Local Labour Markets and Skill Acquisition

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Abstract

Regional inequalities in developed economies have been the subject of both a large academic literature and policy interest. Yet, little is known about the causal impact of local skill demand on the supply of skills by local students. I study this relationship in England, which has large spatial disparities; an educational system where local economic conditions have little direct impact on school funding; standardized test scores; and detailed data on outcomes by field. I use establishment-level administrative data to document the cross-sectional and panel variation in the level and field of skills demanded. I then combine this with individual-level education data to study whether local skill demand shapes local students' educational attainment: their results; level of education; and fields of study. I document a positive cross-sectional correlation between the skills demanded in local jobs and education choices. But, using a dynamic difference-in-difference strategy, I find at most a very muted response to large increases in local demand for degrees or specific skills for subsequent cohorts of students making educational investment decisions. I discuss the implications of my findings for policies aiming to target regional inequality.

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1 Introduction

There are large and persistent differences in educational attainment and skills across locations within countries. These spatial inequalities have recently drawn increased attention for their potential economic and political impacts, as well as for the individual consequences for those in disadvantaged areas. However, more insight is needed as to the ways in which various local characteristics are perpetuated. One important decision facing young people is the choice of education - both in terms of the type and level of education they pursue and the field in which they study.

Within the UK there are large, persistent, differences in educational attainment across areas, which have garnered significant concern and media attention. The gaps between London and rural areas have been documented at least as far back as the mid-nineteenth-century (White, 2007) and have persisted into the twenty-first century (Overman and Xu, 2022). Despite England's relatively small size, location is sticky: 65% of university graduates and 85% of non-graduates live in the same Travel to Work Area (TTWA) in which they grew up, and gains to migration are confined to high-education workers (Britton et al., 2021). These characteristics lead to a natural research question: How responsive are students' educational investment decisions to local skill demand in the labour market in which they grow up?

While I study this question in the context of England (for reasons discussed below), this setting is not unusual in its spatial disparities. For example, in the US, the share of adults with university degrees ranges from less than 27% in Louisiana and Mississippi to more than 42% in Massachusetts and Vermont, and household income in the poorest states is 55% of that in the richest (U.S. Census Bureau, 2019). And despite overall higher (though declining) geographic mobility, 60% of Americans live in the same state in which they were born Jia et al. (2023).

Governments have aimed to address spatial inequalities in part through place-based industrial policy, using both government jobs and incentives for private investment. In the UK, these policies have included the Places for Growth scheme, enacted, in part, to "[ensure] economic growth and job opportunities are more evenly distributed across the UK" by

moving more than 20,000 Civil Service jobs outside of London (Department for Business, 2021). In the US, the Helping Infrastructure Restore the Economy (HIRE) Act, proposed in 2019, would have required the relocation of several federal government agencies away from Washington, D.C.. More recently, the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act of 2022 provided $39 billion of funding to support local hubs and foster the growth of the semiconductor industry.

Understanding whether such policies can spur local skill accumulation is important. The most direct route by which demand may affect locals' skills is through cohorts of students who may change their skill acquisition in response. In the case where the elasticity of education choices to the jobs available is small, these policies may instead primarily change local skill composition through (costly) moves of workers from other locations.

To better understand how students' educational investment decisions respond to local skill demand in the labour market in which they grow up, I turn to England. In addition to the spatial disparities described above, the English context has several advantages. First, local economic conditions have little direct impact on school funding, eliminating one confounding channel present in other contexts. Qualifications, both academic and vocational, are standardized nationally from a young age, and administrative data on both students and firms is available to study. This allows me to observe the near-universe of labour demand changes and student outcomes.

In this paper, I use rich administrative data on both establishments and students in England to evaluate the education response of students to changes in the composition of local skill demand. I examine the role that existing differences in skill demand play in local students' educational attainment: their results; level of education; and fields of study. I then exploit large changes in local demand for skills - either qualifications in a specific field or at the degree level - to measure the short-run response of local students. These changes come from changing local industry composition; I show that, following a large change, local demand for that skill remains at a significantly higher level than it was in the preceding years.

To understand local skill demand, I use the Business Structure Database (BSD), and administrative dataset covering an estimated 99% of economic activity in the UK. This

establishment-level data provides information on the precise location, industry and number of employees of each establishment. I combine this with survey data on the qualifications held by employees in each sector to measure the mix of skills (by level and field), used in each labour market. The granular nature of the data allows me to consider other geographic levels, as well as changes coming from specific events.

On the student side, I use English administrative data on the universe of students who attended state (publicly funded) schools. This data, which is linked to university records, allows me to observe the full educational path - including the subjects studied and results - of students from primary through tertiary education.

In addition to the depth of data available to study, England has many advantageous institutional features for this question. Firstly, school funding is determined nationally on a per-pupil basis, meaning an expansion in local employment or an increase in house prices does not increase education funding. This stands in sharp contrast to other contexts where local taxes provide the bulk of education funding, confounding estimates of student response[1]. Furthermore, the qualifications fit into a standardized framework from before the end of compulsory schooling, allowing me to compare more specific skills at an earlier stage of education. The comparability of qualifications across time and space, as well as comprehensive data on student results, allows me to examine the field of study, student achievement, and level of education.

In the first part of the paper, I document the spatial differences in industries and their associated skills and descriptively relate them to the spatial differences in education attainment. In this section, I show that students' education choices, in both level and field, are strongly correlated with the estimated skill distribution of local employment. I then move to a staggered event study design exploiting large changes in local skill demand to identify causal estimates of students' response.

First, I examine cross-sectional differences in the data. I find that, compared to those in the 25th percentile, those in the 75th have 10pp more students enrolling in A-levels (compared to a national average of 45%) and 8pp more students enrolling in university (compared to

[1]Consider an influx of well-paid jobs requiring degrees; the resulting increase in local property tax base would mechanically increase school funding, an important contributor to school quality, which is associated with higher levels of educational attainment (Eckert and Kleineberg, 2021).

a national average of 27%). I then consider the choice of field of study in university; here, for every additional 10pp of local employment in a field (compared to other TTWA), there is a 3pp difference in university enrolment in that field. Despite these strong correlational relationships, I find no significant changes in enrollment in A-Levels or University following an increase in degree employment, nor change in field enrolment following an expansion of local employment in that field.

I then exploit large changes in local area skill composition to understand whether and when students respond to changing local conditions. I consider 1-year increases of more than 1pp in local degree employment; these changes are persistent. At the TTWA level, I find no evidence of a response of A-level enrolment to changes in the share of employment requiring a degree. To bound the response, I turn to students' immediate surroundings and consider the same change at the postcode group level. Here I also find no evidence for an increase in A-level enrolment, and can bound the response from above by a 2.5pp increase in enrolment for every 1pp increase in the share of jobs requiring a degree. The response for university enrolment is similarly small with the upper bound at 1.8pp for the same increase; this translates to just 5 additional students enrolled in university for every 100 new jobs requiring degrees.

In response to local increases in field share of more than 0.75% of local employment, I first show that these expansions are persistent - the level of employment in that field in the subsequent years remains significantly above its initial level. I then examine the student response. At the TTWA level, I find no evidence of increased field enrolment. Again turning to the postcode group level, I can bound the response from above at a 1pp increase in student enrolment for every 1.5pp increase in field employment.

Given the strong correlation between the skills used in local jobs and students' education choices, the small short-run response of students to changing circumstances warrants further consideration. It could be the case that the period of adjustment is longer than I observe in my data; for example, if local teachers know more about the pathways that previous cohorts of students took, or if students beliefs about the labour market they will enter update slowly. It could also be the case that students do not view local changes as relevant for their later job prospects.

The muted response of local students has important implications for policies targeting regional inequalities. The magnitude of responses I find are not economically meaningful: the response is not enough to fill newly-created high-skill jobs with local students. If that is the goal of these policies, additional intervention may be needed to shape education choices. However, an important caveat is that my results relate only to academic qualifications; it is also relevant to understand whether other skills, such as those requiring vocational training, which are more likely to be used locally are likely to respond to changes.

This paper contributes to understanding in several areas of research. First, it provides an empirical basis for the nascent literature endogenizing education choice in models of spatial inequality and mobility. Prior to Eckert and Kleineberg (2021), models in this literature took skill supply as a fixed local characteristic. In this paper, I exploit local changes to establish a supply elasticity for skills in a context where the supply of education does not vary in response to local income changes.

Secondly, this paper relates to an emerging literature understanding how students' choices respond to local labour market conditions. Most closely related is contemporaneous work examining the impact of STEM jobs on high school and college course choice and major in the US (Mather and Smith, 2024). In contrast to this paper, I focus on isolating the student response in a setting where local conditions do not directly impact secondary education provision. Other papers in this area (e.g. Conzelmann et al. (2023), Weinstein (2022)) focus on college major choice, using university location to determine the relevant labour market. I consider instead students' earlier location and include their decision whether to attend university in my outcomes.

This work also expands on prior work examining the impact of specific local shocks to labour markets in various contexts. The existing literature finds that education is a substitute for labour in response to single-sector shocks caused by natural resource booms (Emery et al. (2012) Maurer (2019) Kovalenko (2023)) and trade policy (Atkin, 2016). I differ from this literature by considering the changes in local composition coming from all sectors, rather than a single industry or policy, and by considering more nuanced educational choices in addition to continued enrolment. My results are also consistent with prior work finding a (permanent) dip in the attainment of those who graduate into a housing-induced local labour

market boom (Betts and McFarland (1995), Charles et al. (2018)).

Also related is the literature on the elasticity of education choice to expected earnings. This literature has focused primarily on college major choice in the US, finding a small but significant elasticity[2]. However, this literature does not explicitly consider the cost of relocation or the spatial distribution of jobs which is the focus of my work.

The findings here also relate to recent work on place-based policies, the hazard cost of which depends on the spatial concentration and willingness to move of the intended transfer recipients Gaubert et al. (2021). My research points to an additional margin —education choice— in which people in a given location may be entrenched and provides evidence that industrial policy may not change these outcomes for locals.

My results also bring results from agglomeration literature into a new light. Recent work has highlighted the importance of spillovers from significant local industrial investment on the local and total cost of investment policies (Kline and Moretti, 2014). This work finds the largest (positive) spillovers from investment in areas which share worker flows with the industry being funded (i.e. already have a pool of qualified workers) (Greenstone et al., 2010). The muted response I find from local students sheds light on why having an existing local pool of qualified workers is important.

The rest of this paper is organised as follows. Section 2 describes the institutional context of English education. Section 3 describes the datasets and measures used in the analysis, and presents descriptive statistics. Section 4 describes the empirical strategy and assumptions required for the identification strategy. Section 5 presents the findings for attainment and field choice. Section 6 describes additional specifications and extensions. Section 7 concludes and highlights potential avenues for future research.

2 Institutional context

In the UK, education is specialised, and qualifications are standardized at a young age. Education is regulated at the national level; that is, each of England, Scotland, Wales and Northern Ireland have their own requirements. In this paper, I study students in England.

[2]Altonji et al. (2016) provides a good review of the findings.

Figure 1 shows the typical progression of students through the English education system. The first opportunity for subject choice comes in Key Stage 4, when students are ages 14-16. At this phase of their education, students choose which subjects to study for their General Certificate of Secondary Education (GCSE) examinations. These exams, typically taken at the end of Year 11 (ages 15-16), are nationally standardised and offered in a variety of subjects. All students are required to take exams in English, mathematics, and science, and schools are required to provide at least one offering in each of arts, humanities, business, and language. Thus, these choices are comparable for all students in England.

Schooling in England is compulsory until age 16. Education is compulsory to age 18; this was increased from 16 to 17 in 2013, and from 17 to 18 in 2015. Post-16 qualifications are standardised across the UK and regulated through the Regulated Qualifications Framework which covers both academic and vocational qualifications. In England, the relevant framework is the National Qualification Framework (NQF). During this period, students have several alternatives for education: academic-track A-levels; technical education; vocational training; on-the-job training; or a mix of volunteering and part-time employment. In this paper, I focus on whether students continue on the academic track.

Following the period of compulsory education, students can choose to continue their education either academically through university courses (which generally require completion of A-levels) or through continuing vocational education. Like academic qualifications, vocational qualifications are regulated and standardized, and thus comparable across time, level, and field.

Students can select up to 5 subjects to study in A-levels but typically take 3 exams, the number required for most university courses. University departments post descriptions of the typical profile of subjects and grades required for admission, which informs students' choices about which subjects to take and where to apply. In practice, this means that the pathways students can take can be restricted by their choice of A-level subjects.

In England, school funding is determined on a per-pupil basis according to the National Funding Formula (NFF); this stands in sharp contrast to the US, where school funding comes primarily from the local tax base. While this formula is adjusted for local economic

conditions[3], it is unrelated to local tax revenue. The funding is distributed to the Local Authority, which then allocates it to schools according to its own formula.

This policy results in school funding on a per-pupil basis being more equitable across schools and less responsive to local conditions than in other contexts. In England, during this time, the 90/10 ratio of per-pupil funding at the school level ranged from 1.3 to 1.6, with the most deprived local authorities having the highest level of funding (Belfield and Sibieta, 2016). This stands in sharp contrast to the US where differences are much larger[4] and positively correlated with local economic conditions, shutting down an important channel of inter-generational human capital transmission.

3 Data and descriptive statistics

My primary unit of analysis is the Travel to Work Area (TTWA) - these regions are defined such that the bulk of their resident population work within the same area. Conceptually, they are similar to Commuting Zones and can be thought of as local labour markets. In some specifications, I also consider results at the Postcode District level. This smaller unit is roughly equivalent to a zip code; it has an average area of 25 square miles. For results relating to A-levels and university, I attribute to each student the local labour market conditions in the TTWA (postcode district) in which they lived when they began secondary school (age 14-15). Throughout, I will refer to this as the TTWA (or postcode district) which the student is from.

3.1 Student data

Student information comes from administrative data from the Department for Education (DfE). Data on qualifications attained during compulsory education, as well as demographic and location information, comes from the National Pupil Database (NPD) (Department For Education, 2023). This is an administrative panel dataset on the census of students

[3]The funding level is adjusted for local hiring costs, a measure of income deprivation in students, and the level of remoteness from other services.

[4]For comparison, the 90/10 ratio of per pupil funding in the US for elementary and secondary schools at the more aggregated school district level was 2.4 in 2016 (U.S. Census Bureau, 2021).

attending state-funded secondary schools in England beginning in the 2001/02 school year. Data on university attainment comes from the Higher Education (HE) dataset, which can be linked to records from the NPD. This student data is collected for all students studying a qualification above level 3 (A-Levels or equivalent vocational qualification) at a reporting HE provider.

Figure 2a shows the average share of students from each TTWA who enrol in A-levels. The share of students enrolling in A-levels ranges from less than 50% in some coastal areas to nearly 70% in parts of the southeast. This pattern is mirrored in Figure 2b, showing university enrolment, with the share enrolled varying from less than 25% to nearly 50% along the same geographic lines.

In addition to enrolment and attainment, these datasets provide specific information about each subject taken (A-levels) and degree program (university). I map each of these to the fields coded in the Labour Force Survey (LFS). Figure 3 shows the field of university enrolment that is most disproportionately popular in each TTWA; that is, the field for which the share of college enrolment is most above the national average. This map shows the geographic clustering of different fields, with Business degrees being overrepresented in London and the surrounding areas and broadly-applicable Arts and Humanities degrees overrepresented throughout South East England.

3.2 Business data

Data on local establishments comes from the Business Structure Database (BSD) (Office for National Statistics, 2024), which is an administrative dataset covering all businesses liable for VAT and/or with at least one member of staff registered for the PAYE tax collection system. This dataset contains approximately 2 million observations annually, covering an estimated 99% of UK economic activity. I observe the location, industry, and number of employees at each establishment, as well as the firm to which it belongs.

3.3 Other data

To link the employment from the BSD to the skills mix in the DfE data, I use the existing skill composition of young workers (ages 25-34) in each industry from the Labour Force Survey (LFS) (Office For National Statistics, 2023). The sample of younger workers is used to more closely approximate the skills requirements for the current students, and for increased consistency in qualification standards over time.

4 Empirical strategy

To estimate the student response to changes in local labour market conditions, I consider students living in location l at time t, measure changes in the local labour market l, and observe the students' academic outcomes in later years.

4.1 Measuring local skill demand

I use several measures to capture changes in the local labour market students will face. The skill demand in location l at time t is calculated as the employment-weighted sum of skills vectors in the industries in that location and time.

$$\boldsymbol{skills}_{l,t} = \sum_{j \in J} emp_{j,l,t} * \boldsymbol{skills}_j \tag{1}$$

Here, $skills_{l,t}$ is the vector of skills used in employment in location l at time t. $emp_{j,l,t}$ is the employment in industry j in l at time t. $\boldsymbol{skills}_j$ is the vector of qualifications held by workers ages 25-34 in industry j. The assumption embedded in this measurement is that the skill requirements for new jobs in the industry are the same as those held by existing young workers.

The industry-specific skills vectors are derived from LFS data as described in Section 3.3. Thus, the actual local skill composition is estimated using the national industry-average skill mix. While this approach was a necessity due to data availability, it has the advantage that it abstracts one level from skill supply decisions in firm moves. That is, the local area need

not have an existing supply of workers with a specific skill for that skill to be recognised as in-demand by the industry.

For tractability, I consider separately the level and field of skills demanded. For outcomes relating to student enrolment decisions and attainment, I consider only the level of qualifications required. For these specifications, the skills vector is $[Degree, Non-degree]$. For specifications relating to field choice, I use the field composition of qualifications[5] seen in Figure 4b.

Figure 4a shows the average expected share of employment in a TTWA requiring a degree. As with the student data, rates of university attendance are much higher in the South East. Figure 4b shows the field of study that is most disproportionately represented in the industry mix in each TTWA. As with the student data, Business degrees are overrepresented in London.

4.1.1 Average skill share

In my correlational results, I consider the average skill share in the three years prior to a decision. I take this measure to smooth any transient changes in labour market shares and because the exact timing of the relevant labour market characteristics is ambiguous.

4.1.2 Changes in the overall local skill composition

I first use the full change in local skill mix coming from changing industrial composition. The change I compute is the one-year difference in skill share. $skills_{s,l,t}$ is the component of the skills vector $skills_{l,t}$ in skill s. Thus, $\Delta skills_{s,l,t}$ is the one year change in the percentage of workers with a given skill.

$$\Delta skills_{s,l,t} = \frac{skills_{s,l,t}}{||\boldsymbol{skills}_{l,t}||} - \frac{skills_{s,l,t-1}}{||\boldsymbol{skills}_{l,t-1}||}$$

To better understand the dynamics of changes in skill composition, I construct an indicator based on the change in skills in the local area. This allows me to compare cohorts who are yet to make a decision with those already past the start of the qualification.

[5]The LFS attributes field only to qualifications level 3 (A-Levels or equivalent vocational qualification) and above in the NQF, thus, the field mix I use is that of qualifications at this level or higher.

Change threshold Θ	TTWA	Postcode Group
Degree share	0.010	0.015
Field share	0.050	0.075

$$D_{s,l,t} \equiv \mathbb{1}(\Delta skills_{s,l,t} > \Theta)$$

To test the validity and observe the skill share dynamics of this change, I consider the following specification:

$$skills_{s,l,t} = \sum_{\tau=-4}^{6} \left(\beta_\tau D_{s,l,t+\tau}\right) + \gamma_{s,t} + \alpha_{s,l} + \epsilon_{s,l,t}$$

Figure 5 shows the dynamics of degree share employment around a large increase in the degree share. Figure 6 shows the same for fields of study. While, in both cases, the share in the years preceding the increase is significantly above that in the year immediately prior, the years after the increase are significantly higher than the earlier level. The overall change shows only a modest attenuation in the 5 subsequent years and remains well above the pre-increase levels. This indicates a sustained change in the share of employment requiring the specified skill.

4.1.3 Changes in total local demand

The last margin I consider is the overall expansion or contraction of local jobs. Here, I create indicators for expansions of at least 5% in the local labour market. At the TTWA level, the average contraction the average expansion was 8.6%.

$$D_{tot,l,t} \equiv \mathbb{1}(\Delta emp_{j,l,t} > 0.05)$$

4.2 Student response

First, for the correlational estimates, I consider how students' choices relate to the level of employment in a skill in the 3 years preceding the decision point, $skills_{s',l,t+\tau}$.

$$Sh_{s,l,t} = \beta \sum_{\tau=-3}^{-1} \Big(skills_{s',l,t+\tau} \Big)/3 + \gamma_{s,t} + \epsilon_{s,l,t} \tag{2}$$

$Sh_{s,l,t}$ is the share of student cohort in location l at time t who choose to study for qualification s. τ is 0 when the student is in the first year of schooling after the decision is made. For example, for the decision to attend university, $\tau = 0$ in a student's last year of A-levels. Take-up of a skill may change in response to demand changes for s, or for related skills s'; for example, A-level enrolment (s) is a prerequisite for degree enrolment, so an increase in jobs requiring degrees (s') can be used on the right-hand side. In all specifications, the data is at the TTWA x Skill level. Observations are weighted by the total number of students in the TTWA in the initial year (2002). Standard errors are clustered at the TTWA level to account for the correlation of field shares within a location at a given time, and the correlation across time within a location from the averaging of local employment shares.

For the causal estimates, I estimate the following Difference-in-Differences specification:

$$Sh_{s,l,t} = \sum_{\tau=-3}^{4} \Big(\beta_{\tau}^{incr} D_{s',l,t+\tau} \Big) + \gamma_{s,t} + \alpha_{s,l} + \epsilon_{s,l,t} \tag{3}$$

Here, the right-hand side variables of interest are lags and leads of the dummy for large increases described above. I also include skill x time and TTWA x skill fixed effects. The unit of observation, weighting, and standard errors are the same as in the correlational estimates; here it is necessary to cluster across time within a location due to the local skill share fixed effect ($\alpha_{s,l}$).

5 Results

In this section, I first show the relationship between local skill demand and student education outcomes. I then discuss the assumptions required for the causal estimates that follow and present students' responses to changes in their local labour market.

5.1 Correlational evidence

5.1.1 Attainment and local degree share

First, I consider the relationship between local degree employment and student attainment. Table 1 shows the correlations at the TTWA level in both levels and differences[6]. TTWAs with a higher share of degree employment have a significantly higher share of students enroling in A-levels, more A-level passes (per student from that area), and a higher share of students enroling in university. Compared to TTWAs in the 25th percentile, those in the 75th have 10pp more students enrolling in A-levels and 8pp more students enroling in university. Looking at the 5-year change in local degree employment, the sign of the coefficients remains positive, but the magnitude is much smaller and they are no longer significant. Most of the differences come from variations between, rather than within, TTWAs.

5.1.2 Field choice and local field share

I next consider the relationship between local field employment and students' field choice. Table 2 shows the correlations at the TTWA level in both levels and differences. TTWAs with a higher share of field employment have a significantly higher share of students enroling in that field in university; the relationship does not hold for A-levels, which are much broader subjects. For every 10pp higher the field share of an area is compared to others, the share of students from that area studying in that field is 3pp higher. Looking at the 5-year change in local field employment, the sign of the coefficients reverses, indicating that students may substitute education for employment within a field.

5.2 Inference and estimation challenges

To understand the dynamics of the changing labour demand, I use the estimators developed in De Chaisemartin and D'haultfœuille (2023). For these estimates to be interpreted as causal, there must be no anticipation effects, and the parallel trends assumption must hold. In my specifications, $t = 0$ is the cohort that had just made a decision about the outcome variable, and thus, in the absence of anticipation effects, is unaffected. I report coefficients

[6]Table A1, shows how these margins respond to local labour market conditions as a whole.

for the three preceding cohorts (who were already past the decision threshold at the time of treatment) as well and see estimates indistinguishable from 0 in all cases. To the extent the immediately preceding cohort anticipates the employment change (perhaps due to newspaper articles, etc.), the earlier cohorts would have to have the same anticipation, which seems unlikely given the nature of the changes. In my specifications, I allow for nonparametric differences in the evolution of different fields over time. The parallel trends assumption is therefore within skill (e.g. the expected evolution of Natural Science degrees is the same for treated and untreated groups; it need not be the same as the evolution of Arts degrees).

5.3 Causal evidence

I find muted responses to local labour market conditions, and responses to hyper-local (post-code district) conditions different than those at the local labour market (TTWA) level.

5.3.1 Attainment and local degree share

I first consider how enrolment and attainment respond to an increase in the share of local jobs requiring degrees. A-levels are the most common path to university enrolment; therefore, if the choice to enrol in A-levels was primarily driven by forward-looking skill concerns, enrolment would grow in response to increased demand for jobs requiring degrees.

Figure 7 shows how enrolment in A-levels changes in response to an increase in local degree employment, as specified in equation 3. I find no evidence that students' choice to enrol in A-levels responds to the local degree demand.

I then turn to the composition in students' more immediate vicinity. Figure 8, shows the response at the Postcode Group level. The positive point estimates increase a change of around 0.35pp in the first two years and 0.90pp in the following two. The confidence intervals rule out an increase of more than 2.5pp, equivalent to one student per cohort for every 10 new jobs.

The next margin of choice students face is whether to attend university. Figure 9 shows how the share of students who enrol in a degree program changes in response to increase in local degree employment. Again, I find no evidence that enrolment changes following an

increase in degree employment [7] .

5.3.2 Field choice and local field share

Finally, I consider the field choice of university students. Figure 10 shows the share of students who study that subject in university. Here, I also find no evidence that, in the short term, students respond to changing local demand. The estimates also bound the change at no more than an 0.4pp increase for every 1pp increase in field share. At the postcode group level, there is a borderline-significant increase in field enrolment, as seen in figure 11. However, the magnitude is small: it is bounded from above by a 0.25pp increase in enrolment for every 1pp increase in field share in jobs. This amounts to 1 new student in a field for every 200 new jobs.

All together, my results show that any short-run student response to changing local conditions is muted, and that the change in sills from local students is insufficient to meet the new demand.

6 Additional specifications

6.1 Different skills

My current analysis focuses on academic track qualifications — A-levels and university — but there is also a unified qualification framework for vocational and technical skills. These skills are relevant for policies such as Reshore UK, intended to relocate manufacturing jobs from abroad to the UK. The response to demand for these skills may be different due to different training modes, and may also be more dependent on local training supply. These students are more likely to remain in the area where they grow up, so the local conditions may be more relevant for them.

[7] Figure A1, shows how these margins respond to local labour market conditions as a whole. I find no evidence that students substitute away from university enrolment when the local economy expands.

6.2 Student characteristics

In addition to using different variations in the skills demanded, it is also interesting to examine how different types of students respond to changes in local demand.

6.2.1 Earlier performance

Graduates from the most selective group of universities[8] are more mobile than graduates of other universities, with those from the least selective universities being the least likely to move (Britton et al., 2021). Another fruitful extension could therefore be to investigate how these responses vary with students' earlier performance by splitting students into groups based on their results before the decision to enter A-levels.

6.2.2 Geographic mobility

In the current analysis, I consider all students that are living in a place at a given time (before the local economic changes). I can also restrict the analysis to students who remain in that area. Conversely, I could identify the area effects on students who move with a measure of 'exposure' to different subjects à la Chetty et al. (2016).

6.2.3 Demographics

While this analysis's primary focus is on the drivers of inequality across space, the drivers of education choice and responsiveness to local changes may also contribute to inequality within a location. Students who are more responsive may differentially benefit from higher returns to in-demand local skills (Altonji et al. (2012) Early et al. (2020)). Although I do not observe the parents' industry, I will use an indicator for whether the student was eligible for Free School Meals (FSM) as a measure of familial background. This will allow me to identify whether the responsiveness is different by parental background.

[8]The most selective universities are defined as the Russell Group, a self-selected group of twenty four research universities. These universities receive the bulk of all research funding.

6.3 Broader changes

This analysis has focused on local changes, controlling for national circumstances, rather than on broader demand. Particularly for university decisions, the overall prospects may have an important impact. Another avenue for future research is using a shift-share instrument to how national shocks, such as import competition, affect students' choices.

7 Conclusion

In this paper, I study spatial differences in student attainment, achievement, and field choice. I find that students' choices are highly correlated with those used in jobs in their local area, but, in the short run, do not significantly respond to changes in local demand. This has important consequences for the results of policies implemented with the goal of bringing good jobs to left-behind communities.

Multiple mechanisms could be at play causing these differences: the local changes may not be salient, the types of skills required may not be those that students had considered, or students may be considering other factors in their choice of study. Regarding salience, I find that even the most local of changes (on average within 5 miles of students' location) do not significantly affect take-up. To further address this concern, future research can instead consider large expansions or contractions of prominent local firms, which may be more noticeable to local students.

While there is no mechanical relationship between one cohort and the next there, could also be momentum at the local or school level driving changes. For example, teachers may be more familiar with the pathways that previous cohorts took. Furthermore, there are other local factors - such as parental composition - that may push students to follow the more traditional local path (Ventura, 2023). Understanding these factors leading to local persistence of education choices is a potentially fruitful area for further research.

While the UK setting is ideal for understanding student responses holding constant local education provision, this needs to be considered when applying of this research to other contexts. Expectations of the total student response to changing local circumstances would also need to consider local skill provision, as the response I measure is that of students when

local provision does not change. This may be complicated by latent demand for skills which were not previously offered, resulting in in higher take-up of these avenues than I observe in England.

The muted response of local students to changing conditions leaves many questions open for future research. If the goal of these policies is for the local population to gain valuable skills, it is important to know whether coordinating job growth policies with targeted up-skilling programs may induce a response not seen with changing job skill composition alone. It is also relevant to understand whether other skills, such as those requiring vocational training, which are more likely to be used locally are likely to respond to changes.

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Figure 1: England education timeline

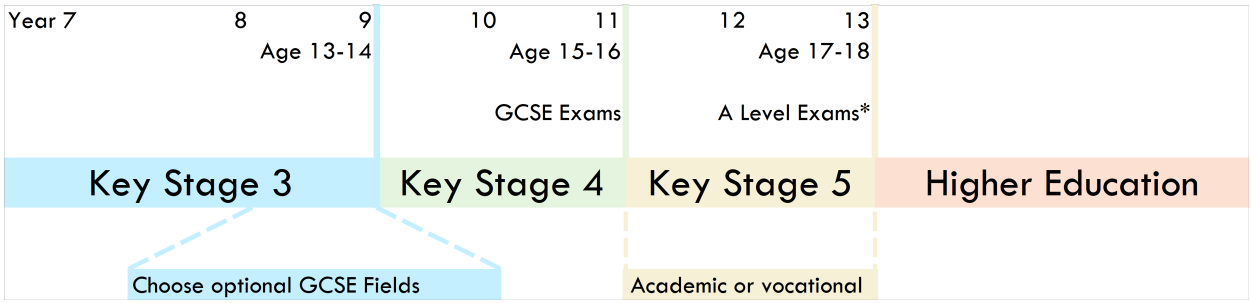
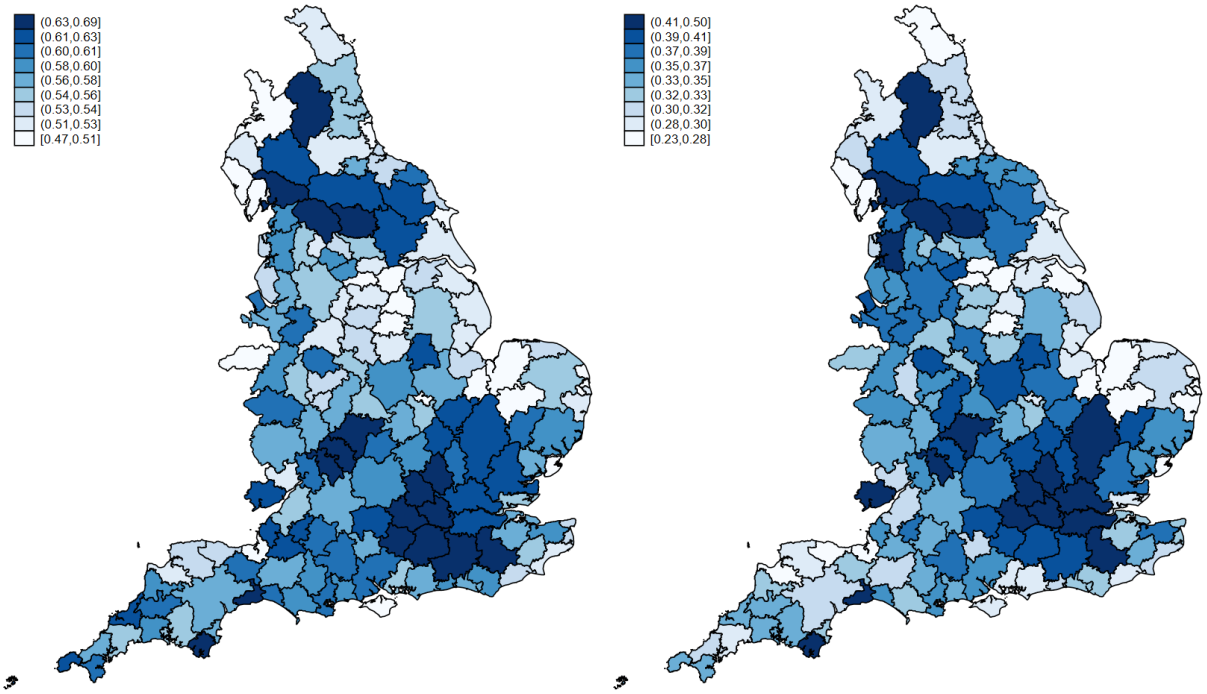


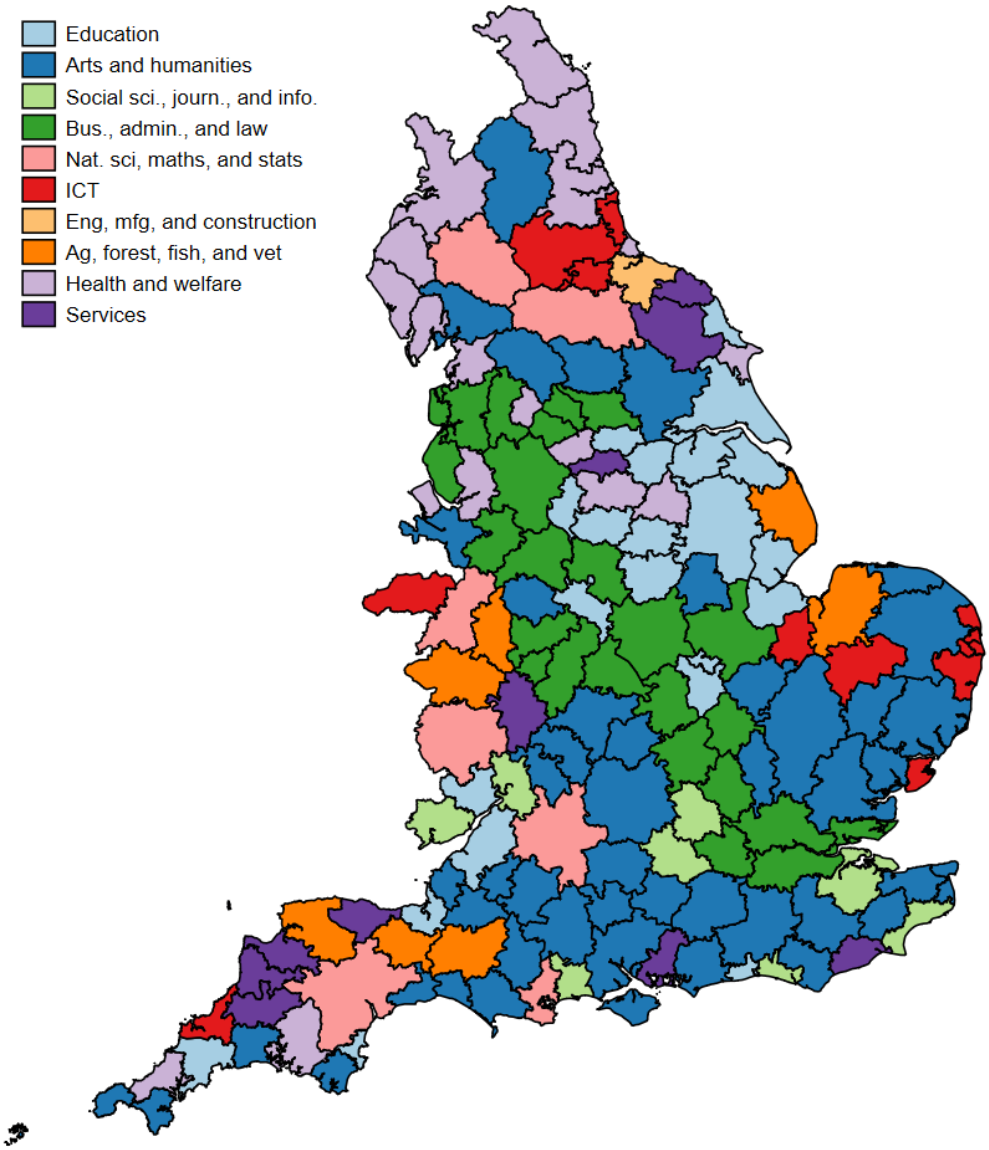
Figure 2: Local student enrolment



(a) A-level enrolment **(b)** University enrolment

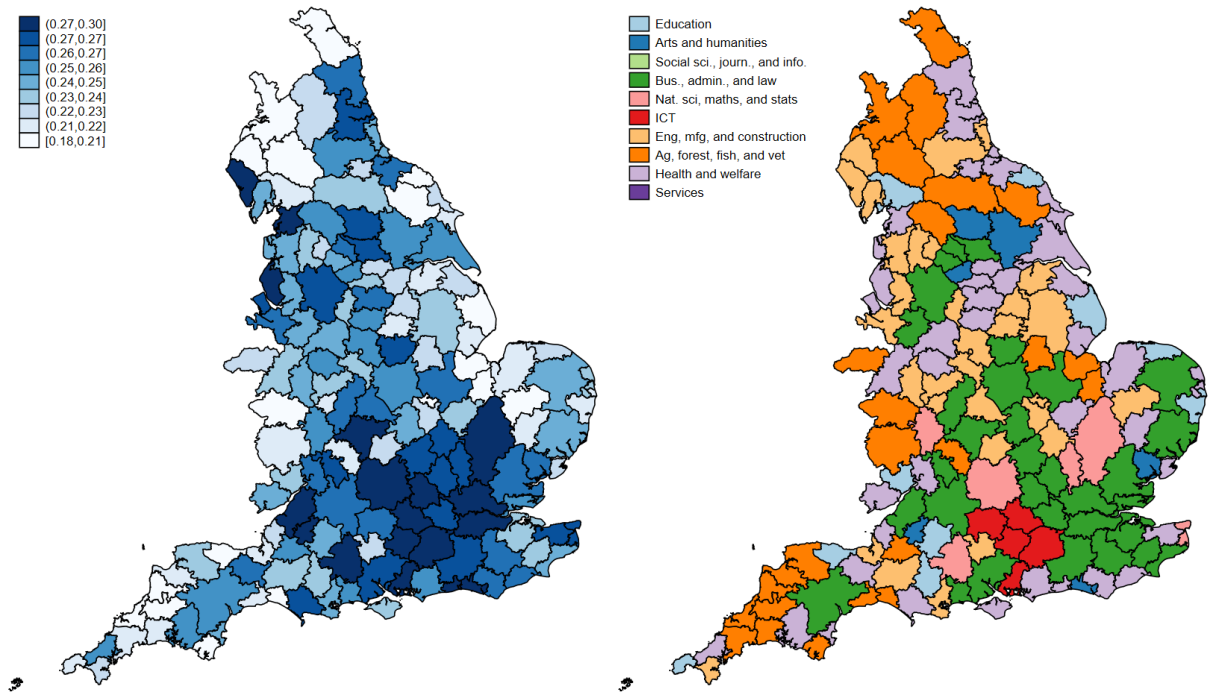
Student information from the NPD. Cohorts that were in Year 10 from 2004-2013 are included. Student information for HE enrolment comes from HESA. For university enrolment, cohorts that were in Year 10 from 2005-2012 are included. Students are allocated to the first degree of the highest level in which they enrol within 9 years of Year 10.

Figure 3: Local students' most prominent university field choice



For each TTWA, the map shows the field of study that is most overrepresented compared to national levels. Student information for HE enrolment comes from HESA. For university enrolment, cohorts that were in Year 10 from 2005-2012 are included. Students are allocated to the first degree of the highest level in which they enrol within 9 years of Year 10.

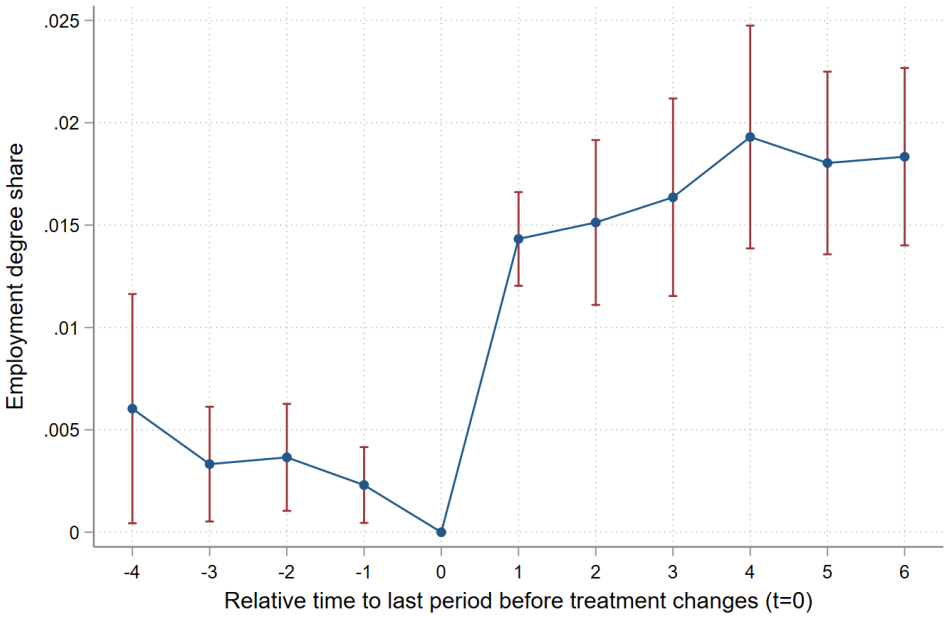
Figure 4: Local employment shares



(a) Degree employment **(b)** Field most above national average

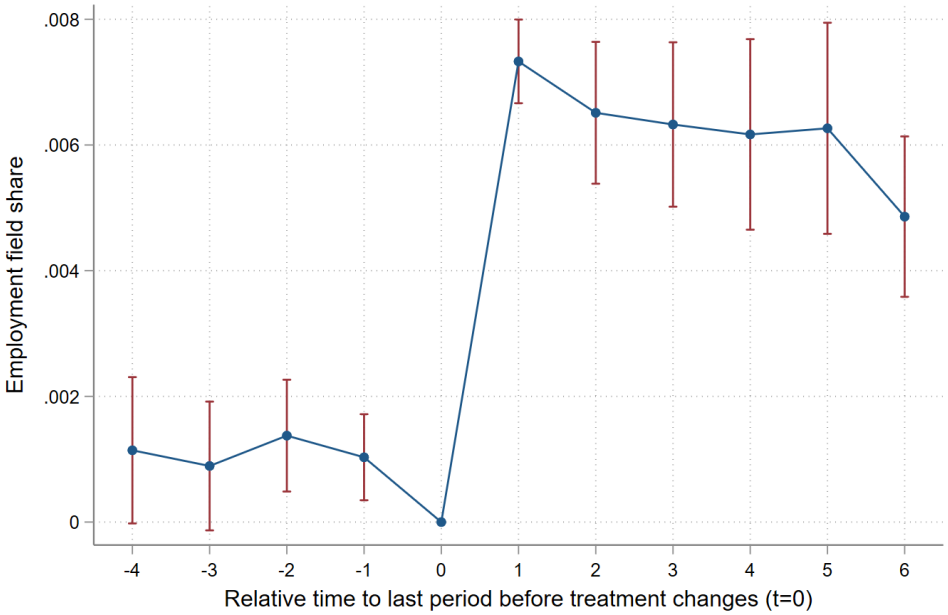
Employment shares from the BSD, combined with the LFS. For each TTWA, the map in panel (b) shows the field of employees in that location that is most overrepresented compared to national levels.

Figure 5: Degree employment shares increase following degree expansion



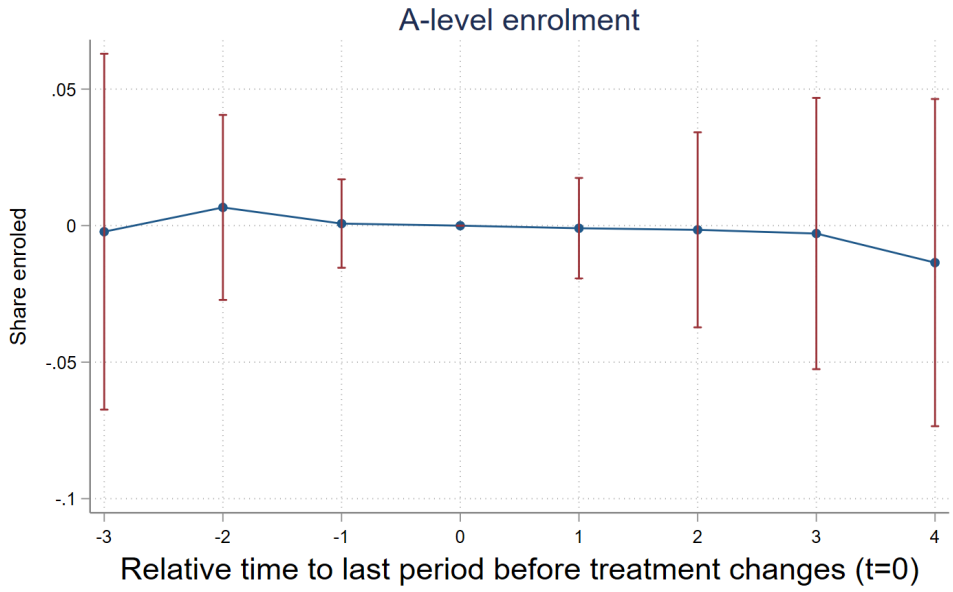
Data at the TTWA x Year level. Employment shares and changes from the BSD.

Figure 6: Field employment shares increase following field expansion



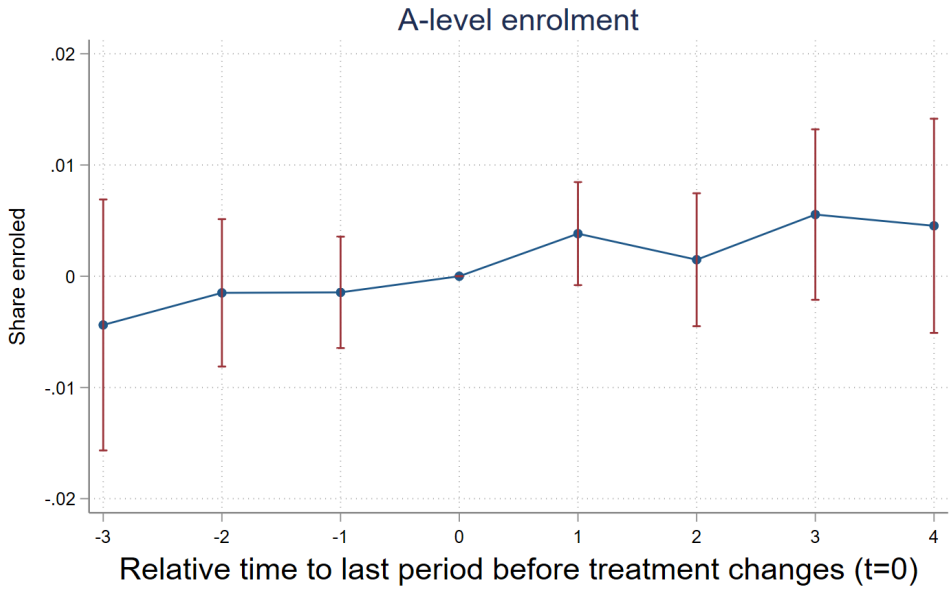
Data at the TTWA x Year x Qualification level. Employment shares and changes from the BSD.

Figure 7: No significant change in A-level enrolment following an expansion of local (TTWA) degree employment



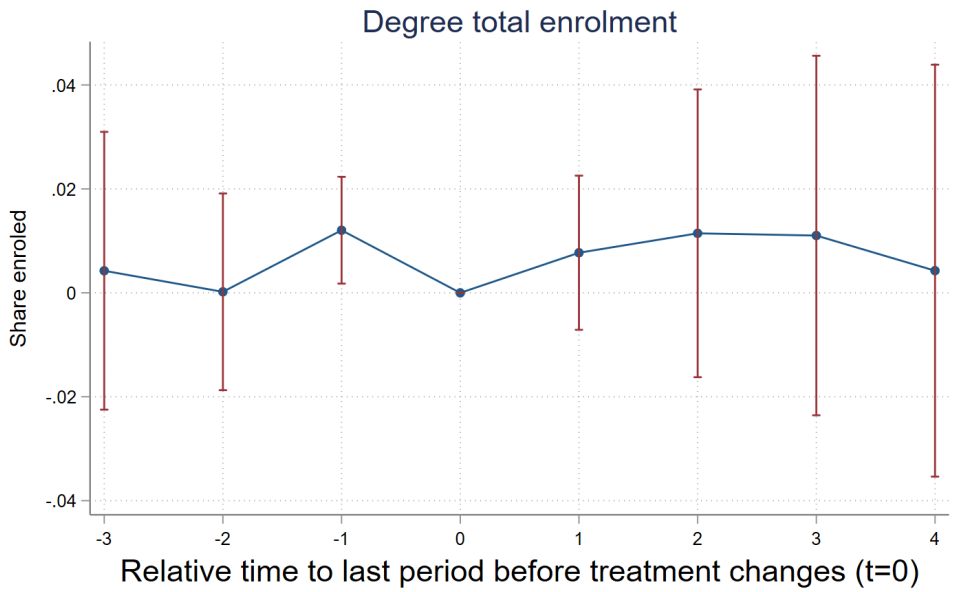
Data at the TTWA x Year level. Employment shares and changes from the BSD. Student information from the NPD. Cohorts that were in Year 10 from 2004-2013 are included. RHS variable used is an indicator for changes of more than 1.0pp in the share of jobs in an area that employ a worker with a degree. Standard errors are two-way clustered by base year TTWA.

Figure 8: No significant change in A-level enrolment following an expansion of postcode group degree employment



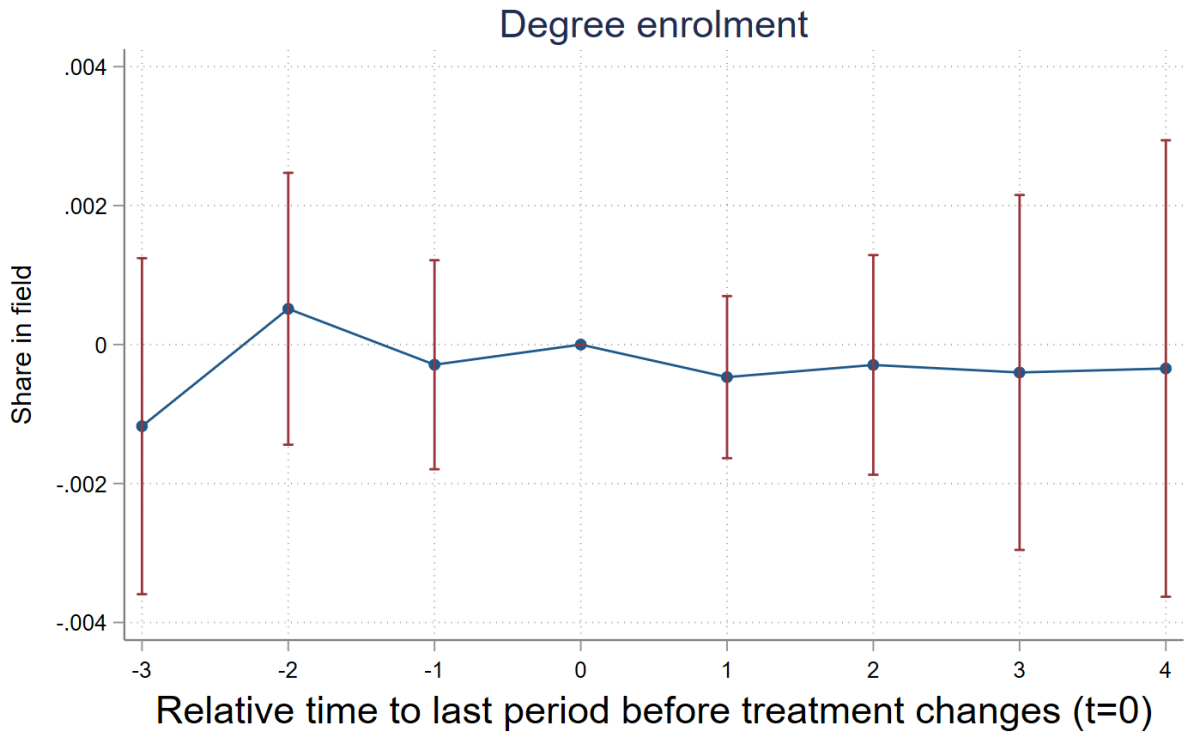
Data at the Postcode Group x Year level. Employment shares and changes from the BSD, student shares from the NPD. Student information from the NPD. Cohorts that were in Year 10 from 2004-2013 are included. RHS variable used is an indicator for changes of more than 1.5pp in the share of jobs in an area that employ a worker with a degree. Standard errors are two-way clustered by base year TTWA.

Figure 9: No significant change in degree enrolment following an expansion of local degree employment



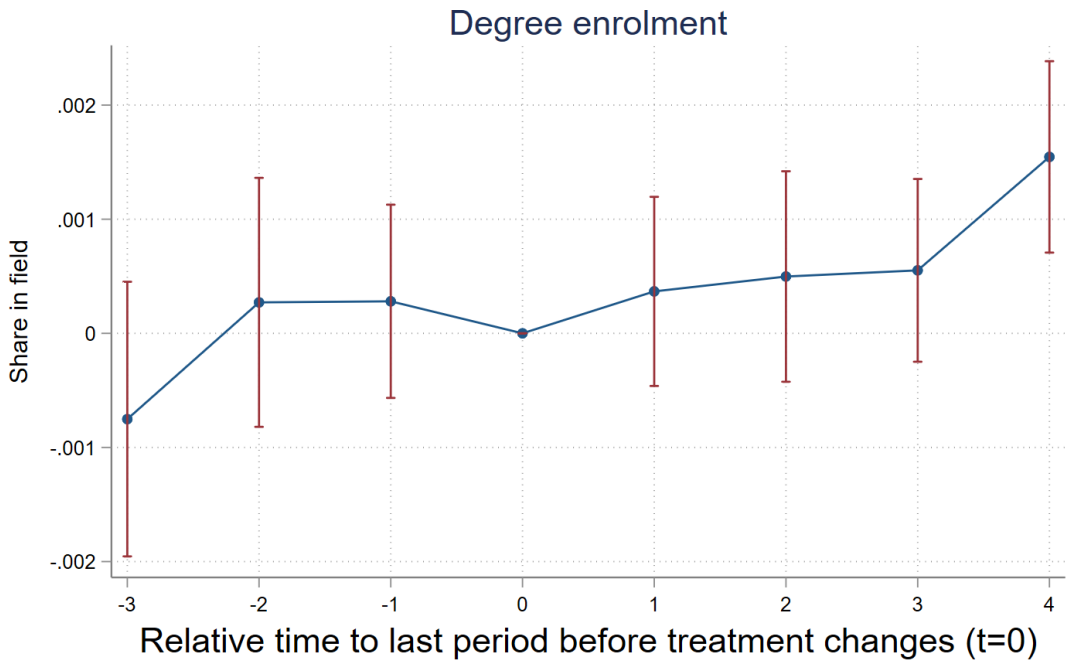
Data at the TTWA x Year level. Employment shares and changes from the BSD. Student information for HE enrolment comes from HESA. For university enrolment, cohorts that were in Year 10 from 2005-2012 are included. Students are allocated to the first degree of the highest level in which they enrol within 9 years of Year 10. RHS variable used is an indicator for changes of more than 1.0pp in the share of jobs in an area that employ a worker with a degree. Standard errors are two-way clustered by base year TTWA.

Figure 10: No significant change in university field selection following an expansion of local field employment



Data at the TTWA x Year x Qualification level. Employment shares and changes from the BSD. Student information for HE enrolment comes from HESA. For university enrolment, cohorts that were in Year 10 from 2005-2012 are included. Students are allocated to the first degree of the highest level in which they enrol within 9 years of Year 10. RHS variable used is an indicator for changes of more than 0.5pp in the share of jobs in an area that employ a worker with a qualification in the field. Standard errors are two-way clustered by base year TTWA.

Figure 11: Small change in university field selection following an expansion of postcode group field employment



Data at the Postcode Group x Year x Qualification level. Employment shares and changes from the BSD, student shares from the NPD. Student information for HE enrolment comes from HESA. For university enrolment, cohorts that were in Year 10 from 2005-2012 are included. Students are allocated to the first degree of the highest level in which they enrol within 9 years of Year 10. RHS variable used is an indicator for changes of more than 0.75pp in the share of jobs in an area that employ a worker with a qualification in the field. Standard errors are two-way clustered by base year TTWA.

	A-Level Enrol.	A-Level Passes	Uni Enrol.	A-Level Enrol.	A-Level passes	Uni Enrol.
Share degree emp.	0.544***	1.566**	0.409**			
	(0.118)	(0.549)	(0.125)			
Δ_5 Share degree emp.				0.157	0.390	0.0890
				(0.154)	(0.660)	(0.157)
Year FE	Y	Y	Y	Y	Y	Y
N	1705	1705	1705	930	930	930

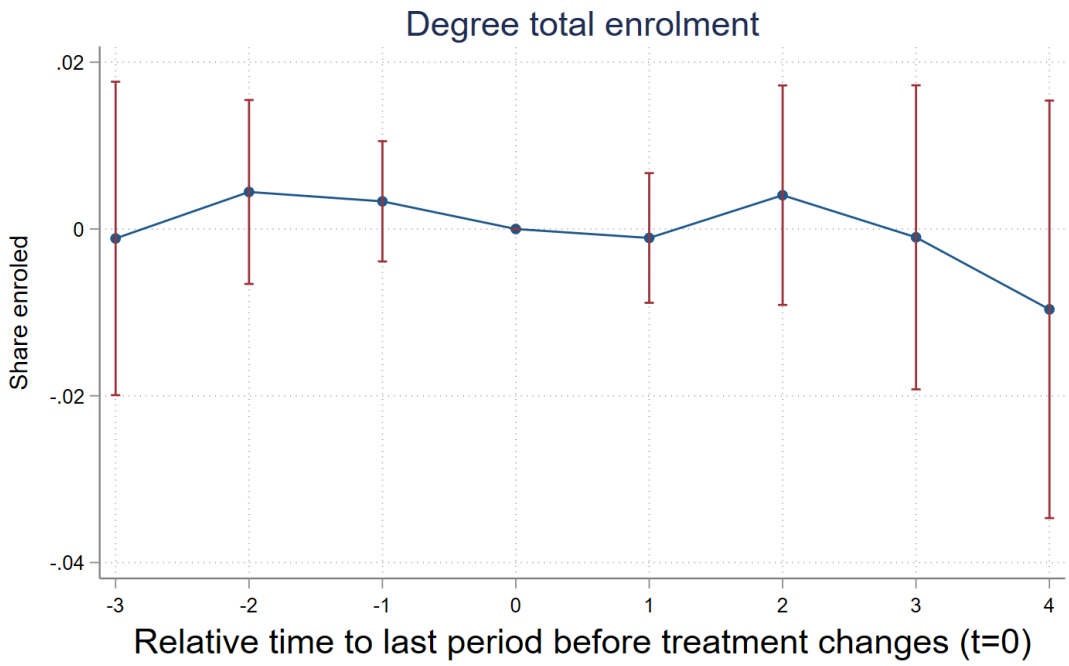
Table 1: Data at the TTWA x Year level. Employment shares and changes from the BSD. Student information from the NPD. Cohorts that were in Year 10 from 2004-2013 are included. Student information for HE enrolment comes from HESA. For university enrolment, cohorts that were in Year 10 from 2005-2012 are included. Students are allocated to the first degree of the highest level in which they enrol within 9 years of Year 10. Results are weighted by the number of students in Year 10 in the TTWA in 2002. Standard errors are two-way clustered by base year TTWA.

	A-Level field	Uni Field	A-Level Field	Uni Field
Share field emp.	0.107	0.316***		
	(0.149)	(0.0390)		
Δ_5 Share field emp.			-0.523*	-0.0835
			(0.238)	(0.111)
Field x Year FE	Y	Y	Y	Y
N	15345	18600	8370	10850

Table 2: Data at the TTWA x Year x Qualification level. Employment shares and changes from the BSD. Student information from the NPD. Cohorts that were in Year 10 from 2004-2013 are included. Student information for HE enrolment comes from HESA. For university enrolment, cohorts that were in Year 10 from 2005-2012 are included. Students are allocated to the first degree of the highest level in which they enrol within 9 years of Year 10. Results are weighted by the number of students in Year 10 in the TTWA in 2002. Standard errors are two-way clustered by base year TTWA.

8 Appendix

Figure A1: Degree enrolment, total economic conditions



Data at the TTWA x Year level. Employment shares and changes from the BSD. Student information for HE enrolment comes from HESA. For university enrolment, cohorts that were in Year 10 from 2005-2012 are included. Students are allocated to the first degree of the highest level in which they enrol within 9 years of Year 10. Standard errors are two-way clustered by base year TTWA.

	A-Level Enrol.	A-Level Passes	Uni Enrol.	A-Level Enrol.	A-Level passes	Uni Enrol.
Indexed total emp.	-0.0657**	-0.0738	-0.0590*			
	(0.0247)	(0.0962)	(0.0260)			
Δ_5 Indexed total emp.				-0.0534	-0.0894	-0.0419
				(0.0293)	(0.0838)	(0.0268)
Year FE	Y	Y	Y	Y	Y	Y
N	1705	1705	1705	930	930	930

Table A1: Data at the TTWA x Year level. Employment shares and changes from the BSD. Student information from the NPD. Cohorts that were in Year 10 from 2004-2013 are included. Student information for HE enrolment comes from HESA. For university enrolment, cohorts that were in Year 10 from 2005-2012 are included. Students are allocated to the first degree of the highest level in which they enrol within 9 years of Year 10.