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Rurality, socio-economic disadvantage and educational mobility: a Scottish case study

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Abstract

Rurality is known to be associated with a number of weaker educational outcomes from lower attainment through to lower social mobility. This is why so much policy and practitioner focus has been directed at addressing the rurality gap in educational outcomes. In this paper, we use pupil-level data for Scotland to contribute to two dimensions of this problem. First, we explore the relationship between socio-economic deprivation and educational mobility across urban and rural primary schools in Scotland. This provides new insights on the issue of rural disadvantage. Second, we use our dataset to explore the socio-economic makeup of urban and rural schools in Scotland documenting that schools located in the highest and lowest SIMD areas are more homogeneous than those in the middle. This is important for the classification of schools in targeting educational interventions in improving social mobility.

Keywords: Educational Mobility; Primary Education; Rurality; Socio-Economic Disadvantage

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Introduction

There is a long-established link between poverty, deprivation and low educational attainment (see Robertson and McHardy (2021) for a review). This has generated various responses from policymakers over time. For instance, the Widening Participation in Higher Education in England, or the Scottish Attainment Challenge which "aims to raise the attainment of children and young people living in deprived areas, in order to close the equity gap" (Scottish Government, 2021). Despite this policy and academic focus, less is known about the link between rurality and academic attainment. Whilst rurality has been shown to be associated with a number of detrimental educational outcomes from lower attainment through to lower mobility to further and higher education (Echazarra & Radinger, 2019; Davies et al, 2021; Lasselle & Johnson, 2021), evidence on primary education remains limited.

This paper contributes to this literature by exploring the attainment achieved by primary schools across a measure of socio-economic disadvantage according to whether the school is in an urban or rural setting. Scotland offers an interesting case study as in the school year 2020/2021 approximately 20% of its school population was in a rural school.[1] We use pupil-level data on educational attainment to construct a measure of educational attainment at the school level and consider this alongside free school meal (FSM) registration rates in that school. As FSM policies are normally designed to support children from low income households, FSM registration is one of the main measures of socio-economic deprivation that is used in practice in educational policy in Scotland.[2] Our approach closely follows that of Chetty et al. (2020), who examine income segregation across US colleges by calculating income mobility rates for each college.[3]

We focus on "educational mobility", in other words how well students from low socio-economic backgrounds perform at school. A similar approach was taken by Blanden et al. (2007) and Jerrim and Macmillan (2015). We explore whether there is any difference in the relationship between socio-economic background and educational attainment in primary schools in urban and rural settings. This is motivated by the vast literature linking poverty or deprivation to low educational attainment (Robertson and McHardy, 2021) as well as the

[1] It is also noteworthy that Scotland is characterised by large variation in population density. For instance, this is about 3,000 per km^2 in Glasgow and 9 in the Highlands.
[2] See Ilie, S., Sutherland, A., & Vignoles, A. (2017) for a discussion on the appropriateness of this measure of socio-economic disadvantage.
[3] In their work, colleges characterised by high intergenerational mobility were those with a higher share of high-income (top 20% of the income distribution) alumni coming from a low-income family (bottom 20% of the income distribution).

longstanding focus of the Scottish Government on the persistent attainment gap.[4] In doing so, we show that there is a clear difference in the educational mobility rates of pupils in urban and rural schools in Scotland.

Addressing these challenges of rural disadvantage requires accessible measures of school socio-economic (dis)advantage that accurately capture different dimensions of disadvantage in a rural and urban context alike. In a recent paper, Lasselle and Johnson (2021) set out several difficulties with the existing approach adopted to define disadvantage for the purposes of policy interventions, like the widening access and attainment challenge initiatives, for schools in remote and rural Scotland. At present common indicators for targeting policy initiatives at deprived schools, for example, the Scottish Attainment Challenge, includes those in the bottom quintile of the Scottish Index of Multiple Deprivation (SIMD) and the fraction of school pupils eligible for FSMs.[5] However, as Lasselle and Johnson (2021) argue, there are several reasons why these metrics may fail to capture the dimensions of deprivation in remote and rural Scotland. In particular, in the 2020 SIMD, there are no parts of Orkney, Shetland or the Western Isles in the bottom SIMD quintile.

Instead, Lasselle and Johnson (2021) argue for three other metrics to be added to the list of measures used to determine disadvantage: the second SIMD quintile, the progression rate of pupils to higher education in each school, and a 'remote' or 'rural' indicator. They then build these measures into a basket where the school is flagged if it meets at least one criterion in each category. The first category is based on whether the school is above average in terms of the fraction of pupils from the bottom two SIMD quintiles. The second category is based on whether it is below the national average in terms of progression to higher education or above the national average in terms of free school meal registrations. Finally, the third category refers to the six-fold urban/rural classification of the Scottish Government, i.e. accessible rural area or small town, remote rural area or small town, large urban area and other urban area.

One limitation of their approach however was that by focusing on schools with an 'above average' number of pupils from the most deprived SIMD deciles, they were not able to differentially weight schools with 55% versus 25% of their pupils from the first SIMD quintile. This was an admitted weakness in Lasselle and Johnson (2021). This raises an interesting question – how heterogenous are schools in Scotland based on the SIMD ranking of their pupils? And how does this compare to the SIMD ranking of the school itself? If the intake of pupils to the most deprived schools is predominantly from the most deprived neighbourhoods

[4] According to Sosu & Ellis (2014), children from more affluent areas are about twice as likely as those from deprived areas to well in school, with inevitable consequences on early school leaving and post-school education. For more details, see https://www.gov.scot/policies/schools/pupil-attainment/.
[5] https://simd.scot/

this suggests we should not be too concerned about the measure that Lasselle and Johnson (2021) utilise.

The second contribution of this paper is to present evidence on this point. We show that the schools in the most and least deprived areas of Scotland based on SIMD are more homogeneous in the socio-economic classification of their intake than schools in the middle of the SIMD distribution. This suggests that using the approach advocated by Lasselle and Johnson (2021) is likely to capture this dimension of disadvantage relatively well. However, unlike Lasselle and Johnson (2021) we also explore the seven domain rankings[6] of the SIMD index and enrich the previous findings with two additional insights: i) rural schools have more homogenous intakes than urban schools; ii) rural schools are on average less 'deprived' according to most of the SIMD domains.

The rest of this paper is structured as follows: In the next section, we review the relevant literature. Afterwards, we set out the data that we use and the approach that we take to calculate our measure of educational mobility. The section after presents our results, the penultimate section discusses the implications of these findings for addressing the urban-rural differences in educational attainment, whilst the final section concludes.

Literature Review

Robertson and McHardy (2021) provide an insightful review of the extensive literature on the link between poverty, deprivation and academic attainment. The authors identify a strand of the literature focusing on factors operating at the meso-level, i.e. families, schools, communities. There has been a considerable focus on the geographic determinants of attainment. For instance, proximity to higher education (henceforth, HE) institutions plays an important role in the decision to attend university (see, for instance, Card, 1995; Mengan et al., 2010; Gibbons & Vignoles, 2012).

Another body of evidence finds that pupils from disadvantaged neighbourhoods experience worse school outcomes and social mobility (Cutler & Glaeser 1997; Gibson & Asthana, 1998; Chetty et al. 2014) and moving to lower-poverty areas improves the chances of HE attendance, especially if the move happens early on in life (Chetty et al., 2016). In addition, parents can mitigate peers' and communities' influence (Agostinelli et al., 2020, Norris, 2020). Poverty, however, is not the only environmental feature affecting educational gains. Rurality, for instance, is linked to a number of weaker educational outcomes from lower attainment (Welch et al., 2007) through to lower mobility and lower post-school education

[6] These are the Income domain rank; Employment domain rank; Health domain rank; Education/skills domain rank; Housing domain rank; Geographic access domain rank and Crime rank.

(Echazarra & Radinger, 2019; Van Maarsaveen, 2020; Davies et al, 2021; Lasselle & Johnson, 2021).

Meanwhile, since the 1997 Dearing Report (Dearing, 1997) on the widening access agenda, a substantial literature has been exploring the determinants of access to HE. For instance, a sizeable literature focuses on factors such as socio-economic status, gender and ethnicity (Ball & Ball, 2002a,b; Reay et al., 2005; Chowdry et al., 2013, Ilie et al., 2021). Further work explores the role of place in accessing HE. Davies et al (2021), for example, use data on university students to explore the role of place in progression to 'elite' universities in the UK. They show that on the basis of raw progression rates to 'elite' universities there appears to be a rural *advantage* dimension. However, when what they call "a vortex of influences" (Davies et al, 2021) is accounted for (including socio-economic disadvantage) a distinct *urban* advantage emerges. This underlines the need to consider attainment and socio-economic disadvantage together.

Similarly, Echazarra & Radinger (2019) use data from the OECD Programme for International Student Assessment (PISA) 2015 alongside the Teaching and Learning International Survey (TALIS) 2013. They find that urban-rural gaps are mostly driven by socio-economic background and diverging expectations towards HE completion. In addition, the difference in expectations, aside from the attainment gap itself, persists even after accounting for socio-economic status. In other words, given two pupils with similar characteristics, i.e. gender, family income, etc, we could expect the one from a rural area to be less inclined to complete HE. Van Maarsaveen (2020) offers similar insights on how living in more densely populated areas significantly raises the odds of attending university and also provides explanations on some potential mechanisms.

Despite the large emphasis put on the urban-rural disadvantage for HE access, there is still a paucity of evidence on the intersection between socio-economic disadvantage, rurality and educational attainment in primary school, with most works focusing on developing countries (see, e.g. Brown & Park, 2002; Chudgar, A., & Quin, E., 2012; Lounkaew, 2013; Bagley & Hillyard, 2014). This is despite the significant policy focus in this area in general (see for the UK or the Scottish Attainment Challenge). Socio-economic disadvantage experienced in early years can strongly affect cognitive and non-cognitive development (Cunha et al., 2006) and thus early-year educational outcomes, with knock-on effects on HE access (Chetty et al., 2011), especially in contexts such as the UK (Anders, 2012; Chowdry *et al.,* 2013; Crawford *et al.,* 2017)). However, socio-economic status persistently influences educational attainment throughout children's lives, even conditional on initially high gains (Crawford et al., 2017; Ilie et al., 2021).

Materials and methods

Our main data source for this analysis comes from the Scottish Pupils Census for all primary schools in Scotland between 2015 and 2018. In particular, we only included schools that are observable every year in the above-mentioned interval, and which had no "missing" stages, i.e. an enrolment count of zero for any of the stages from P1 to P7. The census includes all - approximately 390,000 - pupils enrolled in Local Authority-funded primary schools, and for each of them, we observe their gender, ethnicity, stage, an identifier for the school they are enrolled in and, most importantly for this analysis, whether or not they are registered for FSM.

We then match these data, using an anonymised candidate number, to Curriculum for Excellence teacher-based assessments in literacy and numeracy as well as literacy sub-categories such as reading, writing, listening & talking, for pupils in P1, P4 and P7. Therefore, for each pupil, in each school, we observe the above-mentioned demographic features, alongside whether or not they performed at/above the expected level for the relevant primary school stage they are in. Ultimately, we obtain the following information pooled across school years 2015/16-2018/19 at the stage- and school level: i) the percentage of pupils registered for FSM; ii) the percentage of pupils who perform at/above the level in both literacy and numeracy.

There are two ways in which we could use these data: 1) exploring FSM eligibility against the proportion of pupils in each school performing at or above level, and 2) examining FSM eligibility against educational mobility defined as the proportion of pupils on FSM performing at or above level. The former is simpler, but it does not take into account the compositional effect within the school. Using this second approach is preferable because this measure at least partially considers that pupils from high-SES backgrounds are often attending schools where a large fraction of pupils perform at level. In other words, conditioning on free meal status helps account for pupil (self-)selection.

This measure can be summarised by a standard formula for conditional probability, as illustrated below:

$$P(At\ level \mid Free\ Meals) = \frac{P(At\ level\ \&\ Free\ Meals)}{P(Free\ Meals)} \tag{1}$$

This formula represents the probability that a randomly drawn pupil from a certain population, whether a stage/school/Local Authority, performed at/above the level in literacy and numeracy, given that this same pupil is FSM-registered (we also refer to this as the 'Success Rate'). In other words, if our reference population is school A in Local Authority X, the above formula helps answer the following question: by picking a student at random within this school/LA, knowing that she is FSM-registered, what is the probability that she has also performed at/above the level in that specific year? Given that FSM registration and whether or not the student performs at the level are not two mutually exclusive events, the above-mentioned conditional probability can be illustrated as the ratio between:

$$P(At\ level\ \&\ Free\ Meals) = \frac{No.\ of\ Pupils\ who\ Performed\ at\ Level\ \&\ on\ Free\ Meals}{Total\ No.\ of\ Pupils\ in\ School} \tag{2}$$

Namely, the share of pupils in school A who are FSM-registered pupils AND performing at/above level, also referred to as the 'Mobility Rate' and:

$$P(Free\ Meals) = \frac{No.\ of\ Pupils\ on\ Free\ Meals}{Total\ No.\ of\ Pupils\ in\ School} \tag{3}$$

Which is simply the share of pupils in school who are FSM-registered (Access). It is easy to work out from that the ratio between these two elements is:

$$P(At\ level \mid Free\ Meals) = \frac{No.\ of\ Pupils\ who\ Performed\ at\ Level\ \&\ on\ Free\ Meals}{No.\ of\ Pupils\ on\ Free\ Meals} \tag{4}$$

namely, the share of FSM-registered pupils in school A, who have also performed at/above level. By rearranging Equation 1, it is easy to see how the Mobility Rate is just the product of the Access and Success Rate:

$$\underbrace{P(At\ level\ \&\ Free\ Meals)}_{\text{Mobility Rate}} = \underbrace{P(Free\ Meals)}_{\text{Access}} \times \underbrace{P(At\ level \mid Free\ Meals)}_{\text{Success Rate}} \tag{5}$$

Therefore, the same level of mobility (in our example above, the median level) can be achieved with different combinations of access and success rate. For example, a school which has 60% of pupils registered for FSM, and 40% of these pupils performed at level (0.6 x 0.4=.24, hence 24%) will be just as "mobile" as a school in which 30% of its 80% of FSM-registered pupils will have also passed the level (0.8 x 0.3=.24, hence 24%).

Having calculated this measure, we use it to explore the relationship between socio-economic deprivation and educational mobility across urban and rural primary schools in Scotland. Specifically, we plot these data separately for urban and rural schools in Scotland, with each dot representing a school stage. By fitting an isoquant to the data for urban and rural schools we can see not only the pattern between mobility and deprivation for each school stage, but also how these differ across urban and rural schools. Here we use a 6-categories classification made by the Scottish government based on population size: Large urban areas (settlements with a population greater than 125,000); Other urban (settlements with a population between 10,000 and 124,999); Accessible small towns (settlements with a population between 3,000 and 9,999 and within 30 minutes drive of a settlement with a population of 10,000 or more); Remote small town (settlements with a population between 3,000 and 9,999 and more than 30 minutes drive from a settlement with a population of 10,000 or more); Accessible rural (areas with a population of less than 3,000 and within 30 minutes drive of a settlement with a population of 10,00 or more); Remote rural (areas with a population of less than 3,000 and more than 30 minutes drive from a settlement with a population of 10,00 or more). We recategorise in the following way: 1) Urban = Large and Other Urban; Rural = Accessible and Remote Rural plus Small Towns, whether accessible or remote.

Results

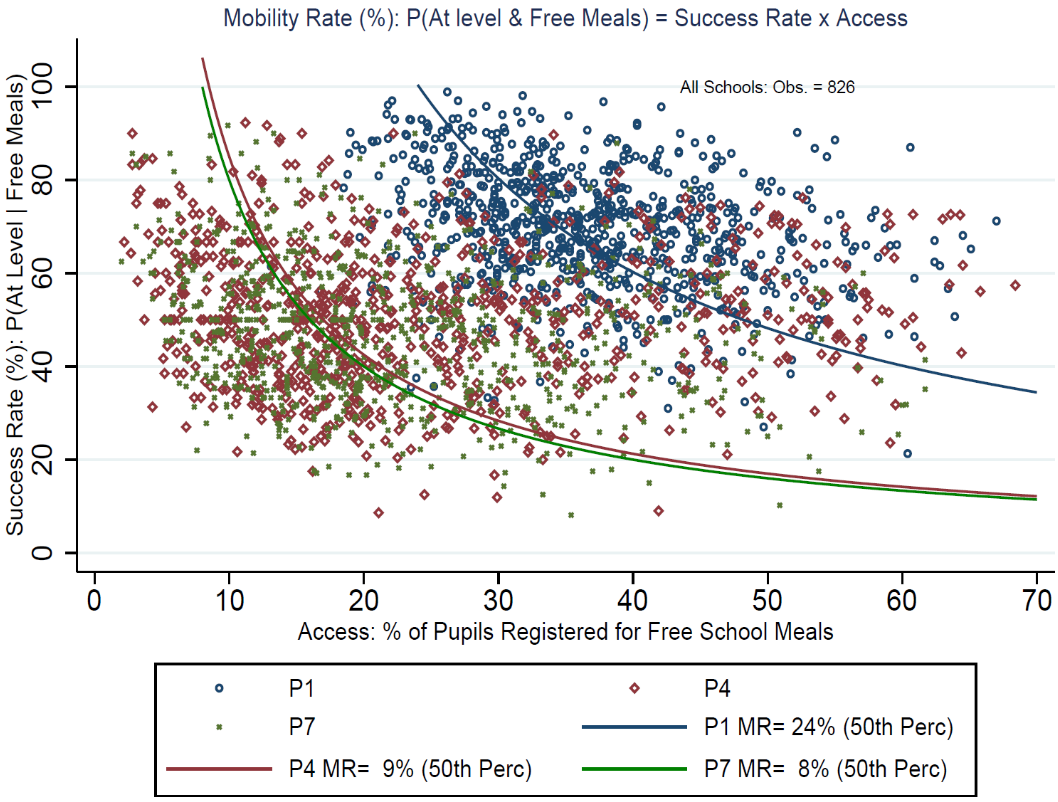
This results section is structured in two parts. In the first part, we present results on the relationship between educational attainment and mobility as well as socio-economic deprivation, while in the second part we explore how heterogeneous primary schools are in their socio-economic makeup.

Rural disadvantage in educational mobility

Before focussing our analysis on urban and rural schools, we start by introducing our general approach to examining educational mobility by considering this across three school stages, P1, P4 and P7, corresponding to the stages at which attainment evaluations take place.[7] This is presented in Figure 1. On the horizontal axis, we measure the percentage of pupils registered for FSM within a specific school stage (Access), whereas on the vertical axis we report the percentage of pupils on FSM who performed at level (Success Rate). By multiplying these two measures, we obtain the Mobility Rate, or simply put, the percentage of all pupils in a specific stage school who are registered for FSM and performed at or above the expected level. The difference between Mobility Rate and Success Rate is that the previous refers to all the pupils in stage school, whereas the latter refers only to those in the school-stage who are on FSM.

Figure 1: Mobility Rates By Stage - All Schools

[7] These refer to 1st, 4th and 7th primary school grades respectively. Pupils in Scotland typically enter P1 between the ages of 4.5 and 5.5, unless parents opt for a deferral. In such case, entry age ranges between 5.5 and 6 years old.

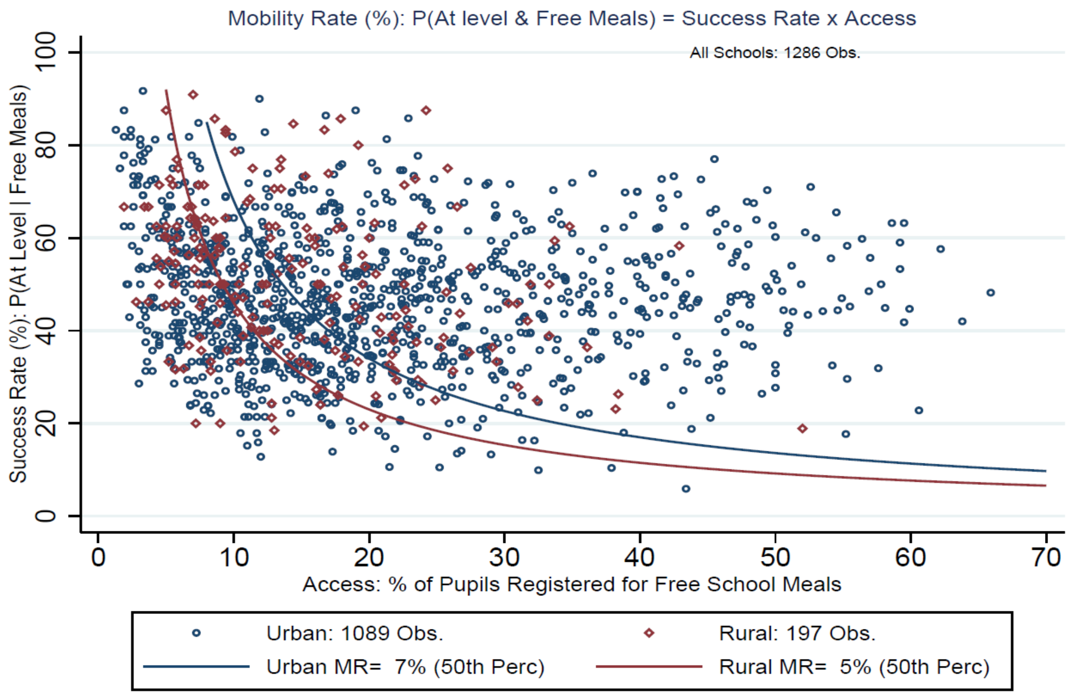


If a school stage has a high percentage of pupils on FSM (moving to the rightward on the horizontal axis) and a high percentage of pupils on FSM who performed at level (moving upward the vertical axis) this school will have a high Mobility Rate. Therefore, as we move from the bottom-left to the top-right of the chart, we go from low-mobility to high-mobility school stages. The same level of mobility can be achieved with different combinations of Access and Success Rates. This is the idea underpinning the three downward-slope curves presented in the chart.

Let us focus on the navy curve. Along this curve are located all the schools in the sample, whose P1 cohorts recorded a mobility rate of 24%, namely 24% of students are FSM-registered and performed at/above level. This value corresponds to the 50th percentile, or median value, within P1 school cohorts. What this means is that 50% of P1 school cohorts have a mobility rate of 24% or more, and 50% of P1 school cohorts have a mobility rate below 24%. By focusing on the top-end of this curve we can see that there are P1 school cohorts whose percentage of FSM-registered pupils is just below 30%, and nearly 90% of these performed at/above level. Likewise, P1 school cohorts whose percentage of FSM-registered pupils is around 50%, and nearly half of which performed at/above level, record the same (0.5 x 0.48 = 24%) mobility rate. A similar rationale applies to the maroon and green lines, which represents the median mobility rates among P4 and P7 school cohorts respectively.

What emerges from this chart is that P1 school cohorts seem to be characterised by a mobility rate that is larger (by a factor of 3, approximately) than those of their P4 and P7 counterparts. The reason for this is twofold: i) the share of pupils performing at level is much larger among P1 than it is for P4 and P7 cohorts; ii) as a result of the extension of FSM eligibility to all P1-P3 pupils from 2015, regardless of their household income, there are many more FSM registered pupils among P1 than P4 and P7 cohorts. In other words, if both these measures are larger, there will be a higher chance that a randomly picked pupil from a P1 cohort will be FSM-registered and performed at/above compared to one from a P4/P7 cohort.

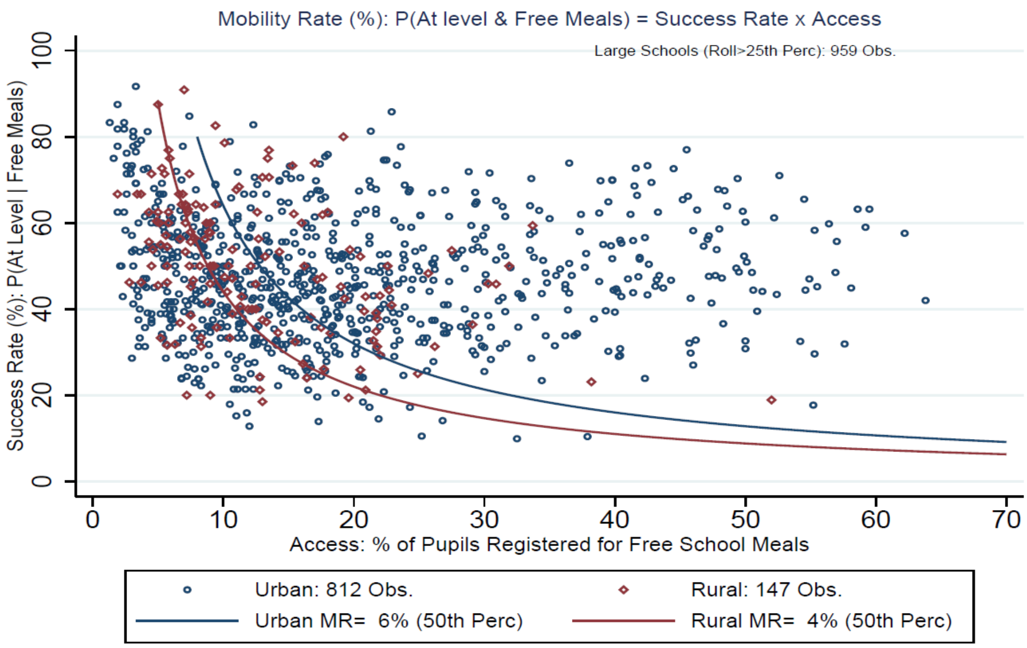
Figure 2: Mobility Rates By Urban/Rural Schools



One aspect to be noted is the “small” number of schools present in this sample (826 against around 2,000 in total). This is the result of statistical disclosure control measures, i.e. some school stages had a count of students on FSM (or on FSM and performing at level) below five leading to these schools being omitted from the sample to prevent identification. The reduced number of observations due to statistical disclosure control means that we pursue a different strategy when splitting out schools by urban and rural, namely pooling together P4 and P7 cohorts and omitting P1 ones. Hence, not only are we able to present larger counts – by summing the number of pupils in P4 and P7– and therefore need not omit a large number of schools, but we are also able to use FSM registration as a more representative measure of socio-economic status, being FSM-registration directly linked to income in these school stage.

Instead of distinguishing school stages, we now separate schools in urban areas from those in rural areas. In Figure 2, Access measures the percentage of P4 and P7 pupils who are FSM-registered, whereas Success Rate is the share of those who also performed at/above level. Each dot represents an entire school. Figure 2 shows that the 197 rural/small town schools present in this sample[8] are characterised by a smaller median level of mobility (5%) than their urban counterparts (7%). This means that among rural and small-town schools in this sample, the portion of P4 and P7 pupils who are FSM-registered and performed at/above the level in literacy and numeracy is slightly smaller than in urban schools. The question arises whether this is a result of there being a smaller number of FSM-registered pupils in rural schools in the first place. However, the same pattern is evident if we only look at larger schools – defined as being where the school enrolment count is above the 25th percentile – see Figure 3.

Figure 3: Mobility Rates by Urban/Rural Schools – larger schools only



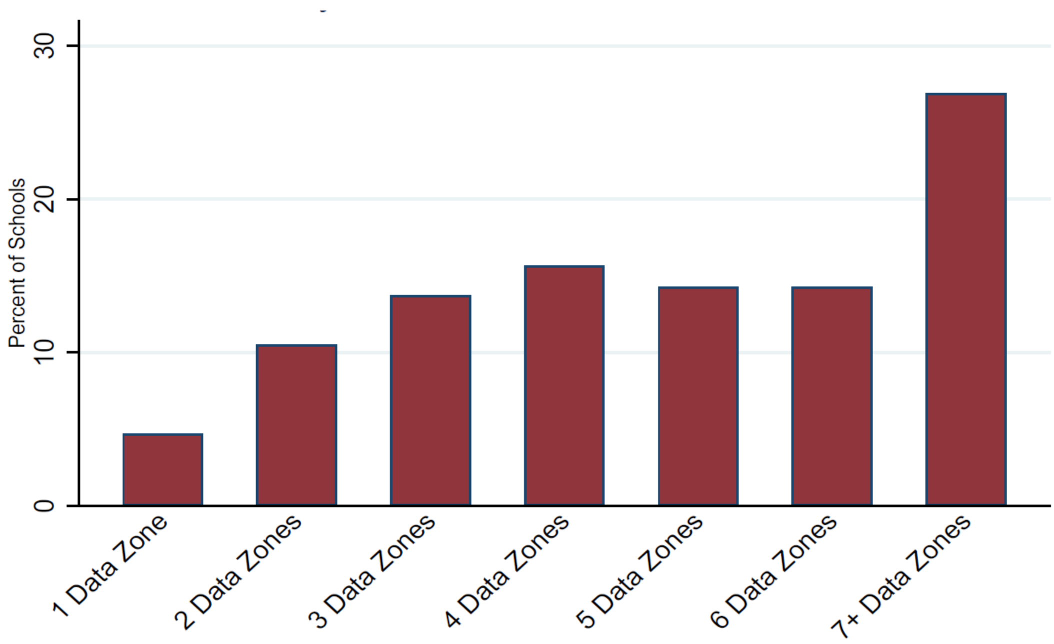
Socio-economic diversity of primary schools in Scotland

In this section, we provide some insights into how heterogeneous schools are in terms of their intake. In the Scottish primary school system, school populations are largely defined by their catchment areas, with relatively few pupils attending a school different from the designated one (this occurs via the use of a “placing request” submitted by the parents). Scotland is split into 6,976 data zones, i.e., statistical units designed to include between 500 and 1,000 households. Figure 4 shows that nearly 30% of Scottish primary school catchment areas

[8] This is a smaller sample size relative to the original sample due to the suppression of observations as part of the required statistical disclosure control.

stretch across seven or more data zones. This might suggest a high degree of heterogeneity in school intakes. However, we need to look closer at how heterogeneous these data zones are in their characteristics. To do this, we will make use of the Scottish Index of Multiple Deprivation.[9] The SIMD provides a means of 'ranking' each data zone according to a range of criteria, as well as a composite multi-criteria deprivation measure. Each data zone can be ranked from 1 to 6,976, with 1 being the least deprived and 6,976 the most deprived.

Figure 4: School Composition - Data Zones



Our starting point in understanding how heterogeneous school intakes are is to examine how many different deciles are represented in each school. Figure 5 provides this information. It is notable that a significant share of schools (25%) "contain" five or more SIMD deciles, with few containing only one or two. Another question that arises is: how well does the physical location of a school predict its composition? Figure 6 classifies groups of schools based on the deprivation decile of the data zone the school is located in (horizontal axis), with respect to the (weighted) average of its composition (vertical axis). The size of each circle/diamond represents the number of schools represented by that specific point (the minimum cell size here is 10). For example, schools whose location is in the first decile of deprivation, mostly gather pupils coming from the first and second deciles. Schools located in

[9] We use Scottish Index of Multiple Deprivation 2016.

"central" deciles, namely around a median level of deprivation, seem to be more heterogeneous than schools located at the two ends of the deprivation distribution.

Figure 5: School Composition - SIMD Deciles

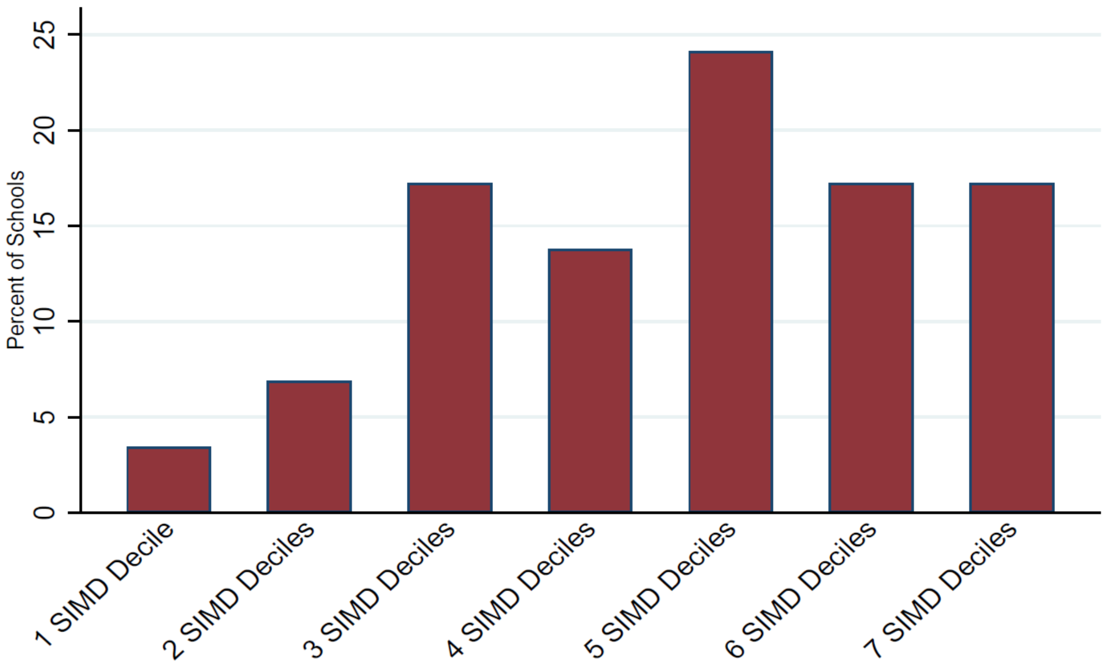
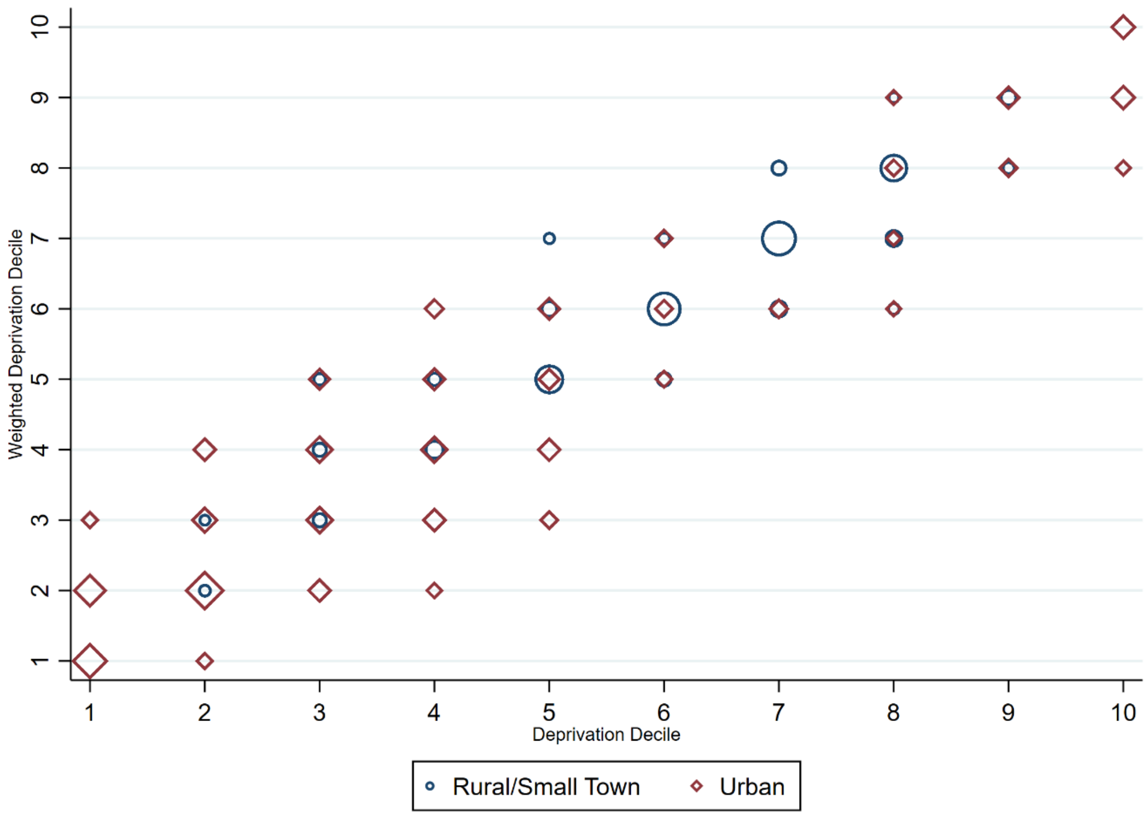


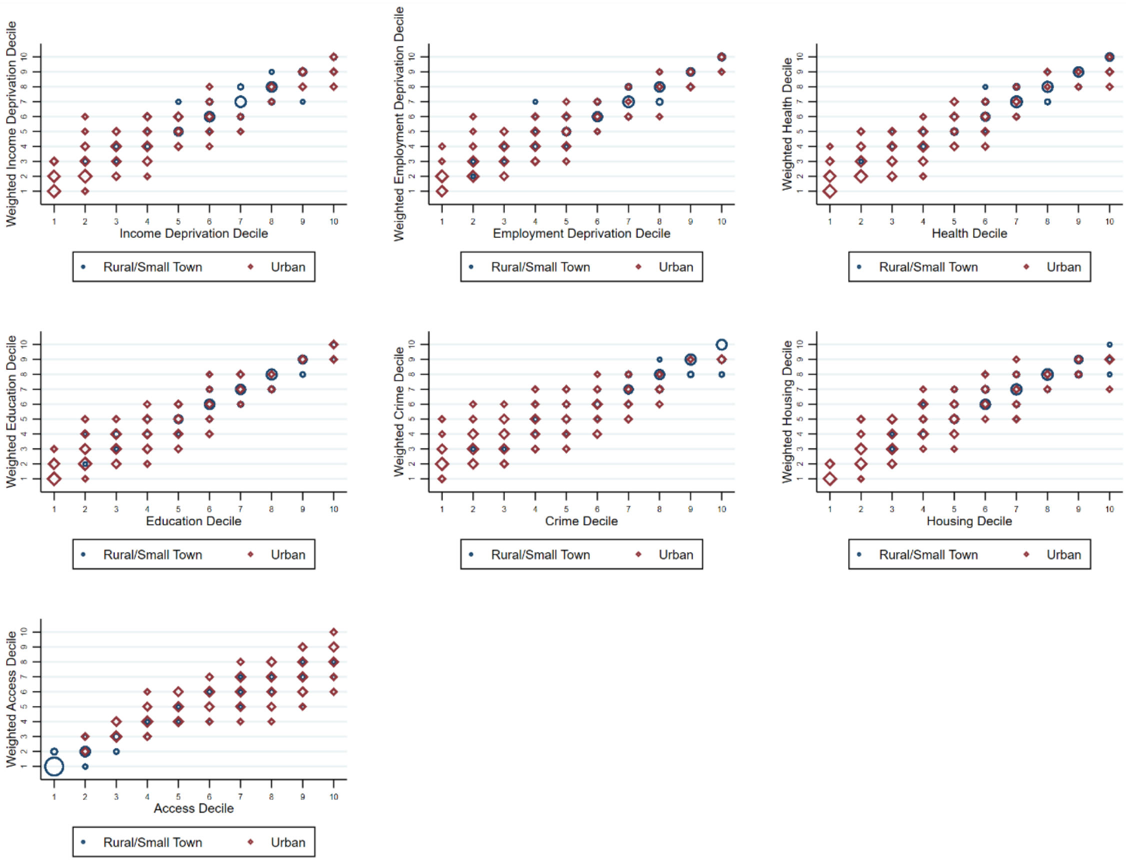
Figure 6: School Composition - SIMD Deciles by Urban/Rural



In addition, rural schools (blue circles) appear to be mostly located between the 3rd and 7th deciles, but they also seem to have a less heterogeneous composition. In other words, unlike urban schools, their average intake seems to mirror their geographic location. Whilst this may be because catchment areas are larger in rural areas, with some schools' data zones covering the entirety of the catchment area, this remains an important outcome in the process that policymakers need to consider, as it suggests that rural schools experience less deprivation and have more homogeneous pupil intakes' than urban schools.

In Figure 7 we look at the different components of deprivation.[10] Once again, we observe a very similar pattern as in Figure 6, with rural schools ranking fairly high in most of the SIMD domains. For instance, most rural schools are located in areas with little income or employment deprivation and lower crime rates, as well as higher levels of education, and better health and housing conditions. However, almost all of these schools are in areas with limited access to services. This domain is measured as the average drive or public transport time to a series of services such as GPs, post offices, retailers and, indeed, schools.

Figure 7: School Composition - SIMD Domains Deciles by Urban/Rural



[10] These are the Income domain rank; Employment domain rank; Health domain rank; Education/skills domain rank; Housing domain rank; Geographic access domain rank and Crime rank.

Discussion

Our results demonstrate a clear pattern of lower attainment and educational mobility among pupils at rural schools compared to urban schools across a measure of socio-economic deprivation. While not causal, this analysis nevertheless is consistent with previous findings on the relationship between attainment, socio-economic deprivation and rurality at the high school level. These differences in attainment between urban and rural schools in our results emerge in primary school and are not eradicated by focussing only on larger primary schools.

This is why our second set of results, related to the characterisation of school deprivation to target funding to improve attainment, are important. Lasselle and Johnson (2021) introduced a new approach to classifying schools according to socio-economic need, but they were unable to differentiate in their approach between schools with different degrees of 'above average' intake from the most deprived quintiles of the SIMD distribution. This was noted as a limitation of their approach – but as we show in our results, schools at the most and least deprived deciles are much more homogeneous in their intake than those schools in SIMD deciles nearer the middle of the distribution. This result holds for both urban and rural schools. This makes it relatively unlikely that schools in either urban or rural areas are going to be disadvantaged by the approach proposed in Lasselle and Johnson (2021).

There is of course an argument that pupil–level data might be helpful more generally in classifying schools based on examining multiple metrics of pupil-level need, rather than school-level aggregate statistics. This is particularly the case given the multi-dimensional nature of deprivation that pupils face. Nevertheless, our results are clear that the advances proposed in methodology by Lasselle and Johnson (2021) are not undermined by our analysis of pupil-level data. And in practice, it is often far easier to work with school-level data.

Conclusion

A substantial literature has looked at the relationships between poverty and deprivation and low educational attainment (see Robertson and McHardy (2021)). Similarly, the relationship between rurality and weaker educational outcomes has been a subject of extensive study (Echazarra and Radinger (2019), Davies et al (2021), Lasselle and Johnson (2021)). Given the continuing focus of education policy on addressing these issues, this paper addressed two key issues in the understudied case of primary schools.

First, we explored the attainment achieved by schools across a measure of socio-economic disadvantage according to whether the school is in an urban or rural setting. Using pupil-level data on educational attainment we constructed a measure of educational attainment at the school level and considered this alongside free school meal FSM uptake rates in that school. We showed that there is a clear difference in the educational mobility rates of pupils in urban and rural schools in Scotland. Furthermore, we showed that this was not driven by the presence of small primary schools in rural communities. This is the first contribution of our paper.

Second, it is clear that having a measure of school socio-economic disadvantage that accurately capture different dimensions of disadvantage in a rural and urban context alike, is key to targeting funding and interventions to address these challenges of rural disadvantage. Our analysis showed that one potential limitation of a recently developed approach to classify schools based on their level of deprivation, and which overcomes problems in characterising socio-economic deprivation in rural schools, is unlikely to be a substantial problem. Lasselle and Johnson's (2021) approach did not differentiate between schools based on how far above average their intake from low SIMD neighbourhoods was, simply that the school had an above-average intake from the bottom SIMD quintiles.

If the intake of pupils to the most deprived schools is predominantly from the most deprived neighbourhoods, this suggests we shouldn't be too concerned about the measure that Lasselle and Johnson (2021) utilise. We showed that schools in the most and least deprived areas (based on SIMD) of Scotland are more homogeneous in the socio-economic classification of their intake than schools in the middle of the SIMD distribution. This suggests that using the approach advocated by Lasselle and Johnson (2021) is likely to capture this dimension of disadvantage relatively well. However, unlike Lasselle and Johnson (2021) we also explore the seven component rankings of the SIMD index. This is the second contribution of this paper.

Our paper highlights the clear challenges facing rural schools in closing the attainment gap relative to urban schools, reinforcing existing evidence for later stages of schooling. But it is clear that the recent developments in the literature also identify improved ways of identifying the rural schools where additional support would be valuable in closing the attainment gap. Despite some limitations of using school-level data, we show that the homogeneity of intake from the most deprived schools makes this a lower-order concern.

References

Agostinelli, F., Doepke, M., Sorrenti, G., & Zilibotti, F. (2020). It Takes a Village: The Economics of Parenting with Neighborhood and Peer Effects. *Working Paper.*

Anders, J. (2012a) The link between household income, university applications and university attendance, *Fiscal Studies*, 33(2), 185–210.

Bagley, C., & Hillyard, S. (2014). Rural schools, social capital and the Big Society: a theoretical and empirical exposition. *British Educational Research Journal*, *40*(1), 63-78

Ball, S.J., Davies, J., David, M. & Reay, D. (2002a) 'Classification' and 'judgement': Social class and the 'cognitive structures' of choice of higher education, *British Journal of Sociology of Education*, 23(1),

51–72. Ball, S.J., Reay, D. & Miriam, D. (2002b) 'Ethnic choosing': Minority ethnic students, social class and higher education choice, *Race, Ethnicity and Education*, 5(4), 333–357.

Blanden, J., Gregg, P., & Macmillan, L. (2007). Accounting for intergenerational income persistence: noncognitive skills, ability and education. *The Economic Journal*, *117*(519), C43-C60.

Brown, P. H., & Park, A. (2002). Education and poverty in rural China. *Economics of Education Review*, *21*(6), 523-541.

Card, D. (1993). Using geographic variation in college proximity to estimate the return to schooling. *NBER Working Paper*.

Chetty, R., Friedman, J. N., Hilger, N., Saez, E., Schanzenbach, D. W., & Yagan, D. (2011). How does your kindergarten classroom affect your earnings? Evidence from Project STAR. *The Quarterly Journal of Economics*, *126*(4), 1593-1660.

Chetty, R., Friedman, J. N., Saez, E., Turner, N., & Yagan, D. (2020). Income segregation and intergenerational mobility across colleges in the United States. *The Quarterly Journal of Economics*, *135*(3), 1567-1633.

Chetty, R., Nathaniel H., Patrick K., & Emmanuel S. (2014). Where is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States. *The Quarterly Journal of Economics* 129 (4): 1553– 623

Chetty, R, Nathaniel H., & Lawrence F.K. (2016). The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment. *American Economic Review*, 106 (4): 855-902.

Chowdry, H., Crawford, C., Dearden, L., Goodman, A. & Vignoles, A. (2013) Widening participation in higher education: Analysis using linked administrative data, *Journal of the Royal Statistical Society, Series A: Statistics in Society*, 176(2), 431–458.

Chudgar, A., & Quin, E. (2012). Relationship between private schooling and achievement: Results from rural and urban India. *Economics of Education Review*, *31*(4), 376-390.

Crawford, C., Macmillan, L. & Vignoles, A. (2017) When and why do initially high-achieving poor children fall behind?, *Oxford Review of Education*, 43(1), 88–108.

Cunha, F., Heckman, J.J., Lochner, L. & Masterov, D.V. (2006) Interpreting the evidence on life cycle skill formation. In E. Hanushek & F. Welch (Eds) *Handbook of the economics of education (vol. 1) (Amsterdam, Elsevier)*, 697–812.

Cutler, David M., and Edward L. Glaeser. 1997. “Are Ghettos Good or Bad?” *The Quarterly Journal of Economics* 112 (3): 827–72.

Davies, J., Donnelly, M., & Sandoval-Hernandez, A. (2021). Geographies of elite higher education participation: An urban ‘escalator’effect. *British Educational Research Journal*.

Dearing, R. (1997). The Dearing Report-National Committee of Inquiry into Higher Education. London.

Department for Education, UK Government (2020)

https://explore-education-statistics.service.gov.uk/find-statistics/widening-participation-in-higher-education/2019-20

Echazarra, A., & Radinger, T. (2019). Learning in rural schools: Insights from PISA, TALIS and the literature.

Gibbons, S. & Vignoles, A. (2012) Geography, choice and participation in higher education in England, *Regional Science and Urban Economics*, 42(1), 98–113

Gibson, A., & Asthana, S. (1998). Schools, Pupils and Examination Results: contextualising school ‘performance ‘. *British Educational Research Journal*, *24*(3), 269-282.

Hutchinson, J., Reader, M., & Akhal, A. (2020). *Education in England: annual report 2020*.

Ilie, S., Rose, P., & Vignoles, A. (2021). Understanding higher education access: Inequalities and early learning in low and lower-middle-income countries. *British Educational Research Journal*, *47*(5), 1237-1258.

Ilie, S., Sutherland, A., & Vignoles, A. (2017). Revisiting free school meal eligibility as a proxy for pupil socio-economic deprivation. *British Educational Research Journal*, *43*(2), 253-274.

Jerrim, J., & Macmillan, L. (2015). Income inequality, intergenerational mobility, and the Great Gatsby Curve: Is education the key?. *Social Forces*, *94*(2), 505-533.

Lasselle, L., & Johnson, M. (2021). Levelling the playing field between rural schools and urban schools in a HE context: A Scottish case study. *British Educational Research Journal*.

Lounkaew, K. (2013). Explaining urban–rural differences in educational achievement in Thailand: Evidence from PISA literacy data. *Economics of Education Review*, *37*, 213-225.

Mangan, J., Hughes, A., Davies, P. & Slack, K. (2010) Fair access, achievement and geography: Explaining the association between social class and students' choice of university, *Studies in Higher Education*, 35(3), 335–350.

Norris, J. (2020) Peers, Parents, and Attitudes about School. *Journal of Human Capital* 14, no. 2: 290-342

Reay, D., David, M. & Ball, S.J. (2005) Degrees of choice: Class, race, gender and higher education (Stoke-on-Trent, Trentham Books).

Robertson, Laura and Fiona McHardy, "The Poverty-related Attainment Gap: A Review of the Evidence," *The Poverty Alliance*, 2021

Sammons, P. M., Katalin Toth, and Kathy Sylva. "Background to success: Differences in A-level entries by ethnicity, neighbourhood and gender." 2015

Scottish Government (2021), Scottish Attainment Challenge, https://education.gov.scot/improvement/learning-resources/scottish-attainment-challenge/

Sosu, E., & Ellis, S. (2014). Closing the attainment gap in Scottish education. York: *Joseph Rowntree Foundation*.

Van Maarsaveen, R. (2020). The urban–rural education gap: do cities indeed make us smarter? *Journal of Economic Geography* (2021) 21, 683–714

Welch A., Helme S., Lamb S. (2007) Rurality and Inequality in Education. In: Teese R., Lamb S., Duru-Bellat M., Helme S. (eds) *International Studies in Educational Inequality, Theory and Policy*. Springer, Dordrecht. https://doi.org/10.1007/978-1-4020-5916-2_25