

# **Does University Level the Playing Field? Impacts of Spatial Inequalities on the Gap in the Earnings of Similar Graduates: Evidence from the United Kingdom**

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## **Abstract**

This paper examines if universities in the UK mediate the impacts of spatial inequalities on earnings disparities among similar graduates and provides new evidence on the persistent income inequality at the neighbourhood level, using the Destination of Leavers from Higher Education (DLHE) survey data on the population of individuals graduating from universities in 2012/13. The results suggest that graduates from neighbourhoods with the highest university participation rate, on average, have higher earnings than those from the lowest-participation neighbourhoods, holding demographic features and university-related factors constant. The earnings gap by the neighbourhood quality remains substantial so that males with a degree from the Russell Group from the lowest-participation neighbourhoods barely earn higher incomes than their counterparts from the highest-participation areas who attended a less prestigious university. These results imply that universities in the UK do not fully level the playing field in terms of earnings disparities among graduates from different neighbourhoods.

**Key words:** spatial inequalities; neighbourhood effects; higher education; wage differentials

**Declarations of interest:** None

This version of the article has been accepted for publication, after peer review but is not the Version of Record and does not reflect post-acceptance improvements, or any corrections. The Version of Record is available online at: <https://doi.org/10.1057/s41307-022-00292-y>. Use of this Accepted Version is subject to the publisher's Accepted Manuscript terms of use: <https://www.springernature.com/gp/open-research/policies/accepted-manuscript-terms>.

## **Introduction**

Promoting social mobility in society has emerged as a key government policy in the UK in recent years, largely in response to a body of literature that has shown an increasing trend of social immobility ([Crawford and Vignoles, 2014](#); [Bukodi and Goldthorpe, 2011, 2018](#); [Gregg et al., 2017](#)). Indeed, much literature, particularly in many developed contexts, has shown the extent to which those from disadvantaged backgrounds can access higher education and succeed in the labour market and has suggested the role that higher education can possibly play in promoting intergenerational social mobility can be limited if there remains a link between family background and individuals' labour market outcomes ([Crawford and Vignoles, 2014](#); [Chetty et al., 2017](#); [Britton et al., 2019](#); [Lee and Choi, 2020](#); [Lee, 2021](#)). As such, social scientists have long discussed the impacts of family backgrounds on individuals' later outcomes, namely educational attainments and labour market outcomes, and the role of higher education in mediating such influences.

However, reviewing various factors explaining earnings disparities among similar graduates, besides family backgrounds, is also required to provide more insightful policy guidance to the government. Indeed, many scholars have recently paid much attention to the effects of neighbourhoods on individuals' educational achievements and wages as well as social mobility outcomes (e.g., [Tienda, 1991](#); [Bolster et al., 2007](#); [Tunstall et al., 2014](#); [McDool, 2017](#); [Social Mobility Commission, 2020](#)). Examining the influences of spatial inequalities on earnings disparities and how higher education can mediate such influences is particularly significant in countries with a high level of spatial inequalities, e.g., the United Kingdom. Despite this, little is known about the extent to which higher education reduces earnings disparities among similar graduates from advantaged and disadvantaged neighbourhoods. Here, the term, 'similar graduates', indicates those who attended the same higher education provider, studied the same discipline subject, and obtained the same degree classification. Though recent studies have

shown that socioeconomic disparities in graduates' earnings based upon family characteristics still exist in many contexts even after controlling for various university-related factors (e.g., [Britton et al., 2019](#); [Lee and Vignoles, 2022](#)), the questions of whether universities mediate the effects of spatial inequalities on earnings differentials among similar graduates have remained largely unanswered. This paper, therefore, fills this gap by focusing on a relatively recent cohort of graduates and examining the earnings disparities among similar graduates from neighbourhoods with different qualities, as measured by a young age higher education participation rate.

Using both the Early and Longitudinal Destination of Leavers from Higher Education (DLHE) surveys, provided by the Higher Education Statistics Agency (HESA) in the UK, this paper asks the following questions: a) Is there a gap in the earnings of similar graduates who grew up in neighbourhoods with a different higher education participation rate? and b) How does the wage premium from different higher education providers vary by individuals' neighbourhood backgrounds?

## **Conceptual Framework**

Research on the role of higher education in graduates' labour market outcomes and/or intergenerational social mobility dates back to the early 1960s within both economics and sociology ([Duncan and Hodge, 1963](#); [Atkinson and Jenkins, 1984](#)). To illustrate, human capital theory frames education as an investment that individuals make to raise their stock of knowledge and gain skills that ultimately yield higher earnings ([Schultz, 1961](#); [Becker, 1964](#)). Human capitalists indeed place education as the principal mechanism through which either advantage or disadvantage is passed from one generation to the next ([Becker and Tomes, 1986](#); [Blanden and Macmillan, 2016](#)). In a similar vein, the role of higher education in mediating

those influences of family backgrounds on graduates' earnings has particularly attracted much attention in many developed countries (Chetty et al., 2017; Chetty and Hendren, 2018; Lee, 2021; Britton et al., 2019; Lee and Vignoles, 2022).

It is however worth noting that a vast body of literature has consistently suggested that education is not the only dimension determining individuals' later labour market outcomes. Since the late 20<sup>th</sup> century, many scholars have begun to discuss the effects of neighbourhoods where individuals grew up on income-producing capabilities (Case and Katz, 1991; Tienda, 1991; Corcoran et al., 1992; Sharkey and Faber, 2014; Chetty and Hendren, 2018). Neighbourhood effects could operate in numerous ways, e.g., through peer influences (contagion theories), role-modelling (theory of collective socialisation), enforcement of social norms by adult residents, and influences of public institutions including schools (Brooks-Gunn et al., 1993). Given the various mechanisms of neighbourhood effects, the study of neighbourhood effects is an interdisciplinary topic. Indeed, economics, sociology, geography, and other social sciences possess their own research methodologies and terminologies (Dietz, 2002).

Despite the sceptical view of many economists regarding the very existence of neighbourhood effects on individuals' educational attainments and labour market success, a few studies in the field of economics still contain models of neighbourhood effects (Bénabou, 1996; Durlauf, 1996; Gibbons, 2002; Chetty and Hendren, 2018). Those models are based primarily upon the process of human capital accumulation where family, community, and system-wide determinants play a role. To put it differently, every individual earns wages, determined jointly by a system-wide measure of human capital, e.g., community or neighbourhood effects, and an individual's human capital level, which is often accumulated through his/her education level and passed down from parental human capital (Dietz, 2002). As such, models from the field of economics often argue that family backgrounds and the neighbourhood qualities, e.g., the mean

neighbourhood higher education participation rates, are complementary to each other in the human capital accumulation process (Bénabou, 1996; Dietz, 2002). Following the economic framework suggesting the combined effects of family background and neighbourhoods on the human capital accumulation processes, this paper examines if universities provide individuals from different neighbourhoods with the equality of opportunities to move up the earnings distribution.

## **Relevant Literature**

### ***Spatial Inequalities in the United Kingdom***

There exist many types of inequality affecting individuals' opportunities and life chances, namely inequalities across education, employment, health, and housing. Among various inequalities existing in societies, spatial disparities or inequalities have arguably become the centre of the political discourse given that places throughout the UK, e.g., regions, cities, and neighbourhoods, turn out to be substantially unequal (Gibbons et al., 2010; Overman, 2019). To illustrate, the top-ranked 10 per cent of the UK regions, e.g., West Inner London, have the Regional Gross Value Added (GVA)<sup>1</sup> at least 50 per cent higher than the bottom-ranked 10 per cent (Gibbons et al., 2010; Office for National Statistics, 2018). A body of literature has persistently shown very clear geographical disparities in terms of outputs per worker and employment with cities in the Greater South East, e.g., London, performing better than the rest of the UK (Bachtler, 2004; Office for National Statistics, 2018; Overman, 2019). Most spatial disparities, as mainly measured by earnings differentials across areas, tend to be explained by individual characteristics, which is often associated with the level of human capital accumulated; however, area or spatial effects also play a role (Gibbons et al., 2010). Spatial disparities are particularly important because local social and economic conditions

substantially affect individuals' life course outcomes, providing important implications for the equality of opportunities in terms of optimal utilisation of human capital (Green, 2011; Overman, 2019).

Given the significance of spatial disparities, considering such spatial disparities in the social mobility research has become important, and many scholars have recently paid attention to earnings disparities and different social mobility outcomes based upon where individuals grow up and live (e.g., Taylor, 2006; Dickey, 2007; Social Mobility Commission, 2020). Though most people expect there to be earnings heterogeneity based upon the level of human capital accumulated mainly through education as human capital theory implies, empirical evidence has recently shown that the main reasons for the difference in the size of the wage differentials between individuals from the most and least deprived families (and the differences in social mobility outcomes) across areas in the UK are to be found beyond education (Dickey, 2007; Wong et al., 2019; Social Mobility Commission, 2020). For instance, disadvantaged individuals aged around 28 in areas with the highest social mobility earn more than twice as much as their counterparts in the areas of lowest mobility, even after controlling for their human capital factors (Social Mobility Commission, 2020). It is important to note that areas with lower pay for disadvantaged individuals are typically more deprived, with lower house prices, fewer labour market opportunities in professional occupations, and fewer education opportunities in quality schools. This is why social mobility in the UK is often referred to as 'postcode lottery', with large differences across areas in both the adult earnings of disadvantaged individuals and the size of the wage differentials for individuals from deprived families, compared to those from more affluent families (Social Mobility Commission, 2020).

### ***Neighbourhood Effects on Individuals' Outcomes***

Neighbourhoods, one of the various central social settings determining human development,

are commonly believed to influence individuals' behaviours, attitudes, values, and opportunities (Brooks-Gunn et al., 1993; Settersten, 2001; Baum and McPherson, 2022). The concept of neighbourhood effects is academically intriguing and has been widely embraced by policymakers, mainly in connection with unemployment, wage disparities, and a lack of social mobility (European Commission, 2011). Given the significance of community-level influences on an individual's level of human capital, an impressive body of literature in the field of economics, sociology, and geography has long attempted to analyse the effects of a neighbourhood on individuals' later life course outcomes (Case and Katz, 1991; Tienda, 1991; Brooks-Gunn et al., 1993; Durlauf, 2004; Bolster et al., 2007; Chetty et al., 2016; Chetty and Hendren, 2018). It is often argued that there exist direct neighbourhood effects on individuals' later outcomes mainly through the beneficial effects of higher-quality public and private services, informal job networks, peer effects, and positive role models (Brooks-Gunn et al., 1993).

The actual presence of such mechanisms is still controversial, however. The causal effects of neighbourhood environments on individuals' later life outcomes particularly remain a subject of disagreement (Ellen and Turner, 1997; Dietz, 2002; Burdick-Will et al., 2011). It is important to note that studies on the neighbourhood effects can largely be divided into two categories based upon research design used, e.g., observational and experimental studies, and the literature in the two categories has often suggested a contradictory picture of the neighbourhood effects (Durlauf, 2004; Bolster et al., 2007; Burdick-Will et al., 2011)

First, there is now a rich array of observational studies assessing the neighbourhood effects, which support the idea that children who live in poor neighbourhoods have weaker academic achievements or school outcomes than their counterparts living in less-disadvantaged neighbourhoods (Harding, 2003; Burdick-Will et al., 2011). Although those studies are often criticised due to their highly unsystematic choices of neighbourhood variables by which to

measure effects, e.g., the median income in the neighbourhood, poverty rates, proportions of high-status adults, ethnic characteristics, and proportion of high school or university graduates, they have consistently suggested that the neighbourhood environment has an influence on important outcomes for both adults and children (Case and Katz, 1991; Brooks-Gunn et al., 1993; Borjas, 1995; Ellen and Turner, 1997; Aaronson, 1998; Ainsworth, 2002; Sharkey and Faber, 2014; McDool, 2017). For instance, neighbourhood deprivation has a large impact on the attainment of an arguably more advanced educational qualification level or difficult set of GCSE results (McDool, 2017). The impact is substantially larger for those with educated parents, indicating that the penalty associated with neighbourhood deprivation imposed upon the educational attainment of young adults is greater for those with educated parents who would benefit to a greater extent by living in a non-deprived neighbourhood (Ainsworth, 2002; McDool, 2017).

Evidence from observational studies on the significant neighbourhood effects on individuals' later outcomes can be found in many countries. In the US for instance, education-related outcomes, namely academic achievements or the percentage of dropping out of high school, appear to be correlated with various neighbourhood measures, e.g., proportions of high-status adults or professional jobs in the neighbourhood (Crane, 1991; Ainsworth, 2002). Although not all observational studies have consistently found the significant neighbourhood effects on the labour market outcomes, a majority of studies still suggest the importance of the neighbourhoods in terms of individuals' earnings and employment status (Datcher, 1982; Case and Katz, 1991; Corcoran et al., 1992; Sampson et al., 2002). It should be noted that such neighbourhood effects are often found to be present, holding family-specific variables constant (Brooks-Gunn et al., 1993; Aaronson, 1998).

An important alternative to the use of observational data is the use of data in which government interventions into the residential choices of individuals, i.e., experimental studies—the idea



being that the intervention at least partially defines groups of individuals who have randomly received a treatment (Durlauf, 2004). The two main experimental programmes mainly reviewed in the neighbourhood effect literature are the ‘Gautreaux programme’<sup>2</sup> and the ‘Moving to Opportunity (MTO)’<sup>3</sup>, conducted in the late 20<sup>th</sup> century in several major cities in the US, namely Baltimore, Boston, Chicago, Los Angeles, and New York (Bolster et al., 2007; Chetty et al., 2016). Whilst a few experimental studies have suggested that moving to better neighbourhoods generally has positive short-run impacts for children in terms of higher rates of university attendance, better health outcomes, and reduced behaviour problems, the majority of experimental studies has found little evidence that neighbourhoods affect individuals’ labour market outcomes, particularly in the longer term (Katz et al., 2001; Oreopoulos, 2003; Kling et al., 2004; Sanbonmatsu et al., 2006; Ludwig et al., 2013; Chetty et al., 2016).

Despite the little long-term impacts of neighbourhood quality on individuals’ later education and labour market outcomes examined by many experimental studies, the most recent studies from the MTO have been clearer about the impact of neighbourhoods, particularly on educational outcomes. To illustrate, long-term results show that moving to a better neighbourhood at the earlier stage of life, namely before age 13, significantly increased the probability of going to university, accessing to a more prestigious university, and graduating from university (Chetty et al., 2016; Baum and McPherson, 2022). Unfortunately, however, moving tended to have a negative impact on later life outcomes for young individuals who moved when they were older, which may be due to disruption and stressors related to moving (Chetty et al., 2016).

The neighbourhood effect has long been at the centre of political and academic discourse in part due to the increasing trend of social stratification and spatial inequalities in many developed countries. As discussed, a vast body of literature has shown inconsistent results mainly depending on the research design used, e.g., observational and experimental studies.

Some have interpreted the findings from experimental studies, e.g., the MTO, as providing sufficient evidence to conclude that neighbourhood effects are not very significant for individuals' academic and/or labour market outcomes; Others tend to be reluctant to draw this conclusion given that a vast body of observational studies has suggested not only significant neighbourhood effects on both individuals' academic achievements and labour market outcomes but the uncertainty about the importance of any potential neighbourhood selection biases (Burdick-Will et al., 2011). To the best of my knowledge, there is little literature examining the extent to which the quality of neighbourhoods continues to affect individuals' labour market outcomes after controlling for individuals' university-related factors, e.g., university attended, discipline subjects and degree classification. This paper attempts to fill this gap by analysing the residual association between the neighbourhood qualities and graduates' wages after controlling for university-related factors and other demographic characteristics.

### ***Enduring Controversy of Neighbourhood Effects on Individuals' Outcomes***

As a large body of literature has suggested inconsistent or even contradictory pictures for the presence of neighbourhood effects, it is indeed complicated to draw causal inferences from those studies given that the attributes of a neighbourhood in which a family chooses to live is likely correlated with family characteristics, predicting academic and labour market outcomes (Burdick-Will et al., 2011). To put it differently, it is difficult to disentangle the multiple environmental factors, e.g., household income, access to support systems, and personal motivation, since families self-select into neighbourhoods (Baum and McPherson, 2022). As a result, a small but growing literature has persistently questioned the evidence base of neighbourhood effects.

To illustrate, though it is relatively straightforward to measure aggregate differences between places, it is much harder to figure out what such differences imply in terms of advantages or

disadvantages a place offers to people who live there and/or to isolate the effects of neighbourhood environments from individual characteristics (Case and Katz, 1991; Ellen and Turner, 1997; Durlauf, 2004; Gibbons et al., 2010; McDool, 2017). A poor or disadvantaged neighbourhood may cause an individual's poor outcomes in the education system or labour market; however, because the individual's characteristics partially determine the neighbourhood selection, such characteristics may inevitably result in poor outcomes despite the features of the neighbourhood. Some caution is hence required to interpret the relationship between the neighbourhood and individuals' outcomes.

It is also noteworthy that some of the inconsistent findings about the extent to which neighbourhoods affect individuals' academic and labour market outcomes may result from the variation in effects across locations and populations, in addition to the neighbourhood selection biases (Burdick-Will et al., 2011). Further, estimates of neighbourhood effects on individuals' outcomes vary widely among the studies seeking to identify their presence and magnitude in part due to substantial variations in the model specification although several experimental studies have allowed researchers to strengthen their analyses and numerous observational studies provide strong evidence regarding the impacts of growing up in impoverished neighbourhoods on individuals (Ginther et al., 2000; Baum and McPherson, 2022). It is hence possible that difficulties in controlling statistically for every dimension of multiple environmental factors lead to either under- or over-estimations of the impact of neighbourhoods because such factors may be partially the product of the neighbourhoods in which families have lived or the effects of those factors may falsely attribute to neighbourhoods.

In sum, though it is likely that neighbourhood effects indeed exist, the causal mechanism producing them and their relative importance compared to individuals' personal characteristics are not yet clear (van Ham and Manley, 2010). As such, one should bear in mind that analyses on the neighbourhood effects may include biases unless studies of neighbourhood effects

adequately control for the influence of individual and/or family characteristics (Ellen and Turner, 1997). It is therefore important to properly allow for personal demographic characteristics to examine neighbourhood effects or the effects of social stratification on earnings disparities among similar graduates.

## **Data and Research Strategy**

### ***Data and Sample***

This paper used data from the ‘Early’ and ‘Longitudinal’ Destination of Leavers from Higher Education (DLHE) surveys carried out by the UK Higher Education Statistics Agency (HESA). The Early DLHE was conducted annually approximately six months after graduation, which first began for graduates in the academic year of 1999/2000, whereas the Longitudinal DLHE was conducted biennially roughly 3.5 years after graduation, which first began for graduates in the academic year of 2002/2003. These data contain information on the labour market trajectories and outcomes of graduates who obtained their first degree at a university in the UK. The university-related factors, e.g., university attended, discipline subject, and degree classification, were collected from the Early DLHE survey and the labour market information, e.g., wage and employment type, was extracted from the Longitudinal DLHE survey. This information was linked to the HESA administrative student records, which contain information on graduates’ characteristics, namely parental education levels and neighbourhood higher education participation rates, university attended, a programme of study, and final qualification achieved (HESA, 2014; Duta and Iannelli, 2018), some of which are the key explanatory variables in the analysis.

This paper focuses on a cohort of graduates who completed their first degree at the undergraduate level at one of the 161 higher education providers in the UK in 2012/13. The

Early DLHE survey for graduates in 2012/13 was conducted with a total of 570,265 eligible the UK and European Union domiciled leavers in 2012/13, of which 427,870 (75.03%) responded (HESA, 2014). The Longitudinal DLHE survey for the same cohort was conducted up to 3.5 years after graduation for a sub-sample of students, with 107,340 valid responses (25%) from the 427,870 students who responded to the Early DLHE survey (HESA, 2021). The key focus of the analysis is on the UK domiciled leavers in full-time employment 3.5 years after graduation (excluding EU domiciled leavers), and a large proportion of missing values particularly for the Longitudinal DLHE survey is a potential problem. There indeed exist systematic differences between the restricted and excluded samples based upon the observable characteristics, and hence the multiple imputations technique is applied to minimise potential biases from the large proportion of missing values.

### ***Main Variables***

#### *Graduates' Earnings*

Information on individuals' labour market outcomes, e.g., wages and employment type, used in the analysis was mainly collected from the 2012/13 Longitudinal DLHE survey, which was conducted up to 3.5 years after graduation, or in 2016. The DLHE provides earnings information as a continuous variable only for those in full-time employment. It is worth noting that, for those with the full-time monthly income under £10,000 and above £100,000, the DLHE survey did not provide the exact amount of salary but provided salary information with categories only, e.g., 'under £10k' and '£100,000 and above'. For the analysis therefore, those values have been replaced with £5,000 (for those in 'under £10k' category) and £150,000 (for those in '£100,000 and above' category), respectively. Also, given that the graduates' earnings are not normally distributed and right skewed, the graduates' earnings measure is logged for

the analysis.

### *Family Backgrounds and Neighbourhoods*

The DLHE survey does not provide information on family income. Instead of information on family income, two different measures of individuals' socioeconomic status are used from the DLHE survey: a) parental education level and b) the neighbourhood higher education participation rate marker. Information on the level of parental education is provided as a binary variable, with 1 indicating parents with higher education (HE) qualifications and 0 indicating parents without HE qualifications. The measure of neighbourhood higher education participation rate is based upon the historical POLAR<sup>4</sup> (the participation of local areas). The POLAR classifies local areas in the UK based upon the young participation rate in higher education. The young participation rate is calculated by dividing the number of young people from each area who enter higher education aged 18 or 19 by the young population of that area (Office for Students, 2019). The POLAR 4 is particularly used in the analysis, given that the POLAR 4 was calculated using data on students who began their studies between 2009/10 and 2013/14 (the target cohort for the analysis 2012/13 leavers). The local areas are then ranked by participation rate and split into five quintiles (Office for Students, 2019), ordered from 1 (those with the lowest participation rate) to 5 (those with the highest participation rate).

### *Other Controls*

Higher education providers in the UK often form alliances or groups when sharing common goals or characteristics. Researchers therefore use various university groups or alliances to compare and review features of universities. For the analysis, higher education providers are grouped into six primary types, which are based primarily on the mission group<sup>5</sup> information

provided by the DLHE survey—e.g., Guild HE, Million Plus, University Alliance, Others, 1994 Group, and the Russell Group.

Individuals' wages are in part determined by their ability. The likelihood that an individual enrolls in a certain higher education provider is also likely to be determined by their ability. As a result, unless individuals' baseline abilities before entering universities are properly controlled, the return to education, or wage premium, for a particular university or mission group may be overestimated and include ability biases, whereby individuals with a higher level of abilities select into a particular group of universities. The HESA provides individuals' tariff scores, and hence a measure of earlier academic achievement, which can be used as a proxy for individuals' ability, is included in the models to minimise any possible ability biases.

Whether an individual attended a private secondary school is also controlled in the analysis. This is because entry to private schools usually requires higher academic achievements than state schools and can partly show individuals' family background given that only richer families can afford the tuition of private schools. The information on individuals' ethnicity is also included as a categorical variable in the model, including five different categories, namely Asian, Black, Mixed, Other, and White. Individuals' ethnicity is included in the model given that a vast body of literature has shown significant inequalities in education and labour market outcomes among different ethnic groups, with White being more likely to have higher educational qualifications and better labour market outcomes than ethnic minorities (Zwysen and Longhi, 2016; Zwysen et al., 2020). Individuals' degree classification is also a categorical variable including five different groups, i.e., the first class, upper second-class, lower second-class, third-class honours and unclassified. It is worth noting that some degree courses, namely medicine, are not classified and hence categorised as 'unclassified'. The discipline subject is also a categorical variable including 19 different subject areas. Including the discipline subject in the model is important given that it turns out to be one of the important factors determining

wage differentials among individuals (Britton et al., 2016; Walker and Zhu, 2017).

### ***Empirical Strategies***

Because the restricted sample systematically differs from the target sample based upon observational characteristics mainly due to missing values for key explanatory variables, a multiple imputation technique was first applied to minimise potential biases.<sup>6</sup> This paper then estimates an ordinary least squares regression model of the relationship between graduates' characteristics and their subsequent earnings up to 3.5 years after graduation. Particularly, the annual earnings ( $Y$ ) of individual  $i$  are hypothesised to be a function of the graduates' individual human capital ( $I$ ) and system-wide measure of human capital ( $S$ ).

$$\ln(Y_i) = \alpha + B_1 I_i + B_2 S_i + \mu_i \quad (1)$$

$\ln(Y_i)$  is logged annual earnings of individual  $i$  approximately 3.5 years after graduation, the individual's stock of human capital ( $I$ ) is measured by their parental education level, academic achievements on entry into higher education, e.g., tariff scores, their programme of study, degree classification and university attended ( $HE_i$ ), as well as age (as a proxy for previous work experience). The system-wide measure of human capital ( $S$ ) is proxied by ethnicity, whether they attended a private school<sup>7</sup>, and the level of a higher education participation rate (in quintiles) in the neighbourhood they lived on entry to university ( $N_i$ ). The main parameter of interest is the coefficient for the neighbourhood marker (embedded in  $B_2$  in equation 1), which measures the correlation between the neighbourhood and graduates' earnings.

The result from the model, which includes the neighbourhood marker and parental education level only, is presented first. This provides an indication of the correlation between the neighbourhood and earnings, conditional only on parental education level. Family background,



as proxied by parental education level, is controlled from the very beginning to address the neighbourhood selection problem discussed in the previous section. Parental education level may not fully capture the family characteristics, which possibly determine the selection of neighbourhood; nonetheless, including parental education level in the model can possibly reduce the neighbourhood selection problems.

There may be interaction effects between the neighbourhoods where individuals grew up and the types of universities attended affecting individuals' earnings 3.5 years after graduation. To determine whether this is the case, the following model is also estimated:

$$\ln(Y_i) = \alpha + B_1 I_i + B_2 S_i + \gamma_1 (N_i \cdot HE_i) + \mu_i \quad (2)$$

where  $N_i$  is a categorical variable indicating the level of higher education participation in the neighbourhood (in quintiles) where an individual  $i$  lived on entry to university, with 1 representing the neighbourhood with the bottom-quintile higher education participation rate and 5 indicating the neighbourhood with the top-quintile higher education participation rate.  $HE_i$  is also a categorical variable indicating a university (mission group) an individual  $i$  attended, with 1 = Guild HE, 2 = Million Plus, 3 = University Alliance, 4 = Other, 5 = 1994 Group, and 6 = Russell Group. As such,  $N_i \cdot HE_i$  is an interaction term between the neighbourhood marker and university attended, and this interaction term is included in the model since the influences of universities attended on graduates' earnings may be conditioned by the neighbourhood where an individual lived. The main parameters of interest here are a) the coefficient for the neighbourhood marker (embedded in  $B_2$  in equation 2) and b)  $\gamma_1$ , which capture the combined effect of a neighbourhood and the interaction effect between the neighbourhood and mission groups on individuals' earnings 3.5 years after graduation.

## Empirical Results

### *Wage differentials among similar graduates from different neighbourhoods*

**Table 1.** The Conditional Relationships between Neighbourhood and Log Wages by Gender

	Males				Females			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Log Salary b/se/t	Log Salary b/se/t	Log Salary b/se/t	Log Salary b/se/t	Log Salary b/se/t	Log Salary b/se/t	Log Salary b/se/t	Log Salary b/se/t
<b>Neighbourhood HE participation marker</b>								
1st quintile (bottom)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
2nd quintile	0.034*** (0.013) 2.64	0.031** (0.013) 2.48	0.028** (0.013) 2.11	0.020* (0.012) 1.66	0.012 (0.010) 1.19	0.013 (0.010) 1.28	0.009 (0.010) 0.83	0.006 (0.010) 0.65
3rd quintile	0.056*** (0.012) 4.51	0.055*** (0.012) 4.55	0.043*** (0.012) 3.54	0.034*** (0.011) 2.96	0.044*** (0.010) 4.52	0.046*** (0.010) 4.82	0.036*** (0.010) 3.60	0.031*** (0.009) 3.34
4th quintile	0.092*** (0.012) 7.59	0.090*** (0.012) 7.63	0.071*** (0.012) 6.06	0.060*** (0.011) 5.27	0.076*** (0.009) 8.12	0.079*** (0.009) 8.55	0.058*** (0.010) 6.11	0.052*** (0.009) 5.86
5th quintile (top)	0.153*** (0.012) 12.88	0.149*** (0.012) 12.88	0.106*** (0.012) 9.02	0.089*** (0.011) 8.26	0.119*** (0.009) 13.28	0.122*** (0.009) 13.74	0.086*** (0.009) 9.24	0.077*** (0.009) 8.77
<b>Parental education level</b>								
Yes (With HE qualification)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
No (Without HE qualification)	0.012 (0.010) 1.19	-0.023** (0.010) -2.35	0.010 (0.010) 1.06	0.008 (0.009) 0.94	-0.016** (0.006) -2.52	-0.035*** (0.006) -5.42	-0.007 (0.006) -1.13	-0.004 (0.006) -0.60
<b>Ethnicity (5 Categories)</b>								
Age	No	0.013*** (0.000) 33.47	0.023*** (0.001) 36.92	0.017*** (0.001) 22.61	No	0.007*** (0.000) 23.31	0.014*** (0.000) 29.27	0.009*** (0.000) 22.03
Tariff scores	No	No	0.001*** (0.000) 32.13	0.000*** (0.000) 12.71	No	No	0.001*** (0.000) 32.01	0.000*** (0.000) 13.65
<b>State school marker</b>								
Private school	No	No	0.000 (.)	0.000 (.)	No	No	0.000 (.)	0.000 (.)
State-funded school	No	No	-0.089*** (0.012) -7.64	-0.076*** (0.011) -6.91	No	No	-0.091*** (0.011) -8.24	-0.063*** (0.011) -5.70
<b>Mission group</b>								
Guild HE	No	No	No	0.000 (.)	No	No	No	0.000 (.)
Million Plus	No	No	No	-0.050*** (0.018) -2.82	No	No	No	0.018 (0.012) 1.46
University Alliance	No	No	No	-0.014 (0.018) -0.79	No	No	No	0.036*** (0.012) 2.91
Other	No	No	No	0.005 (0.016) 0.32	No	No	No	0.042*** (0.011) 3.78
1994 Group	No	No	No	0.055*** (0.020) 2.72	No	No	No	0.107*** (0.015) 7.39
Russell Group	No	No	No	0.079*** (0.019) 4.16	No	No	No	0.127*** (0.013) 10.09
<b>Degree classification (5 Categories)</b>								
Discipline subject (19 Categories)	No	No	No	Yes	No	No	No	Yes
Constant	10.203*** (0.012) 873.47	9.931*** (0.017) 573.94	9.515*** (0.026) 360.10	9.974*** (0.040) 251.87	10.091*** (0.009) 1131.38	9.952*** (0.014) 726.30	9.657*** (0.021) 470.17	10.047*** (0.030) 338.33
N	27,898	27,898	27,898	27,898	34,954	34,954	34,954	34,954

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*Note: Table 1 presents MI (multiple imputations) estimates from OLS regressions of graduate's wages on various control variables (control variables were sequentially added from column 1 to 4 for males and from 5 to 8 for females). Each cell reports the coefficients with standard errors in parenthesis. \*, \*\*, \*\*\* indicate statistical significance at 10, 5, and 1%. (With 5 burn-in iterations). The coefficients for ethnicity, degree classification and discipline subject are omitted for simplicity in the text as the key focus is not on the wage differentials by degree classification and/or discipline subjects but on the wage differentials among similar graduates from different neighbourhoods. Any readers interested in the details can contact the author.*

Columns 1 and 5 indicate the correlation between a neighbourhood's higher education participation rate and graduates' earnings by gender, conditional on parental education levels. For males, graduates who grew up in the highest-participation neighbourhoods, on average, earn 15.3 per cent more than their counterparts who grew up in the lowest-participation neighbourhoods, holding parental education level constant. In a similar vein, female graduates who came from possibly the most advantaged neighbourhood with the highest university participation rate tend to have 11.9 per cent higher earnings than their counterparts from possibly the most disadvantaged neighbourhood with the lowest university participation rate.

The following columns show how these relationships change when various control variables are sequentially added. Columns 2 and 6 for instance, suggest that adding individuals' demographic characteristics, namely age and ethnicity, does not necessarily change the influence of the neighbourhood on individuals' wages 3.5 years after graduation, and the coefficients for the neighbourhood marker, particularly for the top quintile, are still statistically significant. Individuals' earlier academic achievements, e.g., tariff scores, and whether individuals attended a private school are additionally controlled for columns 3 and 7. The coefficients for the top quintile neighbourhoods (those with the highest university participation rate) have slightly decreased from 0.149 to 0.106 and from 0.122 to 0.086 for males and females, respectively, implying that the influence of neighbourhoods where individuals grew up on wages is partially mediated by individuals' earlier academic achievements.

The main parameters of interest are the changes in coefficients for the neighbourhood in columns 4 and 8 compared to the ones in columns 1 and 5, showing the impacts of university-related characteristics on earnings disparities among similar graduates from different

neighbourhoods, holding all the key control factors constant. If universities fully level the playing field in terms of earnings disparities among similar graduates who came from different neighbourhoods, the coefficients for the neighbourhood markers should reduce to zero. Unfortunately, however, the coefficients for the top-quintile neighbourhood marker are only roughly halved for both genders, with males from 15.3 to 8.9 per cent and females from 11.9 to 7.7 per cent. That is, even after controlling for individuals' demographic features and university-related factors, namely higher education providers (mission group), a programme of study, and degree classification, male graduates from the highest-participation neighbourhoods, on average, earn 8.9 per cent more than those from the lowest-participation neighbourhoods. In a similar vein, female graduates who grew up in potentially the most advantaged neighbourhoods tend to have 7.7 per cent higher income than those from possibly the least advantaged neighbourhoods, *ceteris paribus*.

### ***The interaction effect between the neighbourhoods and higher education providers***

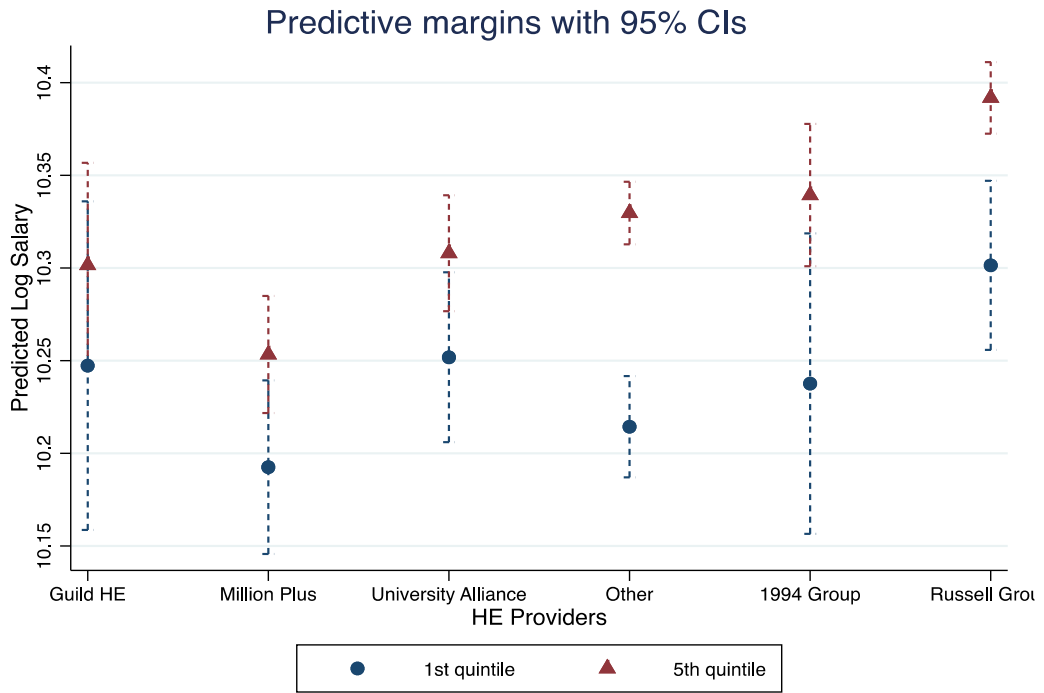
Social scientists should include interaction terms whenever they have conditional hypotheses, in which a relationship between two or more variables depends on the value of one or more other variables (Brambor et al., 2006). For the analysis, the wage premium for six different groups of higher education providers may vary by the neighbourhood where graduates grew up. This paper therefore explores whether there exist any interaction effects between the neighbourhoods and higher education providers, separately by gender.

Figures 1 and 2 present the predicted earnings, considering the interaction effects between the neighbourhood markers and higher education providers for males and females, respectively. The results imply that graduates who grew up in the highest-participation neighbourhoods, on average, have higher wages than those who came from the lowest-participation neighbourhoods within the same mission group for both genders. For instance, the predicted

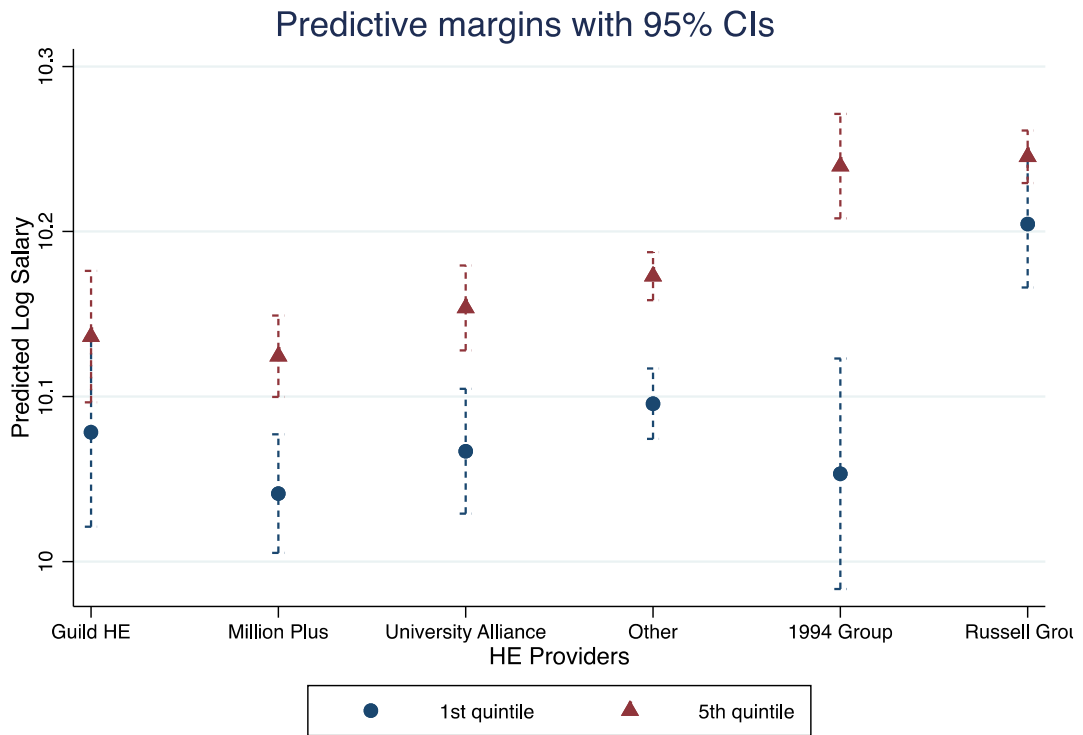
earnings of those from the bottom-quintile neighbourhood who attended the Russell Group are 10.3015 and 10.2045 for males and females, respectively, and the predicted earnings of those from the top-quintile neighbourhood who attended the Russell Group are 10.3919 and 10.2453 for males and females, respectively (see Figures 1 and 2).

It should be also noted that male graduates from the lowest-participation neighbourhoods attending a prestigious university in the Russell Group (predicted earnings = 10.3015), on average, earn even less than their counterparts from the highest-participation neighbourhoods attending a less selective university in the Guild HE (predicted earnings = 10.3016). In other words, since universities in the UK do not fully level the playing field in terms of earnings disparities among similar graduates from different neighbourhoods, those from the lowest-participation neighbourhoods barely have higher earnings than their counterparts from the highest-participation neighbourhoods with a degree from less selective universities even when they attend one of the prestigious universities in the Russell Group. This has an important policy implication given that entering the most prestigious universities does not necessarily guarantee students from the most disadvantaged neighbourhoods to earn sufficiently high or similar wages compared to their counterparts from the least disadvantaged neighbourhoods and therefore does not reduce earnings disparities among similar graduates from different neighbourhoods, particularly for males.

**Figure 1. Predicted Earnings for Males**



**Figure 2. Predicted Earnings for Females**



## **Discussion and Conclusion**

This paper contributes to the existing literature, which has estimated the neighbourhood effects on graduates' wages, by providing empirical evidence regarding the extent to which university-related factors can mediate the influences of spatial inequalities in the UK. Much literature has focused on the magnitude of neighbourhood effects on individuals' later life outcomes, holding various family backgrounds constant. Little is known however, as to whether a university degree can level the playing field in labour market terms, such that where graduates grew up or lived is no longer correlated with graduates' earnings, particularly 3.5 years after graduation. This paper provides new evidence on this issue.

The neighbourhood where individuals grew up still plays a significant role in determining wages of both female and male graduates, even after allowing for key personal demographic features and university-related features. The coefficients for the neighbourhood markers are only roughly halved when university-related factors, in addition to various control variables, are added in the model for both genders. The result implies that universities in the UK do not fully level the playing field in terms of earnings disparities among similar graduates who came from neighbourhoods with different qualities. That is, graduates from the highest-participation neighbourhoods, on average, still have higher incomes than those who grew up in the lowest-participation neighbourhoods, holding all key control variables constant.

It is also noteworthy that the wage premium of each mission group does not significantly vary depending on where individuals grew up. This result implies that, regardless of the neighbourhood where graduates came from, attending more prestigious universities, e.g., Russell Group, on average, allows individuals to earn higher wages than attending less selective universities, e.g., Guild HE and Million Plus. However, it should be noted that because the level of spatial inequalities is substantial, earnings disparities among similar graduates from

different neighbourhoods are still significant and large even after controlling for the university-related factors.

As a result, male graduates from the lowest-participation neighbourhoods tend to earn less even with a degree from the Russell Group than their peers from the highest-participation neighbourhoods who attended a less selective university in Guild HE. That is, though attending the Russell Group universities always yields better labour market outcomes than attending less selective universities, namely Million Plus and Guild HE, regardless of where individuals grew up, earnings disparities based upon the neighbourhoods remain substantial so that those from the lowest-participation neighbourhoods with a degree from the Russell Group barely earn higher wages than their counterparts from the highest-participation neighbourhoods with a degree from less selective universities. The level of spatial inequalities is high, and the effects of such spatial inequalities are persistent. Many people expect that universities could reduce the influences of spatial inequalities on individuals' earnings; however, the results from this analysis suggest that universities do not fully level the playing field, and earnings disparities based upon spatial inequalities are not necessarily addressed with the current higher education system despite a steady rise in the higher education participation rate (Department for Education, 2019).

Clearly, these findings should be considered in light of some of the data limitations. First, the DLHE survey does not provide information on family income. Linking the survey data with high-quality administrative data is not a feasible option for this particular study given that accessing such data is still limited to some extent, particularly for international researchers. Instead of family income, parental education level, i.e., whether parents have a HE qualification, is included in the model to reduce the selection problem regarding the neighbourhood effects. Parental education level may not fully capture the unobserved characteristics determining individuals' choice of neighbourhood; however, it could possibly minimise any biases arising



from the selection problem. Despite this, the magnitude of the neighbourhood effects on individuals' earnings may still be overestimated in the model, and the estimates in this paper should not be interpreted as causal. Second, the estimates in this paper focus solely on earnings differentials among the UK domiciled leavers in full-time employment. The analysis is therefore missing any earnings information on individuals who are in part-time employment or unemployed. In the absence of information on individuals who are not in full-time employment in the DLHE survey data however, I am simply acknowledge that this paper is providing a partial picture that focuses solely on full-time employers.

Even with these limitations, the effect of the neighbourhood on graduates' labour market outcome is still significant even after controlling for various university-related factors, and such results suggest that focusing solely on access to higher education for students from the most disadvantaged neighbourhoods is not sufficient to address earnings disparities among similar graduates from different neighbourhoods. In other words, improving access to university, particularly for students from disadvantaged family backgrounds and/or neighbourhoods, is not enough to reduce the impacts of spatial inequalities on graduates' wages as many studies have already argued (e.g., Britton et al., 2019). It is now the time for the UK government and universities to provide sufficient support for students from disadvantaged neighbourhoods who already entered higher education to reduce the existing earnings disparities among similar graduates from neighbourhoods with different qualities.

Future research could usefully seek solutions for reducing spatial inequalities and improving social mobility outcomes, considering various determinants including family backgrounds as well as neighbourhood effects. By linking the survey data with any high-quality administrative data, future research could include more plentiful variables representing individuals' family backgrounds, namely parental income, and possibly further reduce any potential neighbourhood selection biases. Most importantly, this paper encourages future research into

the drivers of the earnings differentials among similar graduates from different neighbourhoods I observed from this analysis. Possible explanations include early career occupation and location decisions, social networks, or non-cognitive skills developed until the entry to university, all of which turned out to be highly correlated with the neighbourhoods where individuals grew up. Unveiling the most important drivers of the existing earnings disparities among similar graduates from different neighbourhoods could have a significant policy implementation for the UK government to reduce the spatial inequalities through higher education.

## Notes

1. Regional gross value added (GVA) is the value generated by any unit engaged in the production of goods and services. GVA per head is a useful way of comparing regions of different sizes (Office for National Statistics, 2018).
2. The Gautreaux Assisted Housing Programme was the US's first housing mobility programme helping families move from poor and segregated areas into racially and economically diverse suburban communities. By the time the programme ended in 1998, it had helped over 7,100 families (more than 25,000 individuals) relocate to neighbourhoods that were safer and offered better job and educational opportunities (BPI, 2015).
3. The Moving to Opportunity (MTO) is a major randomised housing mobility experiment sponsored by The United States Departments of Education and Housing and Urban Development. Starting in 1994, the MTO offered housing vouchers for low-income families to move from high-poverty neighbourhoods to low-poverty neighbourhoods (Chetty et al., 2016; Baum and McPherson, 2022).
4. POLAR classifies local areas into five groups, based on the proportion of 15 years old who entered universities by the age of 19. These rates are used to assign wards into five quintiles. Wards are contiguous areas that are large enough to typically refer to a recognisable named neighbourhood and the primary unit of English electoral geography for civil parishes, borough, and district councils.
5. Higher Education (HE) providers with similar origins and ambitions often form alliances to encourage collaboration, build relationships with local businesses and produce impactful research. Such a mission group is a typology and not necessarily hierarchical; however, the Russell Group, which comprises 24 research intensive universities, e.g., Cambridge, Oxford, London School of Economic, and Imperial College London, is often considered as the most prestigious universities in the UK. The Guild HE is a group of universities, further

education (FE) colleges, professional bodies, and specialist institutions that specialise in various fields, e.g., art, design/media, music/performing arts, education, business, and health (GuildHE, 2021). The Million Plus is a group of younger or more modern universities focusing on research that drives economic, social, and cultural changes (MillionPlus, 2021). The University Alliance is an association of universities, which was formed in 2006, and its membership mainly comprises technical and professional universities with a mission to drive economic growth in Britain's cities and regions, with a particular focus on links with industry (University Alliance, 2017). The 1994 Group comprised 19 universities in the group, all of which had relatively higher entry requirements. Though the 1994 Group formally dissolved in November 2013 after 19 years of history, the analysis in this paper still includes this group given that the target cohort for the analysis is those who graduated in 2012/13.

6. Any readers interested in the details regarding the multiple imputation and the results of this action can contact the author.
7. The variable indicating whether an individual attended a private school is considered as the system-wide measure of human capital ( $S$ ) since a vast body of literature in the field has suggested peer influences within private school environments are strong enough to outweigh the effect of true learning on various life outcomes (F. Green et al., 2017).

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