Investing in Your Future? How the Cost of University Shapes Labour Market Outcomes

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Abstract

Reducing subsidies to higher education raises concerns about people's willingness to invest in human capital, yet little is known about these effects in settings without credit constraints. I exploit a natural experiment in which the UK government substantially reduced subsidies by raising the price control on university tuition fees to estimate the causal impact on enrolment and early-career labour market outcomes using a difference-in-discontinuities design. The evidence shows that higher tuition fees reduced overall university enrolment, primarily through a fall in participation at less selective institutions, consistent with students becoming more responsive to expected returns. Students from low-income backgrounds were not disproportionately affected, likely due to the UK's income-contingent loan system, which mitigates credit constraints. Overall, the cohort affected by the reform was significantly more likely to enter higher-paying industries by age 25. These findings provide new evidence that a reduction in state subsidies to higher education can reshape, rather than diminish, human-capital investment when supported by a progressive loan system.

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1 Introduction

The cost of higher education plays a central role in human capital investment, shaping both individual decisions to pursue further study and governments' willingness to subsidise that investment. Classic human capital models predict that individuals invest in higher education when the present value of future returns, net of costs, exceeds the value of entering the labour market directly (Becker 1964). An exogenous increase in the cost of university is therefore expected to reduce overall demand, with the largest declines among those pursuing lower-return subjects and institutions.

One widely cited rationale for state intervention and subsidisation is the presence of credit constraints. Individuals with strong academic potential but without collateral may be unable to secure private finance for tuition or living costs, even when the expected returns to university are high. Such barriers to accessing capital can prevent capable students from enrolling, and therefore constitute a clear market failure. Much of the existing literature focuses on these credit constraints, which prevent individuals from financing education even when it would be privately optimal (Black et al. 2023). Broadly, the literature supports the notion that support for credit constrained individuals not only improves outcomes but pays for itself many times over (Denning et al. 2019).

This study examines a reform that allows this friction to be largely set aside. The UK's 2012 tuition fee reform substantially increased the headline cost of university but, because all students had access to government-backed income-contingent loans, credit constraints were effectively mitigated. This provides a clear test of how a reduction in state subsidies affects the decision to pursue higher education and subsequent labour market choices in a context where the under provision of capital should not be a factor.

The theoretical predictions are straightforward. Students with low expected returns to higher education will rationally choose not to enrol; enrolment in institutions with lower projected re-

turns will fall the most; and, due to the progressive loan design, low-income individuals should not be disproportionately affected. These predictions are consistent with the empirical evidence presented in this paper.

I estimate the causal effect of a large tuition fee increase on university participation and early career labour market outcomes. The reform raised fees sharply and uniformly across England and Wales, limiting the scope for substitution across institutions or regions. I find that students were around four percentage points less likely to enrol in university, with the decline concentrated in institutions with lower expected returns. Students from low-income backgrounds were not differentially affected, and if anything exhibited a smaller decline in their enrolment. The cohort exposed to the reform were 3% more likely to enter industries above the median in pay by age 25 and 5% more likely to enter industries in the upper quartile of pay at the same age.

To identify these effects, I exploit the alignment of the 2012 reform with England's school-entry cut-off, using a difference-in-discontinuities design to test whether the discontinuity between September and August-born students changed following the reform. Students born after September 1st enter school one academic year later than those born just before the cut-off, generating a predictable age-at-entry discontinuity in educational outcomes. My design tests whether that discontinuity changed in the 2012 cohort, providing a clean measure of the policy's causal effect.

I draw on population-wide administrative data linking the National Pupil Database (NPD), Higher Education Statistics Agency (HESA) records, and HMRC tax and benefits data. This Longitudinal Education Outcomes (LEO) dataset allows me to track entire cohorts from secondary school through university and into the labour market. I focus on cohorts entering university between 2007 and 2014, estimating effects on overall enrolment, enrolment at selective institutions, and early career industry selection.

I find three main results. First, the fee increase led to a four percentage point reduction in university enrolment. Second, this decline occurred primarily in less selective institutions and

among students with lower A-level attainment, consistent with students responding to higher costs by avoiding universities with lower returns. There is no evidence of heterogeneity in this response by socioeconomic background or other demographics, though the decline in enrolment for low income students was estimated to be lower than the overall effect. This suggests that the design of the student loan system effectively shielded credit-constrained individuals. Finally, I find that the probability of employment in higher-paying industries rose for the cohort overall, indicating that the reform improved labour market outcomes by encouraging a more rational sorting of individuals between higher education and the labour market without widening inequality.

This paper contributes to our understanding of how cost-sharing in higher education influences both efficiency and equity. When governments shift a greater share of higher education costs to individuals, students appear to respond by making more economically rational enrolment decisions, reallocating away from low-return institutions and see improved labour market outcomes. These behavioural responses can reduce public spending without substantially harming access or outcomes.

While previous literature has typically focused on credit-constrained subgroups, I show that a well-designed income-contingent loan system can effectively eliminate these constraints for low-income students, ensuring that those with high potential are not deterred from attending university even as individuals are required to contribute financially. Methodologically, this paper leverages linked administrative data that cover the full population of students in England, enabling outcomes to be followed well into adulthood. Unlike many prior studies, my design captures long-run effects and avoids selective substitution, as the reform applied universally across England and Wales, leaving no scope for students to avoid treatment by choosing an alternative region or institution.

The remainder of the paper is structured as follows. Section 2 reviews the related literature. Section 3 provides institutional background on the UK higher education system and the 2012 reform. Section 4 describes the data sources and sample construction. Section 5 outlines the

empirical strategy. Section 6 presents the main findings, and Section 7 reports robustness checks and additional analyses. Section 8 concludes.

2 Related Literature

Human capital theory provides the foundational framework for understanding individuals' decisions to pursue higher education. In this framework, students weigh the upfront costs of university such as tuition fees, living expenses, and foregone earnings against the expected long-term returns in the form of higher wages and improved employment prospects [(Becker 1964); (Mincer 1974)]. In a perfectly informed and credit-unconstrained world, individuals would invest in education up to the point where the marginal return equals the marginal cost.

In practice, several frictions can lead to underinvestment. Young people may lack reliable information about the returns to different degrees, or may be influenced by local norms or cultural expectations that discourage university attendance [(Jensen 2010); (Hoxby and Turner 2015)]. In addition, capital markets often fail to allocate resources efficiently to individuals with high potential but low current income, due to the non-collateralisable nature of human capital (Lochner and Monge-Naranjo 2011). These factors provide a rationale for public investment in higher education, both to correct underinvestment and to promote intergenerational mobility. Government funding may also be justified on the basis of positive externalities such as innovation, civic engagement, and productivity spillovers, that are not fully captured in private returns.

A large international literature has examined how financial incentives affect higher education participation and attainment, though most studies focus on changes in student aid rather than direct changes in costs. In the United States, generous need-based grant programs have been shown to increase university enrolment and persistence, particularly among low-income students [(Dynarski 2003); (Bettinger 2004); (Castleman and Long 2016)]. Similar effects are found for targeted information or application assistance interventions, which reduce behavioural barriers to

university entry [(Bettinger et al. 2012); (Hoxby et al. 2013)].

This literature extends into the impact of financial aid on the labour market more broadly. Increases in financial aid at the federal level have been shown to increase degree completion, improve later life earnings, and increased debt does not appear to have any impact on home ownership rates or default [(Black et al. 2023); (Denning et al. 2019)]. These benefits have even been shown to be a net financial benefit for the federal government (Denning et al. 2019).

However, these studies generally examine changes to the effective price for a narrow set of students, such as those just above or below eligibility thresholds, and rarely capture broader, population-level responses to cost. Moreover, much of this literature focuses on the impact of changing aid structures which is conceptually different from an increase in tuition costs. Increases in loan aid help to mitigate the impact of under-allocation of capital to low-income students with high potential, while increases in tuition cost affects the decision to invest in human capital from a lifetime return perspective. The institutional features of the UK reform enable a clearer test of the causal impact of higher education costs on behaviour and outcomes at scale.

The UK literature has focused primarily on the educational effects of higher tuition fees, with relatively little attention paid to labour market outcomes, largely due to historical data limitations. Consistent with theoretical predictions and the evidence presented in this paper, higher tuition costs have been shown to reduce university enrolment, particularly in subjects with lower expected returns [(Dearden et al. 2011); (Sá 2014)]. However, existing studies have not examined how such reforms affect degree persistence, academic performance, or progression to postgraduate study, leaving important dimensions of educational behaviour and attainment underexplored.

The most closely related study to this paper finds relatively limited effects of the 2012 tuition fee reform on student outcomes (Azmat and Simion 2021). In contrast to the broader UK literature and the findings presented here, the authors report no meaningful change in overall university enrolment or in the composition of subject choice by expected return. Their labour market analysis similarly suggests minimal effects on pay and employment outcomes.

However, the identification strategy in this study may be confounded by concurrent policy changes such as the 2015 raising of the compulsory schooling age to 18 and the removal of the student numbers cap, which both were intended to increase enrolment independently of tuition fees. Moreover, their analysis relies on the Destination of Leavers from Higher Education (DLHE) survey, which captures a single snapshot of employment status six months after graduation and offers only static, short-term outcomes. In contrast, this paper leverages administrative tax and education records to follow full cohorts of students over multiple years, allowing for a more comprehensive assessment of the long-run effects of the reform on both educational attainment and labour market trajectories.

3 Institutional Background

In the decades following WWII, the funding of students into higher education was largely done by local authorities, an approach which was formalised by the passage of the Education Act (1962). This mandated that local Education Authorities pay tuition fees and provide maintenance grants for eligible full-time university students (UK Parliament 1962). In practice, the 1962 Act made undergraduate education effectively free at the point of use across the UK. Students received means-tested grants for living costs and tuition, which were non-repayable, enabling those from less affluent backgrounds to attend university without upfront financial barriers.

The drive for higher education was summarised in the Robbins Report commissioned by the UK government and published in 1963, which made several recommendations including the expansion of the entire university system and with a focus on a holistic approach to research and teaching (Committee on Higher Education 1963). The report inadvertently summarised the economic case for higher education being free at the point of use: namely that there were considerable positive social and financial externalities, and that the growth of the economy and tax receipts would likely lead to a positive return on investment for the government.

This assumption began to be challenged in the 1990s. Student numbers had grown rapidly and funding per pupil had declined by 40% between the early 1980s and 1997 which put considerable pressure on university budgets (Dearden et al. 2011). Along with funding issues, the case for higher education having a positive return on investment to the exchequer had begun to wane. The Dearing Report (1997) noted that the introduction of a cost sharing approach would be equitable since graduates were the primary beneficiaries of university education (National Committee of Inquiry into Higher Education 1997).

Britton et al. (2020) estimate the lifetime public and private returns for students attending higher education institutions in the 1990s and 2000s, finding that while there is a considerable average return on investment of tax receipts net of public subsidies, these returns are mostly driven by the highest earning individuals. Indeed, the report finds that total returns (including tax receipts and the private wage premium associated with university) was negative for up to 30% of people.

3.1 Post-1998 Reforms

Following the Dearing report, the Labour government passed the Teaching and Higher Education Act (1998). The Act introduced annual tuition fees of £1,000 for public higher education institutions (HEIs), to be paid upfront by students (UK-Government 1998). At the same time, maintenance grants were abolished and replaced with income-contingent maintenance loans (Hillman 2013). The change introduced a cost sharing approach to funding higher education, with the government still shouldering the majority of the burden, and exemptions were made for students from low income families. It is worth noting that, following devolution in 1999, the different UK nations began to diverge in tuition fee policy even as £1,000 fees were introduced UK-wide.

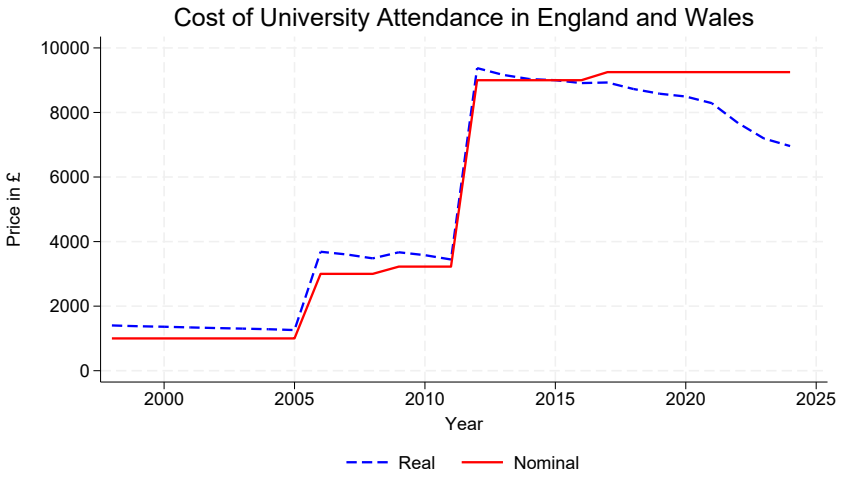
Scotland initially implemented a "graduate endowment" system (a one-time payment after graduation in lieu of upfront fees) and by 2007 abolished tuition fees entirely for Scottish-domiciled undergraduates at Scottish universities (Sá 2014). By the early 2000s, the £1,000

fee cap was yielding limited revenue and universities remained under financial strain amid growing student numbers. There was also public dissatisfaction with the requirement that fees be paid upfront, which was seen as a barrier to access. The government responded with a second major reform: the Higher Education Act 2004, which ushered in a system of "variable" tuition fees up to a new higher cap of £3,000 per year (UK Parliament 2004). These changes took effect from the 2006–07 academic year.

Crucially, under the 2004 Act students would no longer pay tuition fees upfront. Instead, fees would be covered by government-backed student loans, and repayment would be deferred until after graduation, with graduates repaying their tuition (and maintenance) loans on an income-contingent basis of 9% of their earnings above a £15,000 per year threshold (UK Parliament 2004). Any remaining loan would be written off after 25 years. This once again made university free at the point of use, though reduced an individual's lifetime income through an effective graduate tax. This detail is important since it makes the UK literature distinct from the US, where much of the debate around funding centres on an under-allocation of capital to students who cannot use their potential as collateral for student loans.

In 2010, economic recession as well as the declining real value of capped tuition fees once again began to put pressure on university finances. The government commissioned another review into student funding and finance, the Browne report was published in October 2010 and its recommendations accepted by the government in November of the same year. It advocated a radical, market driven change to increase the cap on tuition fees up to £9,000 a year for the 2012-13 academic cohort (Independent Review of Higher Education Funding and Student Finance 2010). In theory, this was intended to create a free market for fees to drive efficiency gains, but in practice almost all universities began charging the maximum immediately after the policy came into effect in the 2012-13 academic year (House of Commons Library 2018).

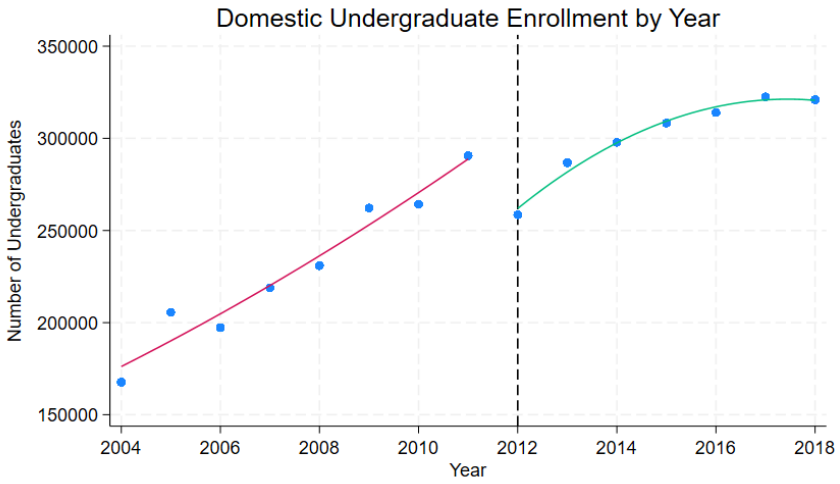
Figure 1



The reform also shifted the repayment threshold from just below £16,000 to £21,000 a year, increased the duration of payment from 25 to 30 years, and introduced a new higher interest rate (House of Commons Library 2018). In practice, this meant that the policy was more progressive as the lowest earners may have indeed been paying less per month than under the older policy (Britton et al. 2017). The reforms are summarised in figure 1.

The graph shows the main discontinuities between 1998 and 2024, with the 2012 increase clearly being a substantial outlier in terms of increased costs. Figure 2 displays trends in undergraduate enrolment over the sample period. There is a general pattern of year-on-year growth in student numbers, with a notable exception in 2012, where enrolment drops sharply—coinciding with the introduction of the higher tuition fee cap. Although participation rates begin to recover in subsequent years, they appear to do so at a slower pace than the pre-reform trend. Not shown in the graph are other reforms that occurred in the same or later years that may have affected enrolment in subsequent years such as the requirement that students continue to post 16 education or the relaxation of the university student number cap.

Figure 2



4 Data and Descriptive Statistics

This paper uses data from the Longitudinal Education Outcomes (LEO) dataset. This administrative panel links data from school censuses stored in the National Pupil Database (NPD) on student characteristics to the Higher Education Statistics Agency (HESA) which collects data on students' university choices and outcomes. This is then matched further to administrative HMRC data on earnings, employment, and benefits registered within the UK. This leaves me with a longitudinal panel with coverage of over 30 million people across a 22 year period (1998-2020) from which I select a sample of students from the 2007/08, 2009/10 2010/11, 2011/12, 2012/13, 2013/14, and 2014/15 academic years at university.

Personal characteristics contained within the NPD are used for heterogeneity analysis. Family income is not included within the NPD data, so an indicator for whether an individual had access to free school meals in year 11, a means-tested program for children from low-income backgrounds, is used as a proxy for childhood poverty.

The aim of this paper is to identify the causal impact of the exogenous increase in tuition fees on student outcomes. As the reform was announced two years in advance of its implementation in the 2012 academic year, there exists the potential for anticipatory behavioural responses. In

particular, students from earlier cohorts who were undecided about university attendance or delayed entry (e.g., via a gap year) may have accelerated their enrolment to avoid the higher fee regime. To address this concern, the analysis is restricted to individuals who entered university in the academic year immediately following their 18th birthday, thereby focusing on those enrolling at the typical age.

While it remains possible that some individuals who might otherwise have delayed entry chose instead to enrol immediately due to the fee announcement, thereby inflating participation rates in the pre-reform period, no evidence of this is found. Strangely, it appears students begin to reduce their enrolment in university in the year prior to the implementation of fees. This is possibly due to students mistakenly believing that the fee increase would occur immediately after the announcement was made, rather than being delayed until the 2012 academic year.

Table 1 presents summary statistics for first-year university entrants immediately before and after the 2012 tuition fee reform. The overall composition of entrants remained relatively stable between the 2011 and 2012 cohorts, with the exception that enrolment in undergraduate degrees declined by 2.3 percentage points. The share of female students remained unchanged at around 56 percent. The proportion of non-white entrants rose slightly, from 24 to 25 percent, and the share of students eligible for free school meals increased marginally from 9 to almost 10 percent. There was also a small rise in the proportion of entrants from areas with historically low university participation. Notably, however, the share of entrants attending more selective institutions increased from 45 to 48 percent, suggesting that while overall enrolment fell, students who did enrol were increasingly concentrated in higher-ranked institutions.

Table A.1 in the appendix gives the overall demographic composition of 2011 and 2012 cohorts. While women make up roughly half of the overall population (about 50 percent), they account for a larger share of university entrants, at around 56 percent. Conversely, students eligible for free school meals and those from areas with low university participation remain underrepresented in higher education, despite small increases in their overall population shares between

Table 1: University Entrant Characteristics Before and After the 2012 Fee Reform

	2011	**2012**
Enrolment into university (%)	24.8	22.5
Female (%)	55.7	55.7
Non-white (%)	24.3	25.3
Eligible for FSM (%)	9.0	9.6
From low university-share area (%)	56.0	56.8
Attending above-average institution (%)	44.8	47.9

Notes: This table reports the share of first-year university entrants by key demographic and background characteristics in 2011 (pre-reform) and 2012 (post-reform). FSM = Free School Meals. "Low university-share area" indicates local areas with below-average university participation in 2011. "Attending above-average institution" refers to institutions ranked above the median in terms of average A-level points of entrants.

2011 and 2012. The share of non-white individuals rose slightly in both the general cohort and among university entrants, which could have contributed mechanically to a modest rise in university participation rates given the higher enrolment propensity among these groups.

5 Methodology

This paper asks whether a sharp increase in the cost of university affected students' decisions about whether to attend, what to study, and how they fared in the labour market. Estimating the causal effect of higher education costs on these outcomes is difficult, as tuition fees typically evolve alongside other policy changes, such as reforms to the generosity of maintenance support. Broader macroeconomic shocks, such as the financial crisis, may also confound simple comparisons. Students facing a weak labour market may enrol in university as a form of strategic delay. These factors make it challenging to isolate the effect of tuition fee changes from other influences on educational and labour market decisions.

To overcome this, I exploit a natural experiment created by the structure of England's school-entry system and the timing of the 2012 tuition fee reform. In England, children are placed into academic cohorts based on their birthdate, with a strict cutoff on 1 September. Those born just before the cutoff (e.g. in August) enter school a full year earlier than those born just after

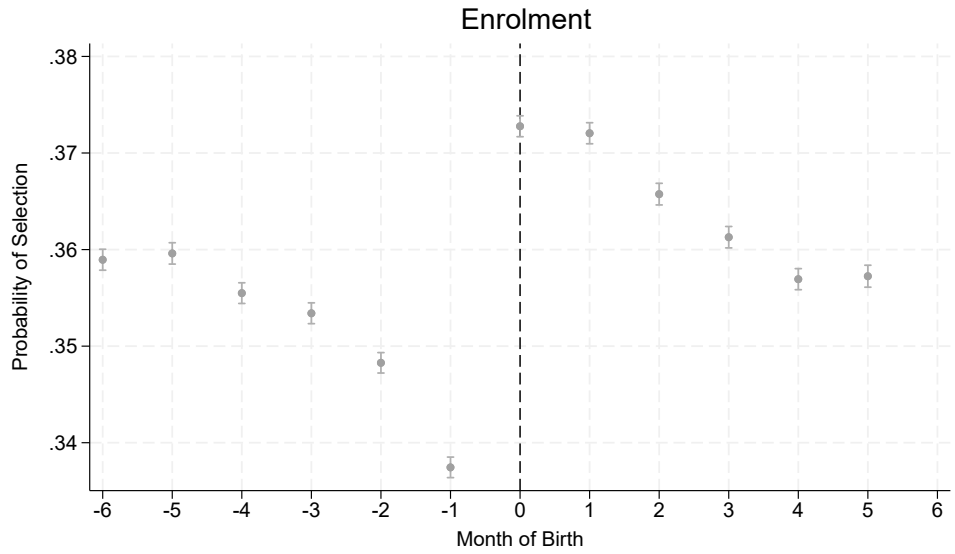


Figure 3: Probability of university enrolment by month of birth, centred at 0 for September-born students, illustrating the discontinuity around the academic year cutoff.

(e.g. in September), even though they are only days apart in age. This leads to sharp and well-documented differences in long-term outcomes, including university attendance and earnings, between children born on either side of the cutoff, commonly referred to as the "Relative Age Effect" [(McPhillips and Jordan-Black 2009); (Campbell 2013); (Crawford et al. 2013); (Russell and Startup 1986); (Crawford et al. 2014). I show evidence of this premium in Figure 3, with September born individuals being significantly more likely to enrol in university, with a steady decline in each subsequent birth month. Across my sample, students born in August are more than 3 percentage points less likely to enrol in university compared to those born in September.

The 2012 tuition fee reform raised the maximum university fee from £3,375 to £9,000 for students entering higher education from September 2012 onwards. Because students enter university in the academic year following their 18th birthday, those born in September 1993 or later were the first cohort fully exposed to the higher fees, while those born just before the cutoff were not. This creates a sharp shift in policy exposure that aligns with the existing school-entry discontinuity.

My identification strategy exploits this structure by examining whether the relative age effect

deviates from its usual pattern in the 2012 university entry cohort. If the tuition fee increase had no effect, we would expect the size of the relative age effect to remain stable across cohorts. A change in the size of the discontinuity that occurs only in the cohort affected by the reform can therefore be interpreted as the causal effect of the policy. This approach, known as a difference-in-discontinuities design, leverages two sources of plausibly exogenous variation: the sharp birthdate cutoff that determines school entry, and the policy reform that raised tuition fees for a specific cohort. I therefore estimate a regression model of the following form:

$$\mathrm{Y}_{i,m,t} = \alpha + \tau(D_i \cdot \mathrm{Fee}_i) + \gamma D_i + \delta \mathrm{Fee}_i + \beta_1 X_{i,t} + \gamma + \epsilon_{i,m,t}$$

Where $\mathrm{Y}_{i,m,t}$ Is the outcome of individual i with month of birth m and year of birth t. This could be enrolment, choice of institution, or selection into higher paid industries. α is the intercept term. $D_{i,m,t}$ is the RDD treatment indicator, equal to 1 if individual i in cohort c was born in the first month of the academic year (September), and 0 if born in August. Fee: is the Post-treatment indicator, equal to 1 for the cohort affected by the tuition fee change, and 0 for all other cohorts. $X_{i,t}$ is the month of birth of individual i. $\gamma_{i,m}$ is the year of birth fixed effects term, ensuring we capture individuals at the age cut-off for the academic year. $\epsilon_{i,m,t}$ is the error term, capturing unobserved factors affecting wages that vary by individual within each cohort.

τ is the interaction of $D_{i,c}$ and Post_c, is the coefficient of interest, which represents the difference-in-discontinuities estimator. This is the change in discontinuity that occurs in the year tuition fees were increased. Conceptually, I am measuring the gap between Summer-born and Autumn-born individuals, and measuring whether this gap gets significantly bigger or smaller in the cohort with increased fees. All specifications cluster at the cohort level.

The key identifying assumption of this model is that no other policy or cohort-specific shock affected any of the cohorts in my sample. I show in section 7 that the results are robust to expanding or changing the estimation window, as well as reducing the window that defines a 'Septem-

ber birth'. One potential concern is changes to loan aid during this time, however any changes evolved smoothly across the sample period and should therefore be conceptually differenced out by the estimation (House of Commons Library 2018).

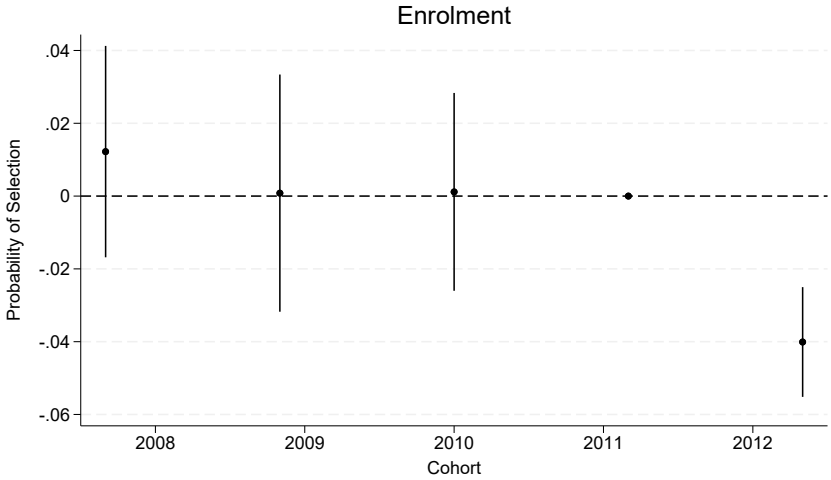
A further potential concern is that some Summer-born students may defer school entry to avoid the so-called birthday penalty. For this to bias the results, there would need to be a substantial and cohort-specific increase in delayed entry among those who later faced higher tuition fees in 2012. Any gradual trend in delayed entry over time would, in principle, be absorbed by the difference-in-discontinuities design. Figure A.1 plots the share of students who delay entry into primary school by university entry cohort. The proportion is very small, approximately 0.5 percent, and there is no evidence of any discontinuous change around the affected cohort. As an additional precaution, the main analysis excludes individuals whose date of birth does not align with the standard academic year of entry.

6 Results

Figure 4 presents the estimated difference-in-discontinuity effects on the probability of university enrolment for cohorts entering between 2008 and 2012. The first four estimates serve as placebo tests, capturing estimated discontinuities for cohorts unaffected by any fee reform. These are estimated excluding the 2012 discontinuity, since including it would bias the estimated birthday premium downward and thereby inflate the placebo estimates. Because the 2012 cohort is omitted, the 2011 cohort cannot be separately identified due to collinearity with the year-of-birth fixed effects, and is therefore not estimated in the central specification.

The estimates remain close to zero in the pre-reform years, indicating stable enrolment patterns prior to the tuition fee increase. In 2012, however, there is a sharp decline of around four percentage points in the likelihood of university entry, representing a substantial contraction in participation coinciding with the introduction of higher fees. This is well above the 2.3-

Figure 4



Note: Figure plots the estimated difference-in-discontinuity effects on the probability of university enrolment for cohorts entering between 2008 and 2012. Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuses.

percentage-point decline observed between the 2011 and 2012 entry cohorts, and corresponds to a 16% decline in overall enrolment.

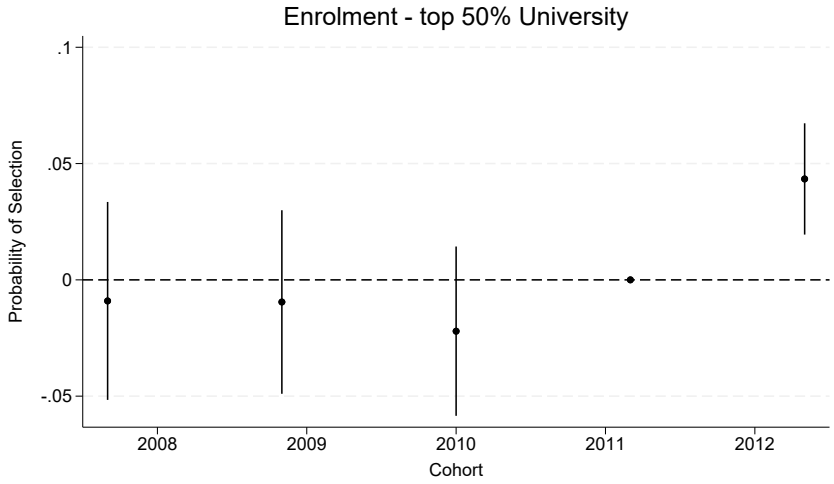
Given the substantial decline in overall university enrolment shown in Figure 4, the next step is to examine how the composition of enrolment changed across institutions. Conditional on students deciding to attend university, Figure 5 plots the estimated difference-in-discontinuity effects for enrolment at universities above the median in selectivity[1]. This analysis captures whether students became more or less likely to enter higher-ranked institutions following the reform.

The estimates show a marked increase in the likelihood of attending a higher-ranked institution following the 2012 fee reform, suggesting that while fewer students enrolled overall, those who did were increasingly concentrated in more selective universities. This pattern implies that higher tuition fees may have discouraged marginal applicants, who are typically more likely to attend lower-ranked institutions, while leaving enrolment at top universities relatively unaffected. Consequently, the reform appears to have intensified the stratification of higher education partici-

[1]Selectivity is defined by ranking institutions according to the average A-level points of their entering students.

pation, shifting the composition of entrants toward students with stronger academic backgrounds or higher expected returns. For completeness, I re-run this estimation in Figure A.2 without conditioning on university entry, finding a smaller (but still highly significant) two percentage point increase in unconditional enrolment into selective institutions.

Figure 5



Note: Figure plots the estimated difference-in-discontinuity effects on the probability of enrolment at universities above the median in selectivity. Estimates are conditional on entry into university. Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuses.

The preceding results suggest that the overall decline in university enrolment following the 2012 fee reform was driven primarily by marginal students opting out of higher education. To explore this directly, Figure 6 interacts the difference-in-discontinuity estimator with measures of academic ability, captured by standardised A-level point scores. The interaction term is positive and statistically significant, but only at the 5% level unlike the other results which are significant at the 1% level, likely due to an outlying result in 2008 which flattens the other regression discontinuities. On it's own, this result indicates that higher-ability students were more likely to enrol following the reform. This finding supports the interpretation that the fee increase disproportionately deterred lower-ability students, consistent with a tightening of the ability margin for university participation.

To strengthen this interpretation, I re-estimate the specification in Figure A.3 after excluding

Figure 6

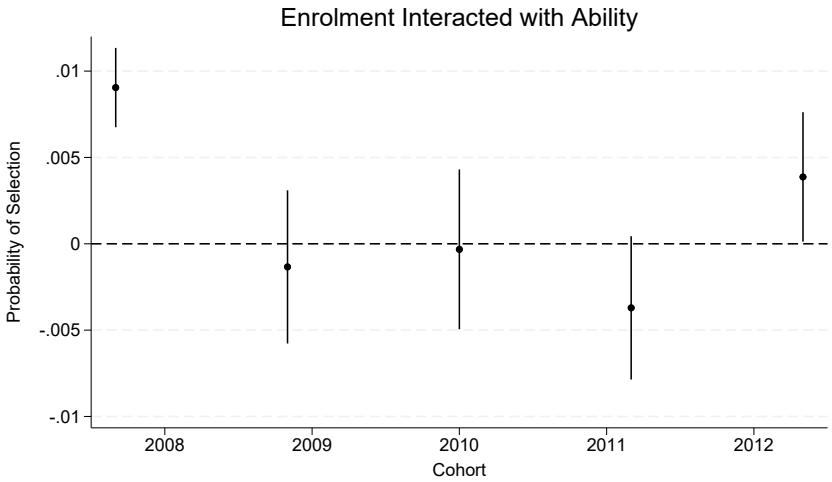


Figure plots the estimated difference-in-discontinuity effects on the probability of university enrolment for cohorts entering between 2008 and 2012. Estimates are interacted with the standardised total points scored at A-level, a proxy of student ability. Estimates are conditional on entry into university. Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuses.

the 2008 outlier. The estimated effect becomes larger and more precisely estimated, which is consistent with the notion that the earlier result was attenuated by this anomalous cohort.

I then examine whether the tuition fee increase affected enrolment into postgraduate study, such as master's and doctoral programmes, which experienced no exogenous price changes during this period. Figure 7 presents the cohort-level estimates for enrolment into any postgraduate course. We observe a clear increase of approximately 2.4 percentage points relative to a baseline rate of 20 percent. The unconditional estimation shows no comparable increase[2]. The higher propensity of the 2012 cohort to progress into further study provides additional support for the interpretation that the smaller group of students who enrolled after the reform were disproportionately higher-ability individuals who were more likely to pursue postgraduate degrees irrespective of the fee change.

[2]Figure A.4 presents the unconditional estimates for enrolment into postgraduate courses.

Figure 7

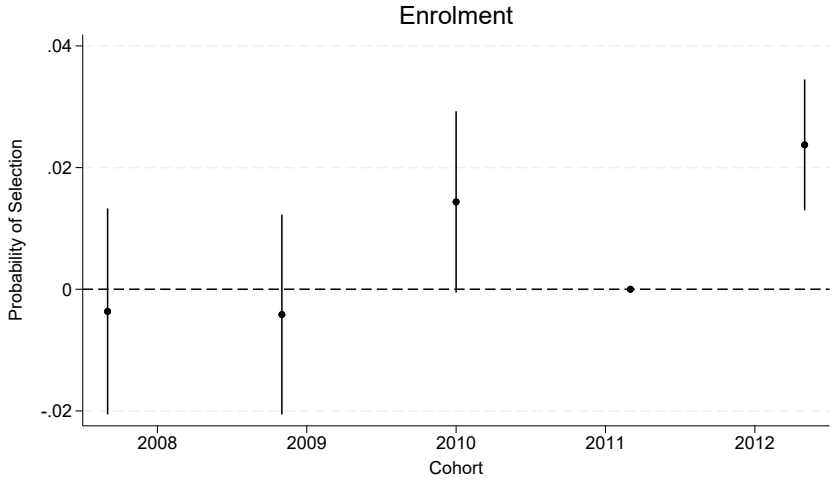


Figure plots the estimated difference-in-discontinuity effects on the probability of university enrolment for cohorts entering between 2008 and 2012. Estimates are interacted with the standardised total points scored at A-level, a proxy of student ability. Estimates are conditional on entry into university. Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuses.

6.1 Heterogeneous Effects by Income Background

This pattern raises a broader concern about potential distributional effects. If academic ability is correlated with other observable characteristics such as socioeconomic background, ethnicity, or gender, then the reform's impact may have been uneven across groups. The reform therefore has the potential to widen existing participation gaps, such as those observed for students eligible for free school meals particularly if these groups are more price sensitive.

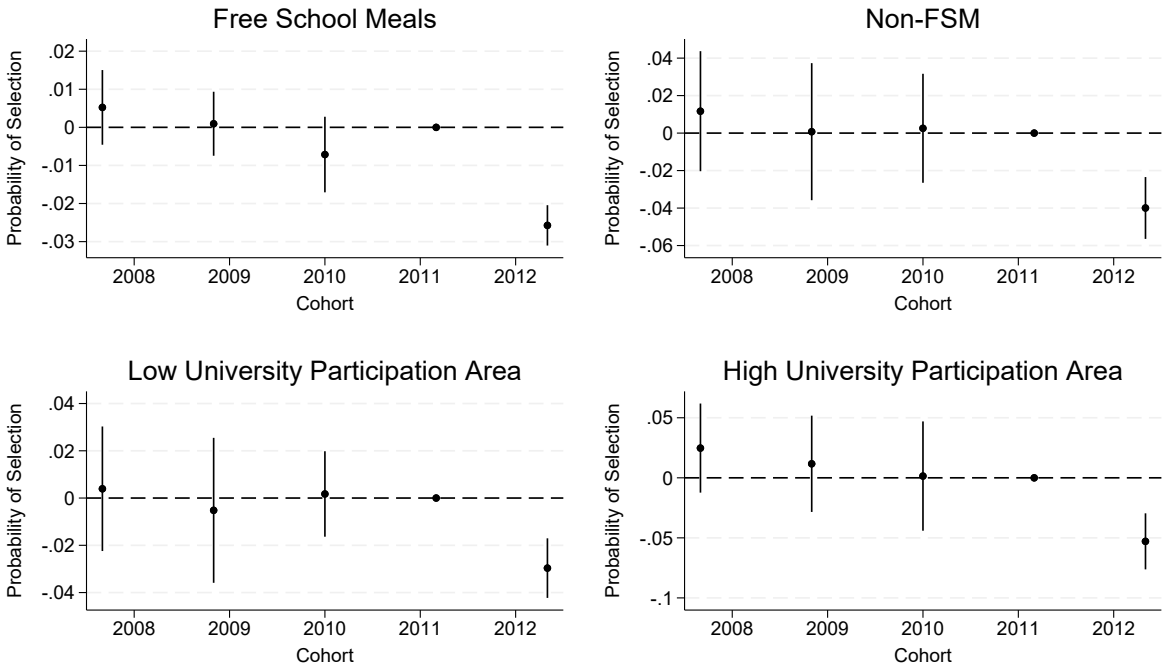
Figure 8 plots enrolment trends for two indicators of low socioeconomic status. The first is eligibility for free school meals when they were in year 11 and the second is residence in a neighbourhood with below median university participation. The y-axis is deliberately allowed to vary across panels so that it is easier to compare the point estimates of each estimation.

The evidence indicates that individuals who had received free school meals experienced a 2.3 percentage point reduction in enrolment. Those who had not received free school meals exhibited a larger decline of approximately 4 percentage points. A similar pattern is observed when stratifying by neighbourhood participation rates. Students from areas with lower university participation

saw a decline of 3 percentage points, compared with a 5.3 percentage point reduction among students from higher participation areas. These patterns do not support the view that the reform disproportionately reduced enrolment among those from more disadvantaged backgrounds. On the contrary, the reduction is weaker among lower socioeconomic groups, consistent with the notion that the universal loans system provided some degree of insulation from the increase in fees.

Figure A.5 presents the results separately for men and women, and for white and non-white individuals. There is no evidence of heterogeneous effects along these dimensions. The results are therefore consistent with the interpretation that the removal of subsidies did not widen existing participation gaps across demographic groups.

Figure 8



Note: Figure plots the estimated difference-in-discontinuity effects on university enrolment by key demographic subgroups, including gender, ethnicity, and socioeconomic background. Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuses.

6.2 Employment Outcomes

Having established that the tuition fee reform reduced overall enrolment while shifting participation toward higher-ranked universities and higher-ability students, the next step is to consider the longer-term labour market implications. Figure 9 Shows the estimated effect of selecting into an industry[3] that pays above the median in wages[4] by age 25 by individual entry cohort. It is important to note that this is the combined estimated effect for both graduates and non-graduates in the aggregate. There is a distinct 1.1 percentage point increase in the probability of selection into an above average paying industry from a baseline of 36.7%. This is a 3% increase overall.

Figure 9

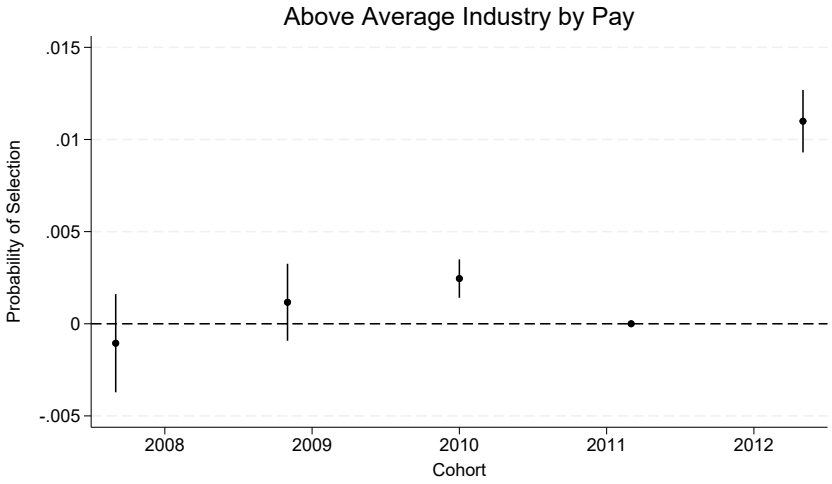


Figure plots the estimated difference-in-discontinuity effects on the probability of gaining employment in an above average paying industry by age 25, comparing cohorts entering higher education before and after the 2012 tuition fee reform. Data come from the 1998–2020 National Pupil Database, the Higher Education Statistical Agency census, and HMRC earnings and industry data.

A central concern of this figure is that it could be picking up part of the recovery from the 2008 financial crisis. Indeed, the 2010 coefficient is significant and positive and the previous two exhibit an insignificant upward movement in 2008 and 2009. That being said, these estimations

[3]Unfortunately, LEO does not cover occupation codes, so it remains a possibility that people may be shifting industry but not necessarily into more highly paid occupations.

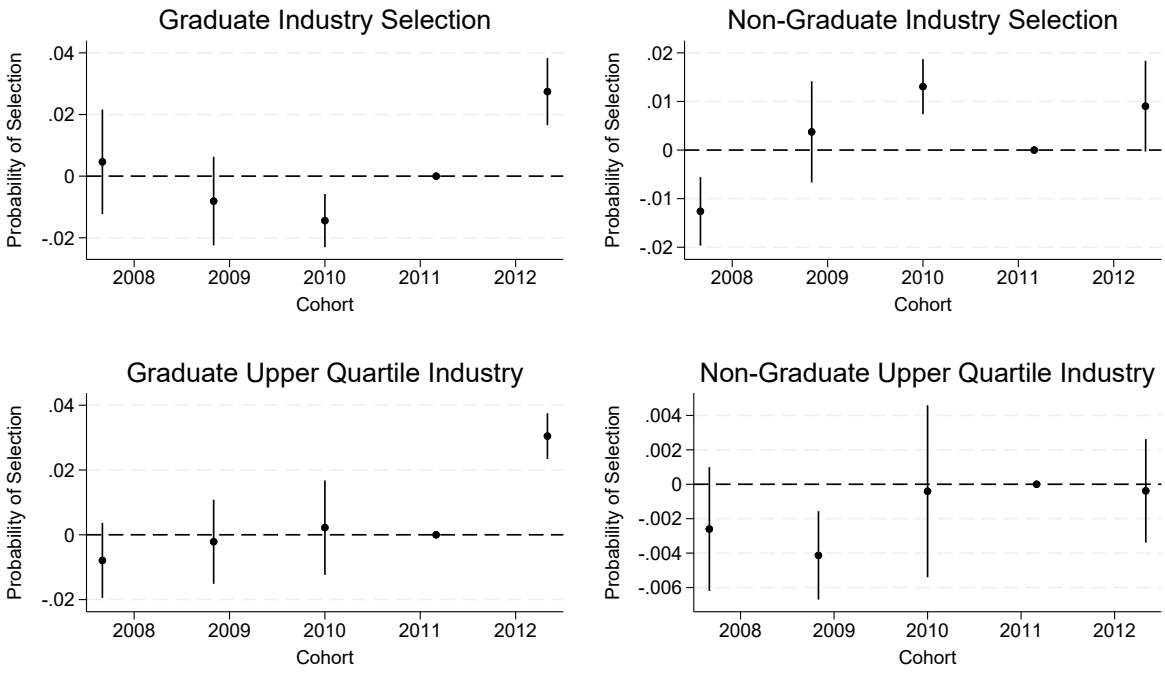
[4]A cross-section of the 2015 tax year was used as the reference to measure industries by average pay, but the results are highly robust to changing the year this is measured from.

are produced for individuals at age 25, with the earliest observations of their labour market outcomes registered in the 2015 tax year, several years after the financial crisis, and the coefficient for the 2012 cohort is 5 times greater in magnitude than the 2010 coefficient. However, to dig deeper into whether there could be scarring effects of the financial crisis I re-estimate this regression for graduates and non-graduates separately. This is presented in the upper two panels of Figure 10. For graduates there appears to be no pre-trend (or, if anything, a minor declining trend), which is intuitive as these individuals would have attended university during the worst years of the crisis and graduated into the recovery, potentially protecting them from scarring. However, for non-graduates who would have left school in the worst of the recession, there is a clear upward trend in their employment in high paying industries, providing evidence of recovery from the recession.

To account for this, I re-estimate this same specification using only selection into the upper quartile of industries by pay. The intuition here is that only a very small proportion (14.5%) of non-graduates are able to obtain a job in an industry within the upper quartile of pay, and from Figure 10 we can see their selection trends into these industries are much flatter in the pre-reform period and do not appear to significantly decline after. However, for graduates we still see increased selection into upper quartile jobs of about percentage points from a baseline of 20.3%.

Figure 11 therefore presents the aggregate effects for selection into industries in the upper quartile of pay. Across the entire 2012 cohort, we observe stable pre-trends followed by a significant 0.8 percentage point increase in selection from a baseline of 16.8%. This amounts to a 5% increase in people shifting into high paying industries, offering the strongest evidence yet that the reform caused a re-allocation of students into educational and labour market choices that better align with their underlying innate ability.

Figure 10



Note: Figure plots the estimated difference-in-discontinuity effects on Selection into industries in the upper quartile of pay, disaggregated by graduate status. Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuses.

Figure 11

Figure plots the estimated difference-in-discontinuity effects on the probability of gaining employment in an upper quartile paying industry by age 25, comparing cohorts entering higher education before and after the 2012 tuition fee reform. Data come from the 1998–2020 National Pupil Database, the Higher Education Statistical Agency census, and HMRC earnings and industry data.

7 Robustness

Placebo tests are embedded directly within the difference-in-discontinuities estimation framework in the results section. By estimating the discontinuity for multiple pre-reform cohorts, I can assess whether any observed changes in the treatment year reflect underlying trends rather than the tuition fee reform itself. In the placebo years, the estimated difference in discontinuities fluctuates noisily around zero, consistent with the absence of any systematic effect. Consequently, the associated standard errors appear larger in these years, reflecting the greater uncertainty around an effect that is expected to be null. In contrast, in the treatment year (2012), the estimate is both statistically precise and markedly negative, producing narrower confidence intervals. This pattern supports the interpretation that the estimated discontinuity shift in 2012 reflects the causal impact of the reform rather than random variation across cohorts.

A second robustness check extends the bandwidth around the September school-entry cutoff from one to four months to assess the sensitivity of the results to the definition of the discontinuity

window. The educational results are highly stable across all specifications: the decline in overall enrolment and the shift toward more selective institutions remain of similar magnitude and significance as the bandwidth widens. In contrast, the labour market estimates become less precise when using wider bandwidths, although the direction and approximate size of the effects are consistent with the main results. When the analysis is restricted to undergraduate degree holders, the labour market effects remain strong and statistically significant across all bandwidths, reinforcing the conclusion that the main findings are not driven by arbitrary bandwidth choice.

A third robustness check varies the window of observation to ensure that the results are not confounded by macroeconomic conditions surrounding the Great Recession. In particular, I exclude the 2008 and 2009 cohorts, which may capture cyclical effects unrelated to the tuition fee reform, and re-estimate the models using a restricted sample from 2010 to 2014. All central results remain robust to this narrower specification. Where estimates do change, the direction of the effect is consistent with the main findings—for example, the estimated increase in selection into higher-paying industries becomes smaller but remains positive. The attenuation likely reflects the substantial reduction in sample size when omitting early cohorts, which reduces statistical precision rather than altering the underlying relationships.

A final robustness check considers the potential influence of delayed school entry on the identification strategy. The difference-in-discontinuities design relies on the assumption that the timing of school entry around the September cutoff is stable across cohorts. Any systematic change in the proportion of parents choosing to delay their child's entry could bias the estimated discontinuity if it occurred specifically for the cohort first exposed to the higher tuition fees. For this to pose a threat to identification, there would need to be a large and abrupt increase in delayed entry among children starting school in 1998, corresponding to the cohort entering university in 2012. Such a shift is highly unlikely given the policy environment and observed long-run stability in school delayed-entry patterns, which remain stable at around 0.5%.

8 Conclusion

This paper investigates how a sharp increase in tuition fees affected university enrolment, attainment, and early career outcomes in England and Wales by exploiting a natural experiment induced by the timing of the reform in conjunction with the placement of students within an academic year. Using a difference-in-discontinuities design and population-wide linked administrative data I isolate the causal effect of higher private costs in a setting where credit constraints are mitigated by an income-contingent loan system, offering new evidence on how the price of higher education shapes human capital investment and labour market trajectories.

I show that higher tuition fees reduced overall university enrolment, with the decline concentrated among less selective institutions and among students with lower prior attainment. There is no evidence of heterogeneous effects by gender, ethnicity, or socioeconomic background, suggesting that the loan system's progressive design helped insulate disadvantaged groups from the deterrent effect of higher costs. On the labour market side, the reform did not weaken outcomes but instead reshaped them. Graduates were more likely to select into higher paying industries, while non-graduates appear to show no decline in their selection into higher paying industries despite their lower university participation. Taken together, the results indicate that the 2012 tuition fee reform led to a smaller but stronger university cohort and a more efficient matching of individuals to education and employment pathways, without widening socioeconomic inequalities.

This issue is topical, with many UK universities currently operating under severe financial strain coupled with the political difficulty governments face in raising fees sharply while avoiding backlash. My findings indicate that increases in fees, if well-paired with income-contingent repayment and targeted support, can help preserve access for disadvantaged students while giving institutions more breathing space. Given universities' squeezed margins, policy options like indexing fees to inflation, easing the proposed levy on international student income, and reducing regulatory burdens could maintain institutional viability without severely harming equity. In

particular, the evidence suggests that fee hikes should be accompanied by reforms in loan repayment thresholds and greater transparency over returns by field of study, so that both students and policymakers can weigh costs and benefits more clearly.

Viewed in an international context, the UK occupies a middle ground. A fully private system, such as in the United States, generates world-leading universities but often leaves access inequitable and capital under-allocated to high-ability students from poorer backgrounds. By contrast, fully public systems with no or minimal fees promote greater parity but risk budget constraints and higher enrolment in low-return degrees. The UK's cost-sharing model, with income-contingent repayment at its core, has so far allowed institutions to remain globally competitive while protecting disadvantaged students from being priced out. The challenge for policymakers is therefore not whether to subsidise or privatise, but how to calibrate fee and loan structures so that universities remain financially sustainable without undermining access or efficiency. The evidence in this paper suggests that the UK has managed to successfully balance this trade-off.

Overall, this paper contributes to the literature in two main ways. First, it provides rare population-level evidence consistent with the predictions of human capital theory: higher private costs reduced participation, particularly in less selective institutions, while disadvantaged students were shielded from harm by an income-contingent loan system. Second, it extends the UK evidence base by moving beyond university applications and enrolment to track labour market outcomes using rich administrative data. Unlike prior studies that rely on survey snapshots or are confounded by overlapping reforms, this paper isolates the causal impact of tuition fees and demonstrates how cost-sharing can shape both who attends university and the outcomes they achieve. More broadly, it contributes to the policy debate by showing that reductions in government subsidies that increase the private cost of tuition, when paired with progressive repayment design, need not undermine equity and can even improve the alignment between enrolment decisions, expected returns, and fiscal sustainability.

References

Azmat, Ghazala and Ştefania Simion, "Charging for higher education: Estimating the impact on inequality and student outcomes," *The BE journal of economic analysis & policy*, 2021, *21* (1), 175–239.

Becker, Gary S, "Human capita," *New York: N ational Bureau of Economic R esearch*, 1964.

Bettinger, Eric, "How financial aid affects persistence," in "College choices: The economics of where to go, when to go, and how to pay for it," University of Chicago Press, 2004, pp. 207–238.

Bettinger, Eric P, Bridget Terry Long, Philip Oreopoulos, and Lisa Sanbonmatsu, "The role of application assistance and information in college decisions: Results from the H&R Block FAFSA experiment," *The Quarterly Journal of Economics*, 2012, *127* (3), 1205–1242.

Black, Sandra E, Jeffrey T Denning, Lisa J Dettling, Sarena Goodman, and Lesley J Turner, "Taking it to the limit: Effects of increased student loan availability on attainment, earnings, and financial well-being," *American Economic Review*, 2023, *113* (12), 3357–3400.

Britton, Jack, Lorraine Dearden, and Ben Waltmann, "The 2012 tuition fee reforms made the poorest graduates £1,500 better off. Later reforms have more than wiped out that gain," https://ifs.org.uk/news/2012-tuition-fee-reforms-made-poorest-graduates-ps1500-better-reforms-have-more-wiped-out-gain 2017. Accessed July 2025.

_ , _ , Laura van der Erve, and Ben Waltmann, "The impact of undergraduate degrees on lifetime earnings," Technical Report, IFS Report 2020.

Campbell, Tammy, "In-school ability grouping and the month of birth effect," *Preliminary evidence from the Millenium Cohort Study. London: Centre for Longitudinal Studies*, 2013.

Castleman, Benjamin L and Bridget Terry Long, "Looking beyond enrollment: The causal effect of need-based grants on college access, persistence, and graduation," *Journal of Labor Economics*, 2016, *34* (4), 1023–1073.

Committee on Higher Education, "Higher Education: Report of the Committee appointed by the Prime Minister under the Chairmanship of Lord Robbins," Command Paper, London 1963. Cmnd. 2154.

Crawford, Claire, Lorraine Dearden, and Ellen Greaves, *When you are born matters: evidence for England* number R80, IFS Report, 2013.

_ , _ , and _ , "The drivers of month-of-birth differences in children's cognitive and non-cognitive skills," *Journal of the Royal Statistical Society Series A: Statistics in Society*, 2014, *177* (4), 829–860.

Dearden, Lorraine, Emla Fitzsimons, and Gill Wyness, "The Impact of Tuition Fees and Support on University Participation in the UK. CEE DP 126.," *Centre for the Economics of Education (NJ1)*, 2011.

Denning, Jeffrey T, Benjamin M Marx, and Lesley J Turner, "ProPelled: The effects of grants on graduation, earnings, and welfare," *American Economic Journal: Applied Economics*, 2019, *11* (3), 193–224.

Dynarski, Susan M, "Does aid matter? Measuring the effect of student aid on college attendance and completion," *American Economic Review*, 2003, *93* (1), 279–288.

Hillman, Nicholas, "From grants for all to loans for all: Undergraduate finance from the implementation of the Anderson Report (1962) to the implementation of the Browne Report (2012)," *Contemporary British History*, 2013, *27* (3), 249–270.

House of Commons Library, "Tuition Fee Statistics," Technical Report, House of Commons Library 2018. Notes that "most universities immediately began to charge the maximum £9,000 fee".

Hoxby, Caroline M and Sarah Turner, "What high-achieving low-income students know about college," *American Economic Review*, 2015, *105* (5), 514–517.

Hoxby, Caroline, Sarah Turner et al., "Expanding college opportunities for high-achieving, low income students," *Stanford Institute for Economic Policy Research Discussion Paper*, 2013, *12* (014), 7.

Independent Review of Higher Education Funding and Student Finance, "Securing a Sustainable Future for Higher Education: An Independent Review of Higher Education Funding and Student Finance," Presented to Parliament by the Secretary of State, October 2010 2010. Chair: Lord Browne of Madingley.

Jensen, Robert, "The (perceived) returns to education and the demand for schooling," *The Quarterly Journal of Economics*, 2010, *125* (2), 515–548.

Lochner, Lance J and Alexander Monge-Naranjo, "The nature of credit constraints and human capital," *American economic review*, 2011, *101* (6), 2487–2529.

McPhillips, Martin and Julie-Anne Jordan-Black, "The effect of month of birth on the attainments of primary and secondary school pupils," *British Journal of Educational Psychology*, 2009, *79* (3), 419–438.

Mincer, Jacob A, "Schooling and earnings," in "Schooling, experience, and earnings," NBER, 1974, pp. 41–63.

National Committee of Inquiry into Higher Education, "Higher Education in the Learning Society: Report of the National Committee of Inquiry into Higher Education," Report to the Secretary of State for Education and Employment, London 1997. Chair: Sir Ron Dearing.

Russell, RJH and MJ Startup, "Month of birth and academic achievement," *Personality and individual differences*, 1986, *7* (6), 839–846.

Sá, Filipa, "The effect of tuition fees on university applications: evidence from the UK," 2014.

UK-Government, "Teaching and Higher Education Act," Technical Report 1998.

UK Parliament, "Education Act 1962," https://www.legislation.gov.uk/ukpga/Eliz2/10-11/12/enacted 1962. 10 & 11 Eliz. 2 c. 12.

_ , "Higher Education Act 2004," https://www.legislation.gov.uk/ukpga/2004/8/enacted 2004. 2004 c. 8.

Appendix Figures and Tables

Table A.1: Overall Cohort Characteristics, 2011 vs 2012

	2011	**2012**
Female (%)	49.8	49.7
Non-white (%)	17.5	18.0
Eligible for FSM (%)	12.9	13.5
From low university-share area (%)	62.1	62.8

Notes: Shares are calculated for the full cohort of school leavers in 2011 and 2012. FSM = Free School Meals. "Low university-share area" indicates local areas with below-average university participation in 2011.

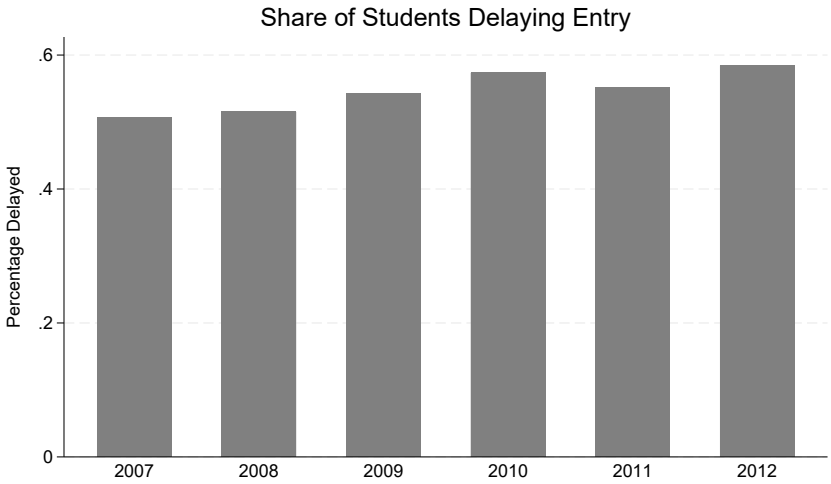
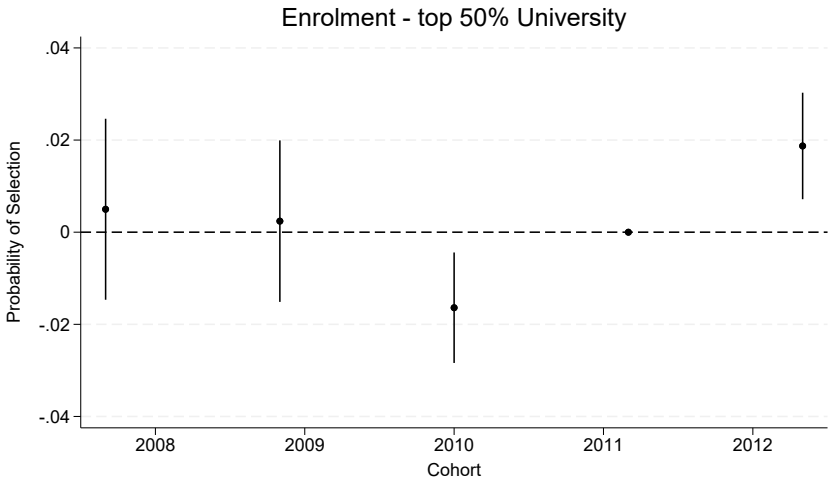


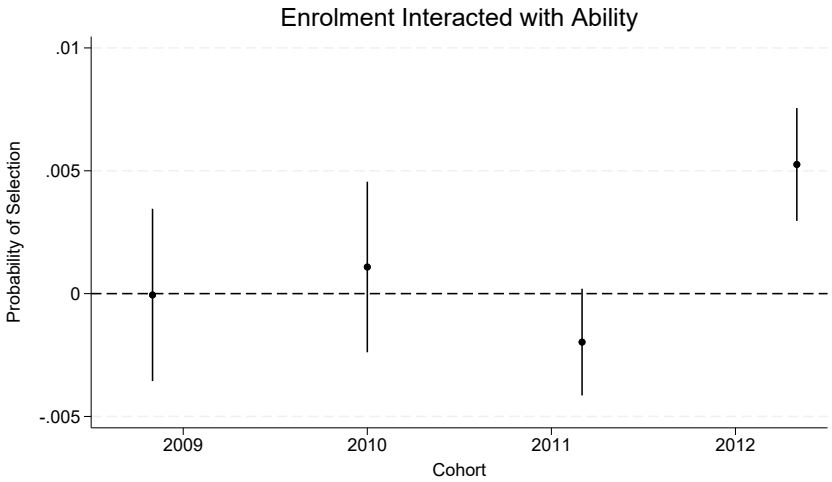
Figure A.1: Figure shows the proportion of students who delay school entry by one year by cohort across the sample.

Figure A.2



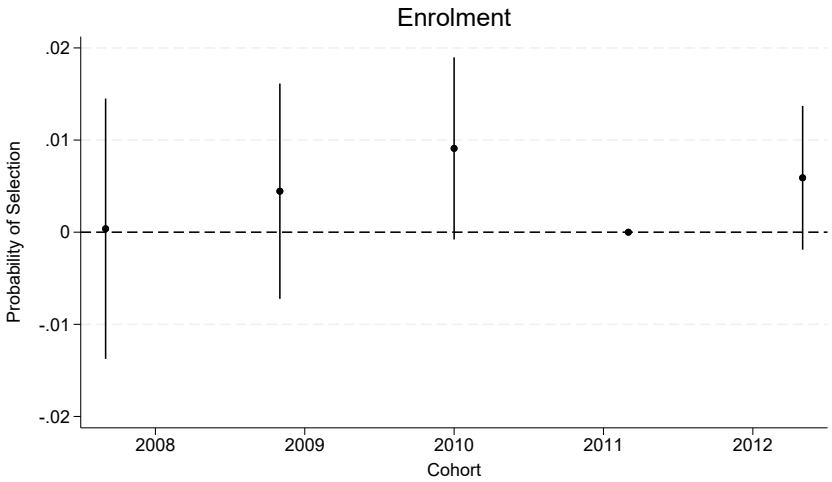
Note: Figure plots the estimated difference-in-discontinuity effects on unconditional university enrolment into selective instiutions. Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuses.

Figure A.3



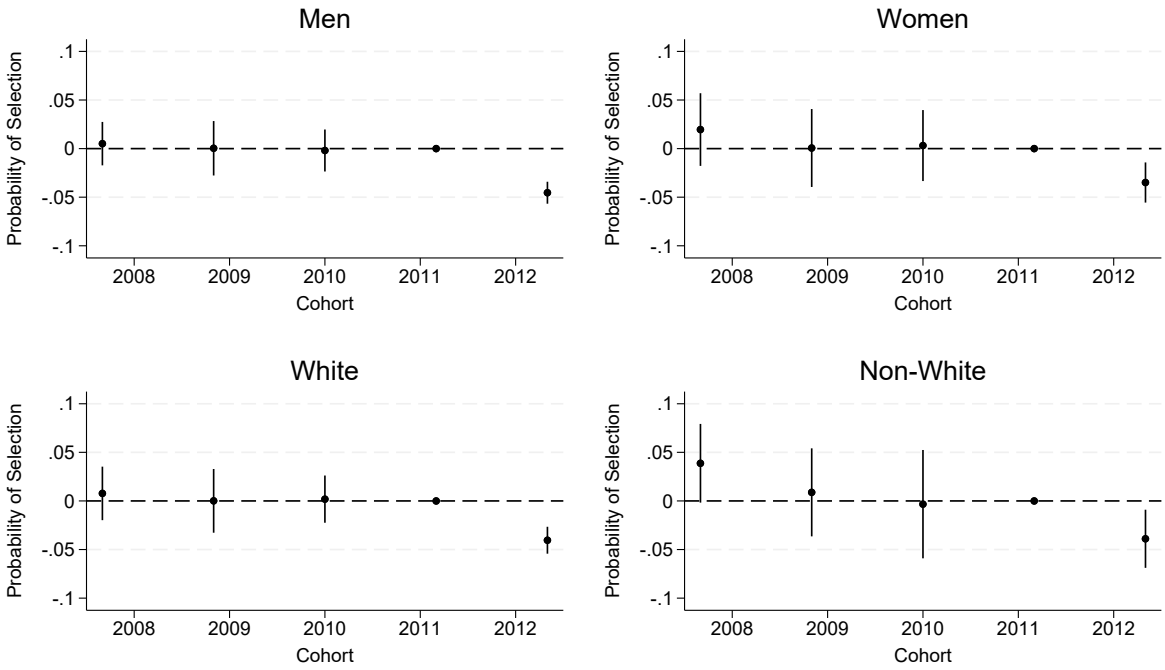
Note: Figure plots the estimated difference-in-discontinuity interacted with a standardised measure of ability, removing the 2008 result. Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuses.

Figure A.4



Note: Figure plots the estimated difference-in-discontinuity for unconditional postgraduate enrolment. Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuses.

Figure A.5



Note: Figure plots the estimated difference-in-discontinuity effects on university enrolment by gender and ethnicity. Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuses.

Table A.2: Difference-in-Discontinuity Estimates by Cohort and Outcome

	2008	2009	2010	2011	2012
Enrolment into university	0.012	0.001	0.001	–	-0.040
	(0.008)	(0.009)	(0.007)		(0.004)
Observations	717,905	717,905	717,905	–	818,425
Enrolment into selective university	-0.009	-0.010	-0.022	–	0.043
	(0.011)	(0.011)	(0.010)		(0.007)
Observations	317,550	317,550	317,550	–	361,520
Enrolment for women	0.020	0.001	0.003	–	-0.035
	(0.010)	(0.011)	(0.010)		(0.006)
Observations	356,355	356,355	356,355	–	404,955
Enrolment for FSM	-0.011	-0.004	0.011	–	-0.026
	(0.007)	(0.008)	(0.007)		(0.006)
Observations	95,305	95,305	95,305	–	108,805
Enrolment for non-white	0.039	0.009	-0.003	–	-0.039
	(0.011)	(0.012)	(0.015)		(0.009)
Observations	126,345	126,345	126,345	–	144,845
Enrolment for low university participation area	0.004	-0.005	0.002	–	-0.030
	(0.007)	(0.008)	(0.005)		(0.004)
Observations	439,175	439,175	439,175	–	501,640
Employed within first year of Graduation	-0.012	-0.019	-0.025	–	0.020
	(0.014)	(0.012)	(0.012)		(0.008)
Observations	921,095	921,095	921,095	–	1,038,875
Above median pay industry	-0.004	0.004	0.003	–	0.007
	(0.002)	(0.002)	(0.002)		(0.001)
Observations	1,063,585	1,063,585	1,063,585	–	1,220,990
Above median pay industry - Graduates	-0.000	0.003	-0.003	–	0.018
	(0.001)	(0.001)	(0.001)		(0.001)
Observations	331,330	331,330	331,330	–	380,925
Enrolment interacted with ability	0.005	0.001	-0.007	–	-0.026
	(0.003)	(0.003)	(0.003)		(0.003)
Observations	407,165	407,165	407,165	–	467,500
Enrolment interacted with female	0.005	0.001	0.010	–	0.012
	(0.003)	(0.003)	(0.003)		(0.003)
Observations	717,905	717,905	717,905	–	818,425
Enrolment interacted with FSM	-0.022	0.000	0.029	–	0.004
	(0.006)	(0.007)	(0.005)		(0.006)
Observations	717,905	717,905	717,905	–	818,425
Enrolment interacted with non-white	0.009	0.016	0.008	–	0.006
	(0.006)	(0.006)	(0.006)		(0.005)
Observations	717,905	717,905	717,905	–	818,425

Note: Each cell reports the difference-in-discontinuity estimate for the cohort column and outcome row. Standard errors in parentheses, clustered at the cohort level. The 2011 cohort is not estimable due to collinearity with year-of-birth fixed effects unless interacted.