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Executive summary

Segregation in society can hinder social mobility. For instance, segregated schools can prevent disadvantaged pupils from experiencing high-quality teaching and constructive peer interactions. Segregated neighbourhoods may result in poor access to amenities such as good-quality housing and services.

Segregation is potentially affected by the process of assigning children to schools. If school access is determined solely by residence in a catchment area, higher-performing schools may increase demand for properties in their catchment area. This increase in demand would lead to higher property prices, in turn shaping the socio-economic composition of the neighbourhood as lower-income households are 'priced out'. This neighbourhood sorting would then be reflected in the composition of the schools: high-income neighbourhoods imply schools with high-income intakes, and vice versa.

Conversely, if households have the option to attend any school regardless of their address, there would be weaker incentives to sort into particular neighbourhoods. In turn, this would weaken the link between school and neighbourhood socio-economic composition.

We focus on England and Scotland to understand how pupil school assignment policies influence school and neighbourhood segregation, and the interaction between them. These two nations of the UK are institutionally and culturally very similar, but have very different systems to assign pupils to schools. In Scotland, the criterion is purely geographical: each school has a pre-determined set of postcodes (the catchment area) whose residents are automatically entitled to attend that school.

In contrast, households in England have more choice: any pupil can choose any school, and no pupil has any default or guaranteed school. Although 60% of schools in England have a pre-defined catchment area, this is only one factor that gives pupils priority if the school is over-subscribed, rather than guaranteeing admission.

Documenting patterns of neighbourhood and secondary school segregation across England and Scotland, we find the following.

Key findings

1. **Income segregation in neighbourhoods is similar in Scotland and England.** The spread of residents who are income-deprived is broadly similar across the two countries. According to the index of dissimilarity, 31% of residents in Scotland and 29% in England would need to move neighbourhoods to achieve an equal distribution of low-income residents. That said, there are more neighbourhoods in Scotland with very low levels of income deprivation relative to England.

2. **English schools are more segregated by income than Scottish schools.** Despite similar residential segregation, schools in England are more segregated. Using pupils eligible for free school meals (FSM) to proxy for low income, England has both more schools with very low shares of FSM pupils and very high shares compared with Scotland. The index of dissimilarity indicates 22% of pupils would need to be reallocated across schools to achieve an equal distribution of low-income pupils in England. This figure is only 17% in Scotland.

3. **Neighbourhood composition shapes school composition more strongly in Scotland.** In both countries, the correlation between school and neighbourhood segregation is positive. This link is stronger in Scotland compared with England, however (0.72 versus 0.53). This suggests that Scottish schools are more representative of their local areas. Indeed, around half of the variation in segregation across schools is explained by variation in neighbourhood segregation in Scotland. The equivalent figure is 28% for England. This is likely due to the strict catchment system in Scotland. Despite this, other processes in England lead to higher school segregation overall.

4. **Incentives to sort into areas with 'better' schools translate into higher house prices, and more so in Scotland.** In both countries, there is a positive association between house prices and local school performance (correlation of 0.31 and 0.4 in England and Scotland, respectively). This relationship is not causal, as other factors could be correlated with both neighbourhood and school quality.

5. To isolate the effect of school quality on residential sorting causally, we compare neighbourhoods just either side of catchment boundaries. Here, within a small geographical area, the only difference in neighbourhood 'amenities' should be the school quality of the catchment area school. In both countries, there is a property price premium on the side of the catchment area boundary with the higher-performing school. This

premium is higher in Scotland (8%) relative to England (3%), however, suggesting stronger demand in desirable catchment areas.

6. Household composition also differs across catchment area boundaries, and to a greater extent in Scotland. For example, the share of households in a professional occupation is 2.4 percentage points higher in Scotland on the high-performing side of the boundary, compared to 0.9 percentage points in England. These differences in the extent of neighbourhood sorting across countries suggest that school assignment policies could affect the composition of neighbourhoods as well as schools.

7. Taken together, **these findings suggest that school choice environment is related to levels of segregation**, though future work will address this link more causally. To implement effective policies to reduce segregation and improve social mobility, it is essential to consider the interplay between school and neighbourhood choice, and how they are affected by the policy environment.

1. Introduction

The level of segregation in society is likely to influence social mobility. For example, segregated schools could limit access to high-quality teaching and positive peer groups for disadvantaged pupils, with consequences for their educational achievements (Guryan, 2004; Reber, 2010; Hanushek, Kain and Rivkin, 2009; Lutz, 2011; Johnson, 2011; Billings et al., 2013; Rao, 2019; Burgess and Platt, 2021). Segregated neighbourhoods could limit access to services and good quality housing, and reduce positive peer/neighbour effects (Kling, Liebman and Katz, 2007; Boustan, 2011; Ludwig et al., 2013; Chetty, Hendren and Katz, 2016). It is vitally important for central and local government policy to consider both types of segregation in any mission to improve social mobility.

But how do neighbourhood segregation and school segregation interact? Does the way we choose to assign pupils to schools have implications for where people choose to live? Understanding how segregation in schools and neighbourhoods is influenced by the school choice environment is key to determining the most effective policy actions to improve social mobility. For example, would reducing neighbourhood segregation be a solution to school segregation? Or are there school-level policies that could reduce both school and neighbourhood segregation?

To begin to study these questions, this report investigates whether the different processes of assigning pupils to schools are linked to the levels of school and neighbourhood segregation of low-income children. To do so, we compare Scotland and England, two nations of the UK with different approaches to school choice. In Scotland, pupils are assigned to schools almost entirely based on their address. This strict catchment area system generates strong incentives for families to sort into neighbourhoods with higher-performing schools. In turn, this increases demand in 'desirable' catchment areas, raising prices and potentially restricting access for lower-income households.

In comparison, households in England have weaker incentives to consider local school quality when making residential decisions. Catchment areas are only used by around 60% of schools in England (Burgess et al., 2023) and are never the unique criterion used to assign pupils to schools. Because of the tighter link between residential location and school attendance in Scotland, all else being equal, we would expect the relationship between school and neighbourhood segregation to be stronger in Scotland than in England.

We investigate this by first presenting a descriptive analysis of school and neighbourhood segregation across countries. Here, we hypothesise that segregation is higher in Scotland to due to stronger incentives for residential sorting. We complement this with a causal analysis of the effect of school catchment area boundaries on residential sorting. The expectation is that on the side of the boundary with higher school performance, there is higher demand for properties. This increases property prices, and will also affect the composition of households if certain groups are more willing or able to pay higher prices. For example, more professional or higher-income households might have stronger preferences for school performance, or might be more willing or able to sacrifice some income to afford the higher property price.[1]

This analysis allows us to examine whether sorting takes place, but does not provide information about *why* households sort across boundaries. Previous research studying households' preferences for school quality typically finds that more advantaged parents have stronger preferences for school quality (Hastings, Kane and Staiger, 2009; Burgess et al., 2015; Borghans, Golsteyn and Zölitz, 2015; Harris and Larsen, 2019; Walker and Weldon, 2020; Britton, Clark, and Lee, 2023) but these could partly be due to residential choices or constraints. In contrast, studying the school choice response to information only (excluding the residential channel), Greaves and Hussain (2023) find that richer and poorer households respond in the same way to updated school quality information, suggesting similar preferences.

Emerging evidence from the US supports the hypothesis that neighbourhood segregation is linked to the school choice environment. Studying the impact of increased school choice on segregation via the introduction of charter schools (which lie outside the traditional public school system), Rich, Candipan and Owens (2021) and Monarrez, Kisida and Chingos (2022) find increases in school segregation by ethnic group, but reductions in segregation at the neighbourhood level. The implication is that parents make different residential choices when the school their child attends becomes less tied to the traditional school zone (or catchment area) for the public schools. Rich et al. (2021) concisely summarise that 'because charter school options unbundle housing and school choice processes, White and Black families opt into marginally more integrated neighbourhoods while sending their children to more racially segregated schools'.

In the UK context, previous evidence finds that schools in Scotland and England are segregated according to pupils with and without income disadvantage. Jenkins, Micklewright and Schnepf (2008) study social segregation across OECD countries. Based on parents' occupations as the measure of social class, England is found to be a middle-ranked country, below countries with a tracking system at secondary level. In contrast, Scotland is found to be a lower-ranking country.

[1] This is because the same decrease in income in pounds is a lower share of income for higher-income households. Also, there is diminishing value of consumption/income at higher income levels.

Van den Brande, Hillary and Cullinane (2019) find that 'top performing' state comprehensive schools have roughly half the share of pupils eligible for free school meals (FSM) – one marker of income disadvantage – than the national average in both England and Scotland. Given the method of school assignment in Scotland, Van den Brande et al. (2019) find that these 'top performing' state schools are broadly representative of their local area, and conclude that 'the observed FSM gap is almost entirely due to the top performing schools being located in more affluent areas'. We extend this important research to consider whether local areas become more affluent and segregated as a result of the strict catchment area system.

This is a tough methodological challenge, as there are many factors that could affect neighbourhood and school segregation across these countries. In this first report in our research agenda, we present the patterns of income segregation across the two countries, focusing on the choices (school and residential) associated with secondary school. We draw some tentative conclusions about the underlying processes, but are unable to make causal claims. In future work, we will carefully match similar local authorities in Scotland and England (for example, according to their industrial history and urban/rural status) to more explicitly isolate the impact of differences in school admissions arrangements.

The rest of the report is set out as follows. In Section 2, we outline the secondary education systems in England and Scotland, highlighting differences in school choice design. Sections 3 and 4 describe our data and approach to measuring income segregation in schools and neighbourhoods. In Section 5, we provide descriptives on school quality and income deprivation and we document segregation in neighbourhoods and schools across the two countries. In Section 6, we study the relationship between school quality and neighbourhood sorting. We conclude in Section 7.

2. Context

In this section, we provide an overview of the Scottish and English education systems and describe the school choice environment in both countries.[2]

Schooling system

School policies and institutions differ across England and Scotland across a variety of areas including governance, curriculum, testing and resources. These differences are longstanding, although, since education became a devolved matter in 1999, approaches have further diverged between the two countries (Sibieta and Jerrim, 2021).

England has greater diversity in secondary school types than Scotland. First, 163 academically selective schools remain in England. These schools select pupils primarily according to performance on a standardised test, commonly known as the 11 plus. Second, since the 2010 Academies Act, an increasing number of secondary schools in England have become academies.[3] Indeed, fewer than 10% of secondary schools in England remain maintained by the local authority, with over 80% now academy schools. In contrast, in Scotland, the diversity in governance of the state sector is mainly between religious and secular schools. According to our sample, nearly 15% of secondary schools in Scotland are faith (Roman Catholic) schools. This compares to around 7% of schools that are religious in England (Burgess et al., 2023). Private schools exist in both countries and educate around 4% of the school population in Scotland, compared to around 6.5% in England.

Another key difference between countries is around curriculum and assessment. England has a National Curriculum followed by most schools, though academy schools are permitted to deviate. The English curriculum emphasises the importance of traditional subjects and is more prescriptive in terms of specifying minimum amounts of material expected to be covered at each stage, relative to Scotland (Sibieta and Jerrim, 2021). In Scotland, in 2010, a new national curriculum, the Curriculum for Excellence (CfE), was implemented for all state-funded schools. The rationale was to focus less on testing, to give children a more rounded education beyond

2 See Sibieta and Jerrim (2021) for a more comprehensive description.

3 Academy schools are state schools that are not maintained by the local authority. These schools receive direct funding from central government rather than through the local authority, for example, and have the opportunity to set their own term dates in addition to changing their curriculum. Academy schools include free schools, which are newly established schools in areas with need.

academic attainment, as well as to provide teachers with more freedom (Seith, 2019; McEnaney, 2021).

Despite these differences, in both countries, secondary school culminates at age 16 with formal assessments. In England, these are known as GCSEs (General Certificate of Secondary Education) and in Scotland these are known as National Qualifications. In England, the results of these formal assessments are used to hold secondary schools to account. For example, each year, league tables rank schools according to their pupils' level of attainment and progress made from the end of primary to the end of secondary school. In the spirit of the CfE, Scotland places less emphasis on external testing and assessments are less likely to form part of accountability measures for schools and teachers than in England. School-level results are published, but not officially converted into league tables or publicised by the Scottish Government.

Finally, the two countries also differ in the level of school resources. Spending per pupil is highest in Scotland, and the gap has widened over time. For instance, in 2009–10 Scotland spent just over £7,500 per pupil aged 3–15 compared to around £7,250 in England in 2022–23 prices. By 2022–23, spending per pupil was 18% higher in Scotland than England (Sibieta, 2023). Among other things, this higher funding per pupil allows schools in Scotland to have smaller class sizes. The number of pupils per teacher is significantly lower in Scotland: in 2019–20, the pupil:teacher ratio in secondary schools stood at 16.5 in England compared to just 12.5 in Scotland. Scotland has consistently outperformed England on this metric since at least the mid-1990s (Sibieta, 2023). Despite higher levels of funding overall, explicit funding for disadvantaged pupils is higher in England; for example, the Pupil Premium covers more pupils than the equivalent scheme in Scotland. Indeed, performance of low-income pupils is remarkably similar across countries (Lester, McKendrick and Sibieta, 2023).

School choice

School choice works very differently in Scotland and England. In Scotland, each address is assigned to a single secondary school, school choice is limited, and most pupils attend their catchment area school. For example, the Education website for the Scottish Government states: 'You don't decide which school your child is given a place at. It's your local council's choice.'[4] These catchment areas are publicly and easily available.[5] Parents can express a 'placing request' to attend an alternative school, but this is not widely used.[6]

[4] See https://www.mygov.scot/register-your-child-for-a-school.

[5] See, for example, the interactive map available for Aberdeen, https://accabdn.maps.arcgis.com/apps/webappviewer/index.html?id=2716ebdc4d744593bd532f706c8545df.

[6] Based on freedom of information requests to Scottish local authorities, Bhattacharya (2021) finds that, on average, 13% of pupils made placing requests in 2017/18 and 2018/19.

In contrast, in England, pupils have no default school. Each parent must submit a list of preferred schools (in ranked order) to their local authority, with a maximum of three to six choices, depending on the local authority. Each school must have a pre-defined and published set of admissions criteria that determine which children are admitted if the school is over-subscribed. These admissions criteria must align with the school admissions code that prohibits certain criteria, such as interviews with parents. Around 60% of secondary schools in England use catchment areas to determine which children are admitted if a school is over-subscribed (Burgess et al., 2023). Catchment areas (and admissions criteria more generally) are only binding if a school is over-subscribed, however, rather than being the default allocation as in Scotland.[7]

Table 1 shows the percentage of households in Scotland and England that make an 'active' school choice. In Scotland, this is through submitting a placing request; in England, this is through submitting a first-choice school that is not the closest school.[8] For secondary schools in England, around 60% of households' first-choice school is not their closest school (Burgess et al., 2019), while for primary schools the figure is around half (Greaves and Hussain, 2023). Greaves and Hussain (2023) also find that parents are most likely to avoid their closest school if it has a lower rating by the schools' regulator Ofsted, suggesting that 'active' choices are more likely to be for higher-quality schools. Although attending a school that is not the catchment/closest is far less common in Scotland (around 13% of pupils submit a placing request), as in England, parents are more likely to actively choose schools with higher performance.[9] Table 1 shows that 4.7% of households make a placing request for a low-performing school, compared to 8.8% (about 65% of all requests) for a high-performing school.

7 Other commonly used admissions criteria include having a sibling at the school, attending a feeder primary school and faith (Burgess et al., 2023).

8 Note that the closest school might not be the catchment school (where catchment schools are used). We use closest for this table due to data availability and because catchment areas are not defined for all schools in England.

9 The acceptance rate for placing requests is around 70%.

Table 1. 'Active' school choices in Scotland and England

	Scotland (%) (placing request)	England (%) (first choice school not closest)
All	13.75	61.02
To low-performing school	4.7	–
To high-performing school	8.8	–

Note: A 'placing request' is a formal application that parents submit to local authorities, requesting that their child attends a school different from the one assigned based on residence. High-performing schools are those whose fraction of leavers achieving at least five SCQF level 6 or above (roughly the equivalent of 'Highers' qualifications) was above the median in the previous year. Conversely, low-performing schools are those below the median of the attainment distribution. 'First choice school not closest' is defined as whether the first choice school recorded in national administrative data differs to the closest school, defined by straight line distance between home and school.

Source: Placing request information for Scotland is taken from Bhattacharya (2021). The source for England is Burgess et al. (2019).

3. Data

We use a number of publicly available data sets to conduct our analysis. To study the composition of children in secondary schools, we rely on pupil characteristics at school level published by the Department for Education for England and equivalent data from the Scottish Government. Our focus is around the allocation of low-income pupils across schools, which we define as children registered and eligible for FSM.[10]

To identify a comparable measure for neighbourhoods, we use the share of population affected by income deprivation from English and Scottish Income Index of Multiple Deprivation (IMD) measures.[11] Income deprivation is defined by eligibility for out-of-work and means-tested benefits.[12]

Neighbourhood is defined at the data zone level in Scotland and at the lower layer super output area (LSOA) in England. Each LSOA is home to between 400 and 1,200 households (around 650 on average), whereas the average data zone contains between 500 and 1,000 people in households (about 340 households on average). In both countries, the sample size within neighbourhoods is relatively large, for example compared to the number of pupils within schools. The difference in size between England and Scotland could affect our measure of segregation, however. This is because segregation is typically higher when measured at a finer level of geography (Manley, Jones and Johnston, 2019). In our case, this implies that our measure of neighbourhood segregation in Scotland could be systematically higher than in England due to the finer level of geography we must use, rather than a different underlying process of household sorting. We therefore make cautious conclusions when discussing segregation at the neighbourhood level.[13]

Data on school performance are accessed from the Scottish Government and the Department for Education for Scotland and England, respectively. For Scotland, our measure of school

[10] In 2019/20, this covered around 15.9% of state-funded secondary school children in England and 15.6% in Scotland. Eligibility is determined by receipt of means-tested benefits including income-based jobseeker's allowance, working tax credit run-on or universal credit. This is consistent across England and Scotland.

[11] Available at 'English indices of multiple deprivation 2019' (https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019) and 'Scottish Index of Multiple Deprivation 2020' (https://www.gov.scot/collections/scottish-index-of-multiple-deprivation-2020/).

[12] Both English and Scottish IMDs are based on seven domains: income, employment, education and skills, health, crime, access to services and housing. We only use the income domain, which is consistently defined across the two countries. The criteria are the same as eligibility for FSM.

[13] In future work, we will explore the implications of the geographical size of neighbourhoods for our measures of neighbourhood segregation.

performance corresponds to the share of school-leavers attaining a minimum of five awards at SCQF level 5 (or above). The equivalent statistic for England is the percentage of school-leavers that achieve at least five GCSE grades of at least grade C, including English and maths. For both England and Scotland, we take the average school-level performance data between 2016/17 and 2018/19.

Our main analysis studies the dispersion of low-income children across schools and low-income people across neighbourhoods, within local authorities. We supplement this analysis by documenting the sorting of households across school catchment area boundaries in both countries. Information on catchment areas is provided centrally in Scotland. For England, we incorporate catchment areas data collected by Burgess et al. (2023) relevant for entry in the 2020/21 school year.

We use information on household characteristics at the neighbourhood level from the English and Scottish 2011 censuses, including the number of children in the household, socio-economic status, ethnicity, and number in social housing.[14] To study differentials in house prices across catchment boundaries, we also incorporate data from the land registries in Scotland and England, which contain the universe of property transactions and price paid. For both countries, we take the average of the median property price in each neighbourhood, for the years 2017, 2018 and 2019.

[14] In future work, we will use 2021 Census for England and the 2022 Census for Scotland to be more comparable to our other data sources.

4. Methods

This report mostly documents descriptive statistics on school and neighbourhood segregation. We complement this with a method known as boundary discontinuity design to study the causal effect of catchment area boundaries on residential sorting.

Descriptive statistics

We calculate the mean (or average) of variables at the local authority level, for example, the mean percentage of pupils that are eligible for FSM. We present these in a distribution for each country, which shows how the mean varies across all local authorities in the sample.

To measure segregation, we use a commonly adopted measure called the index of dissimilarity, *D* (Duncan and Duncan, 1955). As for our summary statistics, we use local authorities to show the distribution across countries. We focus on segregation by social background, proxied by the subgroups of those with and without eligibility for FSM. Segregation between the two subgroups is calculated, within each local authority, for schools and neighbourhoods separately.

The index of dissimilarity *D* has an intuitive interpretation as the proportion of either of the subgroups who would have to move between geographical units (for example, schools) to equalise the spatial distributions of the two groups. Taking schools as an example, a value of $D = 0.3$ would mean that 30% of pupils would need to change schools for the distribution of the schools to be the same as the distribution of the local authority. The potential range for *D* is between 0 and 1. The maximum value of 1 implies complete segregation, that is, no two members of different subgroups – in this case with and without eligibility for FSM – attend the same school. At its minimum value of 0, *D* implies that the share of each subgroup across schools is the same. See Appendix A.1 for the formal equation used to calculate *D*.

Boundary discontinuity design

We use boundary discontinuity design to study the sorting of household types into catchment areas. This method uses the catchment area boundary as a discontinuity, or sharp change, in the associated school. On one side of the boundary there is a higher-performing school, and on the other side there is a lower-performing school. We use this method as it compares neighbourhoods that should otherwise be very similar, for example in access to public services and transport, housing stock, and so on, but where the performance of the associated school is

different. We use neighbourhoods very close to the boundary to ensure, as far as possible, that school performance is the only changing factor across the boundary.[15]

Our estimation approach is regression analysis using boundary fixed effects. More formally, the variable of interest is the binary variable for treatment, which is equal to one if the neighbourhood is located on the higher-performing side of the boundary. Boundary fixed effects account for all factors of the broader neighbourhood that are both observable and unobservable to a researcher, such as public transport options and proximity to amenities. To account for local correlation in the dependent variables, we cluster the standard errors at the boundary level.

The interpretation of the effect we estimate is that the difference between the higher- and lower-performing sides of the boundary is due to the difference in school performance (assuming all other neighbourhood attributes are constant). For example, if property prices are 5% higher, on average, on the side of the boundary with higher school performance, then the interpretation is that access to the higher-performing school increases prices by 5%.

[15] The precise method of classifying neighbourhoods as close to the boundary is to identify neighbourhoods that share a border, and whose population-weighted centroids fall in different school catchment areas. The neighbourhood on the side of the boundary with higher school performance is classified as the 'treatment' side, while the neighbourhood on the side with lower school performance is the 'control' side. Note that some neighbourhoods may cross school catchment area boundaries, even if the population-weighted centroid falls only on one side. In a robustness check, we include only neighbourhoods where at least 90% of the area of the neighbourhood falls in one school catchment area.

5. Patterns of segregation in neighbourhoods and schools

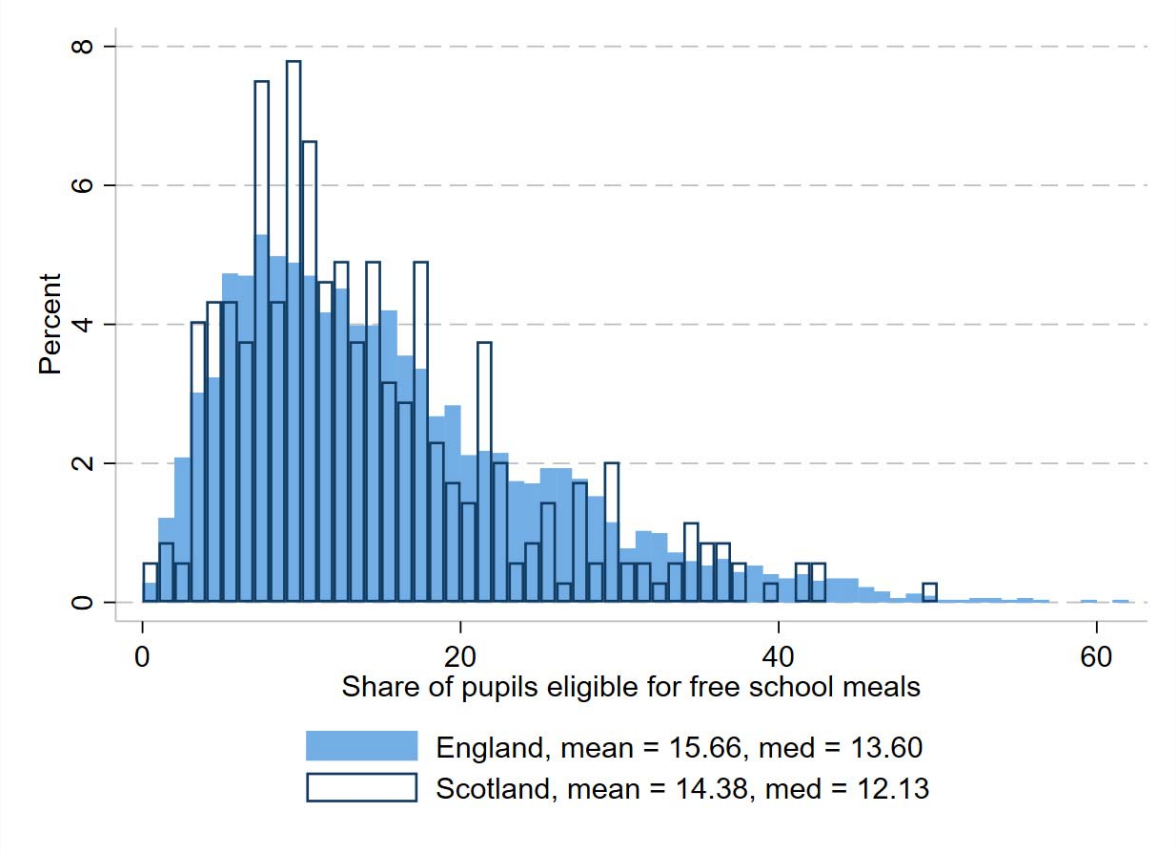
Income deprivation in schools and neighbourhoods

We begin by comparing the distribution of low-income children across schools and neighbourhoods in England and Scotland. Figure 1 shows the overlaid distributions of the percentage of pupils eligible for FSM across schools in England (blue bars) and Scotland (transparent bars). If there were no segregation by income, each school would have a share of FSM-eligible pupils equal to the average (15.7% in England and 14.4% in Scotland). In reality, the share of low-income pupils across schools varies widely in both countries: in some schools, almost no children are eligible for FSM; in others, more than half of the pupils are eligible for FSM.

While the distributions are similar in both countries, Scotland has fewer schools at the extremes. At the lower end, selective schools in England account for most of the schools with very low percentages of pupils eligible for FSM. For example, of the 115 schools with the percentage below 3%, 82 (or 71%) are selective schools. In contrast, in Scotland, the schools with very low percentages result from the low level of income deprivation in the catchment area. At the other extreme, in England, 9.3% of schools have at least 30% of pupils eligible for FSM, for example, while the equivalent percentage for Scotland is 6.8%.

Figure 1 suggests that English schools are somewhat more segregated by income than Scottish schools. A relevant question is then whether this higher sorting is associated with greater variation in school performance. Figure 2 shows the distribution of school performance, averaged across school years 2016/17 to 2018/19, in Scotland and England. For Scotland, this is given by the percentage of school-leavers achieving at least five awards at SCQF level 5 or above. For England, this is the percentage of pupils achieving at least five GCSEs of at least grade C, including English and maths. School performance is standardised across all state secondary schools within the country, so that the mean is equal to zero and the standard deviation is equal to one.

Figure 1. Distribution of school-level pupils eligible for FSM in Scotland and England

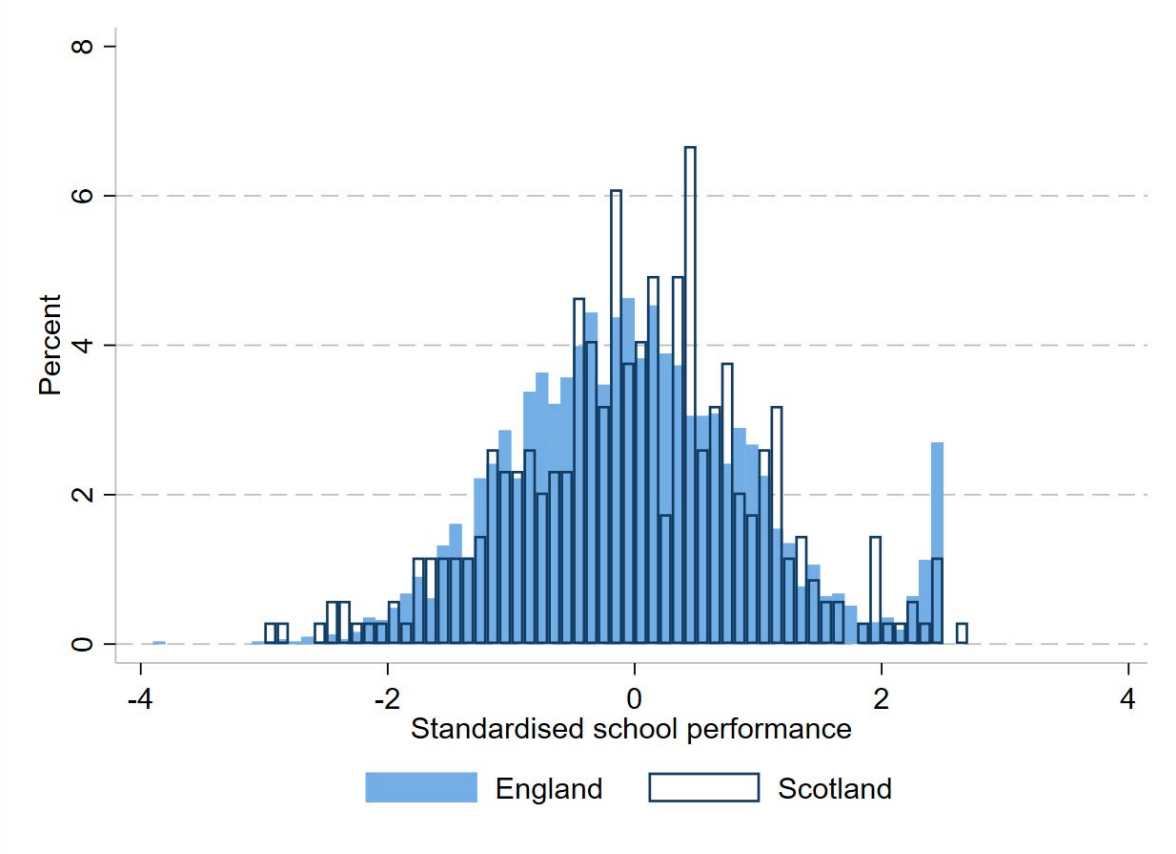


Note: Each bar shows the share of secondary schools with each percentage of pupils eligible and registered for FSM in school year 2018/19. The mean and median for each country are reported in the legend.

Overall, the distributions are similar for Scotland and England, with many schools performing around the average (zero) and a minority of schools at the tails.[16] For England, selective schools account for most of the spike at very high levels of school performance. For example, selective schools account for 152 of the 198 schools (or 77%) with school performance at least two standard deviations above the average. At the other extreme, there are slightly more schools in Scotland than England with school performance far below the average.

[16] This is to be expected from the standardisation process.

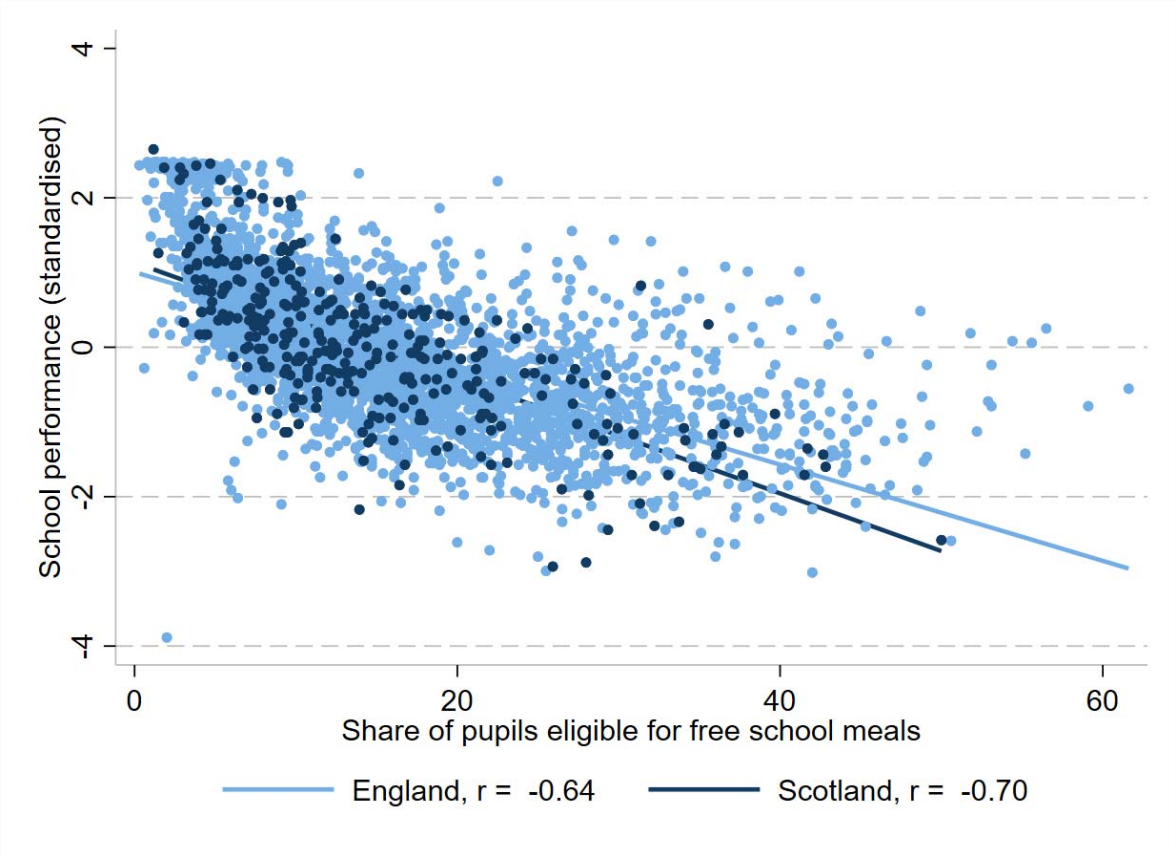
Figure 2. Distribution of secondary school performance in Scotland and England



Note: Each bar shows school performance, standardised within country, averaged across school year 2016/17 to 2018/19, in Scotland and England. For Scotland, this is given by the percentage of school leavers achieving at least five awards at SCQF level 5 or above. For England, this is the percentage of pupils achieving at least five GCSEs of at least grade C.

How much do the distributions of school performance and school composition reflect the same underlying forces? Figure 3 shows the relationship between school performance and share of pupils eligible for FSM. As documented elsewhere, there is a negative association between the percentage of pupils eligible for FSM and school performance in both countries. This correlation is stronger in Scotland, however, driven by schools with a very high share of pupils eligible for FSM performing relatively well in England. For example, 13.5% of schools in England with the percentage of pupils eligible for FSM above 40% achieve at least the average school attainment, compared to no equivalent schools in Scotland. This divergence can be partly explained by London schools, where it has been widely documented that pupils eligible for FSM achieve more highly than elsewhere in the UK (Burgess, 2014; Greaves et al., 2014; Ross et al., 2020). Figure A.1 in Appendix A.3 shows the correlation excluding schools in London. When excluding schools in London, the overall correlation for England is −0.7, equal to the correlation in Scotland.

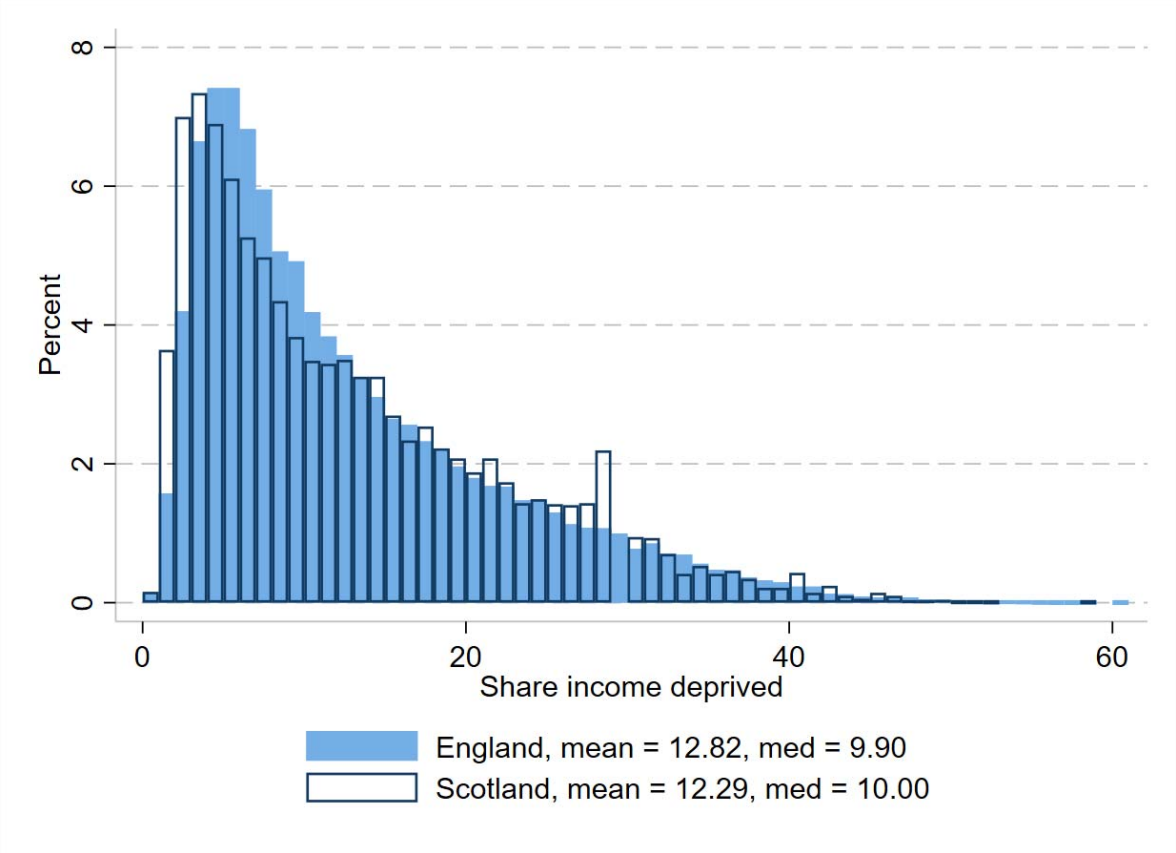
Figure 3. School composition and school performance in Scotland and England



Note: Each point represents one school. Lines of best fit and correlation coefficient, *r*, are reported for both countries. School performance is averaged across school years 2016/17 to 2018/19 and is standardised within country. For Scotland, this is given by the percentage of school leavers achieving at least five awards at SCQF level 5 or above. For England, this is the percentage of pupils achieving at least five GCSEs of at least grade C. Pupils eligible for FSM are measured in 2018/19.

Turning to segregation across neighbourhoods, Figure 4 shows the equivalent distributions to Figure 1 for neighbourhoods in England and Scotland. In this case, each bar represents the proportion of the neighbourhood population that is income-deprived. As for schools, the distributions for England and Scotland are similar, although the Scottish distribution is shifted slightly to the left. This is driven by the presence of more neighbourhoods with very low income deprivation in Scotland. In contrast to the picture of segregation across schools, this suggests that neighbourhoods in Scotland are less income diverse compared with England.

Figure 4. Distribution of neighbourhood-level share of people with income deprivation in Scotland and England



Note: Each bar shows the share of neighbourhoods with each percentage of people who are income-deprived in the most recent data available (2020 for Scotland and 2019 for England). The mean and median for each country are reported.

Figure 1 highlighted a minority of schools with very low percentages of pupils eligible for FSM, while Figure 4 shows a minority of neighbourhoods with very few income-deprived people. Are these schools and neighbourhoods located in the same places with very little diversity? In Scotland, the answer is broadly yes. Among the bottom 5% of schools in Scotland with the lowest share of pupils eligible for FSM, nearly half (46%) of neighbourhoods in the catchment area are also in the bottom 5% in terms of the share of people with income deprivation. In England, there is a much weaker association between neighbourhood composition and school composition. For the schools with the lowest percentage of poor pupils, only 9% of the local neighbourhoods have very low population deprivation. Given the strict catchment area system, this is indicative evidence of a tighter link between neighbourhood deprivation and local school composition in Scotland compared with England.[17]

[17] This is not driven by selective schools in England, which have low percentages of pupils eligible for FSM and have lower geographical incentives. Excluding local authorities with a significant share of selective schools, the percentage rises from 9% to 10.5% in England.

The previous findings show that the overall distribution of pupils eligible for FSM is similar in Scotland and England, and yet the patterns of segregation are stronger in England. This implies that the segregation *across* local authorities in Scotland is stronger.

Local variation in school composition

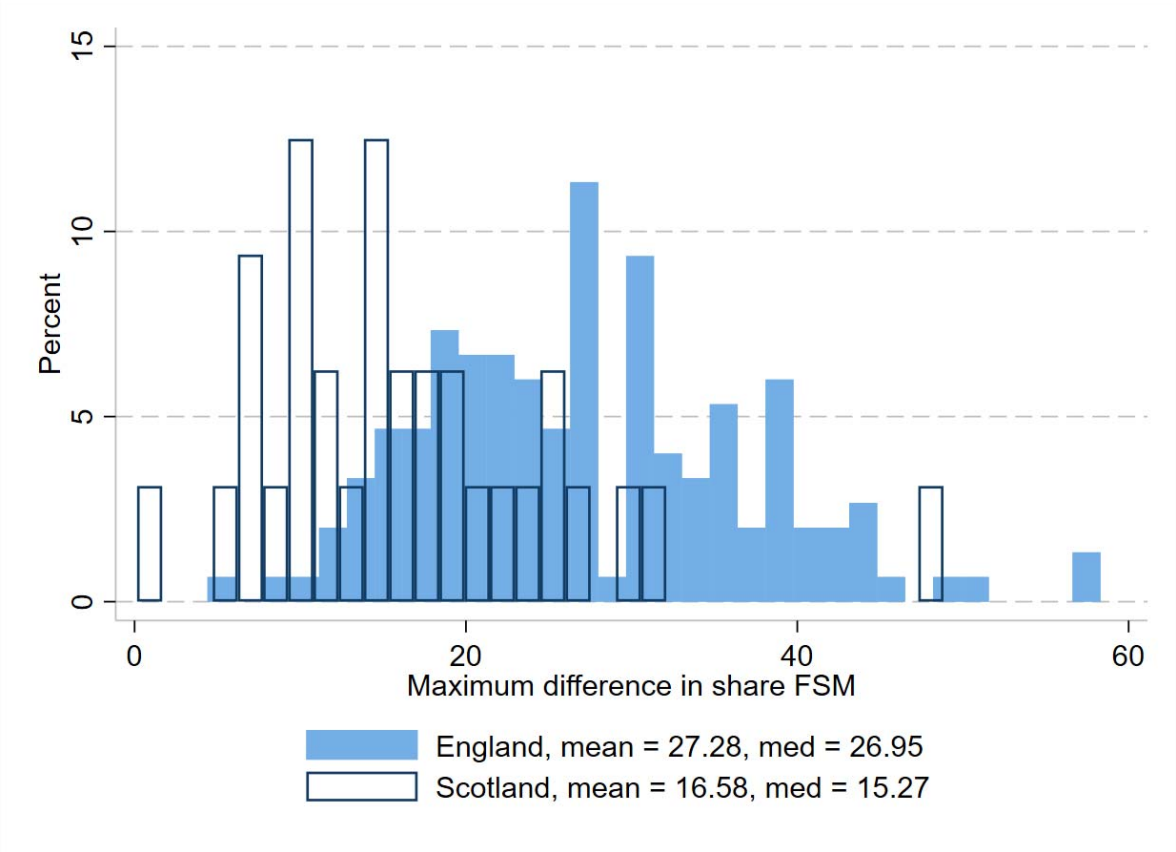
The previous subsection showed that the national distribution of pupils eligible for FSM is broadly similar in Scotland and England. There is likely to be variation in how pupils are allocated to schools within countries, however, in part due to historical factors, such as the degree of rurality of local areas, as well as industrial and immigration history. We therefore turn to study how pupils are distributed across schools *within* local authorities. For example, within a city such as Edinburgh (Scotland) or Birmingham (England), are pupils eligible for FSM distributed evenly or unequally across schools? We first present descriptive evidence for the variation within local authorities, followed by a more formal measure of segregation using the index of dissimilarity.

Figure 5 shows the distribution of within local authority differences in schools' pupil composition. Each bar represents a local authority (or group of local authorities with the same value), and plots the difference between the school with the highest and lowest shares of pupils eligible for FSM. As in previous figures, the distribution for England is shown in blue, and the distribution for Scotland is shown by the transparent bars.

There is more variation in school composition within local authorities in England than Scotland. More local authorities in England are clustered to the right (indicating larger differences between schools) while more local authorities in Scotland are clustered to the left (smaller differences). At one extreme, only two of 32 local authorities in Scotland (around 6%) have a maximum difference in school composition of more than 30 percentage points, compared to 56 of 150 local authorities in England (around 37%). At the other extreme, while a minority of local authorities in England have small differences in school composition, it is much more common in Scotland.

Figure A.2 in Appendix A.3 repeats this analysis using differences between the school at the 75th percentile (relatively high percentage of pupils eligible for FSM) and 25th percentile (relatively low percentage of pupils) to reduce the impact of outliers. This shows a similar pattern. Taken together, this suggests that schools in England may be more segregated within local authorities than Scottish schools.

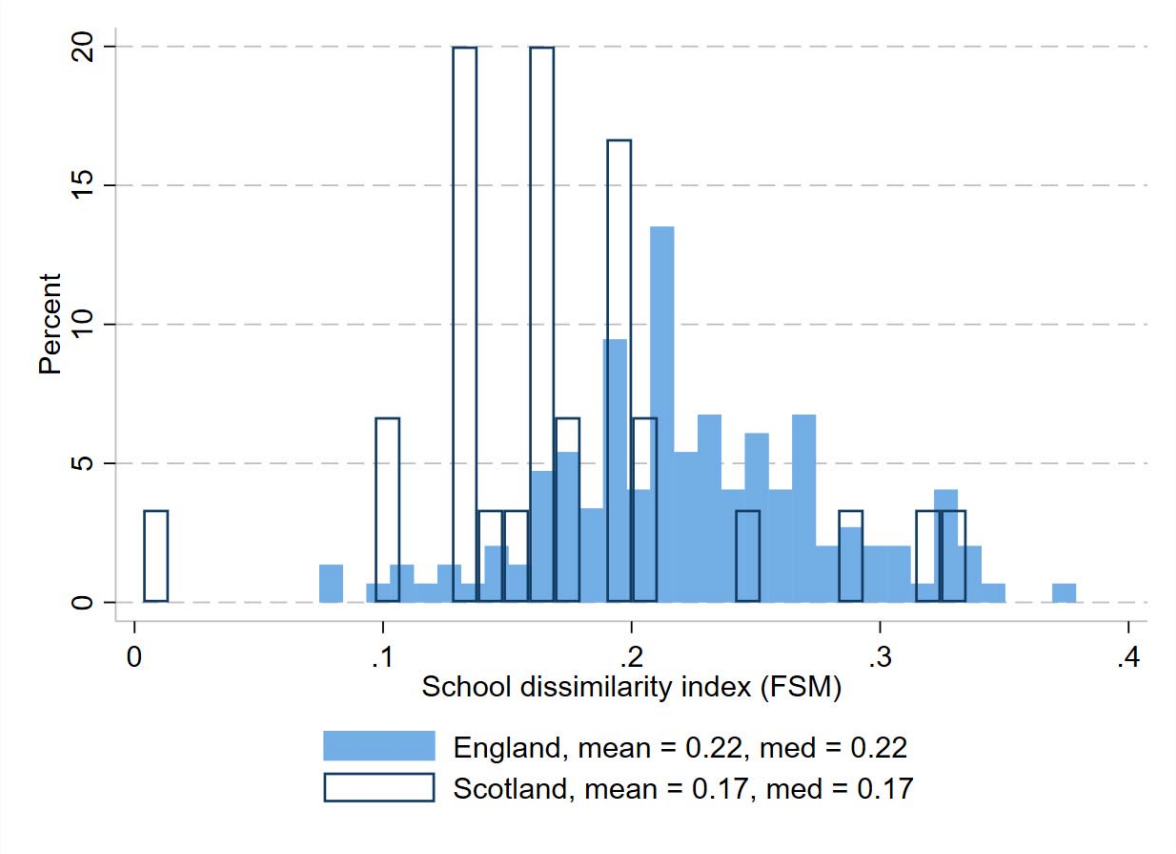
Figure 5. Variation in share of pupils eligible for FSM that occurs within local authorities in Scotland and England



Note: Each bar shows the share of local authorities in England and Scotland with each difference between the school with the highest and lowest fraction of pupils eligible for FSM. The mean and median for each country are reported in the legend.

Figure 6 confirms this by plotting the index of dissimilarity, *D*, described in Section 4, using the pupil composition of schools within each local authority. This provides a more complete measure of segregation, rather than focusing on the extremes. English schools are more segregated than their Scottish counterparts. The average *D* for English local authorities is 0.22, meaning that 22% of the secondary school population would need to be reallocated to achieve equal distribution of FSM-registered pupils across schools. This is in line with previous estimates (e.g. Greaves, 2023), though is slightly lower than in Jenkins et al. (2008), who find a value of 0.35 across the whole country and all schools. This is not surprising, as our study focuses only on state-funded schools and calculates *D* within local authorities (therefore excluding the variation across local authorities). In contrast, the average *D* in Scotland is only 0.17, suggesting a more equal distribution of pupils from disadvantaged socio-economic backgrounds across secondary schools.

Figure 6. Distribution of secondary school segregation in Scotland and England

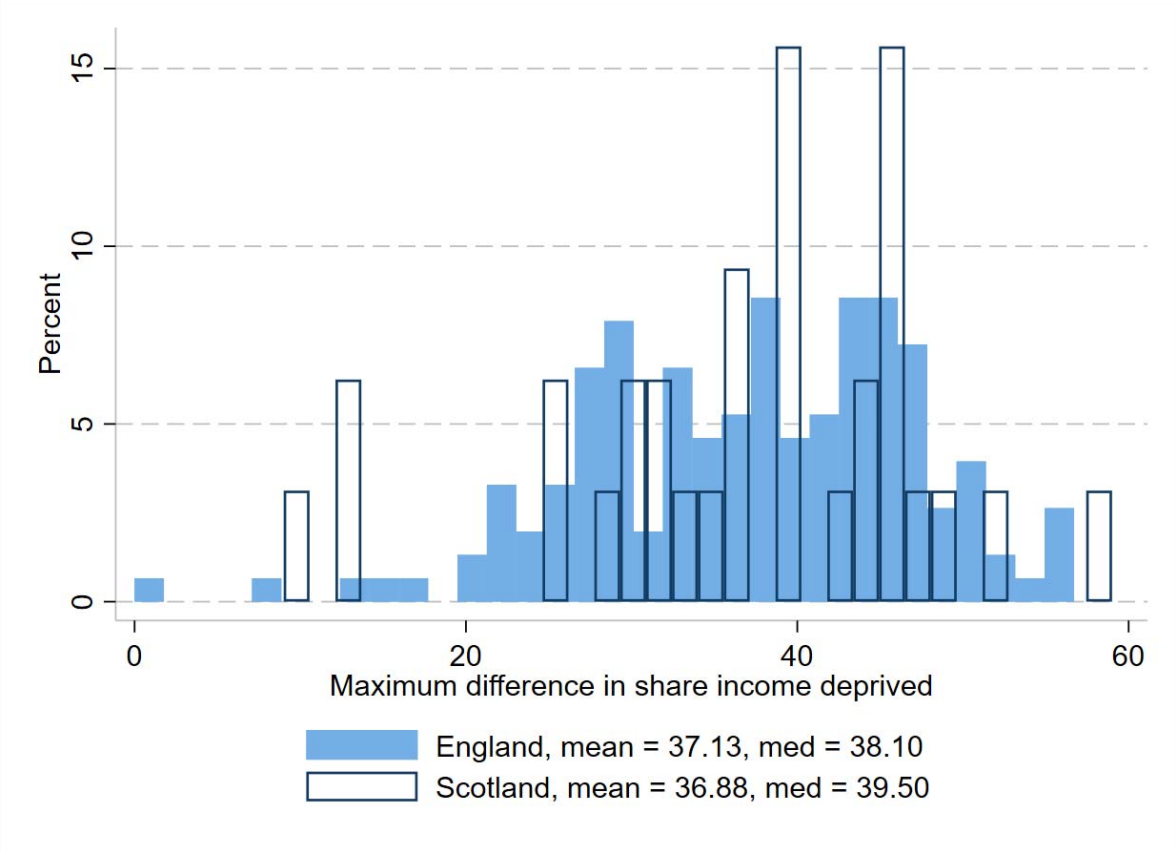


Note: This figure plots the kernel distribution of the index of dissimilarity with respect to pupils eligible for FSM in schools within local authorities in England and Scotland. Local authorities with five or fewer schools are dropped. The mean and median for each country are reported in the legend.

Local variation in neighbourhood composition

We now document equivalent descriptive patterns for neighbourhoods within local authorities. In contrast to composition across schools, variation in neighbourhood composition within local authorities is much more similar in Scotland and England. Figure 7 plots the difference between the neighbourhoods with the highest and lowest shares of people that are income-deprived. The distributions of the two countries are similar; for instance, both have a mean of around 37. This means that the average local authority has one neighbourhood with 37 percentage points higher share of people with income deprivation than in another neighbourhood. Figure A.3 shows the equivalent figures for the differences between neighbourhoods at the 25th and 75th percentile. In line with Figure 7, the distributions for England and Scotland are largely overlapping, indicating similar differences within local authorities in the spread of households with income deprivation across neighbourhoods.

Figure 7. Variation in share of people who are income-deprived that occurs within local authorities in Scotland and England

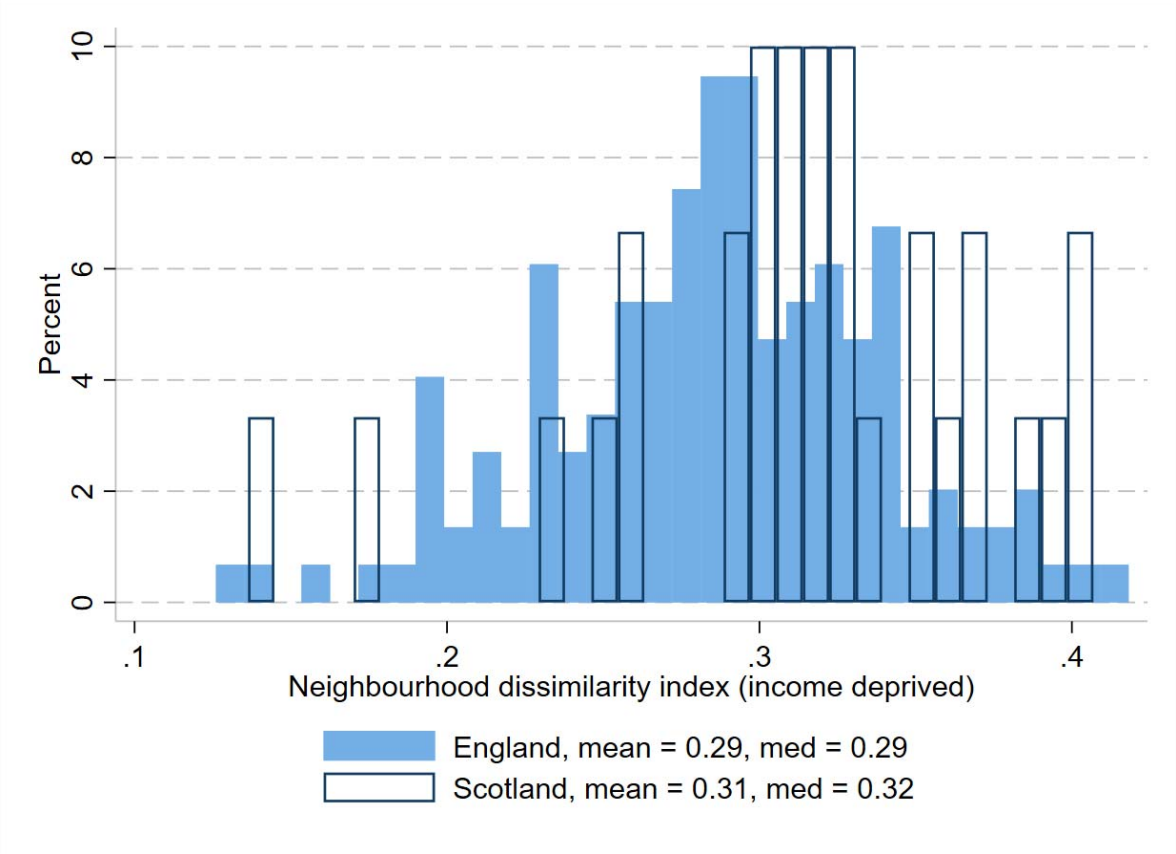


Note: Each bar shows the share of local authorities in England and Scotland with each gap between the neighbourhood with the highest and lowest fraction of people with income deprivation for 2020 in Scotland and 2019 for England. The mean and median for each country are reported in the legend.

Using all neighbourhoods to measure neighbourhood segregation (*D*), again Figure 8 shows that segregation is similar on average in Scotland and England: the mean local authority in Scotland has a measure of 0.31, compared to the mean local authority in England of 0.29. Averages mask key differences between countries, however. For example, there are more local authorities in Scotland exhibiting high levels of segregation than in England. As noted in our data description, this could partly be due to neighbourhoods in Scotland being geographically smaller than in England, which tends to increase the measured level of segregation (Manley et al., 2019).

Comparing sorting across schools and neighbourhoods, the descriptive evidence presented here suggests that sorting in neighbourhoods is stronger than for schools in both countries. In England, 22% of pupils would need to move schools for the composition of all schools to reflect the local authority, compared to 29% of all people that would need to move neighbourhoods. The equivalent figures for Scotland (at the mean) are 17% for schools and 31% for neighbourhoods.

Figure 8. Distribution of neighbourhood segregation in Scotland and England



Note: This figure plots the kernel distribution of the index of dissimilarity with respect to income-deprived people in neighbourhoods within local authorities in England and Scotland. The mean and median for each country are reported in the legend.

Relationship between school and neighbourhood segregation

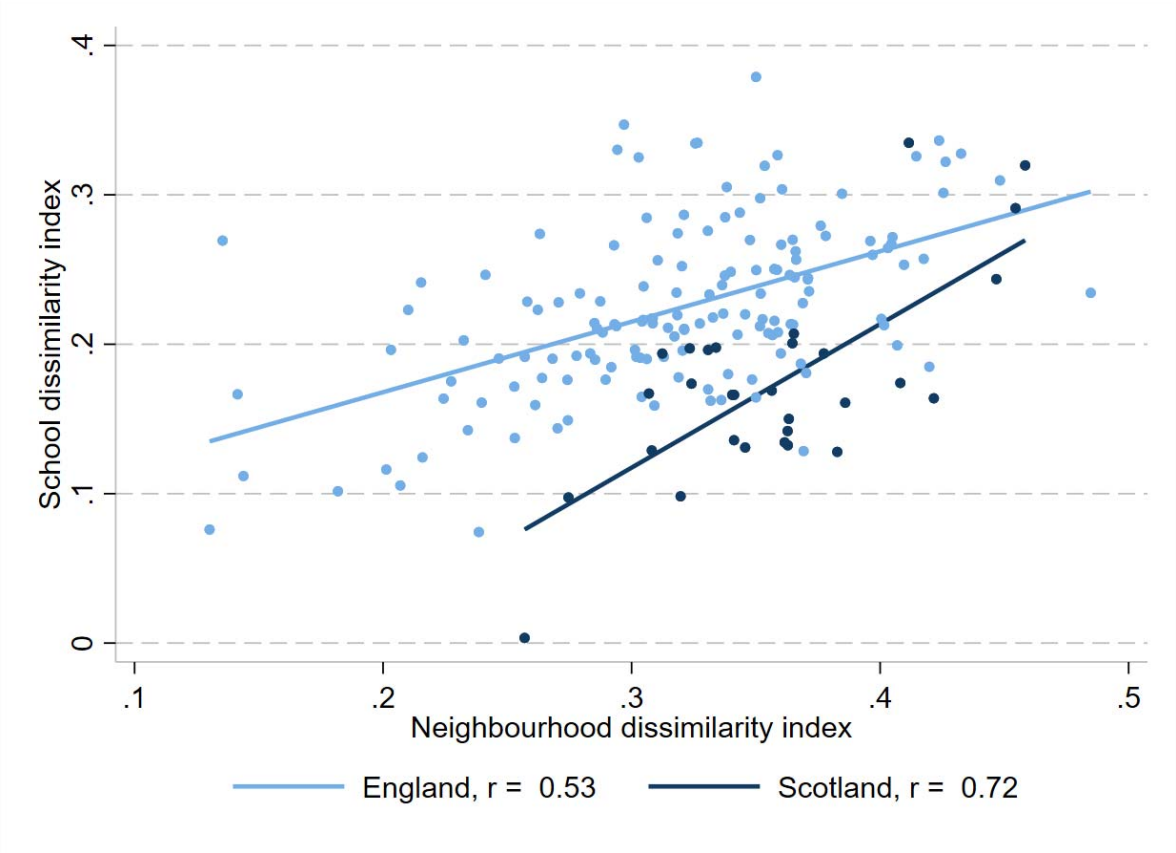
We have shown that different approaches to school assignment across Scotland and England may contribute to differing levels of school and neighbourhood segregation across countries. The school assignment process may, however, also influence the *strength* of the relationship between school sorting and neighbourhood sorting. In this subsection, we study the correlation between school and neighbourhood segregation within local authorities.

Figure 9 shows the relationship between neighbourhood- and school-level segregation in England and Scotland. Each dot represents one local authority. Areas with more income-segregated neighbourhoods also tend to have more segregated schools in both countries. Yet, this link is stronger in Scotland compared with England (a correlation of around 0.7 compared to 0.5), suggesting that Scottish schools are more representative of their local areas, and, in turn, neighbourhood segregation is reflected more strongly in schools. This is corroborated when we

exclude selective local authorities in England – which select pupils on the basis of factors other than residence – and correlation increases between school and neighbourhood segregation in England to around 0.6 (see Figure A.4).

At each level of neighbourhood segregation, the level of school segregation (on average) is higher in England compared with Scotland. Despite the stronger relationship between neighbourhood and school segregation in Scotland, therefore, the eventual level of school segregation is greater in England. This suggests that other factors are more important in shaping school segregation in England, while in Scotland, neighbourhood segregation is a stronger predictor. In Scotland, around half of the variation in school segregation across schools is explained by the variation in neighbourhood segregation. In contrast, only around 28% of the variation in school segregation is explained by the variation in neighbourhood segregation in England. Further research is required to study the separate forces that lead to higher levels of school segregation in England, over and above neighbourhood segregation.

Figure 9. School and neighbourhood segregation at local authority level in Scotland and England



Note: Each point represents one local authority. Lines of best fit and correlation coefficient, *r*, are reported for both countries. Local authorities with five or fewer schools are dropped.

6. School quality and neighbourhood sorting

The emerging picture is that neighbourhood segregation is marginally higher in Scotland, which could be due in part to the school assignment system. To more directly explore whether, and to what extent, neighbourhood segregation is related to the school assignment process, we study the simple correlation between local school quality and house prices. Our hypothesis is that the relationship is stronger in Scotland, where the strict catchment area creates a definite local 'amenity' that would be priced into property values. While this is informative, there are many other factors that might be correlated with both local school quality and property prices, such as the quality of the housing stock or transport connections. To uncover a more causal relationship between school quality and sorting, we additionally study differences in household characteristics across catchment area boundaries. In these small areas, where neighbourhood amenities are presumed to be constant, only the amenity of school performance should differ either side of the boundary.[18] This allows us to isolate the effect of the performance of the catchment area school on household characteristics and sorting.

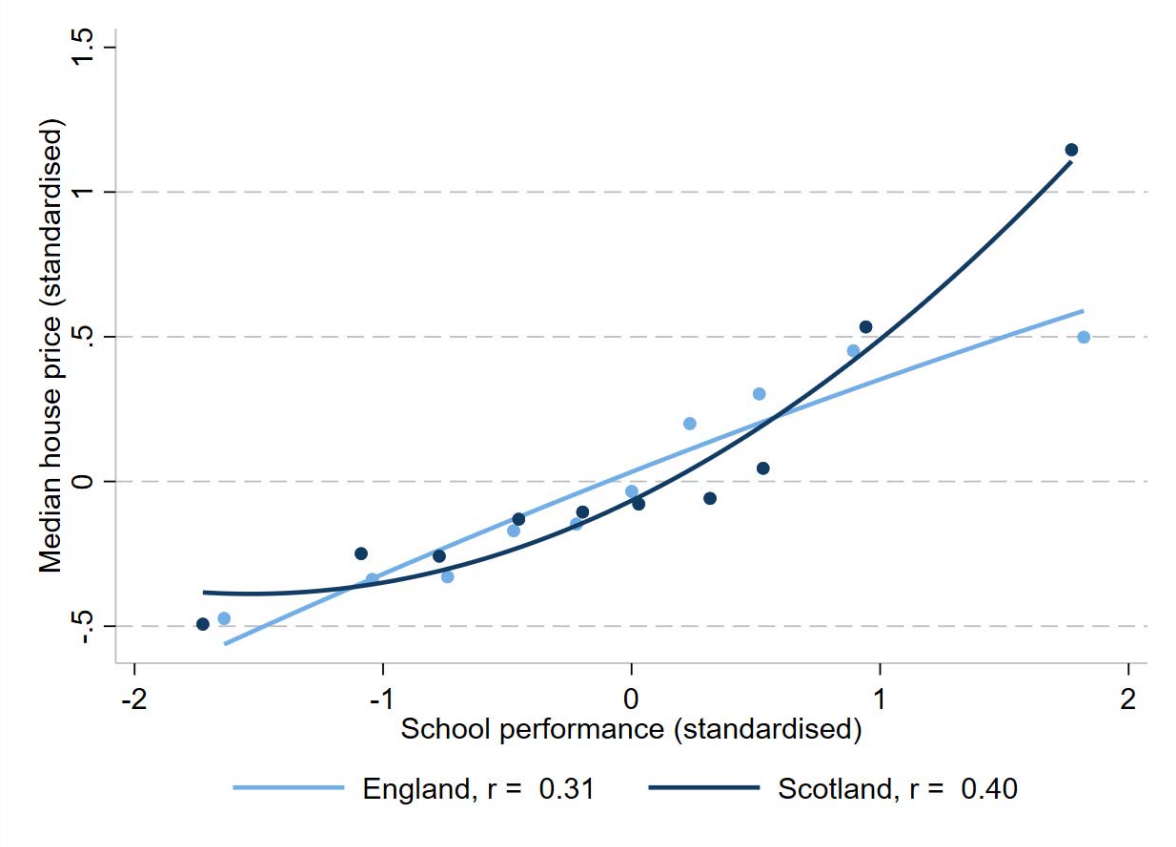
Local property prices and school performance

Figure 10 groups neighbourhoods in England (in light blue) and Scotland (in dark blue) into 10 equal-sized bins on the basis of school performance of the associated catchment area school, and it plots the average median property price.[19] Both countries exhibit a strong positive correlation between local property prices and local school quality. This relationship is somewhat stronger in Scotland compared with England, with correlations of 0.4 versus 0.31, respectively. This is consistent with the strict geographical admission system in Scotland increasing demand for housing in catchment areas with high-performing schools.

[18] This analysis has the disadvantage that only neighbourhoods around catchment area boundaries can be included, which excludes large parts of England and the inner parts of all catchment areas in both countries.

[19] For neighbourhoods in England that do not fall in a pre-defined catchment area, we use the closest school to define school performance. Where a neighbourhood in England falls in multiple catchment areas (that can be overlapping) we use the school performance of the highest attaining school.

Figure 10. School performance and property prices at the neighbourhood level in Scotland and England



Note: Binned scatterplot which groups neighbourhoods into 10 equal-sized bins of school performance and plots the mean of median house prices in each bin. Lines of best fit and correlation coefficient (for the underlying neighbourhood-level data), *r*, are reported for both countries.

Although the same mechanism exists in England (as geography largely determines access to over-subscribed schools), incentives for households to sort are weaker. For instance, as mentioned previously, not all (around 60%) local authorities have pre-defined school catchment areas and those using distance to ration places do not guarantee admission as in Scotland, but rather give the household 'priority'.

To explore the role of the pre-defined catchment area, Figure A.5 shows the relationship only for neighbourhoods in England with a catchment area school. We now see a stronger link between school performance and property prices in England – from 0.31 to 0.38 – but still not as strong as in Scotland. This is likely to be because, in England, even when schools have catchment areas, geography is not the unique criterion used to assign pupils to schools.[20] This is again consistent with the claim that sorting across catchment areas is stronger in Scotland than in England, perhaps as a result of the strict geographical admission system.

[20] The correlation in England excluding areas with a catchment school is 0.30.

These correlations between school performance and property prices may not reflect causal relationships between the two factors, however. This is because, as mentioned above, there could be other neighbourhood characteristics that influence both local school quality and local property prices. The following subsection tries to overcome this problem by considering differences in property prices and population composition closely around two sides of a catchment area boundary. In this design, only the school performance of the catchment school should vary, while other neighbourhood attributes should be roughly constant. Differences in property prices and household composition can therefore be attributed to differences in school performance of the catchment school (under some assumptions).

Sorting across catchment area boundaries

Tables 2 and 3 show the differences in property prices and household characteristics across school catchment boundaries in Scotland and England, respectively. To capture the socio-economic composition of households, we look at the share of income-deprived residents, shares of residents in low- and high-class occupations, education groups, ethnic groups, and living in social housing. We also consider the age structure of households to test whether catchment areas affect the sorting of households with children.

We focus on all neighbourhoods in Scotland and England that share a boundary with each other, but whose population centroids fall on different sides of a school catchment area boundary. We define the 'high side' of the boundary as the one whose school has a higher school performance, relative to the 'low side'. Columns 1 and 2 report the mean and the standard deviation (SD) for the variables of interest on the high side of the boundary, whilst columns 3 and 4 do the same for the low side. Finally, in columns 5 and 6, we estimate the difference in mean between the two sides. Refer to Section 4 for more details on how these estimates are derived.

Both countries display evidence of catchment area effects on property prices and household composition. In Scotland, property prices are, on average, 8% higher on the side of the boundary with higher school performance, all else equal. In England, the equivalent effect is around 3%. This suggests that while the catchment area is a neighbourhood attribute that increases demand for properties in both countries (and, in turn, prices), the effect is much stronger in Scotland where residence in the catchment area guarantees a place at the school. Both estimates are within the range of previous estimates that use the same methodology for England and Scotland and other countries.[21]

[21] For example, for a one-standard-deviation increase in school quality, property prices increase by: 1.4% in Paris (Fack and Grenet, 2010); 1.8% in San Francisco Bay (Bayer, Ferreira and McMillan, 2007); 2%–4% in Boston (La, 2015); 2.1% in Massachusetts (Black, 1999); 3.3% in Helsinki (Harjunen, Kortelainen and Saarimaa, 2018); 3.5% in Australia (Davidoff and Leigh, 2008); ~3.5% in England (Gibbons, Machin and Silva, 2013); 5% in North Carolina (Kane, Staiger and Samms, 2003); 7%–10% in Oslo (Machin and Salvanes, 2016).

Table 2. Sorting across catchment area boundaries in Scotland

Variable	High side		Low side		Estimate	
	Mean	SD	Mean	SD	β	S.E.
ln(property price)	5.088	0.538	5.017	0.573	0.080***	0.023
% Income-deprived people	9.093	7.930	10.684	9.017	−1.716***	0.327
% Managers/professionals	28.776	11.779	26.516	11.559	2.414***	0.427
% Elementary occupation	10.195	5.091	11.099	5.710	−0.986***	0.219
% No qualification	23.735	10.450	25.030	11.093	−1.429***	0.393
% Highest qualification group	30.099	13.311	27.876	13.188	2.381***	0.442
% Ethnic minority	7.932	7.506	8.314	8.054	−0.427*	0.167
% Social housing	15.513	16.317	18.960	19.059	−3.731***	0.791
% Children aged 10–14	5.493	1.844	5.608	1.981	−0.104	0.071
% All children aged 10–14	28.133	5.613	27.780	5.658	0.365	0.227
Number of boundaries	431		431		431	
Number of boundaries × data zone pairs	3,283		3,226		6,509	

Note: *** $p < 0.001$; ** $p < 0.05$; * $p < 0.1$. 'S.E.' (standard errors) are clustered at the boundary level. Differences between the high- and low-performing sides of the catchment are measured using a univariate regression where the demographic variable of interest is regressed on a binary indicator for whether the catchment area is on the high-performing side of the boundary. School performance is based on the percentage of school leavers achieving at least five awards at SCQF level 5 or above. We use the natural logarithm of median property prices. Children aged 10–14 is based on the entire population, whereas share of all children aged 10–14 is based on all people aged 0–17.

Tables 2 and 3 also reveal that household composition is affected by school catchment area. On average, households with characteristics associated with advantage cluster on the side of the boundary with higher school performance. For example, the share of households with a professional occupation is around 2.4 percentage points higher in Scotland and 0.9 percentage points higher in England. A similar pattern is found for the share of households with a higher degree qualification. Conversely, there are fewer households with an elementary occupation on the higher performing side (1 percentage point in Scotland and 0.3 percentage points in England) and no qualification (1.5 percentage points in Scotland and 0.5 percentage points in England).

Table 3. Sorting across catchment area boundaries in England

Variable	High side		Low side		Estimate	
	Mean	SD	Mean	SD	β	S.E.
ln(property price)	5.535	0.469	5.508	0.464	0.028***	0.003
% Income-deprived people	10.516	7.859	10.929	7.938	−0.427***	0.061
% Managers/professionals	29.327	10.384	28.478	10.324	0.860***	0.086
% Elementary occupation	10.345	4.771	10.648	4.875	−0.310***	0.038
% No qualification	21.165	8.255	21.649	8.333	−0.497***	0.067
% Highest qualification group	28.006	11.300	27.147	11.230	0.869***	0.091
% Ethnic minority	13.361	14.689	13.553	14.757	−0.215**	0.077
% Social housing	13.987	14.501	14.455	14.792	−0.484***	0.113
% Children aged 10–14	5.835	1.561	5.783	1.550	0.051***	0.012
% All children aged 10–14	27.582	4.388	27.341	4.315	0.243***	0.035
Number of boundaries	2,294		2,293		2,295	
Number of boundaries × LSOA pairs	33,429		33,391		66,820	

Note: *** $p < 0.001$; ** $p < 0.05$; * $p < 0.1$. 'S.E.' (standard errors) are clustered at the boundary level. Differences between high- and low-performing sides of the catchment are measured using a univariate regression where the demographic variable of interest is regressed on a binary indicator for whether the catchment area is on the high-performing side of the boundary. School performance is based on the average school-level performance between the academic years 2016/17 and 2018/19 using the percentage of pupils achieving at least five GSCEs of at least grade C, including English and maths. We use the natural logarithm of median property prices. 'Children aged 10–14' is based on the entire population, whereas share of 'all children aged 10–14' is based on all people aged 0–17. Sample of local authorities includes all local authorities where the majority of schools have pre-defined catchment areas, and these local authorities provide information through a Geographic Information System. Five local authorities – Hertfordshire, Norfolk, Solihull, South Gloucestershire, and Windsor and Maidenhead – are excluded as many catchment areas are overlapping. Three schools in Staffordshire are excluded as the geographical coordinates are invalid.

As for property prices, the effects are generally present for both countries, but stronger in Scotland, as hypothesised. The share of people who are income-deprived is 1.7 percentage points lower, on average, on the high-performing side of the boundary in Scotland compared to 0.4 percentage points lower in England.

We also study the prevalence of social housing either side of catchment boundaries. This household characteristic differs to others in that housing tenure is largely pre-determined and in a fixed location. We find that the share of households in social housing is 3.7 percentage points lower in Scotland on the higher-performing side of the boundary (the equivalent statistic for England is 0.5 percentage points). This can less obviously be explained by more-affluent households sorting into catchment areas with 'better' schools. Identifying the forces producing this pattern requires further investigation of the interaction of housing tenure and schools – and the differences across countries in this regard.

The final dimension of sorting we look at is among families with children. In Scotland, there is no systematic difference in the presence of secondary school children between the high- and low-performing sides of catchment boundaries. This finding runs counter to the hypothesis that demand for properties in desirable catchment areas is driven by families with children. In England, there are more households with children on the higher-performing side of the boundary, though the difference is small in magnitude. These findings could suggest that desirable school catchment areas are also desirable for households that do not value the school quality directly. For example, non-parents might value the increased certainty of their property investment around a popular school, or the 'type' of neighbour they are more likely to have. Another explanation is that, due to high moving costs, households that expect to have children move into desirable catchment areas in advance, and/or that households whose children have left school decide to remain in the neighbourhood.[22]

Tables A.1 and A.2 in Appendix A.2 show equivalent results for the subset of school catchment boundaries where the difference in school performance is at least one standard deviation. This zooms in on boundaries with relatively large differences in school quality either side. As expected, given the stronger incentives for households to sort to access a markedly higher-performing school, there is a stronger effect on property prices and household composition than in the whole sample. We additionally test robustness to using only neighbourhoods mostly nested within school catchment areas (Tables A.3 and A.4). The results display the same pattern as the main results, and the relative magnitude of the coefficients is mostly in line.

Overall, this section demonstrates that the composition of otherwise similar neighbourhoods is affected by the 'quality' of the school catchment area attached to it. This is most evident in Scotland, where residence in the school catchment area guarantees access to the school. These findings suggest that policymakers should consider the effects of education policy on outcomes beyond schooling, such as residential segregation.

[22] See Greaves and Turon (2021) for more discussion of this mechanism.

7. Conclusions

Local and national governments can set school admissions arrangements. Traditionally, in Scotland, policymakers have played down choice and, more generally, 'markets' in education (Cope and I'Anson, 2009). In England, the right of parents' to express a preference for their child's school is long-established and has been strengthened over time. In England, in contrast to Wales and Scotland, school league tables are provided by central government to inform parents' choice and increase the competition between schools.

What lessons can be drawn from comparing across countries? Neighbourhood segregation is similar across the two countries, although marginally higher in Scotland. There are very integrated areas and very segregated areas in both countries. In Scotland, however, there is a stronger relationship between school and neighbourhood segregation. Neighbourhoods with very few income-deprived children are strongly tied to schools with very few pupils eligible for FSM. This suggests that Scottish schools are more representative of their local areas. Given the strict catchment area system, existing neighbourhood segregation (for example, due to historical factors) is reflected more strongly in school composition.

Sorting of affluent parents into areas with higher-performing schools may exacerbate this pattern. In both countries, we find evidence of sorting across catchment area boundaries, with higher house prices and more advantaged households located on the side with higher school performance. This pattern is most strongly evident in Scotland, however. For example, property prices are around 8% higher on the high-performing side of the boundary in Scotland, compared to around 3% in England. This suggests that the strict catchment system with guaranteed admission results in higher demand and, in turn, higher prices around the 'best' schools.

Turning to segregation across schools, however, we find that school segregation within local authorities is *lower* in Scotland than in England. In England, 22% of pupils eligible for FSM would need to be reallocated across schools to achieve an even distribution of low-income pupils within local authorities, compared to 17% for Scotland. Stricter catchment areas are therefore associated with lower school segregation than the process of school choice, despite higher residential segregation. What might explain this seemingly counter-intuitive result? One explanation is that many schools in England select by ability or aptitude, which may increase the segregation of pupils by income (Coldron et al., 2008). Alternatively, England has a long-established system of school league tables and competition, which may heighten awareness of differences between schools in England relative to Scotland. Although it is beyond the scope of this report to determine the causes of the differences in school segregation between countries,

these results point to different underlying mechanisms governing the processes of school and neighbourhood segregation across countries.

These differing levels of segregation may have important implications for the life chances of low-income children across countries. Higher residential segregation in some areas in Scotland may serve to restrict access to key neighbourhood amenities (including schools) or more-affluent peers. Higher concentrations of low-income pupils across schools in England may adversely affect the academic achievement of poorer pupils or reduce access to higher-achieving peers. In documenting patterns of residential and school segregation and studying their interplay, this report serves as an important first step for policymakers in Scotland and England concerned about equality of access to resources for low-income children. A caveat to this analysis is that there are other factors beyond the school assignment process that differ between Scotland and England. For example, provision of social housing, resourcing for schools or historical location of industry all might affect the levels of segregation today. Our eventual goal is to test whether the school assignment process contributes to segregation above and beyond these other factors. In future work, we will carefully match local authorities with similar characteristics across countries. This method will better causally identify the effect of the school assignment process on school and neighbourhood segregation by holding other contributing factors constant.

Appendix

A.1. The index of dissimilarity

Formally, for two disjoint subgroups of the population indexed by *t*, where *t* is in {0, 1} representing, for instance, pupils with and without eligibility for FSM, and *G* are non-overlapping geographical units (such as schools), the index is defined as

$$D = \frac{1}{2}\sum_{g=1}^{G}\left|\frac{n_{g,0}}{N_0} - \frac{n_{g,1}}{N_1}\right|,$$

where $n_{g,t}$ is the number of group t in unit g, and N_t is the total population of group t across all units. At the local authority level, N_0 would be the total population of pupils without eligibility for FSM in the local authority, for instance.

A.2. Tables

Table A.1. Sorting across catchment area boundaries in Scotland, large school performance differential

Variable	High side		Low side		Estimate	
	Mean	SD	Mean	SD	β	S.E.
ln(property price)	5.142	0.551	5.020	0.583	0.130***	0.036
% Income-deprived people	8.747	8.131	11.314	9.573	−2.662***	0.543
% Managers/professionals	30.733	12.763	26.560	12.625	4.336***	0.612
% Elementary occupation	9.933	5.023	11.645	6.257	−1.782***	0.369
% No qualification	22.198	10.287	25.027	11.145	−2.919***	0.557
% Highest qualification group	33.147	14.390	28.667	14.481	4.656***	0.684
% Ethnic minority	8.910	8.128	9.532	8.947	−0.613*	0.278
% Social housing	14.603	16.619	20.973	20.671	−6.596***	1.386
% Children aged 10–14	5.324	1.945	5.402	2.055	−0.088	0.105
% All children aged 10–14	28.163	5.679	27.251	5.820	0.908**	0.335
Number of boundaries	163		163		163	
Number of boundaries × data zone pairs	1,250		1,226		2,476	

Note: *** $p < 0.001$; ** $p < 0.05$; * $p < 0.1$. ‘S.E.’ (standard errors) are clustered at the boundary level. Sample restricted to catchment boundaries with large differences in school performance either side (at least one standard deviation). Differences between high- and low-performing sides of the catchment are measured using a univariate regression where the demographic variable of interest is regressed on a binary indicator for whether the catchment area is on the high-performing side of the boundary. High- and low-performing are based on the percentage of school leavers achieving at least five awards at SCQF level 5 or above. We use the natural logarithm of median property prices. ‘Children aged 10–14’ is based on the entire population, whereas share of ‘all children aged 10–14’ is based on all people aged 0–17.

Table A.2. Sorting across catchment area boundaries in England, large school performance differential

Variable	High side		Low side		Estimate	
	Mean	SD	Mean	SD	β	S.E.
ln(property price)	5.574	0.452	5.528	0.457	0.047***	0.006
% Income-deprived people	10.002	7.448	10.819	7.716	−0.828***	0.124
% Managers/professionals	30.545	11.164	29.084	11.249	1.472***	0.202
% Elementary occupation	10.084	4.591	10.670	4.885	−0.591***	0.087
% No qualification	20.588	8.252	21.520	8.479	−0.943***	0.135
% Highest qualification group	29.288	12.176	27.802	12.281	1.497***	0.210
% Ethnic minority	13.630	13.715	14.034	13.926	−0.407**	0.141
% Social housing	14.236	14.476	15.345	15.064	−1.125***	0.220
% Children aged 10–14	5.898	1.468	5.781	1.482	0.117***	0.022
% All children aged 10–14	27.760	4.246	27.251	4.205	0.510***	0.073
Number of boundaries	730		730		731	
Number of boundaries × LSOA pairs	11,383		11,372		22,755	

Note: *** $p < 0.001$; ** $p < 0.05$; * $p < 0.1$. ‘S.E.’ (standard errors) are clustered at the boundary level. Sample is restricted to catchment boundaries with large differences in school performance either side (at least one standard deviation). Differences between high- and low-performing sides of the catchment are measured using a univariate regression where the demographic variable of interest is regressed on a binary indicator for whether the catchment area is on the high-performing side of the boundary. High- and low-performing are based on the average school-level performance between the academic years 2016/17 and 2018/19 in the percentage of pupils achieving at least five ‘good’ GSCEs, including English and maths. We use the natural logarithm of median property prices. ‘Children aged 10–14’ is based on the entire population, whereas share of ‘all children aged 10–14’ is based on all people aged 0–17. Sample of local authorities includes all local authorities where the majority of schools have pre-defined catchment areas, and these local authorities provide information through a Geographic Information System. Five local authorities – Hertfordshire, Norfolk, Solihull, South Gloucestershire, and Windsor and Maidenhead – are excluded as many catchment areas are overlapping. Three schools in Staffordshire are excluded as the geographical coordinates are invalid.

Table A.3. Sorting across catchment area boundaries in Scotland, neighbourhoods nested within school catchment areas

Variable	High side		Low side		Estimate	
	Mean	SD	Mean	SD	β	S.E.
ln(property price)	5.019	0.571	4.894	0.590	0.143***	0.025
% Income-deprived people	9.666	8.538	12.558	9.719	−3.159***	0.461
% Managers/professionals	28.063	12.624	24.519	12.184	3.827***	0.486
% Elementary occupation	10.522	5.255	12.247	6.114	−1.994***	0.293
% No qualification	24.091	11.258	26.755	11.818	−3.022***	0.509
% Highest qualification group	29.510	14.169	26.372	14.464	3.584***	0.543
% Ethnic minority	8.154	7.650	8.980	8.746	−0.684*	0.274
% Social housing	16.979	17.271	23.106	20.462	−6.933***	1.124
% Children aged 10–14	5.402	1.840	5.407	1.908	−0.116	0.097
% All children aged 10–14	27.867	5.341	27.349	5.434	0.256	0.280
Number of boundaries	325		312		400	
Number of boundaries × data zone pairs	1,814		1,675		3,489	

Note: *** $p < 0.001$; ** $p < 0.05$; * $p < 0.1$. ‘S.E.’ (standard errors) are clustered at the boundary level. Sample is restricted to data zones that are almost entirely nested within school catchment areas. Differences between high- and low-performing sides of the catchment are measured using a univariate regression where the demographic variable of interest is regressed on a binary indicator for whether the catchment area is on the high-performing side of the boundary. School performance is based on the percentage of school leavers achieving at least five awards at SCQF level 5 or above. We use the natural logarithm of median property prices. ‘Children aged 10–14’ is based on the entire population, whereas share of ‘all children aged 10–14’ is based on all people aged 0–17.

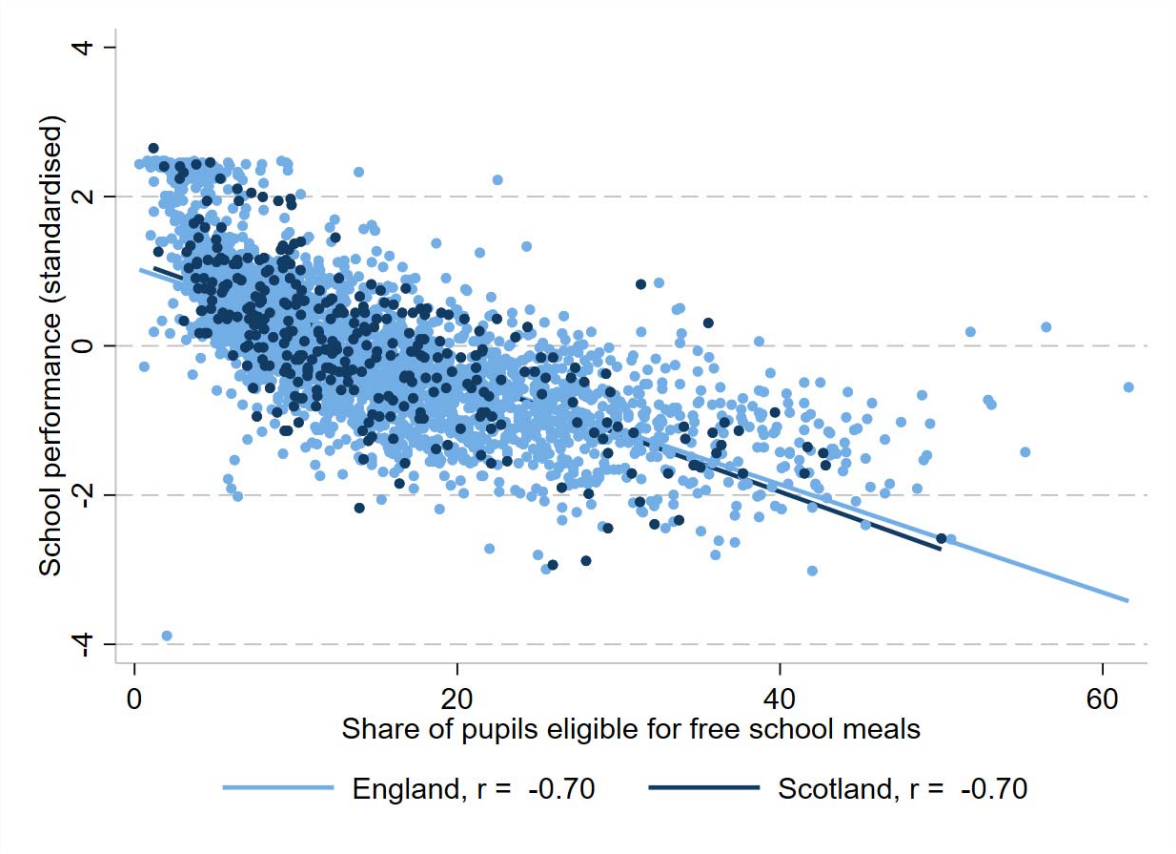
Table A.4. Sorting across catchment area boundaries in England, neighbourhoods nested within school catchment areas

Variable	High side		Low side		Estimate	
	Mean	SD	Mean	SD	β	S.E.
ln(property price)	5.494	0.472	5.469	0.472	0.022***	0.003
% Income-deprived people	11.049	8.367	11.468	8.396	−0.404***	0.067
% Managers/professionals	28.753	10.960	27.912	10.897	0.666***	0.088
% Elementary occupation	10.708	5.002	11.009	5.055	−0.250***	0.040
% No qualification	21.459	8.889	21.959	8.938	−0.410***	0.070
% Highest qualification group	27.657	12.020	26.819	11.937	0.652***	0.092
% Ethnic minority	13.793	14.744	13.860	14.608	−0.077	0.085
% Social housing	15.365	15.540	15.939	15.733	−0.528***	0.127
% Children aged 10–14	5.916	1.524	5.862	1.517	0.037**	0.012
% All children aged 10–14	27.508	4.250	27.219	4.159	0.244***	0.038
Number of boundaries	1,657		1,696		2,042	
Number of boundaries × LSOA pairs	20,441		20,572		41,013	

Note: *** $p < 0.001$; ** $p < 0.05$; * $p < 0.1$. ‘S.E.’ (standard errors) are clustered at the boundary level. Sample is restricted to LSOAs that are almost entirely nested within school catchment areas. Differences between high- and low-performing sides of the catchment are measured using a univariate regression where the demographic variable of interest is regressed on a binary indicator for whether the catchment area is on the high-performing side of the boundary. School performance is based on the average school-level performance between the academic years 2016/17 and 2018/19 using the percentage of pupils achieving at least five GSCEs of at least grade C, including English and maths. We use the natural logarithm of median property prices. ‘Children aged 10–14’ is based on the entire population, whereas share of ‘all children aged 10–14’ is based on all people aged 0–17. Sample of local authorities includes all local authorities where the majority of schools have pre-defined catchment areas, and these local authorities provide information through a Geographic Information System. Five local authorities – Hertfordshire, Norfolk, Solihull, South Gloucestershire, and Windsor and Maidenhead – are excluded as many catchment areas are overlapping. Three schools in Staffordshire are excluded as the geographical coordinates are invalid.

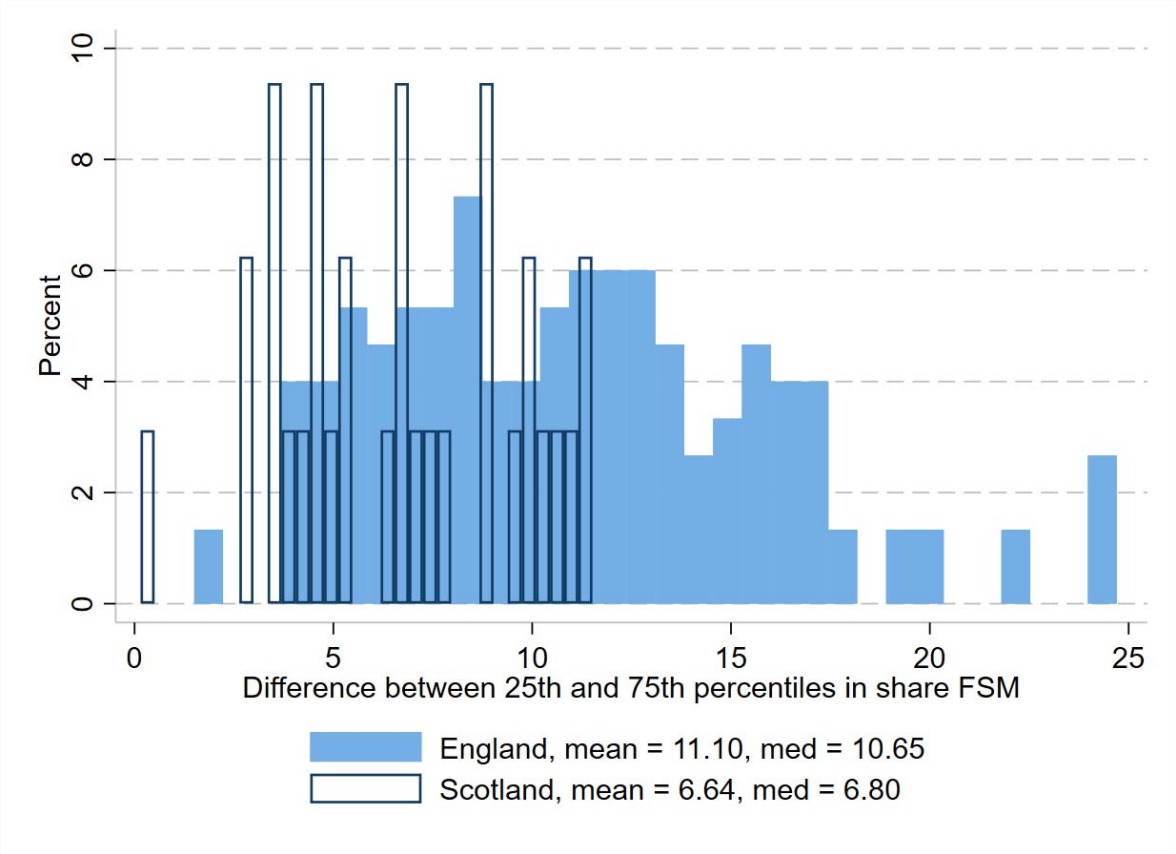
A.3. Figures

Figure A.1. School composition and school performance in Scotland and England, excluding London



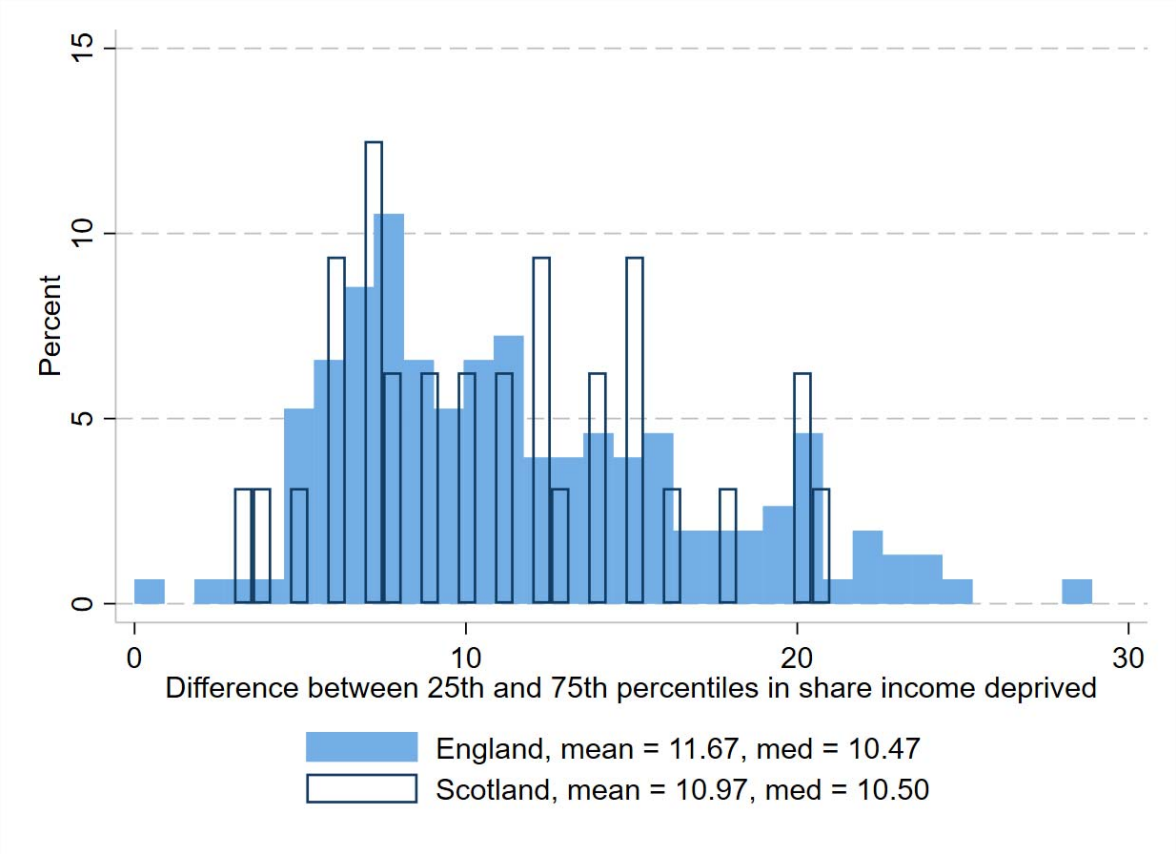
Note: Each point represents one school. London schools are dropped from sample. Lines of best fit and correlation coefficient, *r*, are reported for both countries. School performance is averaged across school years 2016/17 to 2018/19 and is standardised within country. For Scotland, this is given by the percentage of school leavers achieving at least five awards at SCQF level 5 or above. For England, this is the percentage of pupils achieving at least five GCSEs of at least grade C. Pupils eligible for FSM measured in 2018/19.

Figure A.2. Variation in FSM share that occurs within local authorities in Scotland and England (difference between 25th and 75th percentile)



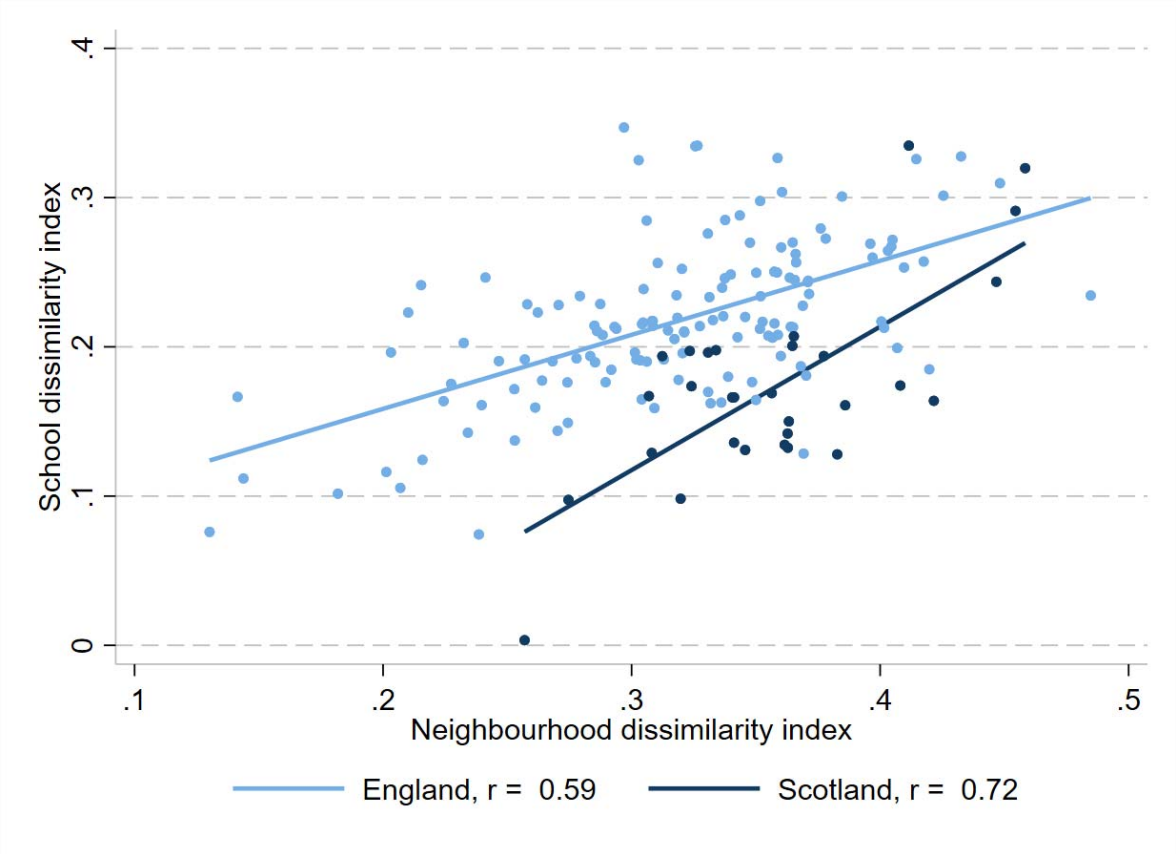
Note: Each bar shows the share of local authorities in England and Scotland with each difference between the school at the 75th and 25th percentile of fraction of pupils eligible for FSM. The mean and median for each country are reported in the legend.

Figure A.3. Variation in share of people who are income-deprived that occurs within local authorities in Scotland and England (difference between 25th and 75th percentile)



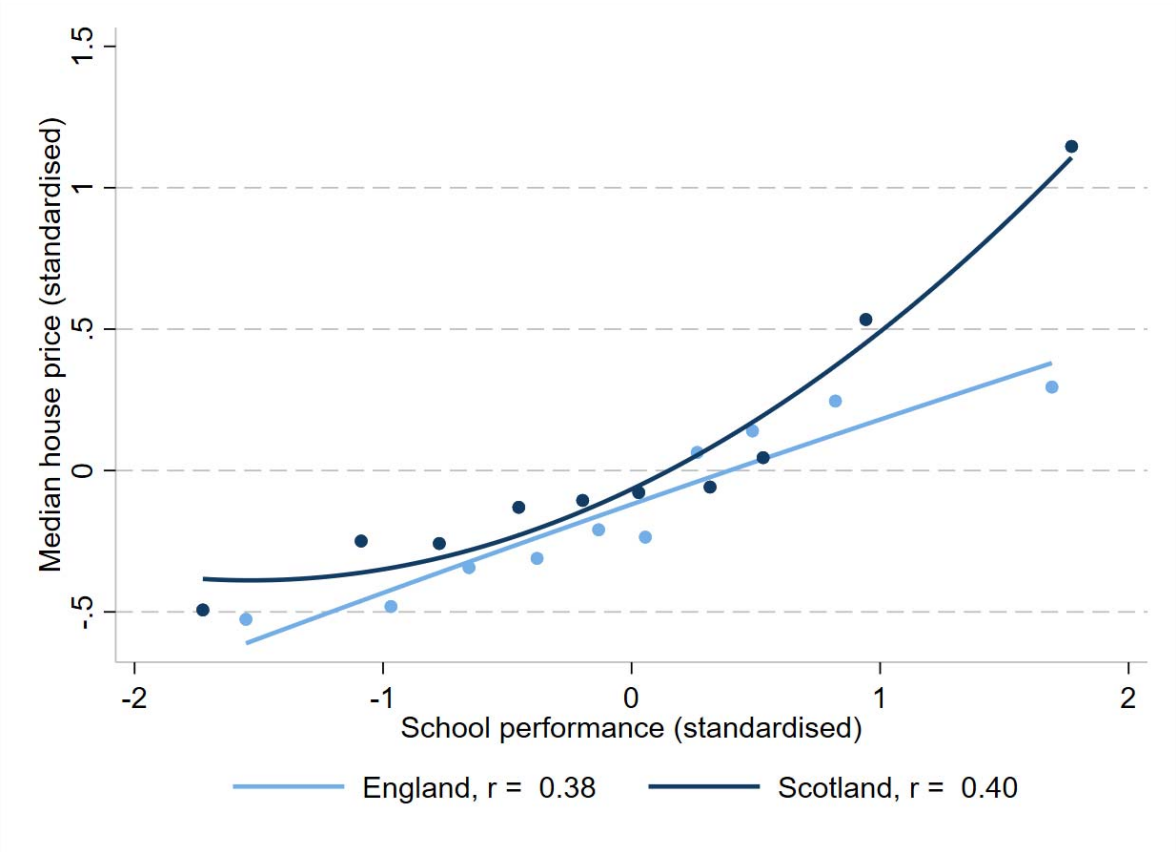
Note: Each bar shows the share of local authorities in England and Scotland with each gap between the neighbourhood at the 75th and 25th percentile of fraction of people with income deprivation for 2020 in Scotland and 2019 for England. The mean and median for each country are reported in the legend.

Figure A.4. School and neighbourhood segregation at local authority level in Scotland and England, excluding selective English local authorities



Note: Each point represents one local authority. Sample excludes local authorities in England with selective schools. Lines of best fit and correlation coefficient, *r*, are reported for both countries. Local authorities with five or fewer schools are dropped.

Figure A.5. School performance and property prices at the neighbourhood level in Scotland and England, catchment area neighbourhoods



Note: Binned scatter which groups neighbourhoods into 10 equal sized bins of school performance and plots the mean of median house prices in each bin. For England, the sample includes only neighbourhoods with a catchment area school. Lines of best fit and correlation coefficient (for the underlying neighbourhood-level data), *r*, are reported for both countries.

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