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The Effects of the 2006 Tuition Fee Reform and the Great Recession on University Student Dropout Behaviour in the UK*

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Abstract

This paper investigates the causal effects of the increase in tuition fees and the Great Recession on the risk of students dropping out of HE. For students from high unemployment areas the effect of the recession was positive for males and females. The tuition fee reform counteracted the recession effect for males, whereas for females the reform effect reinforced the recession effect. For students from low unemployment areas, the recession had no effect whereas the tuition fee reform reduced the risk of dropout. Differences in dropout behaviour occur between high and low income groups, and between different types of university.

JEL Classification: I22, I28, J6

Keywords: Tuition fee reform, Recession, University Dropouts.

1 Introduction

Dropping out of education can be costly for individuals, especially if there is an increased risk of unemployment and associated lower lifetime earnings (Arulampalam et al., 2005), for universities insofar as income is reduced, and for society as a whole, especially when the state subsidy to education is high. Countries like the US and the UK have witnessed substantial increases in participation rates in higher education, and dropout rates have remained high as more marginal (in terms of ability) students have enrolled on university courses. With the increase in participation rates, and associated increased taxation to finance this expansion, it is no surprise that governments should look for alternative funding mechanisms. In recent years, successive UK governments have sought to reduce the subsidy to higher education and have sought to push more of these costs onto the beneficiaries of their education - the students.

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A tuition fee was first introduced for students enrolling at universities in the UK in 1998/99 when they were required to pay approximately 1,000 GBP per annum. The Higher Education Reform Act, approved in 2004, which was effective from the academic year 2006/07, raised the cap on fees to 3,000 GBP per annum. This increase applied equally to all universities and all undergraduate programmes. From 2006 students could defer the payment of fees by taking a Tuition Fee Income Contingent Loan (TICL) up to the maximum amount of fees being charged. Repayment of the loan was linked to income obtained after graduation, at a 9 per cent fixed interest rate for everything earned above 15,000 GBP and at a zero real interest rate. Hence, graduate students only repaid when they could afford it.¹ A further fee increase was introduced in 2012/13, which raised the fees to 6,000-9,000 GBP.²

Students did receive financial support through both loans and grants. From 1999 support for living costs was entirely through Income Contingent Maintenance Loans (ICML), a quarter of which were means tested. Some students also received means tested tuition fee grants. In 2004/05, to help cover the cost of participating in higher education, the government introduced the Higher Education grant, and this was fully means tested and non-repayable. However, this grant was replaced from 2006/07 by the maintenance grant, which was also an income-assessed support.³

Table 1 shows the evolution of fees and student support from 2003 to 2009. We note that the introduction of the tuition fee loans in 2006 drastically decreased the number of tuition fee grants.⁴ In general, after 2006 although students could choose to pay fees up-front, the majority took out a tuition fee ICL and the total amount of debt (ICML + TICL) has therefore been increasing.

The 2006 reform represented a three-fold increase in tuition fees and was targeted at students whose nationality was English or Northern Irish, which may have influenced student behaviour.⁵ Fees at Scottish universities were unchanged, but English, Welsh and Northern Irish students studying in Scotland were liable for the fee increase. Similarly, Scottish students choosing to study in English universities, for instance, were subjected to the fee increase as were students from the European Union (EU). Scottish students attending Scottish institutions did not have to pay increased tuition fees. This differential implementation of the policy implies that Scottish students at Scottish institutions could be a control group for identifying a causal effect of the tuition fee reform on English students. However, if the reform affected the likelihood of studying outside Scotland, it is possible that the composition of the Scottish university student body changed, hence leading to an indirect effect of the tuition fee reform. In fact, in our analysis below we test to see if there is evidence of an indirect effect of the tuition fee reform.

In this paper we investigate whether the tuition fee reform has affected the dropout behaviour of first year undergraduate students. The US literature on this topic suggests that higher student debt can generate a ‘reluctance to borrow’, either because students fear potential credit constraints after graduation or because they are ‘debt averse’, which consequently affects their risk of drop out (Stinebrickner and Stinebrickner, 2008; Rothstein and Rouse, 2011; Johnson, 2013). However, the levels of debt experienced by students in the US are likely to be substantially higher than the levels of debt experienced by students in the UK, especially for those groups of students affected by the

¹Before 1998/99 loans were repaid on mortgage style basis. From 2012/13 the government added a tapered rate of interest which would rise to 3% depending on earnings, and the earnings threshold at which the loans start to be repaid was increased from 15,000 to 21,000 GBP. The debt, however, will be written off after 30 years.

²It was hoped that the increase in 2012 would lead to a range of fees charged by universities, however, almost all universities chose to charge the highest fee.

³In 2016 the maintenance grant was also replaced by a loan.

⁴Tuition fee ICL were also available to pre-2006/07 entrants if they made a full or partial contribution to their fixed fees, but we observe in Table 1 that the number of these loans are now negligible.

⁵The tuition fee reform for students studying in Wales, mostly Welsh students, was introduced a year later and a substantial scholarship or bursary was made available to these students.

2006 tuition fee reform.

It is therefore possible that other factors, apart from a reluctance to borrow, have influenced drop out behaviour. Tuition fee increases were not the only major event to have a potential influence on student behaviour in the last decade. The financial crisis, which precipitated the so-called Great Recession (2007-2009), led to rising rates of unemployment especially amongst school leavers and graduates (Bell and Blanchflower, 2010). Substantial increases in unemployment are likely to create uncertainty regarding future employment and wage prospects post-graduation and so may have influenced drop out behaviour. However, this effect is unlikely to be uniform for all students. Unemployment rates following the onset of the recession did not increase in a spatially even way - some local labour markets experienced relatively large increases in unemployment whereas in other areas the increase was modest. We therefore expect that in those local labour markets where the increase in unemployment was relatively larger, there was a different and more substantial effect on student drop out behaviour because job opportunities will have decreased more. Our approach assumes that students respond to local labour market conditions in their home areas. This is a plausible assumption insofar as students are likely to have far more information on labour market conditions in their home area which influences the formation of expectations post-graduation. We also argue that students are more likely to respond to aggregate labour market conditions, rather than conditions in the youth labour market, because they are less likely to see the 16-24 year old group as reflecting the opportunities available to them in the future. Furthermore, we utilise the spatial variation in unemployment rates to identify a causal effect of the recession on student drop out behaviour.

Disentangling the effect of the tuition fee reform from the effect of the recession is not a trivial issue, but it is necessary that we do so if we are to identify a causal effect of the tuition fee reform on student drop out behaviour. To do this we follow a series of steps. First, using unemployment rate data at the travel-to-work area level we identify 'high' and 'low' unemployment rate areas which reflect the initial conditions facing students. Within each area we then identify a treatment group, that is, labour markets with relatively large increases in unemployment, which is compared with a control group - areas with relatively modest increases in unemployment. The change in unemployment, especially in already high unemployment labour markets, is likely to have influenced student expectations about future labour market prospects. Second, we then compare treatment and control group labour markets before and after the tuition fee reform and then again before and after the recession. Third, we adopt a difference-in-differences methodology at step two to indirectly uncover a causal effect of the tuition fee reform on student dropout rates. Having disentangled the effect of the recession from the tuition fee reform we address the following questions. Does the reform effect dominate the recession effect in terms of absolute magnitudes and are these effects reinforcing or do they counter each other? Also, how do the effects of the recession and reform vary between high and low unemployment areas?

By utilising duration modelling methods we are also able to address the question of whether the tuition fee reform reduced the time to drop out, once we allow for observable and unobservable differences between students. If students dropped out before the end of the calendar year in which they enrolled at university then they would be exempt from the repayment of any accumulated debt. To observe this effect it is necessary to estimate non-parametric duration models. Furthermore, if students are observed to drop out earlier in the post reform period then one could conjecture that attitudes to debt accumulation is a possible cause. We use HESA data for the population of university students in the UK for the period 2004-2010.

Our base, or naive, model estimates suggest that the tuition fee reform increased the risk of drop out by 19 percent for males but with no effect for females. There is evidence of heterogenous policy effects insofar as the tuition fee reform increased drop out rates 1 year after the reform but

thereafter had a negative effect. We also show that the hazard of drop out is not constant, tending to increase towards the end of the first year. Of course these effects are likely to be confounded by the recession effect.

A richer story emerges when we apply difference-in-differences methods and distinguish between students coming from ‘high’ versus ‘low’ unemployment areas. Estimates show that in high unemployment areas the effect of the recession on drop out behaviour was positive, statistically significant and substantial (10-15 percent) with some differences between male and female students. The tuition fee reform counteracted the recession effect for males, with a 2 percent reduction in the risk of drop out, whereas for females the effect was positive and so reinforced the recession effect. In contrast, and as expected, for students from low unemployment areas, the recession had no effect but the tuition fee reform reduced the drop out rate by between 8-10 percent. We interpret these two sets of effects as reflecting debt aversion in high unemployment areas and increased effort in low unemployment areas.

We also present evidence of differences in drop out behaviour in high and low unemployment areas between high and low income groups, and for students who attend different types of university. Specifically, we find that for students from higher income backgrounds in high unemployment areas there is no effect of the reform on dropout behaviour, whereas if they come from low unemployment areas the reform substantially decreases the dropout rate. The opposite behaviour is observed for students from poorer backgrounds; if they live in a high unemployment area they tend to drop out less, probably because they have fewer opportunities in the labour market, whereas if they come from a low unemployment area the likelihood to drop out increases by 10 per cent. In terms of the type of university attended, if students are enrolled in research focused universities, the effect of the reform is to reduce the dropout rate regardless of the level of unemployment in the area in which they live. On the contrary, students enrolled in teaching focused universities have a higher likelihood to drop out if they live in high unemployment areas.

In the next section of this paper we review the recent literature on dropout behaviour. This is followed by a detailed discussion of our data in Section 3, and in the proceeding section we outline our econometric modelling strategy. The results of our analysis are presented in Section 5 which is followed by our conclusions and policy implications.

2 Literature and hypotheses

2.1 A review of the literature

Models of the decision to attend university or not, and the subsequent decision to drop out or not, are based on the solution to a series of optimisation problems that are well known in the literature (Ben-Porath (1970); Heckman (1976) and Oreopoulos (2007)). Individuals maximise their expected lifetime utility by choosing their level of education, conditional on the present value of the expected lifetime wealth. Lifetime utility is a function of consumption which is affected by the individual’s rate of time preference, risk aversion, the inter-temporal elasticity of substitution and the non-pecuniary benefits of education. Uncertainty is another important factor that may have an effect on drop out decisions, which we discuss in more detail below.

With respect to debt aversion, Rothstein and Rouse (2011) shows for the US how student debt can affect graduates employment decisions. They evaluate, in a very selective US college, the effects of the replacement of students loans with a grant aid to students in financial need. They find that student debt reduces the probability of accepting low-paying jobs (e.g. in education, government and non-profit sectors) and an increased probability of accepting jobs with high starting salaries. Field (2009) offers a clear example of how psycho-social costs of debt can affect career decisions, by

looking at the effects of an experiment run at the NYU School of Law. Students randomly selected in a lottery obtained income-contingent tuition fee waivers to be repaid only if after graduation the graduate obtains a high-paying (private sector) job. Students not selected obtained tuition loans which were repaid by NYU if after graduation they decided to work in low-paying (public sector) jobs. Thus the two packages of financial aid were equivalent in terms of net present values and, according to the standard economic theory, students should have been indifferent to the lottery outcomes. However, Field finds that graduates that received the tuition fee waiver were more willing to work in low-paying jobs. This, they argue, can only be attributed to the different perception, and the associated psychological costs, of the debt horizon between the two financial packages. Johnson (2013) extending the structural model of Keane and Wolpin (2001) finds that changes in the size of government loans, which relax students' borrowing constraints, do not have important effects on degree completion rates. Johnson interprets these results as a consequence of the reluctance to borrow.

In terms of labour market effects, there is a small but growing literature which has attempted to uncover a causal effect on high school dropout behaviour. Higher rates of (youth) unemployment have been shown to increase the risk of dropping out of high school (Eckstein and Wolpin, 1999), whereas some studies show no effect (Warren and Lee, 2003; Mocetti, 2008). Several authors have also found a negative relationship between unemployment and the risk of drop out (Rees and Mocan, 1997). Very little work has been undertaken for university students, although Smith and Naylor (2001) using data for a single cohort of HE students in the UK who enrolled in 1989-90, do find a positive effect of unemployment on the risk of drop out. In addition, family background, prior attainment, personal characteristics and the subject studied at university also had an effect on drop out behaviour. In spite of this mixed evidence on the effects of unemployment on dropout, we argue that students may be uncertain about their ability, the distribution of earnings in graduate and non-graduate jobs, as well as the possibility of short-term credit constraints during university attendance. As suggested in the Introduction, the financial crisis which led to a severe recession is likely to have led to increased uncertainty amongst students with respect not only to reduced graduate and non-graduate job opportunities, but also with respect to the earnings distribution in those jobs. Existing students may therefore be less reluctant to drop out of university fearing a higher risk of becoming unemployed, especially if they come from areas of high and rising unemployment. There may be little or no effect in areas of low and stable unemployment.

More generally, there are very few studies of the decision to drop out of higher education and almost none that investigate the duration to dropping out. Many of the studies that do exist for the UK are largely descriptive and do not assess the impact of policy reforms on drop out behaviour. An exception is Dearden et al. (2013) who evaluate the re-introduction of grants in the UK universities in 2004/05. Using a difference-in-differences approach they find that the increase in grants raised first-year degree participation (in 2005/06) by around 4 percentage points. By implication one might expect an increase in tuition fees to reduce university participation.

A further study by Johnes and McNabb (2004) focused on drop outs from UK HE institutions in 1993 and investigate the role of student-course matches and the effect of the students peers. Although it is difficult with this data to mitigate the reflection problem (Manski, 1993) they do provide some descriptive evidence that males with low ability peers are more likely to drop out. Students in higher quality universities are less likely to drop out. Arulampalam et al. (2005) analyse the effect of prior qualifications, following eight cohorts of university entrants over the period 1984-1992. Perhaps unsurprisingly, weaker students are more likely to drop out. Females were less likely to drop out. They confirm the negative effect of university quality on student drop out behaviour. Vignoles and Powdthavee (2009) assess the effect of socio-economic background using administrative data for 1st year students who enrolled at a university in 2004-05. Students

from families of higher socio-economic status are less likely to drop out; interestingly, students from an ethnic minority background were also less likely to drop out. Although of less relevance to our paper, there are many more studies of drop out behaviour at the secondary school level. Lofstrom (2007), for instance, suggests that economic disadvantage, or family background, accounts for nearly 50% of the hispanics-whites gap in dropout rates. Studies that use more sophisticated econometric techniques, such as Ermish and Francesconi (2001) and Bratti (2007) find a limited effect of family income on high school dropout behaviour.

2.2 Hypotheses

Our approach attempts to disentangle the effects of the tuition fee reform and recession on student dropout behaviour. In view of this and the review of the literature, Table 2 outlines the expected effects of the recession and tuition fee reform for the treated and control groups in high and low unemployment areas. Note, in our empirical analysis we are only able to estimate the difference in the effects between the treated and control groups. However, it is instructive to explore how the recession and reform effects might influence dropout behaviour amongst the treated and control groups.

For high unemployment areas with a relatively large increase in unemployment (T1), we expect the recession effect will increase the dropout rate. This is because the relatively larger increase in unemployment creates uncertainty about future labour market prospects. In this context the reform effect is also likely to be positive since these students may be debt averse, and they may also drop out sooner to avoid the accumulation of debt. We also expect the recession effect to be less than the reform effect for the control group since unemployment, although high, does not increase substantially, unlike in the treatment group. For the difference E we expect the recession effect and the reform effect to reinforce one another and hence increase the dropout rate, however *a priori* we cannot determine which effect dominates.

In low unemployment areas where the unemployment rate has been rising (T2) we expect the recession effect to be positive, but less than its effect for T1 because labor market opportunities are better. For the control group there should be no effect on student drop out behaviour since labor market opportunities are unaffected. The reform effect may be positive or negative for T2 depending on the level of student debt aversion. We expect students from C2 areas not to be debt averse and therefore are expected to drop out less. Based on this reasoning we expect the recession effect to be positive in low unemployment areas, but *a priori* we cannot determine sign and size of the reform effect, and therefore we do not know which effect dominates. Therefore, we do not know the sign of the difference F.

Table 2: The expected effects of the recession and tuition fee reform on drop out behaviour

Unemployment:			Dropout effects:		
Initial	Change	Group	Recession(A)	Reform(B)	$ A - B $
High	+	T	+	+	$ A > B $
High	=	C	0	+	$ A < B $
Difference (E)		T-C	+	+	?
Low	+	T	+	+ or -	?
Low	=	C	0	-	$ B > A $
Difference (F)		T-C	+	?	?

3 Data and Descriptive Statistics

We use administrative data which refers to the population of students who first enrolled at an institution of Higher Education in the UK between 2004-2010. The data were obtained from the Higher Education Statistics Agency (HESA) who had, in turn, obtained the data from each university and institute of higher education in the UK. There are several important features of these data. First, they record a students start date and end date and hence allow us to calculate the duration of stay in education in days. Second, the data contains personal information on age, ethnicity, gender, family information on parental occupation, which corresponds to broad income status, as well as information on the university attended and programme of study. Third, since the data refer to the population of students there are no problems of attrition which is common in survey data. Finally, we are able to make use of repeated cohort data for students who enrolled in HE prior to the reform (2004-2005) and post-reform (2006-2010) to investigate the hazard of exit from university.

The data refer to over 1.8 million students. However, there are various restrictions that we impose on the data. Students who enrol at a university between 2004 and 2010 are included in the analysis, however, we restrict our attention to drop out behaviour amongst 1st year undergraduate students. This is because we believe that the determinants of dropout behaviour are likely to vary by year of study and the first year is the period in which students learn most about their ability and either adjust, or not, to studying away from home. Furthermore, if students dropped out before the end of December in the 1st year of enrolment they could avoid accumulating debt through the student loan. Insofar as students are aware of this rule then we should see a spike in the hazard of drop out during the first 3-4 months of study. Only full time students are considered since the dropout behaviour of part time students is likely to be very different. Students who have been registered for 6 years or more are excluded. We also exclude students who register for an undergraduate course but who have a prior postgraduate qualification. These could have been data errors and where they are not, then they are likely to be ineligible for student loans. Students aged 36 years or more are excluded from the analysis. We exclude non-EU international students since they are subject to different fee regimes and are not covered by the tuition fee reforms. Students studying in Wales are excluded because the tuition reform started 1 year after that in England, that is, in 2007, and students studying in Scottish universities are also excluded because of the different fee regime. In sum, we keep 'Home/EU' students studying in English and Northern Irish universities. Finally, using the students home postcode we map on to the student data a time series of unemployment rate data at the travel-to-work area level. These data refer to unemployed

claimants aged 18 years old and over, and were obtained from the Office for National Statistics.⁶

To perform a duration analysis we need additional assumptions and restrictions. The survival time to dropout is clearly discrete, since the event of interest can happen on any day of the year. The time students become at risk of dropping out coincides with the start of the observation period. Censoring occurs at the end of the first academic year, which we assume to be the 31st of August. We also restrict the enrolment period to a twelve month time period and so the maximum length of our observation period is therefore 365 days. We further divide the duration in days into 12 periods of equal length i.e. ‘monthly’ intervals.

Table 4, Panel A, reports the actual dropout rates by year (cohort) and gender. It is clear that, on average, the drop out rate has remained fairly constant at around 8 per cent of the student population up to 2008 when the drop out rate began to fall, implying an effect from the recession. Indeed, by 2010 the dropout rate was almost 2/3 of the rate of 2004. Comparing the pre- and post-reform periods, the drop out rate was around 1.4 percentage points lower in the post-reform period. Panel A also shows that there are differences in drop out behaviour between male and female students - in the post-reform period the drop out rate for males falls slightly more (1.6pp), compared to the pre-reform period, than for females (1.3pp), but the absolute drop out rate for males is still higher than females in the post-reform period.

Panel B disaggregates the dropout rate by the socio-economic background of the students’ parents, where their occupation is collapsed into one of three groups - high, middle and low socio-economic groups.⁷ These groups roughly correspond to high, middle and low income groups. What is clear from Panel B is that all groups exhibit a similar percentage point decline in the dropout rate following the tuition fee reform, even though there is still a clear ranking of dropout rates by socio-economic group for each year. The decrease in the dropout rate for the low income group is slightly higher from 2008, perhaps following the onset of recession, although this group still has the highest absolute dropout rate when compared with the middle and high income groups in the same period. The differences in drop out rates between income groups are between 1-2 percentage points. Taken together these findings do not suggest any major difference in student behaviour between income groups following the tuition fee reform or in response to the recession.

The dropout rate for the broad type of university attended, classified here by the membership of various ‘mission groups’ is shown in Panel C. It is worth noting that UK HE is highly stratified and several ‘mission’ groups have emerged. The Russell Group of universities tend to be research intensive, are generally bigger in terms of student numbers and typically have a strong science base. Examples include Oxford, Cambridge, Imperial and UCL. The 1994 Group, which disbanded in 2013, focus on teaching and research and include universities such as, Lancaster and Sussex. Post-1992 universities which converted from polytechnic or college of higher education status are essentially teaching focused, and these make up the majority of our ‘Other’ category.⁸ Not surprisingly, the type of students who attend universities in each of the mission groups vary in terms of prior educational attainment (A level scores) and socio-economic background, the greatest overlap occurring between Russell and the 1994 Groups of Universities. It is important to allow for university type when trying to estimate the effect of the 2006 policy reform on dropout behaviour. We note that drop out rates are always higher in the ‘Other’ group of universities and lowest for

⁶We also mapped youth unemployment rates (16-24 year olds) at the travel-to-work area level as a sensitivity test.

⁷The high income group includes students whose parents have managerial and professional occupations. The middle income group includes students with parents in intermediate and technical occupations, small employers and self-employed. The low income groups includes student with parents in routine occupations and unemployed.

⁸This group of universities also includes some pre-1992 universities. Note that we also allow mission group membership to be time varying since some universities shifted from the 1994 Group to the Russell Group.

Russell group universities (see Panel C). Nevertheless, the decrease in the dropout rate in the post-reform and recession period is greatest for the ‘Other’ group of universities (i.e. 1.8pp) and changes marginally for the 1994 Group of universities.

Finally, Table A1, Appendix A, provides some descriptive statistics for the covariates used in our econometric analysis.

4 Econometric Methodology

Let M be the time in months to dropout, which can take integer values $m = 1, \dots, M$ and consider a sample of N students ($i = 1, \dots, N$). Define y_{im} as a dummy variable taking values 0 for all the periods if a student i is censored at time M , and 1 in the period m when dropout occurs and zero otherwise.

The conditional probability of dropping out for student i at period m , given that event has not yet occurred, is the discrete-time hazard

$$h_{im} = P[T_i = t | T > t - 1, \mathbf{x}_{im}] \quad (1)$$

where \mathbf{x}_{im} is a vector of observed explanatory variables, which can be time-variant or time-invariant.

Following Jenkins (1995) we expand the data to enable us to estimate discrete-time hazard models. More precisely, we reorganize our pooled cross-sectional data in order to have multiple rows of observations for each individual student with as many rows as the periods at risk. Our final dataset has the format of an unbalanced panel. The likelihood for binary regression models based on the expanded data corresponds to the likelihood for the discrete-time hazard, and the predicted hazards are maximum likelihood estimates. We define the likelihood contribution for a student i who is censored at time M as the probability

$$P[M_i > m] = \prod_{m=1}^M (1 - h_{im}) \quad (2)$$

The likelihood contribution of a student who drops out in period M is

$$P[M_i = m] = h_{iM} \prod_{m=1}^{M-1} (1 - h_{im}) = \frac{h_{iM}}{1 - h_{iM}} \prod_{m=1}^M (1 - h_{im}) \quad (3)$$

From Equations (2) and (4) the corresponding log-likelihood is

$$\log L = \sum_{i=1}^N \sum_{m=1}^M y_{im} \log\left(\frac{h_{im}}{1 - h_{im}}\right) + \sum_{i=1}^N \sum_{m=1}^M \log(1 - h_{im}) \quad (4)$$

We have to specify now the form of the hazard function. The most common method for modelling covariate effects for continuous-time hazard data assumes proportionality.⁹ As demonstrated by Prentice and Gloeckler (1978) the discrete-time counterpart of the proportional hazards model is the complementary log-log hazard rate.

$$c \log \log(h_{im}) = \log(-\log(1 - h_{im})) = \mathbf{x}_{im}\beta + f(m) \quad (5)$$

where $f(m)$ is the baseline hazard. In our model we use a piecewise-constant function by including dummy variables for each period. Thus, within each month interval the duration dependence is

⁹This implies that the covariates act proportionally on the underlying hazard function.

assumed constant. In our base analysis we estimate the following semi-parametric, discrete-time, hazard model

$$h_{imt} = 1 - \exp(-\exp(\mathbf{d}_{im}\alpha + \theta_1 R_t + \theta_2 U_{it}^w + \theta_3 R_t \times U_{it}^w + \mathbf{x}_{im}\beta)) \quad (6)$$

where \mathbf{d} are period dummy variables, w are the TTWAs where students i is domiciled before enrolling at the university, U is the unemployment rate in the corresponding TTWA in the month of August before the start of academic year t . R is the policy reform dummy, such that:

$$R_t = \begin{cases} 1, & \text{if } t \leq 2005 \\ 0, & \text{if } t \geq 2006 \end{cases}$$

θ_3 is the coefficient of the interaction between policy reform and unemployment rate. It should measure the variation in the conditional probability of drop out after the reform for different levels of unemployment in the local labour markets.

In our analysis, we generalize this model to account for any unobserved individual-specific effects. Ignoring unobserved heterogeneity can generate misleading inference due to inconsistent parameter estimators (Lancaster (1992)). In Equation (6) we therefore include a random intercept η_i , which is uncorrelated with the vector of covariates, \mathbf{x}_{im} (Narendranathan and Stewart, 1993).

$$h_{imt} = 1 - \exp(-\exp(\mathbf{d}_{im}\alpha + \theta_1 R_t + \theta_2 U_{it}^w + \theta_3 R_t \times U_{it}^w + \mathbf{x}_{im}\beta + \eta_i)) \quad (7)$$

This new specification requires an assumption on the the distribution of the unobservable individual-specific error term. Nicoletti and Rondinelli (2010) have provided Monte Carlo evidence that a misspecification of the random effect distribution does not bias either the duration dependence or the covariates included in our model.¹⁰ We assume in all our estimations that the random intercept is normally distributed and constant over each time interval.

4.1 An approach to disentangling the effects of the tuition fee reform and the recession

To isolate the effect of the reform from the effect of the recession, we adopt a difference-in-differences approach with duration modelling, and exploit variation in unemployment rates in the local labour market where students are domiciled. We have data on monthly unemployment rates for each Travel-To-Work Area (TTWA) in Britain for the period 2004-2011.¹¹ Using student postcode data we merged the unemployment rate to our individual student level data, thus we know for each student the monthly variation of the unemployment rate in their local labour market.

For the purposes of our analysis, we only consider the unemployment rate for the month of August, given that most students will start to enrol at university from early September through to early October. Our focus is on the years 2005, 2007 and 2009. These years are chosen for the following reasons: 2005 is prior to the tuition fee reform and precedes the recession; 2007 is the year following the 2006 tuition fee reform and is also just prior to the recession; and 2009 is in the post-reform period and just after the recession. Using the estimates from the duration analysis which we convert to log odds ratios, we can perform two DiD analyses, the first for the sub-period 2005-2009, which should identify a causal cumulative effect of the reform *and* the recession on student dropout behaviour. The second DiD is for sub-period 2007-2009, which should identify the

¹⁰They also show more generally that discrete-time hazard models are robust to different form of misspecification of the unobserved heterogeneity.

¹¹TTWAs are self-contained local labour markets, where by definition at least 75% of the population live and work in the area. TTWA boundaries are non-overlapping, are contiguous and cover the whole of the UK.

causal effect of the recession on dropout behaviour in the post-reform period. The ‘pure’ reform effect is then isolated by differencing the two DiD estimates.

In order to distinguish a simple before-after estimator from a DiD estimator we need to identify 4 groups, that is a treated and a control group observed before and after the treatment. The recession increases the unemployment rate but does so in a differential way. This is well established in the spatial economics literature, and arises for a whole variety of reasons to do with differences in local aggregate demand and aggregate supply conditions. Therefore, we examined the distribution of the unemployment rate between local labour markets and begin by classifying TTWAs into ‘high’ and ‘low’ unemployment areas, reflecting the initial conditions outlined above. For ‘low’ and ‘high’ unemployment areas we then include in the treated groups students in those TTWAs with a relatively large increase in their unemployment rate as a result of the recession. The control groups include students in those TTWAs which were relatively unaffected by the recession - they had a modest change in their unemployment rate.

To construct the different treatment and control groups for high and low unemployment areas we identify whether a TTWA is above or below the mean unemployment rate in August 2005 (i.e. in the pre-treatment and pre-recession period). We then observe the variation in unemployment rate in the same TTWA between August 2005 and August 2009 for the 2005-2009 which enables us to create the treatment and control groups. Ideally, the control group should include TTWAs where the variation in the unemployment rate is zero (and hence completely unaffected by the crisis) whereas the treated group of TTWAs should show a positive variation. However, in practice, it is almost impossible to identify such a control group. Therefore, for ‘high’ unemployment areas we include in the treated group all those TTWAs whose increase in their unemployment rate between 2005 and 2009 is greater than 1 standard deviation of the average variation between TTWAs for the same period. Similarly, for the control group we include TTWAs where the variation in the unemployment rate was between -0.5 and +0.5 of a standard deviation around the average rate for the period 2005-2009. The TTWAs in the control group therefore exhibit relatively static unemployment rates around the mean. For ‘low’ unemployment areas we include in the treated group those TTWAs with an unemployment rate between 2005 and 2009 of 0.5 of a standard deviation above the mean rate for the same period, whereas for the control group we include TTWAs whose rate is one standard deviation below the mean variation. This methodology ensures that we have reasonably balanced numbers of TTWAs in the treated and control groups for high and low unemployment areas in the 2005-2009 period. We adopt the same strategy to define the treatment and control groups for the period 2005-2007. Table 3 summarises the four groups.

Table 3: Unemployment rate in Treated and Control TTWAs

	2005	2007 or 2009
T	$u_{ttwa_j}^s$	$u_{ttwa_j}^s + \Delta$
C	$u_{ttwa_c}^s$	$u_{ttwa_c}^s$

u=unemployment rate, s= high, low

Δ =positive increase; j and c are TTWAs

The purpose of following this approach is to see if the effect of the tuition fee reform varied depending on where a student home labour market was ranked prior to the reform. To disentangle the effect of the reform from the effect of the recession we estimate the following semi-parametric, discrete-time, hazard model:

$$h_{imt} = 1 - \exp(-\exp(\mathbf{d}_{im}\alpha + \gamma_1 Y_t + \gamma_2 T_i + \gamma_3 T_i \times Y_t + \mathbf{x}_{im}\beta)) \quad (8)$$

where $i = 1, \dots, N$ are students, t is the academic year, $m = 1, \dots, M$ time in months to dropout,

$$Y_t = \begin{cases} 1, & \text{if } t = 2009 \\ 0, & \text{if } t = 2005, 2007 \end{cases}$$

$$T_i = \begin{cases} 1, & \text{if } i \text{ is in a treated TTWA} \\ 0, & \text{if } i \text{ is in a control TTWA} \end{cases}$$

γ_3 is the coefficient of the interaction between the treated and the post-treatment dummy, which sums to γ_1 and will give an estimate of the combined effect of the reform and recession on the risk of drop out. Estimating equation 8 for the periods 2005/2009 and 2007/2009 and then computing the difference $(\gamma_1 + \gamma_3)^{(05/09)} - (\gamma_1 + \gamma_3)^{(07/09)}$, allows us to produce a ‘pure’ effect of the tuition fee reform on the risk of dropout.

4.2 Evaluation of Treatment and Control groups

Note, that the DiD analysis relies on one important assumption, that is the presence of a common trend in dropout rates between the treated and the control group in the counterfactual situation of no treatment. This assumption cannot be formally tested, however we report in Figure 1 the variation in the dropout rates for students living in the TTWAs included in our analysis and enrolled between 2004 and 2010. We show the ‘high’ and ‘low’ unemployment cases, separately, and we note that in both the treated and the control groups there is no significant variation in dropout rates from 2005 to 2007. However, we do observe a negative and significant variation after the recession in 2008. This evidence provides some confidence that the common trends assumption holds.

Table 5, Panel A, shows the number of TTWAs for each of the two time periods for high unemployment areas; Panel B reports the equivalent information for low unemployment areas. In each case we have a reasonably large number of TTWAs which is reassuring since it implies that our findings can be generalised. Furthermore, we have checked the selected TTWAs to ensure that they are not highly spatially concentrated in terms of the treated and control groups for high and low unemployment areas, respectively. For instance, are all high unemployment areas in the north of England and low unemployment areas in the south? Inspection of the data suggests that this is not the case with TTWAs in each of the selected treatment and control groups coming from across England.¹²

Panels A and B also show the raw difference-in-differences for high and low unemployment areas, respectively.¹³ However, to illustrate our methods of calculation, Panel A shows the difference in the average dropout rate between treated and control groups in high unemployment areas in 2005 (row 1 minus row 3), and the equivalent for 2009 (rows 4 and 2). The first difference-in-differences between these two groups for 2005 and 2009 is reported in the final row of the panel and shows that for males the risk of dropout declined by a very small amount (-0.005) but increased slightly for females (0.008). Repeating the exercise for the post-reform/recession period (2007-09) shows that the dropout rate increased more for males than for females. Differencing the two sub-periods

¹²A list of TTWAs for the low/high by treated/control groups is available on request.

¹³Note that these differences are not strictly comparable to our estimates below because they are simply means whereas the estimates from the econometric analysis are derived from a duration model and then converted to odds ratios.

then gives the raw effect of the tuition fee reform, and suggests that the reduction in the risk of drop out for males was quite substantial (-3.5pp) which compares with a small positive effect for females. The effects for high unemployment areas are larger than the equivalent effects for low unemployment areas, which is to be expected. In sum, the raw data suggests that we do observe differences in the effects of the recession and tuition fee reform for high and low unemployment areas, as well as for males and females. Whether these effects persist once we control for covariates remains to be seen.

5 Results

5.1 Base Model - The effect of the tuition fee reform and recession on the incidence and timing of dropping out

In Table 6 we report the estimates of our base model, which includes a full set of covariates together with the unemployment rate variable for all students in all TTWAs. We estimated models with and without unobserved heterogeneity (equations 6 and 7), however, these results were almost identical.¹⁴ The estimated effects on most of the covariates are signed appropriately and consistent with the existing literature. There are very few differences in the estimated effects for males and females, exceptions being the estimates for mature students and students from the Asian sub-group which suggest that females are less likely to drop out; for males the effects are positive. For both males and females, students with higher levels of prior attainment have a lower risk of drop out, however, females with a vocational qualification (NVQ level 4 qualification) are more likely to drop out. Male students studying creative subjects are less likely to drop out whereas in all other subjects the effects are positively signed.

Turning now to the variables of particular interest in this paper, we can see that the log odds ratios suggest that for males the tuition fee reform increased the risk of drop out by 19 percent, whereas for females the effect is positive but statistically insignificant. Similarly, students from TTWAs with higher unemployment rates were more likely to drop out, although again the effects are statistically insignificant for females. Also note that the effect of the unemployment rate is lower in this model than the effect of the tuition fee reform. However, for male students the interaction effect between the unemployment rate and policy reform is negative and statistically significant, suggesting that in the post-reform period students from areas of higher unemployment were less likely to drop out. In sum we observe different responses to the reform and the recession by male and female students which may reflect differences in their attitudes to debt or differences in labour market expectations.

In Table 7 we explore whether there are heterogeneous policy/recession effects this time comparing the pre-reform period (2004-05) with the post-reform/recession period (2006-10). This analysis shows that the increase in the tuition fee may only have had a positive effect on the risk of dropping out 1 year after the reform, and thereafter is negative, substantially so 3 years after the fee increase when the effects of the recession start. These effects are now statistically significant for males and females. The unemployment rate variable is also positive and significant for males and females, and suggests that in general throughout the time period students from areas of higher unemployment are more likely to drop out, especially in the case of males. The interaction effect between unemployment and reform remains negative and statistically significant 1 year after the reform but is positive and insignificant for 2-4 years after the reform becoming negative and sig-

¹⁴We also include the p-value of the likelihood ratio test of the hypothesis of zero unobserved heterogeneity. Unobserved heterogeneity does not appear to be an issue in these models.

nificant 5 years after the reform. For females there are positive effects throughout the post-reform period, underlining again the different responses of male and female students to the reform and the recession.

To investigate further the effect of the reform and recession on the timing of the dropout decision we have re-estimated the models in Table 7 separately for the pre- and post-reform periods. Figure 2 plots the estimated baseline hazards for the homogenous models, pre- and post-reform and for females and males, respectively. There is very little difference between the estimated hazards in these two models. What is interesting, however, is that the hazard of exit from university decreases slightly in the first six periods of study and then flattens off until period 11 from which it begins to decrease again for the post-reform/recession period. Thus, although students avoid the accumulation of debt if they leave university before December (i.e. by period 3) of the first semester, the tuition fee reform and recession do not appear to have substantially affected the timing of the dropout decision by 1st year undergraduate students.

5.1.1 The Indirect Effects of the Tuition Fee Reform in Scotland

In this section we check whether the tuition reform that impacted students studying in England and Northern Ireland could have affected the drop out behaviour of Scottish students studying at Scottish universities. It is likely that the tuition fee reform in 2006 changed the distribution of students between the home countries, leading to an increase in the percentage of Scottish students choosing to stay in Scotland for their university education. This could have changed the composition of the student body in Scottish universities and hence affected drop out rates. Table 8, Panel A shows that dropout rates vary over the period 2004 to 2010 for Scotland following a very similar pattern to those for England. For instance, we notice a small decrease in the drop out rate in 2006 and a subsequent decline in the dropout rate after 2008 as the recession begins to bite. Panel B reports the estimated effects and it is clear that there is a reduction in the risk of drop out amongst Scottish students at Scottish universities, however, given the raw drop out rates in Panel A these effects are only partly to do with the tuition fee reform. The recession is also likely to have played a substantial role in reducing drop out rates in Scotland. Nevertheless, we take the view that there is sufficient evidence to suggest that Scottish students would not be a suitable control group in seeking to uncover a causal effect of the tuition fee reform in England.

5.2 Preferred model - A difference-in-differences approach

In this section we present estimates from a DiD approach where we seek to disentangle the effect of the tuition fee reform from the effect of the recession and hence, indirectly, identify a causal effect of the increase in tuition fees on student dropout behaviour. In our analysis we consider the years 2007 and 2009 as the post-treatment period, and the year 2005 as the pre-treatment period. Recall that we observe ‘high’ and ‘low’ unemployment areas (TTWAs), and within each area we are able to define a treatment group and a control group. Our aim is to investigate whether there are variations on the drop out behaviour of students between the treatment and the control groups. We do so using a difference-in-differences approach.

Table 9 reports the main results of this analysis for male and female students separately. We focus our discussion on the odds ratios.

Table 9, Panel A, shows the DiD results for high unemployment TTWAs. The year dummy (Year), which reflects the change in the drop out rate between 2005 and 2009, shows that for males the drop out rate decreased by around 21 percent for the whole period. This variable captures the effects of the tuition fee reform and recession, with a larger percentage reduction (24%) for the

2007-09 period. For females the effects are much larger with a 31 percent reduction in the risk of drop out for the two time periods.

The effect of unemployment rate ($TTWA_{\Delta u}$) shows that in those TTWAs where unemployment was high and increased substantially (i.e. the treated group) there was a 8-15 percent rise in the drop out rate when compared to the control group. For males, this increase is statistically significant for the 2005-09 and 2007-09 periods, whereas for females the increase is statistically significant only between 2007-09.

Since the year dummy 2005-09 picks up the effects of both the tuition fee reform and the recession, the dummy for the 2007-09 period picks up only the effect of the recession. The variable, $Year*TTWA_{\Delta u}$, is the DiD estimate, and this is our first causal effect. We do not find a statistically significant effect for males for the whole period 2005-09 period, whereas for females there is a 14 percent increase in dropout rate. The drop out rate in treated areas in 2009 compared to 2007 increased by around 10-15 percent, and the effect is larger for males than for females by around 5pp.

To obtain the indirect (causal) effect of the tuition fee reform we subtract the cumulative estimated effect of year dummy and interaction effect for the two sub-periods. For males we find that the increase in tuition fees reduced the drop out rate by around 2 percent whereas for females it increased the drop out by 2.5 percent. Clearly these effects are much smaller than those for the recession. For the low unemployment areas (Panel B) a different story emerges. For students in these localities the unemployment rate and interaction effect variables are not statistically significant as one might expect. However, the effect of the tuition fee reform in the bottom part of Panel B is statistically significant, and suggests that the reform reduced the drop out for students from the treated localities by 10 percent for males and 8 percent for females when compared to their control group counterparts.

This set of results is consistent with the view that students from high unemployment areas, who also witness relatively large increases in the risk of unemployment, are risk averse and drop out early because they see the future returns in the labour market to be poor. The tuition fee reform had a reinforcing effect for females which could be interpreted as a debt aversion response, whereas for males increasing the fee had the opposite effect. For male students a higher tuition fee led to greater effort and a reluctance to drop out of university, however, this effect was not sufficiently strong to counter the recession effect. In contrast, in low unemployment areas, the recession had no effect, perhaps because students expectations about future labour market prospects were unchanged, whereas the tuition fee increase led to greater effort and hence a lower drop out rate.¹⁵

Table 10 repeats the analysis but this time we disaggregate by socio-economic group, since it could be argued that our earlier results simply reflect the effect of spatial sorting of students from high and low income groups into high and low unemployment areas. We focus on the interaction effect for the 2007-09 period (the recession effect) and the reform effect. Our findings suggest that for high unemployment areas the treated groups experienced an almost identical effect on their risk of drop out regardless of whether they were high or low income - the recession increased their risk of drop out by about 15 percent (Panel A). This finding is similar in magnitude to those found

¹⁵We also conducted a sensitivity check where we use the youth unemployment rate to define high and low unemployment areas and the treatment and control groups. The results of this analysis showed that the recession had no effect on dropout rates whereas the tuition fee reform had much larger effects when compared to the analysis in Table 9. We believe these results to be less plausible because, as we argued above, students are more likely to respond to aggregate labour market conditions than they are to the youth labour market. Unemployed 16-24 year olds are more likely to be less skilled and less educated, and so university students will not see their circumstances as reflecting the labour market opportunities they may face regardless of whether they graduate or drop out. These results are available upon request.

in Table 9. For low unemployment areas once again there was no statistically significant effect of the recession. Differences do emerge, however, between high and low income groups in terms of reform effect. For students from high income groups in high unemployment areas the tuition fee reform had no noticeable effect on the risk of drop out whereas for students from low income groups the risk of drop out decreases by around 4 percent. These students may see university as a way out of their ‘home’ labour circumstances and are willing to invest in their future through further study. As such they are not debt averse. In contrast, in low unemployment areas, treated students from low income backgrounds behave very differently to their high income counterparts facing similar labour market prospects and also when compared to low income students in high unemployment areas. For low income students in these areas the risk of drop out increases by 10 percent compared to their control group. Since the recession has no effect on these groups, we conclude that students from low income groups are debt averse and drop out of university probably to go into work. Students from the high income treated group in low unemployment areas are 13 percent less likely to dropout when compared to the control group; high income groups are not debt averse and stay on.

In Table 11 we report the findings for university mission groups where we compare the effects of the tuition fee reform and recession for the so-called Russell Group with more teaching focused universities, most of which are modern universities. Recall that students from Russell Group universities are less likely to drop out when compared with students from the Other Group. Panel A shows that the recession had a substantial effect on drop out rates for students from research intensive universities (i.e. increasing this by 41 percent), compared to their control group, whereas the effect for teaching intensive universities was a modest 7 percent increase, again compared to their control group. Since there is sorting of students on the basis of academic ability between the two types of universities, it is plausible that more highly qualified Russell Group university students from areas of high and rising unemployment see their labour market prospects post-graduation as being bleak and take their chances in the labour market early. Less qualified students from teaching intensive universities see the acquisition of a degree as a worthwhile investment helping to boost their employment prospects post-graduation. Panel B shows that the effect for Russell Group universities is even larger (i.e. a 96 percent increase in the risk of drop out) in low unemployment areas, which is to be expected because employment prospects are presumably much better. The tuition fee reform significantly counteracts the recession effect for students from research intensive universities reducing the risk of drop out by 21 percent in high unemployment areas, and 42 percent in low unemployment areas. These effects are not sufficient to completely counter the recession effects, and so we can conclude that students from Russell Group universities are not debt averse but they are responsive to labour market prospects. Students from teaching intensive universities are more debt averse, especially in high unemployment areas, because the reform effect is above one. Infact, the magnitude of the recession effect and the reform effect are almost the same - 7 percent and 5 percent, respectively. In contrast, there is almost no effect of the reform or the recession for students from low unemployment localities studying at teaching intensive universities.

6 Conclusion

In this paper we investigate the causal effects of the increase in university tuition fees in 2006 and the so-called Great Recession on the risk of students dropping out of HE in the UK. We develop an approach to disentangle these two effects, and to do so we use HESA data on first year students who enrolled at a university between 2003-2010. Duration modelling techniques are combined with a difference-in-differences approach because the hazard of dropping out of university is likely to

be non-monotonic. It has been argued that increased uncertainty about net lifetime utility, or increased debt aversion, may lead some students who have embarked on a university degree to re-evaluate their ability and hence expectations of success. This implies that students in the post-reform period may have a higher risk of dropping out of university, and may do so earlier, to avoid the accumulation of debt. However, the post-reform period also witnessed the financial crisis and the onset of severe recession, leading to a reduction in job opportunities for young people including graduates. Increased unemployment amongst graduates, and young people in general, is likely to have increased the uncertainty of the returns to university study. Given increased debt, some students may have re-evaluated their situation and decide to leave university and drop out. Other students may take a different view, deciding to stay because the opportunity costs of study have fallen since job opportunities in the labour market decrease. The recession did not have a uniform effect across all local labour markets in the UK - some saw a large increase in unemployment whereas others did not. Furthermore, some labour markets already had a high unemployment rate before the recession. In our modelling, we take advantage of differences in the initial conditions facing local labour markets (high versus low unemployment) and also the fact that in each group unemployment either increased (the treatment group) or remained relatively stable (the control group). This variation allows to identify a causal effect of the recession on drop out rates. To obtain an indirect measure of the causal effect of the tuition fee reform we adopt a *pseudo* triple difference approach, as explained in section 4.1.

Base model estimates suggest that the tuition fee reform increased the risk of drop out by 19 percent for males but with no effect for females. There is evidence of heterogeneous policy effects insofar as the tuition fee reform increased drop out rates 1 year after the reform but thereafter had a negative effect. These estimates are at best descriptive since there is no attempt to disentangle the recession effect from reform effect. Our first substantive finding is that we show that the hazard of drop out is not constant, tending to increase towards the end of the first year of study. When we adopt a difference-in-difference approach, and distinguish between students coming from treatment and control groups for high and low unemployment areas, an interesting story emerges which broadly supports the hypotheses discussed in section 2.2, above. Also recall that we address two broad questions: Does the reform effect dominate the recession effect in terms of absolute magnitudes and are these effects reinforcing or do they counter each other? And, how do these effects of the recession and reform vary between high and low unemployment areas? Our estimates show that in high unemployment areas the effect of the recession on drop out behaviour was positive, statistically significant and substantial (10-15 percent) with some differences between male and female students. The tuition fee reform counteracted the recession effect for males, with a 2 percent reduction in the risk of drop out, whereas for females the effect was positive and so reinforced the recession effect. In contrast, and as expected, for students from low unemployment areas, the recession had no effect but the tuition fee reform reduced the drop out rate by between 8-10 percent. We interpret these two sets of effects as reflecting increased uncertainty about future labour market prospects and debt aversion in high unemployment areas; and increased effort in low unemployment areas.

We also present evidence of differences in drop out behaviour in high and low unemployment areas between high and low income groups, and for students who attend different types of university. Specifically, we find that for students from higher income backgrounds in high unemployment areas there is no effect of the reform on dropout behaviour, whereas if they come from low unemployment areas the reform substantially decreases the dropout rate. Students from high income backgrounds are unlikely to be debt averse, especially if they come from low unemployment areas. The opposite behaviour is observed for students from poorer backgrounds; if they live in a high unemployment area they tend to drop out less. This is probably because they have fewer opportunities in the

labour market and choose to continue their study, in spite of mounting debt, to reduce the risk of future unemployment. The opportunity costs of continued study fall dramatically for this group. In contrast, low income students from a low unemployment areas are far more likely to drop out - the risk increases by 10 per cent. This is presumably because they are debt averse and job opportunities do exist in their home labour market. Finally, we find that the type of university attended has a substantial effect on student drop out behaviour. If students are enrolled in research focused universities (the so-called Russell Group), the effect of the reform is to reduce the dropout rate regardless of the level of unemployment in the area in which they live. These students are not debt averse because they expect to be at the front of the labour queue once they graduate. On the contrary, students enrolled in teaching focused universities have a higher likelihood of dropping out if they live in high unemployment areas. Debt aversion is one possible explanation for this behaviour.

The evidence presented in this paper has implications for policy and practice. From a policy perspective it is clear that the 2006 reform had an effect on drop out behaviour, but the magnitude and sign of this effect depends on local labour market conditions given that the Great Recession quickly followed the fee increase. It is likely that the 2011 reform, which increased fees further (to GBP 6,000-9,000) may have had a more substantial effect because the level of debt accumulation is so much greater. Moreover, these effects are likely to vary by the socio-economic background of the student, local labour market conditions and the type of university attended. In terms of the implications for practice, it is important that universities do all they can to support students from poorer social backgrounds through scholarships and bursaries, to mitigate the effects of debt aversion, and also do all they can to improve their academic and extra-curricular experience to give them a head start in the labour market. However, increased tuition fees may have had the effect of creating a trend increase in student drop out rates which some universities are going to have to cope with from a financial perspective.

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Figure 1: Assessing the common trend assumption: 2004-2010

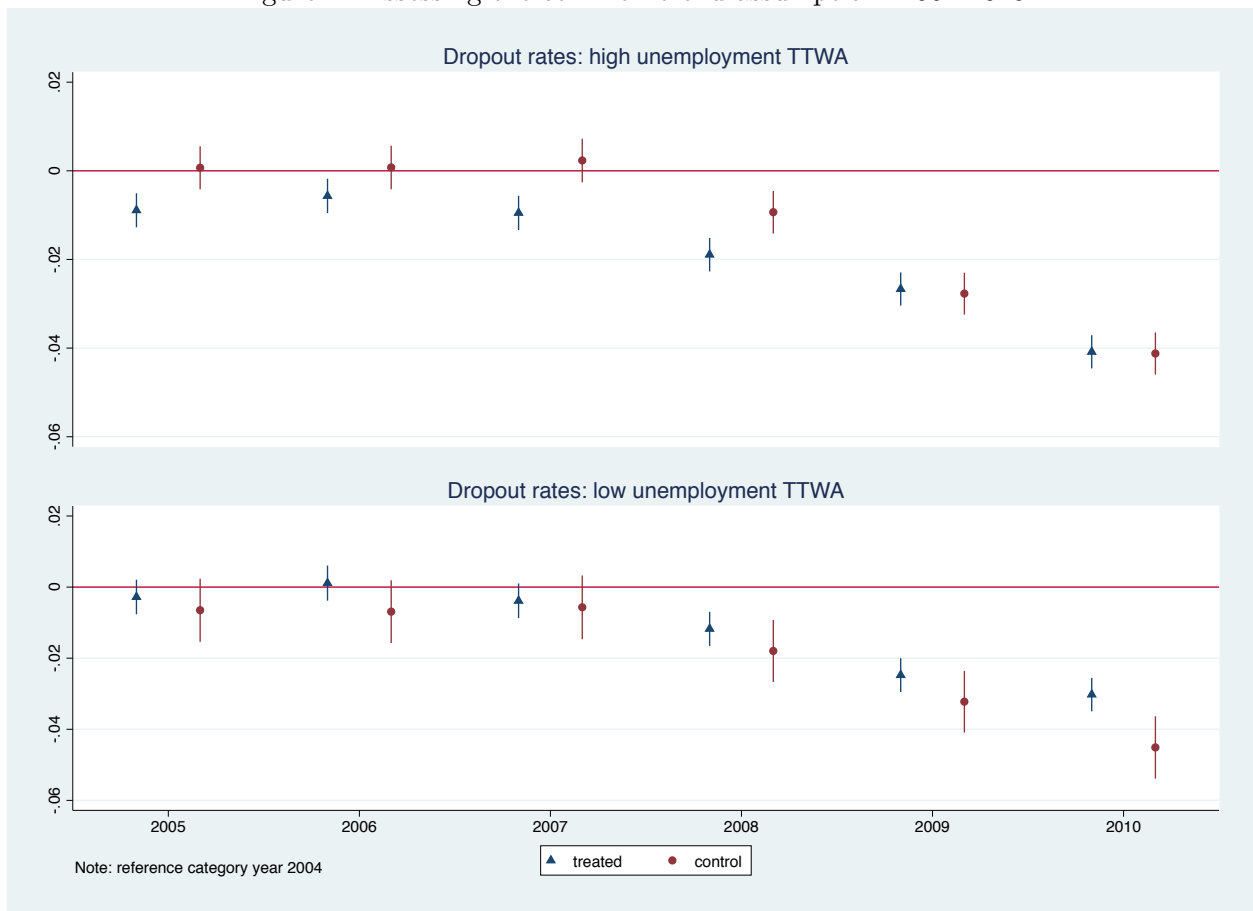


Figure 2: Estimated hazard functions before and after the tuition fee Reform

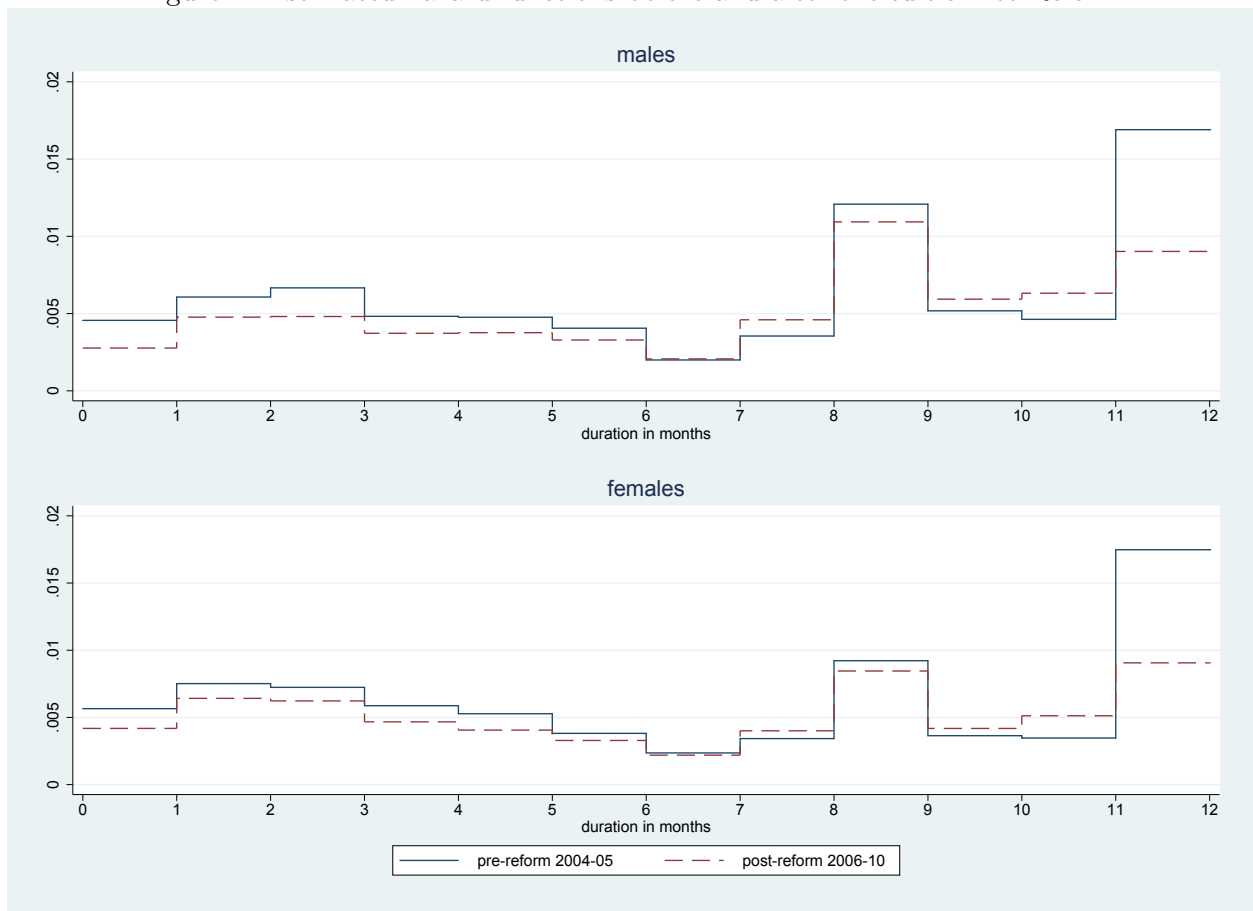


Table 1: The evolution of students financial support in the UK

	<i>2003</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>
tuition fees	1125	1150	1175	3000	3070	3145	3225
<i>Loans</i>							
tuition fee loan							
		<i>students entering prior 2006/07</i>					
number loans	na	na	na	158	99	32	5.6
		<i>students entering from 2006/07</i>					
number loans	na	na	na	234	455	666	780
maintenance loan							
number eligible	840	874	897	905	928	963	1004
number loans	682	693	719	728	746	772	820
<i>Grants</i>							
tuition fee grant							
number full grants	321	327	315	190	102	32	6.5
number partial grants	109	100	92	59	31	9	1.3
maintenance grant							
full	na	na	na	98	180	155	99
partial	na	na	na	68	122	98	54
HE grants							
full	na	83	160	127	77	24	5.2
partial	na	19	36	28	17	5	1

Source: Student Loans Company. Tuition fees are in GBP, other figures are in thousands.

na= not applicable.

Table 4: Changes in dropout rates, pre- and post-reform

<i>Panel A: Full sample and by gender</i>									
	2004	2005	2006	2007	2008	2009	2010	before	after
All	0.089	0.086	0.089	0.087	0.077	0.065	0.054	0.088	0.074
N	281323	297762	287597	297016	317255	334538	339156	582555	1572092
Males	0.097	0.093	0.094	0.092	0.082	0.072	0.061	0.095	0.079
N	126727	133390	128394	132229	141510	150028	152182	261384	703076
Females	0.084	0.081	0.084	0.084	0.073	0.060	0.049	0.082	0.069
N	154596	164372	159203	164787	175745	184510	186974	321171	869016
<i>Panel B: Dropout rates by socio-economic background</i>									
	2004	2005	2006	2007	2008	2009	2010	before	after
High income	0.069	0.069	0.075	0.072	0.064	0.055	0.045	0.069	0.061
N	117176	113443	105606	109835	111375	122211	125536	230788	574394
Middle income	0.082	0.081	0.083	0.083	0.073	0.065	0.055	0.081	0.071
N	54202	54676	51159	52732	56273	60423	60291	109032	280724
Low income	0.098	0.095	0.100	0.102	0.088	0.079	0.069	0.096	0.086
N	33739	36292	35101	37818	46075	42933	46391	70218	208131
<i>Panel C: Dropout rates by type of university</i>									
	2004	2005	2006	2007	2008	2009	2010	before	after
Russell group	0.052	0.046	0.049	0.046	0.040	0.028	0.021	0.049	0.036
N	64463	64801	66064	68349	71074	71182	71144	129470	347607
1994 group	0.072	0.064	0.075	0.074	0.062	0.052	0.044	0.068	0.061
N	32776	33037	34960	37496	39914	40114	40818	65854	193261
Others	0.110	0.106	0.107	0.107	0.094	0.080	0.067	0.108	0.090
N	172751	188862	180060	184395	199481	216376	220765	364819	997871

First year entrants only.

Table 5: Dropout rate by variation of unemployment in subgroups of TTWA

<i>Panel A: Dropout rate in high unemployment areas</i>									
<i>group</i>	<i>year</i>	<i>males</i>	<i>females</i>	<i>TWA</i>	<i>year</i>	<i>males</i>	<i>females</i>	<i>TWA</i>	
T	2005	0.110	0.093	29	2007	0.101	0.099	37	
T	2009	0.099	0.079	29	2009	0.105	0.081	37	
C	2005	0.098	0.100	26	2007	0.104	0.087	31	
C	2009	0.092	0.078	26	2009	0.078	0.067	31	
<i>DiD: 2005/09</i>		<i>DiD: 2007/09</i>		<i>Difference (2005/09)–(2007/09)</i>					
<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>				
-0.005	0.008	0.03	0.002	-0.035	0.006				
<i>Panel B: Dropout rate in low unemployment areas</i>									
<i>group</i>	<i>year</i>	<i>males</i>	<i>females</i>	<i>TWA</i>	<i>year</i>	<i>males</i>	<i>females</i>	<i>TWA</i>	
T	2005	0.085	0.084	25	2007	0.092	0.094	23	
T	2009	0.073	0.063	25	2009	0.084	0.070	23	
C	2005	0.090	0.087	34	2007	0.105	0.088	32	
C	2009	0.065	0.067	34	2009	0.068	0.066	32	
<i>DiD: 2005/09</i>		<i>DiD: 2007/09</i>		<i>Difference (2005/09)–(2007/09)</i>					
<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>	<i>Males</i>	<i>Females</i>				
0.013	-0.001	0.029	-0.002	-0.016	0.001				

Note: sample of 1st year entrants in English universities.

Table 6: Estimates of the determinants of dropout behavior - 2005 vs 2006

	<i>Males</i>		<i>Females</i>	
	<i>Homogenous</i>	<i>Heterogenous</i>	<i>Homogenous</i>	<i>Heterogenous</i>
Policy Reform	0.172*** (0.053)	0.172*** (0.054)	0.048 (0.048)	0.048 (0.049)
<i>log odds ratio</i>	1.188***	1.188***	1.050	1.050
unemployment rate	0.081*** (0.015)	0.081*** (0.015)	0.015 (0.014)	0.015 (0.014)
<i>log odds ratio</i>	1.084***	1.084***	1.015	1.015
Ref×unemp	-0.042** (0.021)	-0.042** (0.021)	0.013 (0.019)	0.013 (0.019)
<i>log odds ratio</i>	0.959**	0.959**	1.013	1.013
<i>Country of origin</i>				
Scotland	-0.070 (0.139)	-0.070 (0.138)	-0.197 (0.135)	-0.197 (0.136)
Wales	0.151** (0.060)	0.151** (0.060)	0.171*** (0.052)	0.171*** (0.052)
N.Ireland	0.251*** (0.081)	0.251*** (0.081)	0.219*** (0.071)	0.219*** (0.071)
<i>Socio-economic background</i>				
Middle income family	0.010 (0.026)	0.010 (0.026)	-0.008 (0.023)	-0.008 (0.023)
Low income family	0.100*** (0.030)	0.100*** (0.030)	0.090*** (0.026)	0.090*** (0.026)
<i>Ethnic background</i>				
Black	0.112** (0.048)	0.112** (0.048)	-0.128*** (0.046)	-0.128*** (0.047)
Asian	0.120*** (0.029)	0.120*** (0.029)	-0.210*** (0.031)	-0.210*** (0.031)
Other/Unknown	0.179*** (0.035)	0.179*** (0.036)	0.072** (0.035)	0.072** (0.036)
<i>Prior Attainment</i>				
1st quartile	-0.156*** (0.036)	-0.156*** (0.037)	0.030 (0.036)	0.030 (0.036)
2nd quartile	-0.387*** (0.039)	-0.387*** (0.040)	-0.210*** (0.038)	-0.210*** (0.038)
3rd quartile	-0.696*** (0.043)	-0.696*** (0.044)	-0.450*** (0.040)	-0.450*** (0.040)
4th quartile	-1.197*** (0.051)	-1.197*** (0.051)	-0.803*** (0.046)	-0.803*** (0.045)
NVQ Level 4	-0.031 (0.043)	-0.031 (0.042)	0.082* (0.043)	0.082* (0.043)
Privately funded school	0.008 (0.034)	0.008 (0.034)	-0.082** (0.035)	-0.082** (0.035)
Other school type	0.172*** (0.030)	0.172*** (0.030)	0.169*** (0.030)	0.169*** (0.029)
Mature student	0.020 (0.033)	0.020 (0.032)	-0.133*** (0.034)	-0.133*** (0.033)
<i>Type of University</i>				
1994 group	0.216*** (0.037)	0.216*** (0.037)	0.113*** (0.035)	0.113*** (0.035)
Other universities	0.407*** (0.034)	0.408*** (0.033)	0.306*** (0.030)	0.306*** (0.029)
<i>Subject of study</i>				
physical sciences	0.151*** (0.030)	0.151*** (0.030)	0.084** (0.038)	0.084** (0.038)
social sciences	0.082*** (0.031)	0.082*** (0.031)	0.162*** (0.026)	0.162*** (0.026)
humanities	0.021 (0.031)	0.021 (0.031)	0.120*** (0.023)	0.120*** (0.023)
creative sciences	-0.151*** (0.035)	-0.151*** (0.034)	0.040 (0.028)	0.040 (0.028)
N	1634255	1634255	2073482	2073482
LogL	-64320.47	-64320.49	-79426.29	-79426.31
<i>chi2^a</i>		0.035		0.041

First year entrants only, in English universities.

^aLR test of model with Normal distributed heterogeneity against model without controlling for heterogeneity.

Base category subject: medical sciences.

Table 7: Estimates of the determinants of dropout behavior - 2004-05 vs 2006-10

	<i>Males</i>		<i>Females</i>	
	<i>Homogenous</i>	<i>Heterogenous</i>	<i>Homogenous</i>	<i>Heterogenous</i>
<i>Years after Policy Reform</i>				
1 year	0.112** (0.046)	0.114** (0.047)	0.053 (0.041)	0.053 (0.042)
<i>log odds ratio</i>	1.118**	1.121**	1.054	1.054
2 years	-0.070 (0.046)	-0.075 (0.047)	-0.078* (0.041)	-0.078* (0.041)
<i>log odds ratio</i>	0.932	0.928	0.925*	0.925*
3 years	-0.344*** (0.051)	-0.351*** (0.052)	-0.235*** (0.045)	-0.235*** (0.045)
<i>log odds ratio</i>	0.709***	0.704***	0.791***	0.791***
4 years	-0.433*** (0.057)	-0.442*** (0.058)	-0.454*** (0.052)	-0.454*** (0.053)
<i>log odds ratio</i>	0.649***	0.643***	0.635***	0.635***
5 years	-0.310*** (0.054)	-0.312*** (0.056)	-0.424*** (0.052)	-0.424*** (0.052)
<i>log odds ratio</i>	0.734***	0.732***	0.654***	0.654***
Unemployment rate	0.064*** (0.010)	0.065*** (0.011)	0.021** (0.010)	0.021** (0.010)
<i>log odds ratio</i>	1.066***	1.068***	1.021**	1.021**
<i>Interaction: Years after Reform × Unemployment</i>				
1 year	-0.039** (0.018)	-0.040** (0.019)	-0.006 (0.017)	-0.006 (0.017)
<i>log odds ratio</i>	0.962**	0.960**	0.994	0.994
2 years	0.019 (0.019)	0.020 (0.020)	0.031* (0.018)	0.031* (0.018)
<i>log odds ratio</i>	1.019	1.020	1.032*	1.032*
3 years	0.025 (0.016)	0.025 (0.016)	0.016 (0.014)	0.016 (0.014)
<i>log odds ratio</i>	1.025	1.025	1.016	1.016
4 years	0.018 (0.016)	0.019 (0.017)	0.026* (0.015)	0.026* (0.015)
<i>log odds ratio</i>	1.019	1.020	1.026*	1.026*
5 years	-0.038** (0.016)	-0.039** (0.017)	-0.018 (0.016)	-0.018 (0.016)
<i>log odds ratio</i>	0.963**	0.962**	0.982	0.982
N	5912180	5912180	7510302	7510302
LogL	-213822	-213831.5	-262101	-262101
<i>chi2^a</i>		18.902		0.161

First year entrants only, in English universities. s.e in brackets

^aLR test of model with Normal distributed

heterogeneity against model without controlling for heterogeneity.

Base category subject: medical sciences.

Table 8: Estimates of the effect of the reform in Scotland

Panel A: changes in dropout rates

	2004	2005	2006	2007	2008	2009	2010	before	after
all	0.095	0.094	0.089	0.098	0.082	0.056	0.042	0.090	0.067
males	0.103	0.100	0.097	0.109	0.091	0.062	0.043	0.107	0.079
females	0.088	0.089	0.083	0.090	0.076	0.052	0.041	0.090	0.067
Nall	20930	20568	20530	20528	21417	24130	23059	64970	109254

Panel B: base model estimates 2004-05 vs 2006-10

	<i>Homogenous</i>				<i>Heterogenous</i>				<i>P-val*</i>
	<i>Policy Reform</i>	<i>s.e</i>	<i>log odds ratio</i>	<i>LogL</i>	<i>Policy Reform</i>	<i>s.e</i>	<i>log odds ratio</i>	<i>LogL</i>	
Male	-0.339***	(0.027)	0.712	-30096	-0.432***	(0.039)	0.648	-30092	0.002
Female	-0.324***	(0.028)	0.722	-31515	-0.381***	(0.035)	0.682	-31514	0.031

First year entrants only, Scottish students in Scottish University

*LR test of model with Normal distributed heterogeneity against model without controlling for heterogeneity. All models contain the same control variables as in the base model, except for nationality.

Table 9: Effect of the reform by variation of unemployment in subgroups of TTWA and by gender

<i>Panel A: High Unemployment areas</i>				
	<i>Males</i>		<i>Females</i>	
	<i>2005-2009</i>	<i>2007-2009</i>	<i>2005-2009</i>	<i>2007-2009</i>
Year	-0.232*** (0.058)	-0.271*** (0.035)	-0.367*** (0.053)	-0.363*** (0.033)
<i>log odds ratio</i>	0.793***	0.763***	0.693***	0.695***
TTWA _{Δur} ^a	0.104** (0.051)	0.077** (0.037)	-0.031 (0.047)	0.144*** (0.034)
<i>log odds ratio</i>	1.109**	1.080**	0.969	1.155***
<i>Recession Effect^b</i>				
Year × TTWA _{Δur}	0.079 (0.071)	0.140*** (0.052)	0.128* (0.065)	0.100** (0.048)
<i>log odds ratio</i>	1.083	1.151***	1.137*	1.105**
N	478302	854045	631771	1113439
LogL	-20522.57	-34235.67	-24919.72	-40844.98
<i>Reform Effect^c</i>				
(2005-09)-(2007-09)	<i>Males</i>		<i>Females</i>	
	-0.022*** 0.000		0.025*** 0.000	
<i>log odds</i>	0.978***		1.025***	

<i>Panel B: Low Unemployment areas</i>				
	<i>Males</i>		<i>Females</i>	
	<i>2005-2009</i>	<i>2007-2009</i>	<i>2005-2009</i>	<i>2007-2009</i>
Year	-0.370*** (0.109)	-0.302*** (0.110)	-0.342*** (0.096)	-0.333*** (0.105)
<i>log odds ratio</i>	0.691***	0.739***	0.710***	0.717***
TTWA _{Δur}	-0.121 (0.086)	-0.117 (0.099)	-0.040 (0.075)	0.050 (0.089)
<i>log odds ratio</i>	0.886	0.889	0.960	1.051
<i>Recession Effect^b</i>				
Year × TTWA _{Δur}	0.137 (0.125)	0.177 (0.140)	-0.005 (0.111)	0.066 (0.128)
<i>log odds ratio</i>	1.147	1.194	0.995	1.068
N	230087	143691	293667	184169
LogL	-7869.29	-5137.06	-10333.81	-6716.25
<i>Reform Effect^c</i>				
(2005-09)-(2007-09)	<i>Males</i>		<i>Females</i>	
	-0.108*** 0.001		-0.080*** 0.001	
<i>log odds ratio</i>	0.898***		0.923***	

First year entrants only in English universities.

All models contain the same control variables as in the base model.

^a TTWAs with high variation in unemployment rate, treated group.

^b Recession effect columns 2 and 4.

^c (Year+Interaction)_{2005/09} - (Year+Interaction)_{2007/09}

Table 10: Effect of the reform by variation of unemployment in subgroups of TTWA and by socio-economic status

<i>Panel A: High Unemployment TWA</i>				
	<i>High Income</i>		<i>Low Income</i>	
	<i>2005-2009</i>	<i>2007-2009</i>	<i>2005-2009</i>	<i>2007-2009</i>
Year	-0.272***	-0.378***	-0.317***	-0.276***
	(0.068)	(0.041)	(0.094)	(0.060)
<i>log odds ratio</i>	0.762***	0.685***	0.729***	0.759***
TTWA _{Δur} ^a	0.107*	0.155***	-0.008	0.111*
	(0.059)	(0.042)	(0.083)	(0.061)
<i>log odds ratio</i>	1.113*	1.168***	0.992	1.118*
<i>Recession Effect^b</i>				
Year×TTWA _{Δur}	0.039	0.142**	0.150	0.152*
	(0.082)	(0.059)	(0.113)	(0.085)
<i>log odds ratio</i>	1.040	1.153**	1.161	1.164*
N	470076	855768	177240	291657
LogL	-16456.11	-27292.22	-8087.26	-12602.95
<i>Reform Effect^c</i>				
	<i>High Income</i>		<i>Low Income</i>	
(2005-09)-(2007-09)	0.003***		-0.043***	
	0.000		0.001	
<i>log odds</i>	1.003***		0.958***	

<i>Panel B: Low Unemployment TWA</i>				
	<i>High Income</i>		<i>Low Income</i>	
	<i>2005-2009</i>	<i>2007-2009</i>	<i>2005-2009</i>	<i>2007-2009</i>
Year	-0.597***	-0.356***	-0.050	-0.386**
	(0.118)	(0.130)	(0.182)	(0.173)
<i>log odds ratio</i>	0.551***	0.700***	0.952	0.680**
TTWA _{Δur}	-0.147*	0.109	0.018	-0.214
	(0.089)	(0.109)	(0.153)	(0.157)
<i>log odds ratio</i>	0.863*	1.115	1.018	0.807
<i>Recession Effect^b</i>				
Year×TTWA _{Δur}	0.186	0.084	-0.262	-0.026
	(0.134)	(0.157)	(0.214)	(0.226)
<i>log odds ratio</i>	1.204	1.088	0.769	0.974
N	246254	155270	68892	43186
LogL	-7509.06	-4765.87	-2714.933	-1898.547
<i>Reform Effect^c</i>				
	<i>High Income</i>		<i>Low Income</i>	
(2005-09)-(2007-09)	-0.139***		0.100***	
	0.001		0.003	
<i>log odds ratio</i>	0.870***		1.105***	

First year entrants only in English universities.

All models contain the same control variables as in the base model.

^b Recession effect columns 2 and 4.

^c (Year+Interaction)_{2005/09} – (Year+Interaction)_{2007/09}

Table 11: Effect of the reform by variation of unemployment in subgroups of TTWA and by university type

<i>Panel A: High Unemployment areas</i>				
	<i>Russell Group</i>		<i>Other Universities</i>	
	<i>2005-2009</i>	<i>2007-2009</i>	<i>2005-2009</i>	<i>2007-2009</i>
Year	-0.206*	-0.492***	-0.341***	-0.271***
	(0.119)	(0.076)	(0.044)	(0.027)
<i>log odds ratio</i>	0.814*	0.612***	0.711***	0.763***
TTWA $_{\Delta ur}^a$	0.393***	0.218***	-0.044	0.112***
	(0.103)	(0.070)	(0.038)	(0.029)
<i>log odds ratio</i>	1.482***	1.244***	0.957	1.118***
<i>Recession Effect^b</i>				
Year \times TTWA $_{\Delta ur}$	-0.179	0.342***	0.189***	0.070*
	(0.139)	(0.105)	(0.053)	(0.040)
<i>log odds ratio</i>	0.836	1.407***	1.208***	1.072*
N	273176	493071	738081	1222385
LogL	-6951.399	-10085.93	-35227.63	-57309.13
<i>Reform Effect^c</i>				
	<i>Russell Group</i>		<i>Other Universities</i>	
(2005-09)-(2007-09)	-0.235***		0.048***	
	0.001		0.001	
<i>log odds</i>	0.791***		1.050***	

<i>Panel B: Low Unemployment areas</i>				
	<i>Russell Group</i>		<i>Other Universities</i>	
	<i>2005-2009</i>	<i>2007-2009</i>	<i>2005-2009</i>	<i>2007-2009</i>
Year	-0.779***	-0.679**	-0.342***	-0.317***
	(0.264)	(0.271)	(0.076)	(0.081)
<i>log odds ratio</i>	0.459***	0.507**	0.710***	0.728***
TTWA $_{\Delta ur}$	0.257	-0.095	-0.147**	-0.038
	(0.167)	(0.181)	(0.063)	(0.070)
<i>log odds ratio</i>	1.293	0.910	0.863**	0.962
<i>Recession Effect^b</i>				
Year \times TTWA $_{\Delta ur}$	0.236	0.673**	0.100	0.072
	(0.293)	(0.305)	(0.090)	(0.097)
<i>log odds ratio</i>	1.266	1.961**	1.105	1.075
N	118873	105326	339784	260336
LogL	-2405.378	-2198.228	-14105.53	-11505.18
<i>Reform Effect^c</i>				
	<i>Russell Group</i>		<i>Other Universities</i>	
(2005-09)-(2007-09)	-0.537***		0.004***	
	0.002		0.001	
<i>log odds ratio</i>	0.584***		1.004***	

First year entrants only in English universities.

All models contain the same control variables as in the base model.

^b Recession effect columns 2 and 4.

^c (Year+Interaction)_{2005/09} - (Year+Interaction)_{2007/09}

Table A1: Descriptive Statistics - Sample proportions

	<i>Mean</i>	<i>Std. Dev.</i>
male	0.442	0.497
English	0.956	0.205
Scottish	0.005	0.074
Welsh	0.02	0.139
Northern Ireland	0.01	0.098
EU24	0.009	0.097
White	0.753	0.432
Black	0.06	0.237
Asian	0.114	0.317
Other/Unknown	0.064	0.246
Non UK	0.009	0.097
high income family	0.415	0.493
middle income family	0.2	0.4
low income family	0.147	0.354
Level 2 and below	0.068	0.251
NVQ Level 4	0.059	0.236
1st quartile tariff score	0.252	0.434
2nd quartile tariff score	0.206	0.405
3rd quartile tariff score	0.212	0.409
4th quartile tariff score	0.203	0.402
State-funded school or college	0.792	0.406
Privately funded school	0.106	0.308
mature	0.147	0.354
Rusell group	0.223	0.416
1994 Group	0.144	0.351
Other universities	0.633	0.482
Medical sciences	0.224	0.417
Physical sciences	0.154	0.361
Social sciences	0.204	0.403
Humanities	0.268	0.443
Creative sciences	0.151	0.358