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

Luke Walsh*
Department of Economics
University of Liverpool

Abstract

Increases in the cost of higher education raise concerns about the returns to human capital and the extent to which financial barriers restrict access, yet little is known about their effects in settings without credit constraints. This study leverages a natural experiment in which the UK government substantially raised a cap on tuition fees, to estimate the causal impact on educational attainment and labour market outcomes using a difference-in-discontinuities design. I find that the fee increase reduced university enrolment, particularly in fields with lower expected returns, while students from low-income backgrounds were not disproportionately affected, likely due to the UK's income-contingent loan system which mitigates credit constraints. Overall, graduates affected by the reform were more likely to enter higher-paying industries and transition into employment more quickly, while low-income graduates experienced a modest increase in earnings. These findings offer new insights into how higher university costs influence human capital investment and post-graduation outcomes.

*Corresponding Author: l.walsh7@liverpool.ac.uk.
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1 Introduction

The cost of higher education plays a central role in human capital investment, shaping not only individual decisions to invest in education but also governments' willingness to subsidize 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 would reduce overall demand, with the sharpest declines among those pursuing lower-return subjects. Much of the existing literature focuses on the role of credit constraints, which prevent individuals from financing education even when it would be privately optimal. Under this model, credit-constrained students are disproportionately deterred from attending university, since capital markets fail to allocate funds based on potential alone [(Black et al. 2023);(Sá 2014)].

This study addresses this friction by examining a reform situated in a unique policy context in which loans are universally allocated by a government agency and are not conditional on family income. The reform simultaneously increased the headline tuition fee cost, while also raising the income-based repayment threshold for student loans, effectively lowering the cost of university for the poorest third of students (Britton et al. 2017) but raising it for everyone else. As a result, credit constraints are effectively mitigated, allowing for a cleaner test of the direct effects of tuition costs on human capital investment. The theoretical predictions are straightforward: students with low expected returns to higher education will rationally choose to reduce enrolment; enrolment in lower-return subjects will exhibit a greater decline; and, due to the progressive nature of the reform, low-income individuals will not be differentially impacted by higher costs. These predictions are consistent with the empirical evidence presented in this paper.

This paper examines the causal effect of a large tuition fee increase on university participation, field of study, and labour market outcomes. This reform provides a natural experiment in which the price of all universities across England and Wales increased considerably and exoge-

nously, limiting the ability of individuals to substitute their demand elsewhere. My results show that students were almost 9% less likely to enrol in university, a decrease which was concentrated in subjects with lower expected returns. Students from low-income backgrounds were not differentially adversely affected, and in some cases benefitted from the reform, reducing socioeconomic inequality; owing to the progressive change in repayment structure. Graduates were more likely to enter into higher paid fields as a result and were in receipt of fewer government benefits, while lower income graduates experienced moderate increases in early career earnings.

To estimate the causal effect of higher tuition fees I exploit variation in birth month using a difference-in-discontinuities design to assess whether the gap between Summer-born and Autumn-born students (the so called 'birthday penalty') changed as a result of the reform. Students born after September 1st in a given year will be placed in a lower academic cohort when first enrolling in school as a child, despite being only days separated from those born on August 31st. Individuals born in September are the oldest in their academic cohort, and this age advantage has been shown to generate differences in educational and labour market outcomes relative to peers in the year above who are only slightly older but placed as the youngest in their cohort. Formally, my estimation strategy tests whether the discontinuity in outcomes induced by academic cohort placement changed significantly following the tuition fee reform.

I draw on rich administrative data linking education, university, and tax records for the entire population of students in England and Wales. The Longitudinal Education Outcomes (LEO) dataset uniquely links the National Pupil Database (NPD), covering all pupils in England and Wales, to the Higher Education Statistics Authority (HESA) records for all higher education learners, and further to HMRC tax and benefits (welfare) data. This allows for a comprehensive view of individuals' educational trajectories and early career outcomes. From this, I construct a sample of all individuals across four academic cohorts[1] who attend university between 2010 and 2013. I examine effects on university participation, subject choice, degree completion, final

[1]Later expanded to six cohorts for robustness

grade classification, and selection into master's courses. I then extend the analysis into the labour market, evaluating pay, employment, and unemployment outcomes for the affected cohort

I present three key findings. First, the tuition fee increase led to an 8.5% reduction in university enrolment, alongside a rise in the share of students entering STEM fields. This shift likely reflects students responding to higher costs by avoiding lower-return degrees. I find no evidence of heterogeneity in this response by socioeconomic background, suggesting that the design of the student loan system effectively shielded credit-constrained individuals. Second, I find a temporary reduction in earnings of approximately 3% in affected cohorts during their mid-20s. This effect dissipates over time and is driven by those who don't attend university, so will likely be offset by this group's avoidance of tuition fee loan repayments. In contrast, graduates experienced improved labour market outcomes, including quicker transitions into employment and higher representation in high-paying industries. Lastly, while the reform did not increase enrolment among low-income students, it did improve persistence: those from low-income backgrounds were more likely to complete their undergraduate degrees and to pursue postgraduate study, with modest increases in post-graduation earnings.

This paper contributes to our understanding of how cost-sharing in higher education affects individual behaviour, public spending, and economic efficiency. When governments shift the financial burden of higher education onto individuals, students respond by making more economically rational decisions, reallocating away from low-return degrees. This behavioural response can reduce government expenditure without substantially undermining access or generating large losses in positive externalities.

While previous literature has typically narrowly on credit-constrained subgroups, I show that a well-designed, income-contingent loan system can effectively eliminate credit 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 high-quality administrative data that links school, university, and tax records for the

full population of students in England, enabling me to follow outcomes well into adulthood. Unlike many prior studies, my design captures long-run effects and avoids issues of 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 college 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 college 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 extension 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 increased 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.

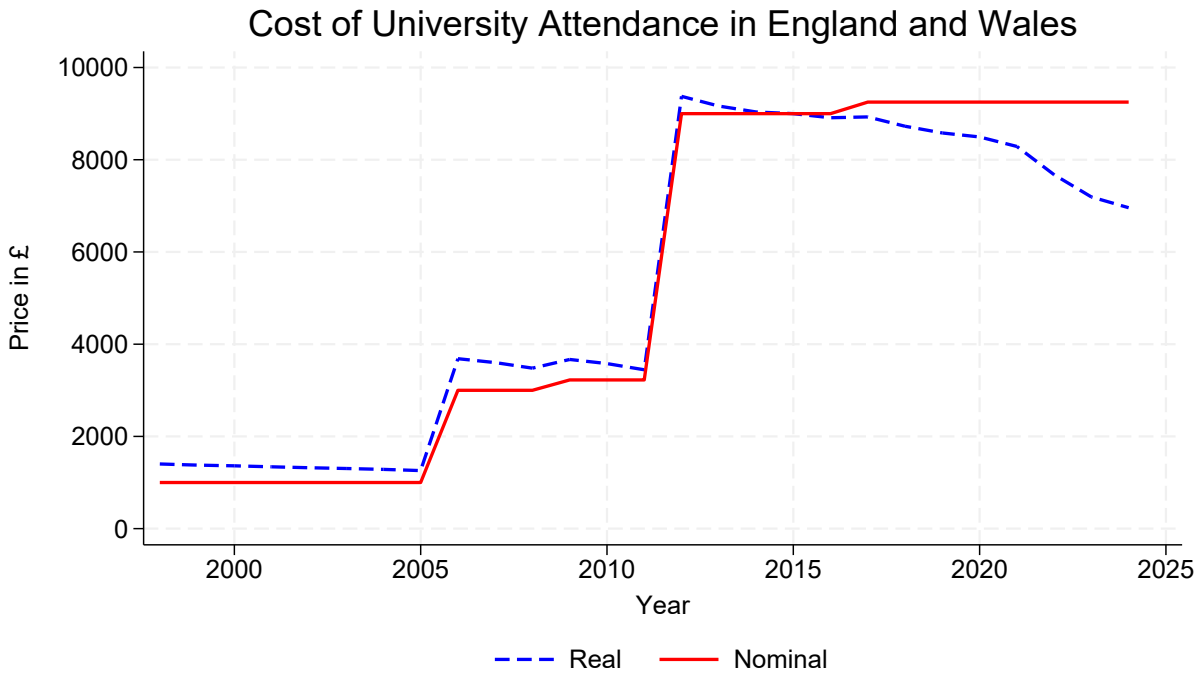
Scotland initially implemented a "graduate endowment" system (a one-time payment after graduation in lieu of upfront fees) and by 2007 abolished tuition fees entirely for Scottish-domiciled undergraduates at Scottish universities (Sá 2014). By the early 2000s, the £1,000 fee cap was yielding limited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

ical, 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



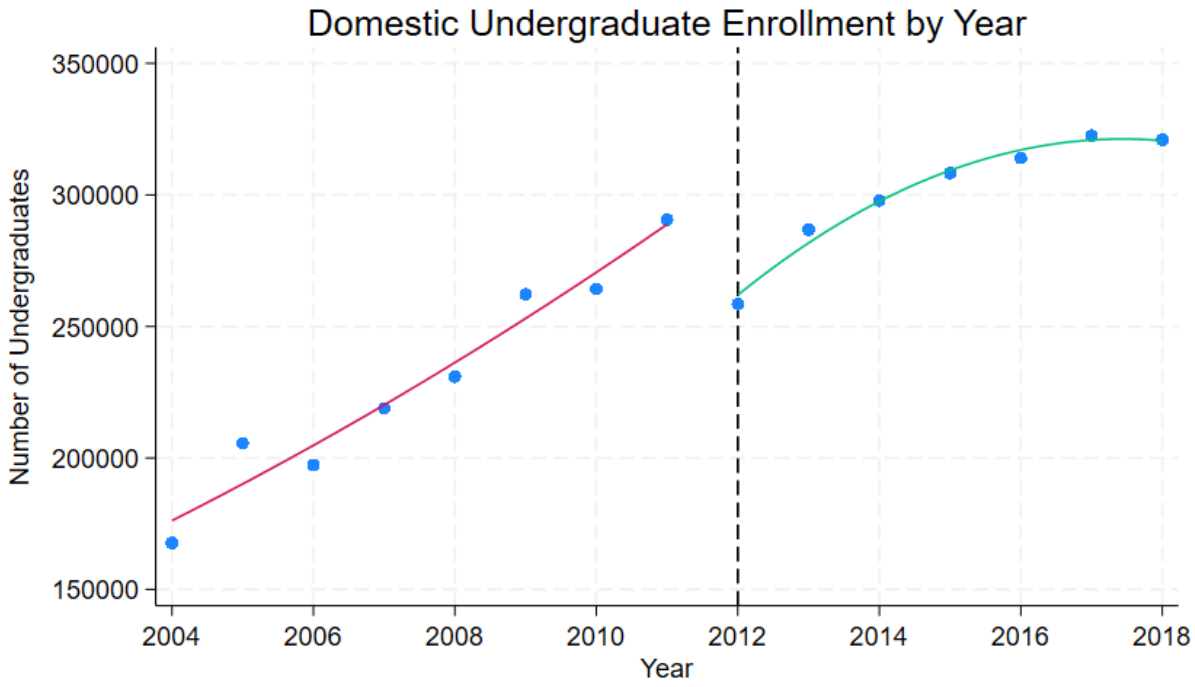
Note:

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 under-

graduate 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



Note:

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 student's 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 2010/11, 2011/12, 2012/13, and 2013/14 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 ever had access to free school meals, a means-tested program for children from low income backgrounds, is used as a proxy for childhood poverty[2].

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 18^{th} 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, this potential source of bias is explicitly addressed in Section 7 where the results are shown to be robust to the inclusion of wider estimation windows on the post-policy side of the cutoff, that should be unaffected by anticipation effects.

In addition to enrolment information, HESA provides detailed data on subject of study (which I classify into an indicator for STEM disciplines) as well as student dropout rates, degree clas-

[2]Across the sample, about 12% of students were eligible for free school meals. As Figure A.1 shows, this proportion increases marginally every year, a fact which should be differenced out by the estimation strategy.

sifications, and subsequent enrolment in postgraduate (master's) programmes. These variables constitute the primary higher education outcomes examined in this paper. A central concern in the tuition fee debate is the potential impact of increased costs on individuals from low-income backgrounds. Table 1 presents a cross-section of descriptive statistics for the 2011/12 cohort, disaggregated by eligibility for free school meals (FSM), to examine disparities in higher education outcomes prior to the 2012 reform.

Table 1: Descriptive Statistics by Free School Meal Eligibility

Outcome	Not FSM	FSM	Total
Undergraduate Degree	0.347	0.193	0.330
	(0.476)	(0.395)	(0.470)
STEM Degree	0.433	0.420	0.432
	(0.496)	(0.494)	(0.495)
Dropout	0.089	0.152	0.095
	(0.285)	(0.359)	(0.292)
Degree Classification	2.171	2.433	2.190
	(0.999)	(1.002)	(1.002)
Master's Degree	0.017	0.012	0.016
	(0.127)	(0.109)	(0.126)
Observations	4,236,830	530,920	4,767,750

Note: Table reports sample means and standard deviations (in parentheses) for key outcomes, disaggregated by free school meal (FSM) eligibility. Degree classification is coded numerically from best to worst.

The table indicates that FSM-eligible students are nearly half as likely to enrol in university compared to their non-FSM counterparts. They are also marginally less likely to pursue a STEM degree, nearly twice as likely to drop out, and significantly less likely to progress to postgraduate study. In addition, their average degree classification is lower[3]. These disparities underscore pre-existing inequalities in higher education participation and attainment. In Section 6, I show that these gaps do not widen following the tuition fee increase, and in some cases, narrow slightly.

Data on employment, earnings, and benefit receipt are obtained from His Majesty's Revenue and Customs (HMRC), which maintains administrative records on all individuals who engage in

[3]Degree classification is an ordinal variable; a higher coefficient denotes a lower final grade

paid employment, pay taxes, or receive government assistance in the UK[4]. The dataset provides information on the start and end dates of all employment spells (including multiple jobs), the associated five-digit Standard Industrial Classification (SIC) codes, and gross annual earnings recorded for each tax year. It also contains the start and end dates of all periods during which individuals claim benefits. Using these data, I construct individual-level profiles detailing gross earnings, duration of unemployment, and time spent in receipt of benefits at each age.

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 (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 "Birthday premium" [(McPhillips and Jordan-Black 2009); (Campbell 2013); (Crawford et al. 2013); (Rus-

[4]This includes both in-work and out-of-work benefits.

sell and Startup 1986); (Crawford et al. 2014). I show evidence of this premium in table 2, with Autumn born individuals being more likely to enrol in university, have better grades, enter into industries in the top quintile of pay, and find a job more quickly after graduation[5].

Table 2: Effect of Being Born in Autumn on Education and Labour Market Outcomes

	University Participation	Degree Classification	Top Quintile Industry Employment	Days to First Job After Graduation
Autumn Born	0.019**	-0.056***	0.006***	-18.098**
	(0.006)	(0.012)	(0.001)	(4.934)

Note: Table includes only outcomes for which the estimated effect of being born in September is statistically significant at the 5% level or better. Robust standard errors in parentheses, clustered at the month-of-birth level. *p<0.1, **p<0.05, ***p<0.01

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 birthday premium in outcomes 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 birthday premium 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:

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

[5]A replication of Autumn born individuals' pay premium is shown in Figure A.2.

Where $Y_{i,c}$ Is the outcome of individual i with month of birth m and year of birth t. This could be grades, degree choice or classification, or wages. α is the intercept term. D_i is the RDD treatment indicator, equal to 1 if individual i in cohort c was born in the first four months of the academic year[6], and 0 otherwise. 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. γ 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. For this reason, I limit the sample to only four academic years in which there were no other major policy changes or shocks, a longer range might capture the effects of the 2008 financial crisis, or subsequent higher education reforms that occurred beyond 2014. 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 an 'Autumn 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 differenced out by the estimation (House of Commons Library 2018).

[6]I use a four-month bandwidth around the September cutoff to ensure sufficient sample size for precise estimation. I show in Section 7 that the results are robust to using narrower windows.

6 Results

Table 3 presents the baseline results for the difference-in-discontinuities estimation. Overall, I find that the increase in university tuition fees led to an 8.5% reduction in enrolment, with the decline concentrated in non-STEM fields which are typically associated with lower expected lifetime returns. These findings align with standard human capital theory, which predicts that higher private costs deter marginal students, particularly those with lower anticipated returns to education. The subsequent results on academic outcomes should be interpreted in light of this selection effect: the post-reform university cohort is smaller and increasingly composed of students pursuing STEM degrees.

Table 3: Effect of Tuition Fee Increase on Educational Outcomes: Overall and by Subgroup

	University Enrolment	STEM	Dropout	Degree Classification	Master's Degree
All Students	-0.085***	0.012***	0.008***	0.070***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Free School Meal Eligible	-0.003	0.002	-0.008**	-0.014	0.004***
	(0.004)	(0.009)	(0.002)	(0.009)	(0.000)
Low Social Class	-0.001	0.010	-0.011***	-0.016	0.000
	(0.007)	(0.007)	(0.001)	(0.016)	(0.001)
Women	0.001	0.004	-0.001	-0.001	-0.001
	(0.004)	(0.003)	(0.002)	(0.004)	(0.001)
Non-White	-0.006	-0.001	-0.002	0.011	-0.000
	(0.004)	(0.002)	(0.001)	(0.010)	(0.001)
Enrolment Area Share	-0.000	0.001**	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	5,029,817	1,631,782	2,995,953	1,392,775	3,524,620

Note: The first row reports the overall effect of the tuition fee increase. Subsequent rows report interaction effects by subgroup. Data come from the 1998–2024 National Pupil Database and Higher Education Statistical Agency censuses. Robust standard errors clustered at the cohort level. **p<0.05, ***p<0.01

This shift in subject composition gives rise to a series of downstream effects on dropout rates, degree classifications, and postgraduate progression. STEM degrees are, on average, more demanding and have higher non-completion rates and lower grade outcomes. The decline in

overall academic performance does not indicate that students performed worse due to the reform but rather reflects a shift in the subject mix. In other words, the results are driven by changes in who attends university and what they study and not by a deterioration in student quality or effort.

Similarly I find a significant increase in the probability of enrolling in a master's degree. This is again consistent with selection effects. Those that chose to attend university in spite of higher costs were more likely to have higher lifetime returns. Those deterred by the reform were disproportionately less likely to have pursued further study in any case. This is strong evidence that raising the private cost of university forces students to make more rational decisions about enrolment, this evidence is consistent with evidence on income and employment covered later in this section.

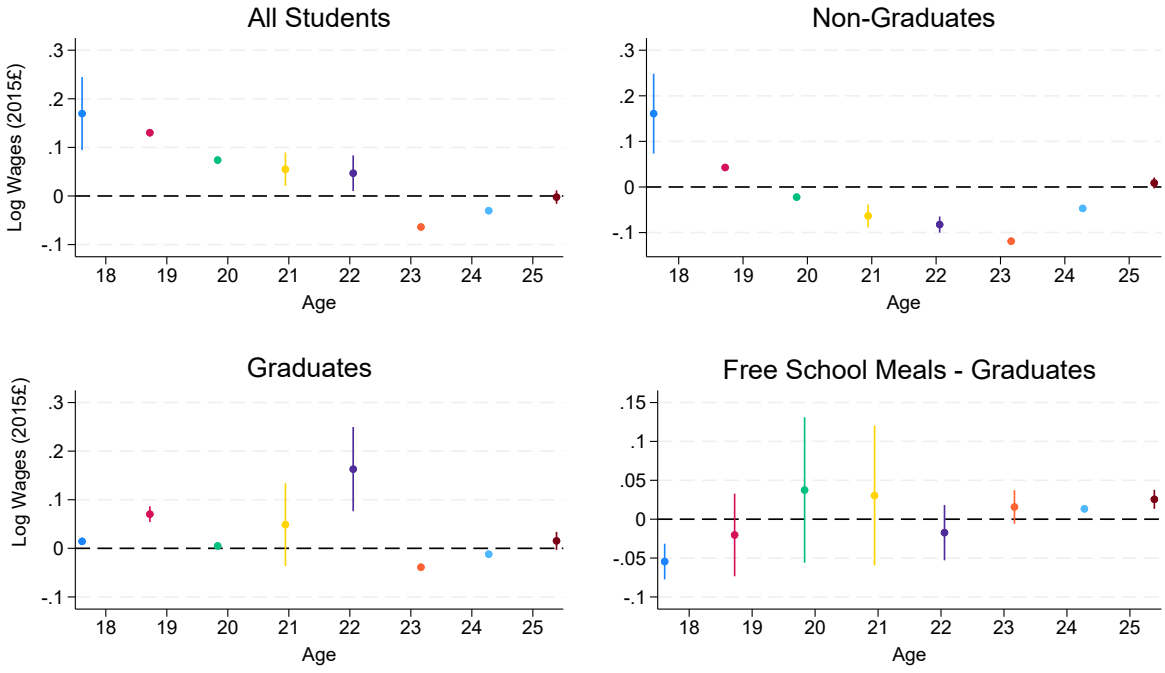
Despite widespread concerns that higher tuition fees would disproportionately harm disadvantaged students, I find little evidence of heterogeneity in the overall effects. In particular, low-income individuals were no worse off in response to the reform and may in fact have experienced modest improvements in outcomes. Specifically, free school meal (FSM) eligible students were less likely to drop out and more likely to pursue a Master's degree after the fee increase. These patterns suggest that the policy's protective mechanisms provided financial security that enabled continued investment in education. For low-income students, university may have become less financially risky under the new system, even as the headline cost rose. As a result, the reform appears to have avoided exacerbating inequality in educational attainment, and may have slightly improved progression for those from disadvantaged backgrounds.

Finally, while the headline decline in participation might raise concerns about lost positive externalities from fewer graduates, the labour market evidence presented in the following section suggests this risk is limited. Those who chose not to attend university under the new system did not go on to suffer worse outcomes in the longer term, particularly when accounting for their avoidance of loan repayments. This indicates that the reform primarily deterred individuals who were unlikely to benefit substantially from higher education in the first place.

6.1 Pay and Employment Outcomes

Figure 3 presents the estimated effects of the tuition fee reform on earnings profiles, disaggregated by graduation status and income background. The top-left panel shows average earnings for the full sample. In the short term, students exposed to the reform appear to earn more during ages 18–22, reflecting their earlier entry into the labour market. This trend reverses post-graduation age, where we observe a modest decline in earnings, which fades out by the mid-20s. The temporary nature of this effect suggests that the policy induced some individuals to forgo university and enter the workforce earlier. While these individuals may earn slightly less than university graduates temporarily, they also avoid student loan repayments permanently, which likely offsets the observed earnings dip. These patterns are consistent with rational sorting in response to changes in the cost of education: marginal students opt out of university when the private cost increases, but do not appear to suffer substantial long-run penalties as a result.

Figure 3



Note: Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuse as well as HMRC tax data.

The top-right panel isolates non-graduates, revealing a persistent decline in average earnings following the reform. This decline is not necessarily evidence of worsening outcomes at the individual level. Rather, it reflects a compositional shift: the tuition fee cohort contains a broader set of non-graduates, including individuals who, under the previous system, would likely have attended university. Their inclusion lowers the average wage among non-graduates, reflecting a larger pool of people competing for jobs that do not require a degree.

In contrast, the bottom-left panel shows no clear or sustained pattern in post-graduation earnings for university graduates. Given the reform led to a smaller and more positively selected university cohort one might have expected a corresponding rise in graduate earnings. The absence of such an effect raises the question of whether the benefits of this selection mechanism are realised through other labour market margins. Later in this section, I explore this further by examining employment-related outcomes such as job quality and time to first employment, where the effects are more pronounced.

Finally, the bottom-right panel focuses on graduates from low-income backgrounds. This group appears to experience a slight earnings premium in the years following graduation. As discussed above, these students were more likely to complete their degrees and to pursue post-graduate education after the reform, likely owing to the increased generosity of loan repayment terms. The improved earnings profile reinforces the interpretation that targeted financial protections helped low-income students not only access university but thrive within it.

Taken together, these results show that the headline effect of the reform was a rational reshuffling of who attends university, rather than a deterioration in outcomes. Marginal students were less likely to enrol, but suffered no lasting economic harm, while those who remained, particularly from disadvantaged backgrounds, saw improved academic persistence and similar or better labour market outcomes.

The final set of results provides important context for interpreting the wage effects. Despite the small, short-lived reduction in post-graduation pay for the affected cohort, Table 4 shows that

students exposed to the tuition fee increase were significantly more likely to enter higher-paying jobs. Specifically, they were more likely to work in industries within the top 10% and 50% of the earnings distribution, suggesting positive sorting into more lucrative sectors. In addition, graduates transitioned into employment more quickly, as evidenced by a reduction in the number of days spent unemployed after graduation and an increase in the likelihood of being employed within the first year. These findings reinforce the earlier interpretation that the reform did not improve outcomes per se, but rather induced a compositional shift in the university-going population. With fewer students attending, those who did were more likely to be suited to higher education and the labour market thereafter, resulting in stronger average outcomes.

Table 4: Interaction Effects of School Starting Age, Tuition Fee Increase, and FSM Eligibility on Graduate Labour Market Outcomes

	Top 10% Job	Top 50% Job	Days to First Job (Unemployed)	Any Job in Year 1
Tuition Fee Increase	0.008***	0.009***	-28.422***	0.006***
	(0.001)	(0.001)	(0.024)	(0.000)
Tuition Fee Increase × FSM	—	-0.030	-10.430	0.004
		(0.010)	(5.899)	(0.007)
Observations	958,510	958,510	1,612,850	1,612,350

Note: This table presents interaction effects of being born in September, exposure to the 2012 tuition fee reform, and eligibility for Free School Meals (FSM) on selected labour market outcomes. Columns 1–2 report effects on the likelihood of entering jobs in the top percentiles of the earnings distribution. Columns 3–4 report effects on early employment outcomes following graduation. The Top 10% estimate for FSM-eligible students is omitted due to insufficient observations. Robust standard errors in parentheses, clustered at the month-of-birth level. **p<0.05, ***p<0.01

These findings also speak to the broader theoretical and policy implications of shifting the cost burden of higher education onto individuals. The reform may have improved the alignment between individuals' enrolment decisions and their expected private returns, particularly by disincentivising university attendance among those with only marginal benefits. From a government perspective, this may represent a more efficient allocation of public resources. If these individuals would not have seen meaningful gains in employment or earnings outcomes, then subsidising their university education would have entailed a transfer with limited long-run societal or fiscal

return. That the reform did not harm low-income students further strengthens this conclusion, suggesting that the policy successfully encouraged more economically rational selection into higher education while preserving equitable access. Importantly, there is no evidence of a significant differential impact on low-income students. Although the reform did not generate sizeable positive effects for low-income students, it did not leave them worse off either. This is consistent with the hypothesis that the progressive repayment design of the UK loan system effectively protected credit-constrained students, allowing them to access higher education and navigate the labour market on similar terms as their more advantaged peers.

7 Robustness

A key identifying assumption underlying this estimation strategy is that the cohorts used for analysis are not differentially affected by other policy reforms or macroeconomic shocks during the period under observation. This assumption must hold not only at the time of university entry but over the full span of outcomes studied. Even a seemingly unrelated policy reform, such as changes to secondary schooling implemented many years earlier, could undermine the design if it differentially affected one cohort. For instance, an educational policy introduced in 2004 would affect students who entered university in 2011, thus invalidating placebo tests using this cohort.

To mitigate this risk, the main analysis focuses on a narrow window of cohorts: those entering university between 2010 and 2013. This restriction minimizes the likelihood that long-run confounders bias the estimates, and it is further motivated by the choice to cluster standard errors at the cohort level. However, this design comes with the trade-off that modelling placebos and bandwidth adjustments around the September cut-off becomes more difficult due to limited degrees of freedom and multicollinearity between cohort and treatment exposure. Therefore, I

first expand the estimation window to include the 2009 and 2014 university entry cohorts.[7] All central results remain robust to this expanded specification with the exception of differential enrolment in STEM fields, however the validity of this result is shown to be robust to alternate specifications.

From here I employ two more robustness checks: I re-run all results using 2011 as a placebo year, and I shorten the Autumn-born bandwidth first to three months and then to two months. The education results are highly robust, with null estimates across all placebo specifications. Education results are also robust to reducing the length of the 'Autumn-born' cut-off to three months, though less so when restricting to only two months due to inflated standard errors from the intensive nature of the design. Importantly the direction and magnitude typically stays the same as the bandwidth reduces despite the significance waning in some cases.

The labour market results are somewhat more sensitive to specification choices, which reflects both the inherently noisier nature of post-graduation employment data and the longer causal chain linking the reform to these outcomes. Time-to-employment estimates remain stable across placebo and expanded-window specifications, though the shortened September window yields larger standard errors due to reduced sample size. Similarly, earnings results are robust to widening the window and to placebo tests, but less precise when the sample is restricted to a narrower birth-month band. Results on job quality, proxied by entry into higher-paying industries, are less robust overall: estimates are sensitive to changes in the estimation window and fail to pass some placebo tests, suggesting these results should be interpreted with greater caution.

Overall, the pattern of findings remains broadly consistent: there is no evidence of harm to low-income students across any outcomes, and there is evidence that the reform reduced enrolment particularly in non-STEM fields. The robustness checks collectively support the view that the tuition fee reform influenced students' decision-making in line with theoretical predictions, while the strongest effects are concentrated in the domains most immediately affected by the

[7] Including only earlier cohorts risks conflating policy effects with behavioural responses to the post-2008 financial crisis, which may have influenced university participation independently of tuition fees.

policy.

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 costs reduced overall enrolment, particularly in lower-return fields, while leaving access for low-income students largely unaffected. Instead, the loan system's progressive design appears to have insulated disadvantaged groups and even improved persistence once enrolled. On the labour market side, the reform reshaped rather than degraded outcomes. Non-attendees entered the workforce earlier, graduates moved more quickly into employment, and those who did enrol were more likely to enter higher-paying sectors. Taken together, the results suggest that higher tuition fees, when paired with income-contingent repayment, induced a more selective and economically rational allocation of students across higher education without widening socioeconomic gaps.

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 reduc-

ing 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 fees 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 lower-return subjects, 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 persistence, attainment, and 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 fee increases, when paired with progressive repayment design, need not undermine equity and can even improve the alignment between enrolment decisions, expected returns, and fiscal sustainability.

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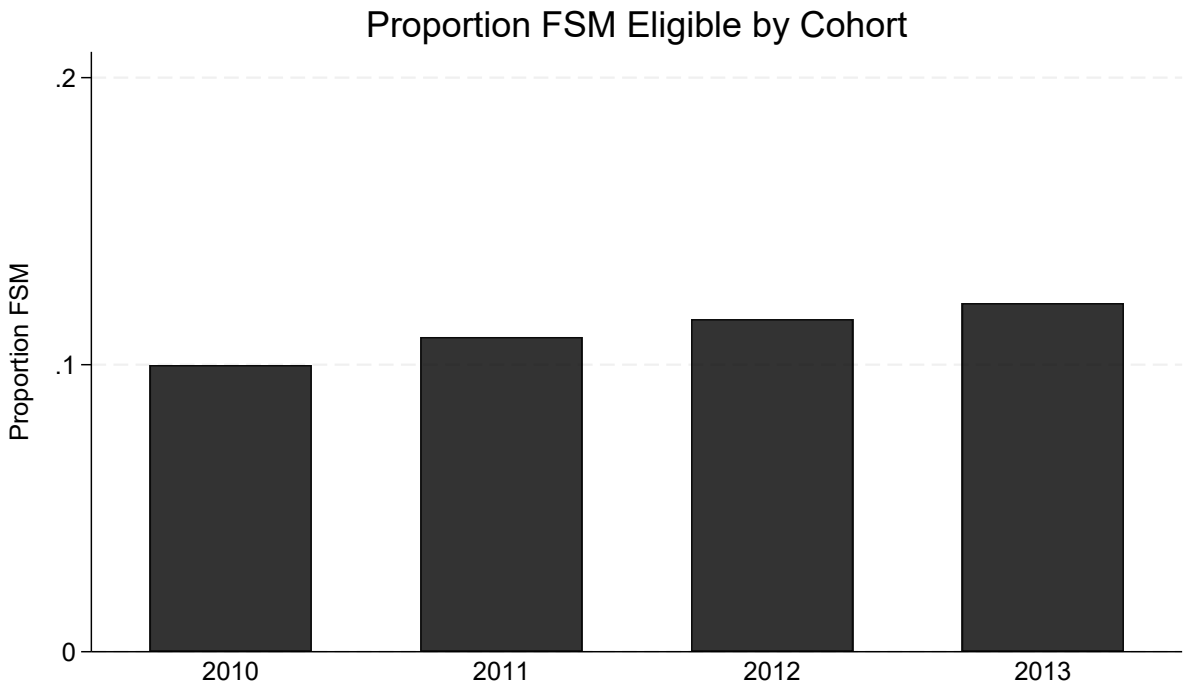
Appendix Figures and Tables

Figure A.1



Note:

Table A.1: Descriptive Statistics by Undergraduate Status

	Non-Undergraduates		Undergraduates	
	Mean	SD	Mean	SD
Share of Women	0.4530	0.4980	0.5570	0.4970
Share of Non-White People	0.1550	0.3620	0.2750	0.4470
Free School Meal Eligible	0.1710	0.3760	0.0910	0.2870
Regional University Attendance	37.1250	6.4070	39.0950	7.2390
Observations	644,790		–	

Note: Table shows means and standard deviations for selected background variables by undergraduate status. Data come from 1998-2020 National Pupil Database and Higher Education Statistics Agency.

Table A.2: Effect of School Starting Age on Likelihood of Entering High-Paying Jobs

	Top 10%	Top 20%	Top 25%	Top 50%
Autumn Born	0.0026	0.0057***	0.0059**	-0.0019
	(0.0014)	(0.0006)	(0.0011)	(0.0022)
Observations	958,510	958,510	958,510	958,510

Note: Each column reports the effect of being born in September on the probability of entering jobs in the top percentiles of the earnings distribution. Robust standard errors in parentheses, clustered at the month-of-birth level. **p<0.05, ***p<0.01

Table A.3: Effect of School Starting Age on Employment and Benefit Outcomes

	Days to First Job (After Graduation)	Any Job in Year 1	Cumulative Benefits (3 Years)
Autumn Born	-18.0977**	0.0013	60.2709*
	(4.9343)	(0.0038)	(15.7759)
Observations	3,068,555	3,067,450	622,710

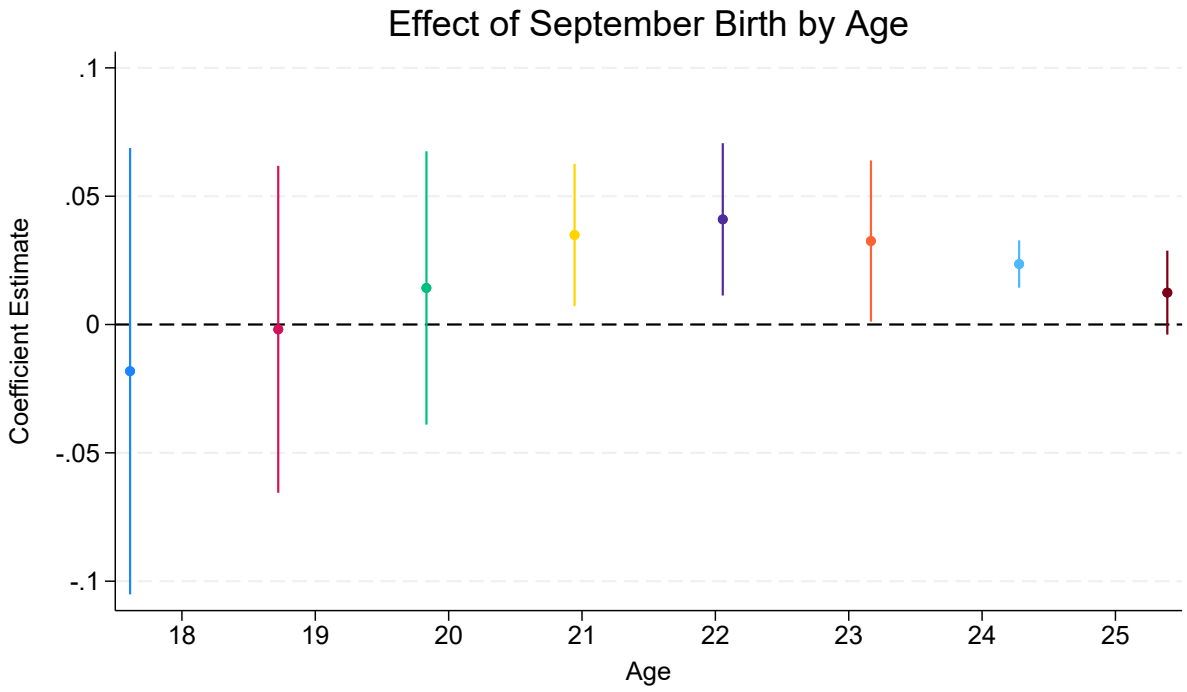
Note: Each column reports the effect of being born in September on early labour market outcomes. 'Days to first job' measures time spent unemployed after graduation. 'Any job' is an indicator for employment within one year. 'Cumulative benefits' captures total days receiving benefits over three years. Robust standard errors in parentheses, clustered at the month-of-birth level. **p<0.05, ***p<0.01

Table A.4: Interaction of School Starting Age and Tuition Fee Increase on Degree Classification

	First Class	Upper Second	Lower Second	Third Class
Tuition Fee Increase	-0.0208***	-0.0234***	0.0396***	0.0046***
	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Observations	1,392,775	1,392,775	1,392,775	1,392,775

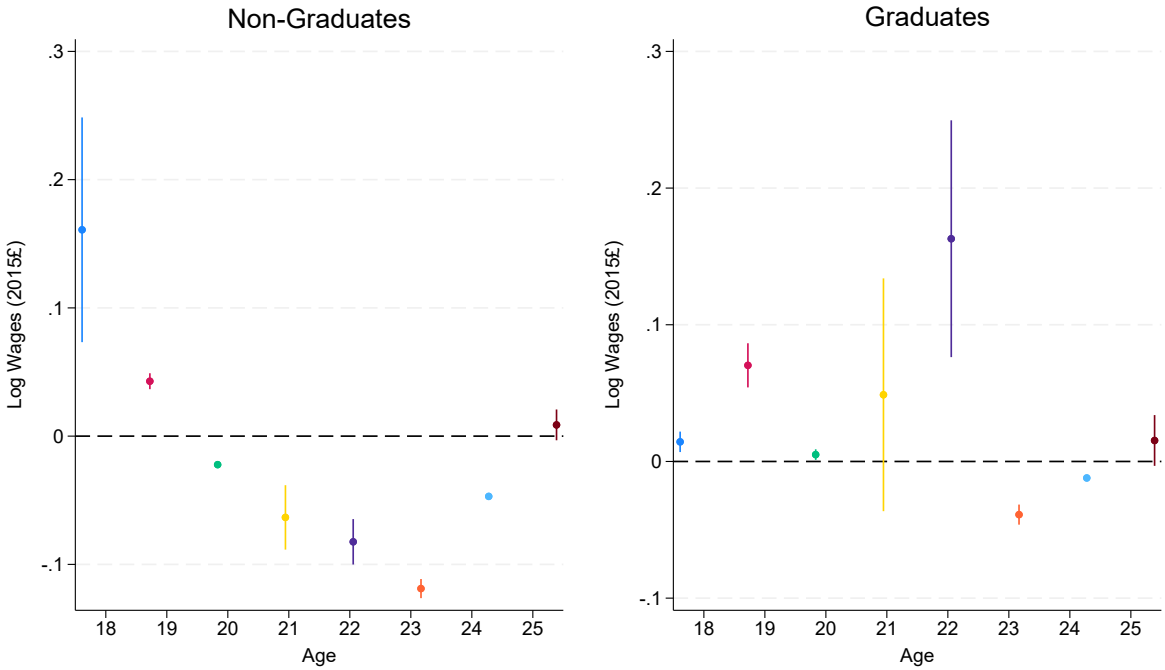
Note: This table shows the interaction effect of being September-born and facing a tuition fee increase on degree classification. Standard errors in parentheses, robust and clustered at cohort level. **p<0.05, ***p<0.01

Figure A.2



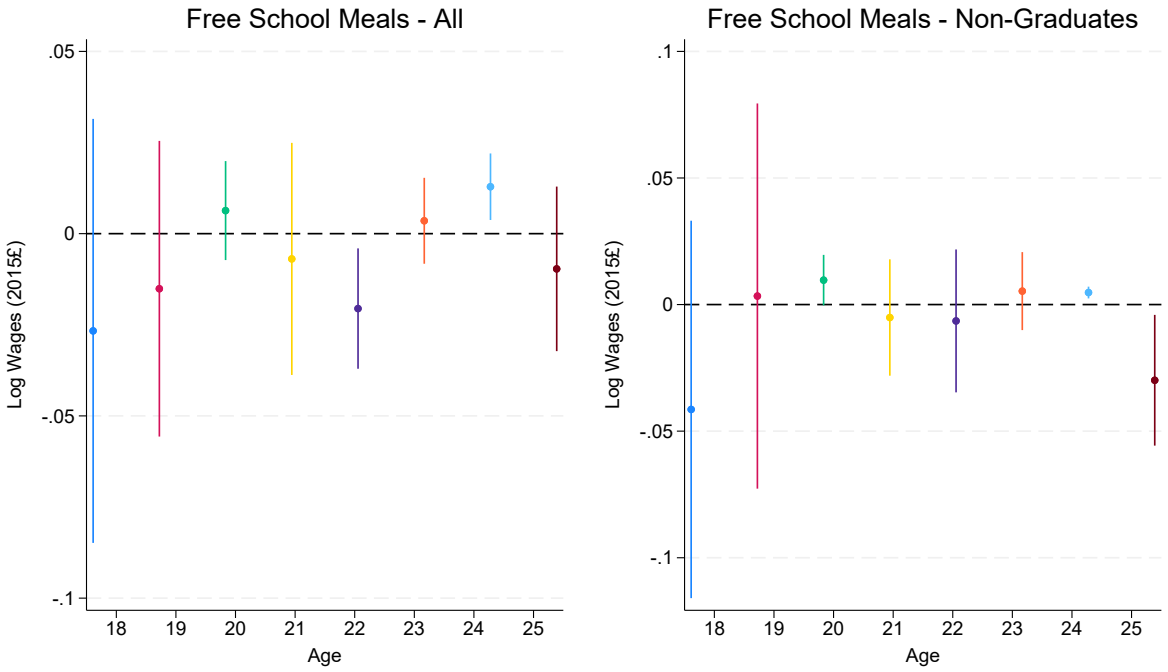
Note: Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuse as well as HMRC tax data.

Figure A.3



Note: Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuse as well as HMRC tax data.

Figure A.4



Note: Data come from the 1998–2020 National Pupil Database and Higher Education Statistical Agency censuse as well as HMRC tax data.

Table A.5: Triple Interaction Effect of School Starting Age, Tuition Fee Increase, and FSM Eligibility on Entry into High-Paying Jobs

	Top 20%	Top 25%	Top 50%
Tuition Fee Increase $\times$ FSM	-0.0043	-0.0045	-0.0303*
	(0.0076)	(0.0099)	(0.0104)
Observations	923,245	923,245	923,245

Note: Each column reports the triple interaction effect of being born in September, exposure to the tuition fee increase, and free school meal (FSM) eligibility on the likelihood of entering jobs in different percentiles of the earnings distribution. The top ten percent cannot be estimated due to lack of observations. Robust standard errors in parentheses, clustered at the month-of-birth level. **p<0.05, ***p<0.01

Table A.6: Triple Interaction Effect of School Starting Age, Tuition Fee Increase, and FSM Eligibility on Early Labour Market Outcomes

	Days to First Job (Unemployed)	Any Job in Year 1	Cumulative Benefits (3 Years)
Tuition Fee Increase × FSM	-10.4296	0.0042	-15.5846
	(5.8990)	(0.0066)	(7.1426)
Observations	1,555,195	1,554,730	599,780

Note: Each column reports the triple interaction effect of being born in September, exposure to the tuition fee increase, and free school meal (FSM) eligibility on early post-graduation outcomes. 'Days to first job' measures time spent unemployed, 'Any job' is an indicator for employment within the first year, and 'Cumulative benefits' refers to the number of days receiving government support in the first three years after graduation. Robust standard errors in parentheses, clustered at the month-of-birth level. **p<0.05, ***p<0.01