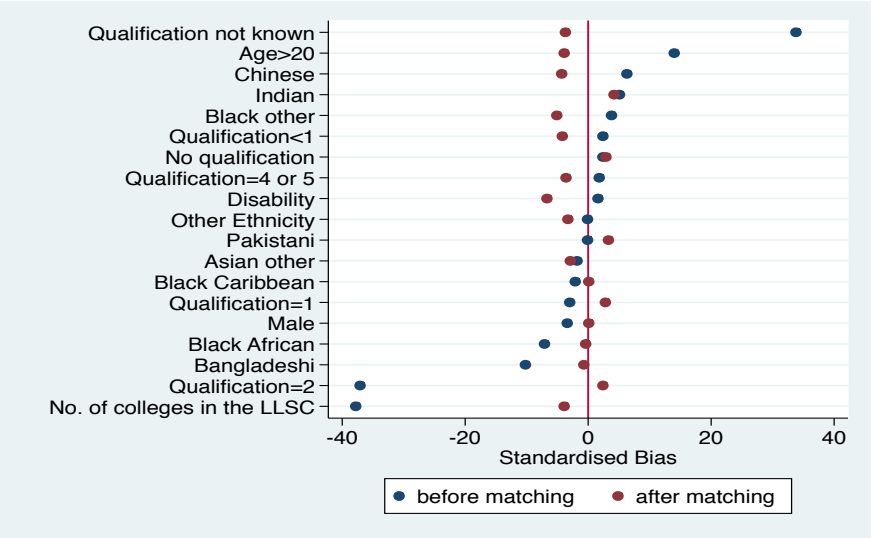

Figure 1: Covariates Balance, year 2005-06. Nearest Neighbour, no replacement.

Table A.1: Estimated marginal effects from the PSM models, within year effects.

Year	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
	Estimates	Estimates	Estimates	Estimates	Estimates	Estimates	Estimates
	(s. e.)	(s. e.)	(s. e.)	(s. e.)	(s. e.)	(s. e.)	(s. e.)
age over 20	-0.000	0.002**	0.000	0.005***	0.000	0.009***	0.005***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
male	0.002***	0.001***	0.000	0.000	-0.002***	0.000	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
disable	-0.008***	-0.004***	-0.007***	0.003***	-0.009***	-0.001	0.002***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)
Ethnic origin							
Bangladeshi	0.000	-0.013***	-0.004***	-0.007***	0.017***	-0.031***	-0.008***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Black African	-0.010***	-0.016***	-0.007***	-0.007***	-0.005***	-0.031***	-0.004***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Black Caribbean	0.014***	-0.016***	-0.007***	-0.005***	0.024***	-0.033***	-0.001
	(0.002)	(0.000)	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)
Black other or mixed	0.006***	-0.010***	-0.005***	-0.002**	0.008***	-0.021***	0.005***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Chinese	0.004**	-0.004**	-0.005***	-0.002*	-0.001	0.004	-0.005***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)
Indian	0.011***	-0.011***	-0.007***	-0.008***	0.012***	-0.032***	0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Pakistani	0.000	-0.014***	-0.005***	-0.002***	0.024***	-0.023***	0.017***
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Asian other or mixed	-0.003**	-0.007***	-0.005***	0.001	-0.005***	-0.014***	-0.002**
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Other or mixed	-0.009***	-0.006***	-0.005***	-0.004***	-0.008***	-0.025***	-0.005***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Prior attainment							
No qualification	-0.009***	-0.018***	0.121***	-0.004***	0.015***	0.008***	-0.001
	(0.001)	(0.000)	(0.008)	(0.001)	(0.002)	(0.002)	(0.001)
Below level 1	0.028***	-0.017***	0.010***	0.003*	0.006**	-0.034***	-0.011***
	(0.006)	(0.001)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)
Level 1 or entry level	0.020***	0.004***	0.018***	0.002**	0.000	0.005***	0.004***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Level 2	-0.008***	0.007***	0.010***	-0.006***	0.004***	-0.006***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Level 4 or 5	0.045***	0.002	0.003	0.023***	0.003	-0.018***	0.007
	(0.012)	(0.007)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
Unknown	0.010***	0.009***	0.024***	-0.005***	0.026***	-0.002*	0.008***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
No. of colleges in the llsc	0.000***	-0.000***	-0.003***	0.001***	-0.002***	0.001***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R-squared	0.045	0.025	0.135	0.030	0.060	0.018	0.069
N.	432593	477065	488650	551140	616171	635150	670167

* p¡0.1, ** p¡0.05, *** p¡0.01

Table A.2: The min-max method for testing the common support condition, 2002-08.

	2002-03		*2003-04*		*2004-05*		*2005-06*	
	min	max	min	max	min	max	min	max
Non merged	0.0033783	0.8354738	0.0049756	0.6218035	0.0060844	0.3736412	0.0167084	0.4304976
Merged	0.0146241	0.7997692	0.0115125	0.6356282	0.0084206	0.3810249	0.022171	0.442333
	maxmin	minmax	maxmin	minmax	maxmin	minmax	maxmin	minmax
Common support	0.0146241	0.7997692	0.0115125	0.6218035	0.0084206	0.3736412	0.022171	0.4304976

	2006-07		*2007-08*		*2008-09*	
	min	max	min	max	min	max
Non merged	0.0224713	0.5269299	0.054417	0.516198	0.0002009	0.2380663
Merged	0.031071	0.5159264	0.0712348	0.516198	0.0019753	0.1177682
	maxmin	minmax	maxmin	minmax	maxmin	minmax
Common support	0.031071	0.5159264	0.0712348	0.516198	0.0019753	0.1177682

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