3 Present and future school costs and access

This chapter analyses present and future estimates of primary and secondary school cost and access across Europe. It first reviews the main discussions and concepts around the balance between school costs and access, including the effects of consolidation of the school network on this balance. It then presents a detailed analysis of present cost and access estimates for Europe at different territorial aggregations including the regional, municipal and degree of urbanisation levels. Finally, the chapter presents a similar discussion for future school cost and access estimates, highlighting the most pressing cases facing challenges in the face of demographic change.

Main takeaways

- This chapter assumes that students choose schools that minimise their travel time or those that are less crowded, without being limited to a specific area. In practice governments often impose bounding conditions: on average across OECD countries, 41% of students are in schools where admission to school always considers residence in a particular area.
- While school consolidation has possible negative implications on school attendance and performance when distances to school increase considerably, maintaining schools open at any cost may not act as a deterrent for out-migration in communities already experiencing population decline.
- For the average of TL3 regions, annual costs per student in primary and secondary schools are EUR 4 034 and EUR 6 571, with a difference between the regions with the maximum and minimum costs of EUR 3 302 for primary schools and EUR 2 495 for secondary schools.
- When aggregated by type of TL3 regions, for all countries with remote regions except Croatia, costs per primary and secondary school student are lowest in metropolitan regions and highest in remote regions.
- While non-metropolitan regions have generally higher costs per student than metropolitan regions, costs can be relatively high in metropolitan regions with a small share of population in school age.
- In countries with strong municipal consolidation, the share of municipalities with only small schools is negligible because a larger number of students are hosted in larger municipal borders. On the other hand, countries with high municipal fragmentation have a relatively large share of municipalities with no schools or only small schools.
- School-based costs per primary school student by municipality increase when at least half of the municipality schools are small. Extreme cases - with costs over four times the average expenditure - all occur in municipalities with one small school and a very small population.
- Costs per student in primary and secondary schools are highest in sparse rural areas and lowest in cities. For EU27+UK, the difference in annual cost per student between cities and sparse rural areas is about EUR 650 and EUR 681 per primary and secondary school student, respectively.
- For secondary schools, the difference between costs per student in villages and sparse rural areas is smaller than for primary schools.
- In both primary and secondary schools, villages have the largest share of students coming from other types of settlements: 39% (54%) of all primary (secondary) students attending school in villages do not come from villages. The large majority of these students actually comes from sparse rural areas.
- Primary school students in sparse rural areas travel on average four to five longer distances than students in cities. In fact, in the majority of countries, more than half of the primary school student population in sparse rural areas has to travel far to go to school.
- While differences in travel distances for secondary schools are smaller in general due to the higher geographic concentration of secondary schools, in some countries over 30% of sparse rural secondary students has to travel far to access a school.
- By 2035 projections show considerable additional demand for schools in cities, and a demand shift from rural to urban areas, in particular in Eastern, Central and North-western Europe.

- In the 2035 scenario with future school placements, changes for primary schools are close to zero in all areas except sparse rural areas, where costs per primary school student are expected to increase by 2.6% on average for EU27+UK countries, while distances are expected to increase in all areas except cities, and proportionally more in villages. Secondary schools are expected to follow a similar pattern with lower increases in expected cost increases, but higher distance increases.
- Keeping the 2011 primary school network – and consequently maintaining distances to schools similar to the present scenario - implies even larger average cost increases for EU27+UK countries of about EUR 36 per student in sparse rural areas and EUR 21 in villages, with substantial variations across countries depending on their expected change in future demand.

Introduction

Population trends are highly relevant for the provision of sustainable schools. Population decline is an OECD trend that will lead to a decline in the number of students in rural areas, raising additional challenges for the attraction of teachers and principals in these locations, and exacerbating the costs of educational provision, which in turn can lead to further school consolidation (OECD, 2021[1]). Given governments' mandate to provide access to basic education to children and adolescents, regardless of where they live, identifying sustainable strategies to provide schooling in areas of expected population decline is of chief importance, especially under tight budgets.

Chapter 2 presented a method to estimate school access and costs. This chapter applies this method to estimate the present and future effect of demographic change within regions, and across European countries. The analysis relies on new comprehensive and internationally comparable data for EU27+UK countries on schooling services, access and costs, which in turn rely on recently published local demographic projections (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

In the analysis, supply of educational facilities, and consequently costs per student, depend only on population distribution in each country, which ensures international comparability. This analysis also uses future youth population projections to simulate changes in costs and access under two future scenarios: one where the school network adapts to future student levels and distribution, and another one where the school network remains constant. More specifically, this chapter compares travel distances to simulated primary and secondary schools and their cost per student by degree of urbanisation. It also estimates changes in school costs driven by future population changes under different policy scenarios, emphasising how demographic change drives changes in students' access to school, especially in rural areas.

The next section presents concepts and evidence on school costs while specifying the costs considered in this report. The third section analyses estimated costs on current primary and secondary school across territories, including regions and municipalities, and by degree of urbanisation. The fourth section discusses projected changes in primary and secondary education as well as future cost estimates. The last section concludes.

School costs: Concepts and evidence

This section starts explaining the type of costs covered in this report, and outlining the subnational school costs by different factors, including the level of education and the demand for educational services. It then outlines the relationship between school access and choice by discussing school competition across OECD countries. Finally, the section examines the financial consequences and impact on declining communities of school network consolidation.

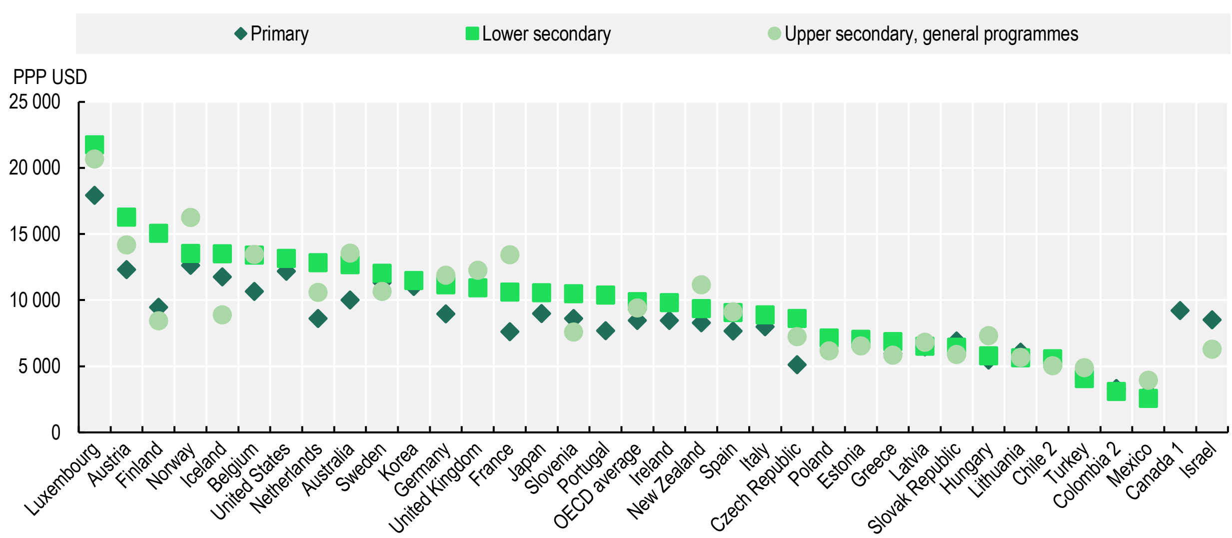
Subnational school costs: drivers and evidence

Educational expenditure tends to vary across levels of education and country regulations. Current expenditure per student depends on several different factors, such as teachers' salaries, pension systems, instructional and teaching hours, the cost of teaching materials and facilities, the type of programme provided (e.g. general or vocational), and the number of students enrolled in the education system, including the number of students per teacher. This report considers costs included in current expenditure incurred in schools. In this sense, the term "school costs" does not include privately incurred costs such as travel costs or other costs related to attending schools that do not relate to the costs of running schools. See the section "what is understood by costs in this report" in Chapter 2 for more details.

Across OECD countries, primary education expenditure per student tends to be lower than secondary education expenditure (Figure 3.1). This is especially true in countries with the highest expenditure on the lower secondary level, such as Luxembourg, Austria and Finland, where the differences in expenditures between primary and secondary are significant (OECD, 2021[1]). Countries with the lowest expenditure per student in both educational levels include Colombia, Mexico and Turkey, all being countries where teacher salaries are relatively low.

Figure 3.1. Total expenditure on educational institutions per full-time equivalent student by level of education, OECD countries

2016 USD PPP values



Notes: In equivalent USD converted using PPPs for GDP, direct expenditure within educational institutions, by level of education, based on full-time equivalents. For notes, see Annex 3 in OECD (2019[4]), *Education at a Glance 2019*, OECD Publishing, Paris, https://doi.org/10.1787/f8d7880d-en.

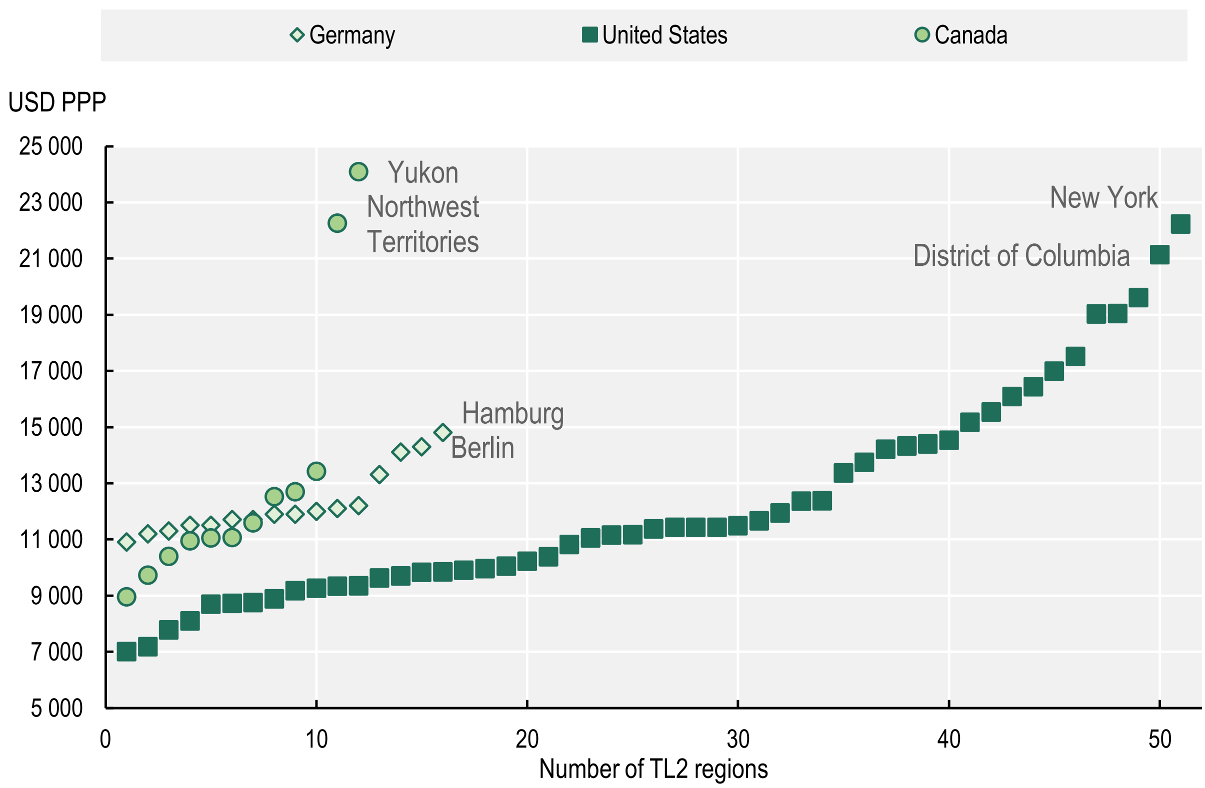
1. Primary education includes pre-primary programmes. Post-secondary non-tertiary figures are treated as negligible.
2. Year of reference 2017.
3. Data on expenditure on public vs. private educational institutions are displayed in OECD Education at a Glance 2019, Table C1.5 available on line.

Source: OECD (2019[4]), *Education at a Glance 2019*, OECD Publishing, Paris, https://doi.org/10.1787/f8d7880d-en.

Data for total educational expenditure or costs per student is usually not available across geographical and subnational levels. Available data on expenditure per student in primary to upper secondary education at the TL2 level for the United States, Canada, and Germany reveal that geographical variations can be quite substantial (Figure 3.2). In Canada, expenditure per student is about USD 10 000 higher in two remote regions compared to the national average. In the United States, both total expenditure on educational institutions per full-time equivalent student vary widely across TL2 regions, from a minimum of USD 7 003 in Utah to a maximum of USD 22 231 in New York.

Figure 3.2. Expenditure per student in primary to upper secondary education by TL2 region, Germany, United States, and Canada

Total expenditure on educational institutions per full-time equivalent student, USD PPP, 2017



Note: Primary to upper secondary education corresponds to ISCED2011 levels 1, 2 and 3.
Source: OECD (2021[5]), "Fertility rates" (indicator), http://dx.doi.org/10.1787/8272fb01-en (accessed on 24 February 2021).

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Local adjustment to local living costs resulting in differences in teacher salaries are behind these geographical differences, as salaries are the largest contributor to expenditure. In New York State, for example, the starting salary for a primary school teacher is USD 60 500, while it is USD 37 100 in Arizona. Smaller local adjustments to teacher salaries may be behind the lower geographical variation in the case of Germany, where the difference between the region with the largest and lowest expenditure is USD 3 900. However, these estimations rely on a national price deflator, so urban-rural differences may be smaller than portrayed here once real wages in urban areas are adjusted to higher cost of living in cities. The estimations in this chapter assume a common salary across EU27+UK countries and consequently do not reflect any real wage differences across and within countries.

The geographical differences in costs will also depend on where costs are measured – at schools or at places of residency. For instance, adding up the expenditure observed in schools within a certain geographical category or boundary does not need to coincide with the expenditure incurred to provide schooling services to children and adolescents within the same boundaries, because they may have attended schools outside those borders. Box 3.1 offers more explanation on how this report considers this issue.

Box 3.1. School-based and residency-based expenditure estimates

This report estimates school costs for simulated school locations, given demand for the school location. Geographical variation in demand drives variation in school expenditure. The costs of education are thus not only borne in the community where the school is located but rather in the wider area that the school serves.

To represent geographical variation in costs accurately, a process of ‘cost porting’ allows translating estimated at the school level into costs at the residency level. This process entails distributing total school costs estimates equally over the students that attend the school. This in turn creates a fine-grained map that indicates total costs per student at the residence of those students. An example may help clarify the concepts. Total costs of EUR 60 000 of a school with 3 students of which 2 are in the school's village, and 1 is in a sparsely inhabited rural location would be distributed equally over the three students, implying a 40 000 expenditure for the village and a 20 000 expenditure for the sparsely inhabited rural location.

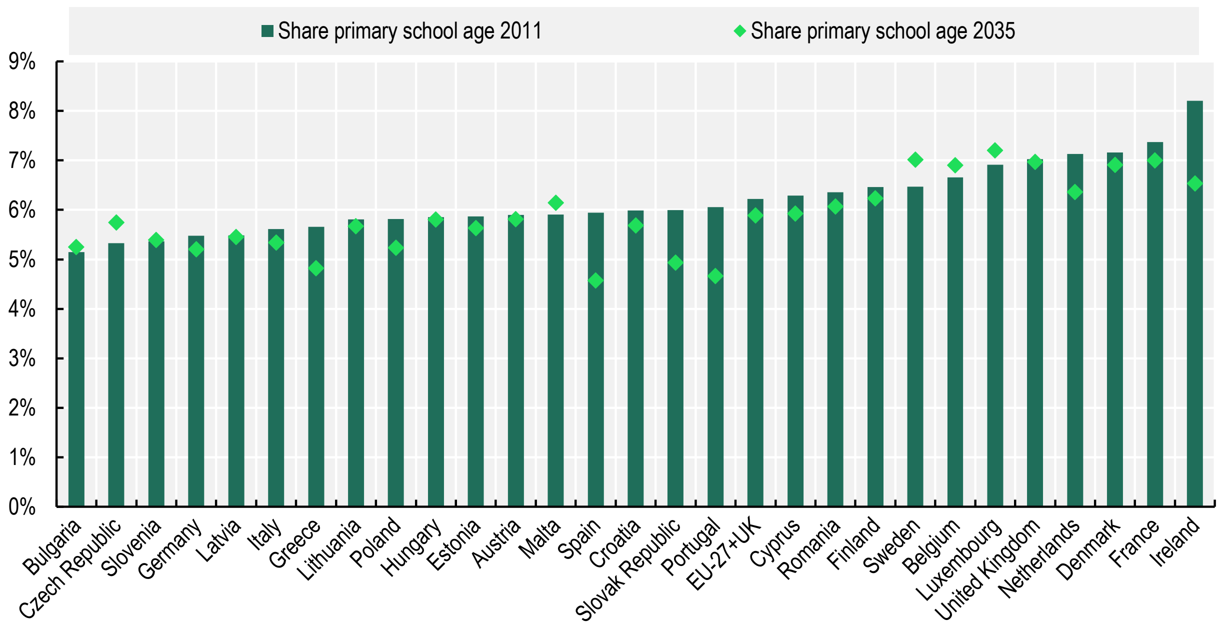
The fine-grained map with ported costs is used to aggregate residency-based costs at different geographical levels (TL3 region and degree of urbanisation).

Besides differences in teacher wages and efficiency in the use of educational resources as reflected for instance in pupil-to-teacher ratios, the levels and distribution of demand for educational services also influence costs per student. Abstracting from differences in the cost of living across locations, a larger and more spatially concentrated demand means that education can be provided at a higher scale in relatively large schools, driving down costs per head. Available evidence confirms that schools are in principle subject to economies of scale (Zimmer, Timothy, Larry DeBoer, and Marilyn Hirth, 2009[6]; Duncombe and Yinger, 2007[7]; Andrews, Duncombe and Yinger, 2002[8]).

Across Europe, Ireland, France, Denmark, the Netherlands and the United Kingdom had a relatively large share of population in primary and secondary school age in 2011 (Figure 3.3 and Figure 3.4). In contrast, Bulgaria, Czech Republic, Slovenia, and Germany had a relatively low share. By 2035, the share of children in the primary school age is projected to remain stable or decrease in all countries except for Czech Republic, Malta, Sweden, Belgium, and Luxemburg, with the largest projected declines in shares of the population occurring in Ireland, Portugal, Slovak Republic, and Spain (Figure 3.3). The situation is similar for children and adolescents in secondary school age, with stability or decline in all countries except for Czech Republic, Germany, Latvia, Italy, Poland, and Slovak Republic (Figure 3.4).

Figure 3.3. Share of population in primary school age, EU27+UK

2011-35



Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

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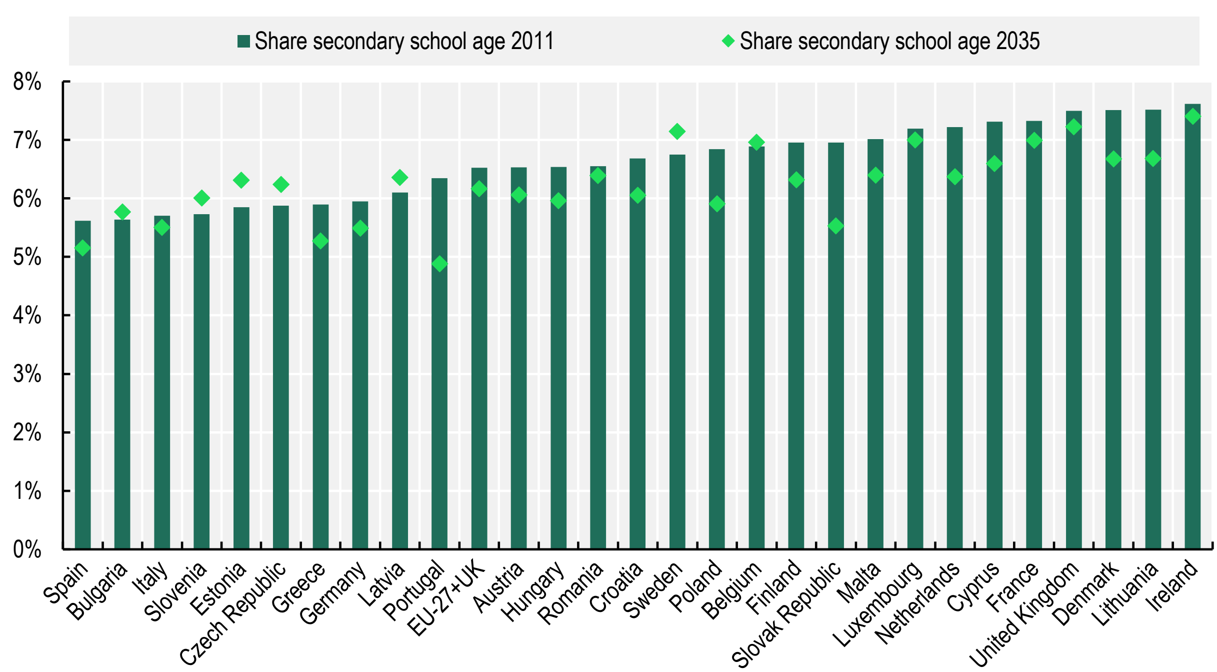
Figure 3.4. Share of population in secondary school age, EU27+UK

2011-35



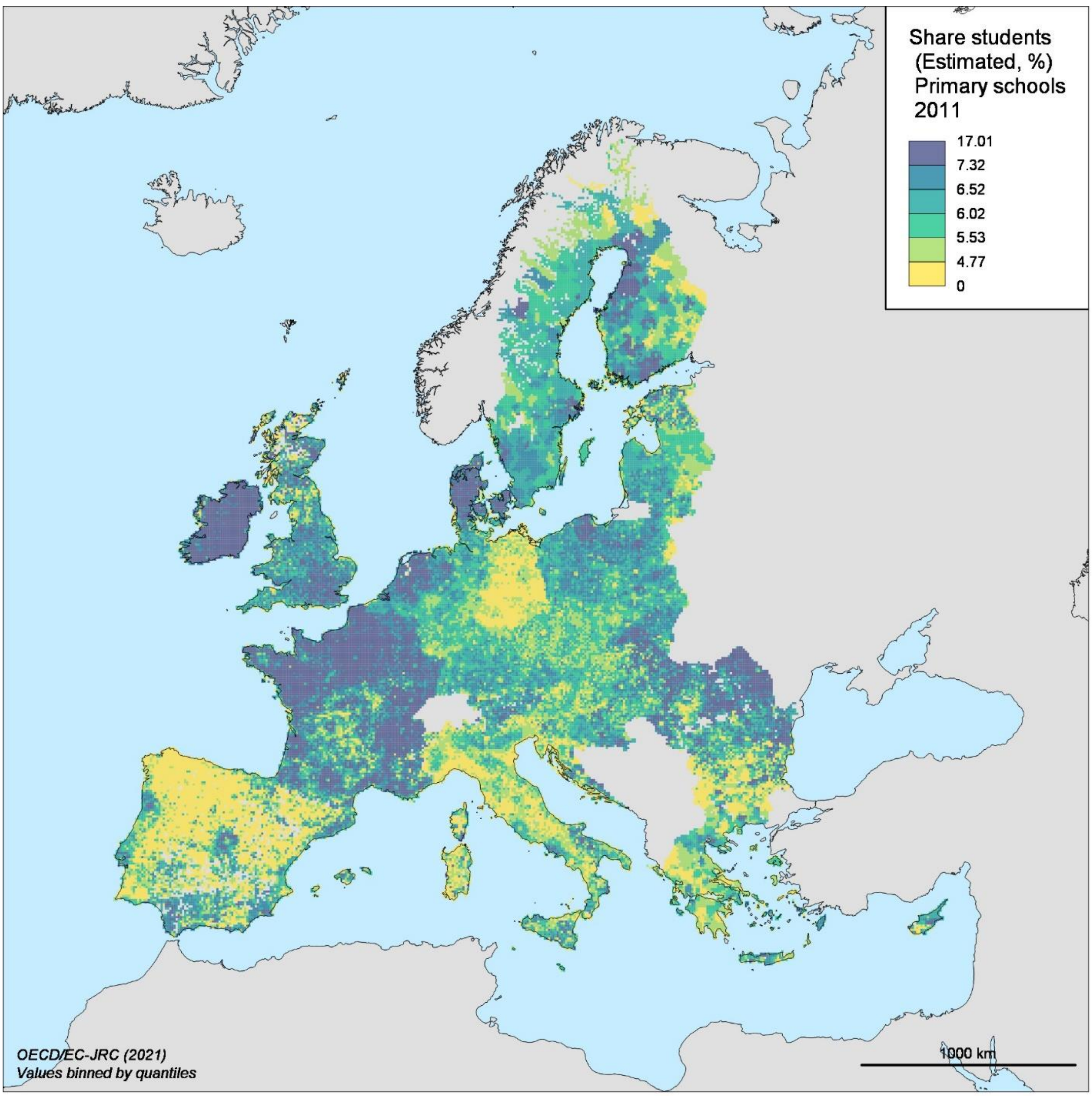
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

StatLink https://doi.org/10.1787/888934246070

Chapter 1 discussed the wide variations in population density that imply different levels of dispersion of existing demand for education. Besides settlement density, the share of children and adolescents in primary and secondary school age also varies widely within European countries. For instance, parts of Eastern Germany and Northern Spain have a small share of population in school age, while in parts of Ireland and France, primary or secondary school students account for 10% or more of the population (Figure 3.5 and Figure 3.6).

Figure 3.5. Share of population in primary school age, EU27+UK

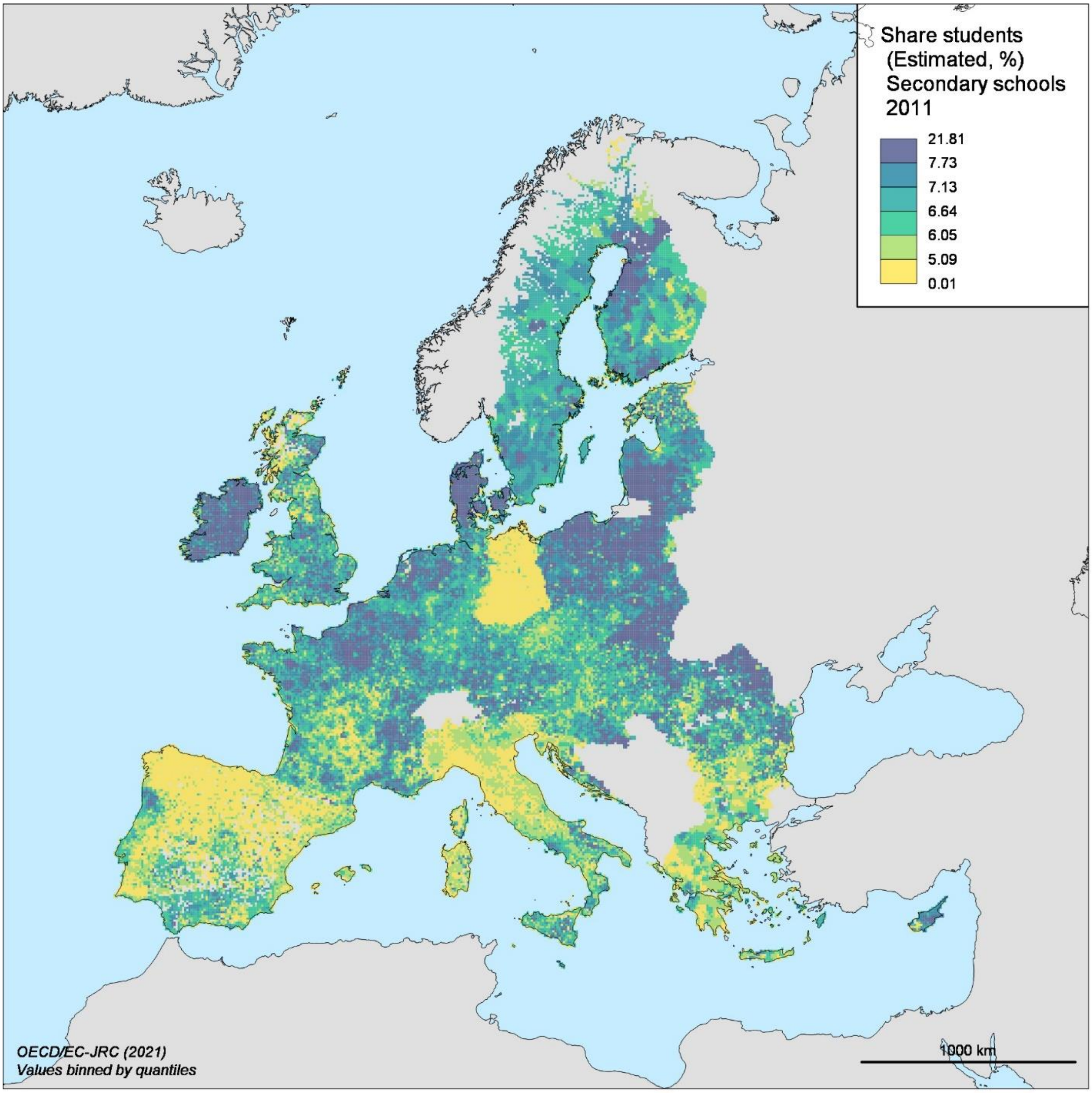
2011



Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

Figure 3.6. Share of population in secondary school age, EU27+UK

2011



Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

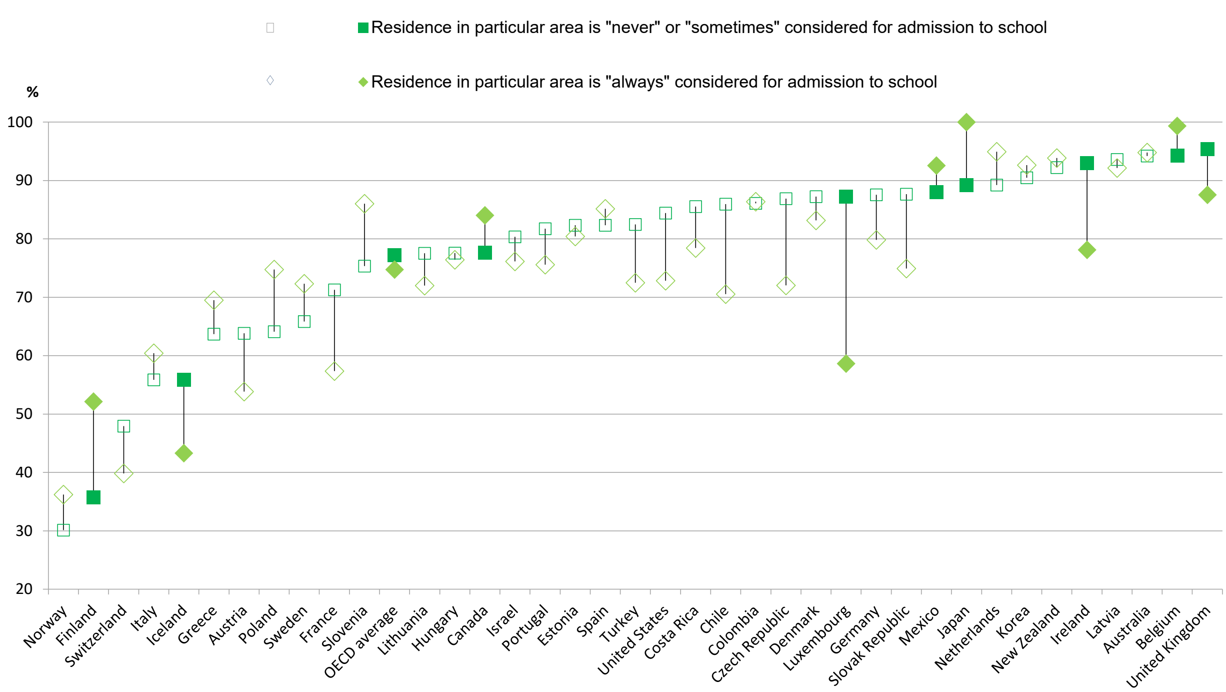
The relationship between school access and choice

While the levels and concentration of demand for educational services drive the potential size of schools, school choice determines actual school sizes. In modelling the access to educational services, this report assumes that students at any given location have some freedom to choose the most convenient school for them – for instance, the one that minimises their travel time, or a school of a limited size. In practice, however, governments can impose bounding conditions on service provision as a requirement for financial support to local authorities (Haan, M. de, E. Leuven, and Ooserbeek. H., 2011[9]) (Tillväxtanalys, 2011[10]), which means that schools may need to be placed in designated communities, and that students may not be allowed to cross a certain boundary (e.g. a municipal boundary or a pre-defined school district). On average across OECD countries, 41% of students are in schools where admission to school always considers residence in a particular area, while 59% are in schools where admission to school never or sometimes considers residence in a particular area (Figure 3.7).

Additionally, school systems in which more schools use admissions criteria other than the school catchment area have more competition among schools.[1] On average across OECD countries, 16% of students are in schools that compete with another school and 61% are in schools that compete with two or more other schools. Fewer than 50% of students in Norway, Switzerland, Finland and Iceland are in schools that compete with at least one other school for students, while over 90% of students in Belgium, Australia, Latvia, New Zealand, the United Kingdom, Korea, the Netherlands, Japan, Mexico, and Ireland attend such schools (Figure 3.7). Under this criterion, school competition is more common at the upper secondary level of education, where there is generally greater differentiation of education programmes than at lower levels of education. In Sweden, the Slovak Republic, Greece, and the Czech Republic, the difference between lower secondary students attending schools that compete with at least one other school, and upper secondary students attending such schools, is between 21 and 39 percentage points (OECD, 2013[11]).

Figure 3.7. School competition and school policy on catchment area, OECD countries

Percentage of students in schools whose principals reported that one or more schools compete for students in the area, according to whether



Note: White symbols represent differences that are not statistically significant.
Countries and economies are ranked in descending order of the difference in the percentage of students in schools whose principal reported that one or more schools compete for students in the area between schools where residence in a particular area is “never” or “sometimes” considered, and schools where residence in a particular area is “always” considered for admission to school (never/sometimes - always).
Source: OECD, PISA 2012 Database, Figure IV.4.6., http://dx.doi.org/10.1787/888932957346.

Geographic restrictions on school locations and school choices, such as those imposed by school districts, influence cost efficiency and accessibility.[2] Restricted access areas have different sizes and shapes and are therefore not comparable across countries. In fact, the inclusion of such restrictions causes that outcomes not only depend on demographic differences, but also on arbitrarily defined administrative boundaries. To ensure comparability, the method adopted in this report allows for competition for school locations across local communities[3] that result entirely from the distribution of the population and in no case depend on exogenously defined administrative borders. At the same time, students are allocated to schools according to travel distances and a mechanism that balances student counts between adjacent school locations.

School network consolidation and its consequences

School consolidation is a response to declining student numbers and economic rationalization (López-Torres and Prior, 2020[12]; European Commission, 2020[13]; Eurostat, 2019[14]; Agasisti, 2014[15]; Witten, McCreanor and Kearns, 2007[16]; Stockdale, Aileen, 1993[17]) (Stockdale, Aileen, 1993[17]). School consolidation means that some students need to travel farther, with possible implications on school attendance and performance. Available evidence shows travel to school affects student performance and participation negatively (Williams and Wang, 2014[18]; Talen, 2001[19]).

Does school network consolidation lead to cost savings? Evidence for school districts (i.e. the areas served by each school) in the United States shows that school consolidation leads to cost savings on average (Andrews, Duncombe and Yinger, 2002[8]). However, diseconomies of scale come into play with larger school districts through poor student attendance and performance, lesser parent involvement, higher transport costs and higher teacher wages (Williams and Wang, 2014[18]; Zimmer, Timothy, Larry DeBoer, and Marilyn Hirth, 2009[6]). In fact, optimal school sizes may be much lower than suggested in other consolidation studies that do not account for travel time impacts (Andrews, Duncombe and Yinger, 2002[8]). This is because studies of consolidation effects often oversee the opportunity costs of longer travel times, leading in many cases to severe underestimation of the welfare implications of school consolidation for students and their families (Kenny, 1982[20]).

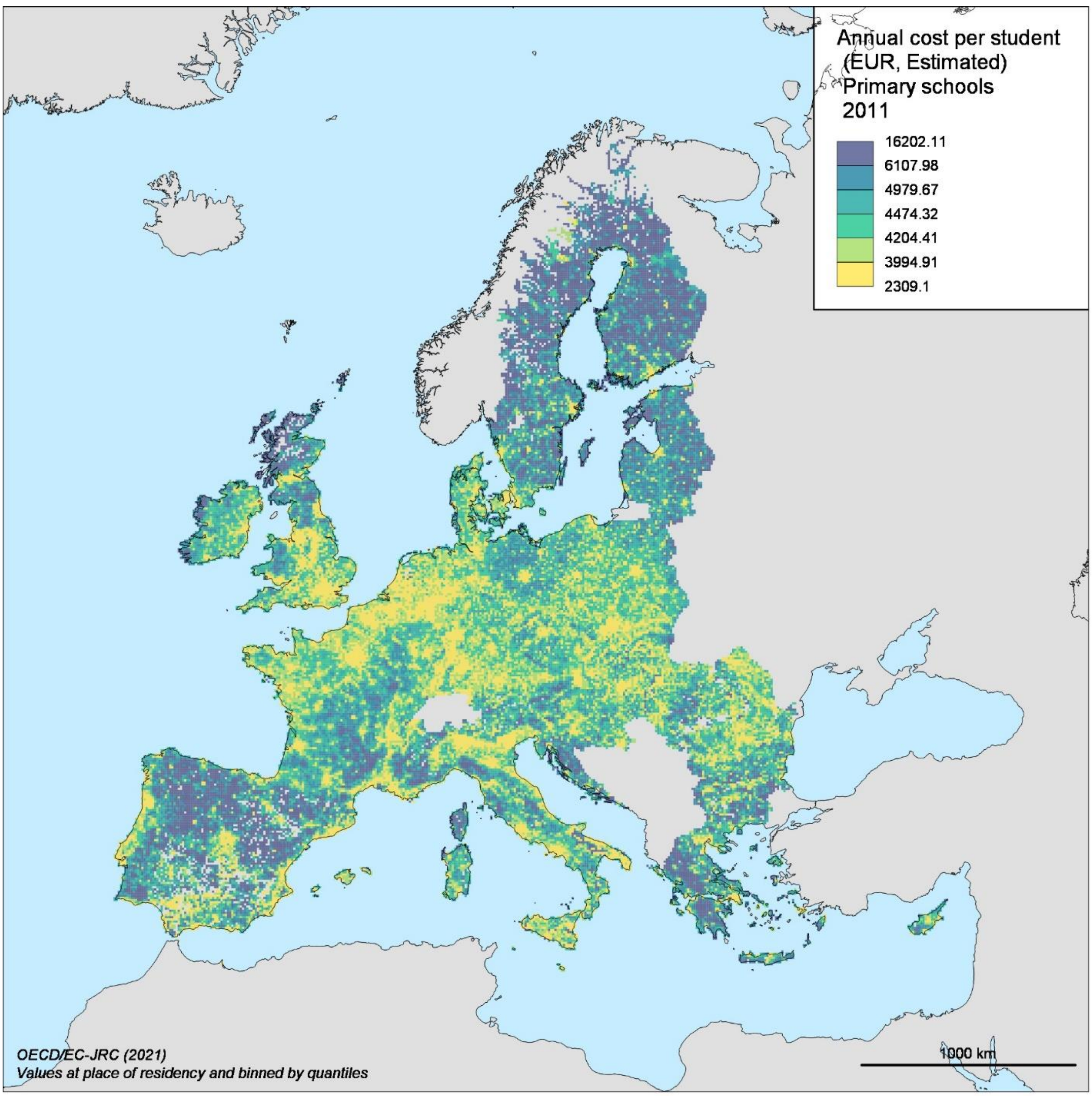
Analyses that link demography, school provision and school costs are scarce despite the clear link between demographic change and school costs. School costs studies take school distributions as independent of population change, with some exceptions (Andrews, Duncombe and Yinger, 2002[8]). In reality, they depend on the evolution and geographical distribution of the number of students. The link between changes in local education demand and supply remains generally unexplored in the literature. The seminar work of (Holland and Baritelle, 1975[21]) links school network reorganisation with current and expected future operating and transport costs for schools in rural areas in the United States.

School closures may also have a broader impact on communities that are already in decline (Barakat, 2014[22]; Elshof, van Wissen and Mulder, 2014[23]; Witten, McCreanor and Kearns, 2007[16]; Lyson, Thomas A., 2002[24]; Salant, P. and Waller, A., 1998[25]). (Elshof, van Wissen and Mulder, 2014[23]) consider population decline and facility closure to be self-reinforcing processes, so that community decline is a cause for school closure, and vice versa. (Christiaanse, 2020[26]) finds that facility decline is dominant in smaller Dutch villages. However, there is no clear evidence that maintaining a school can prevent out-migration in communities experiencing population decline (Lehtonen, 2021[27]), or that school closures necessarily lead to further decline in communities where other services and spaces for social gatherings are maintained.

Present estimated school costs and access

Figure 3.8 and Figure 3.9 show the geographical distribution of estimated annual costs at place of residency for primary and secondary schools in EU27+UK countries, aggregated in 10x10 km grid cells. The estimated costs, which aim to capture differences in costs related only to demographic and population distribution differences, vary considerably across territories. They are highest in the most sparsely populated areas of Europe. This section discusses present primary and secondary school cost across small (TL3) regions, (LAU2) municipalities and by degree of urbanisation. The next section will discuss the future cost estimates.

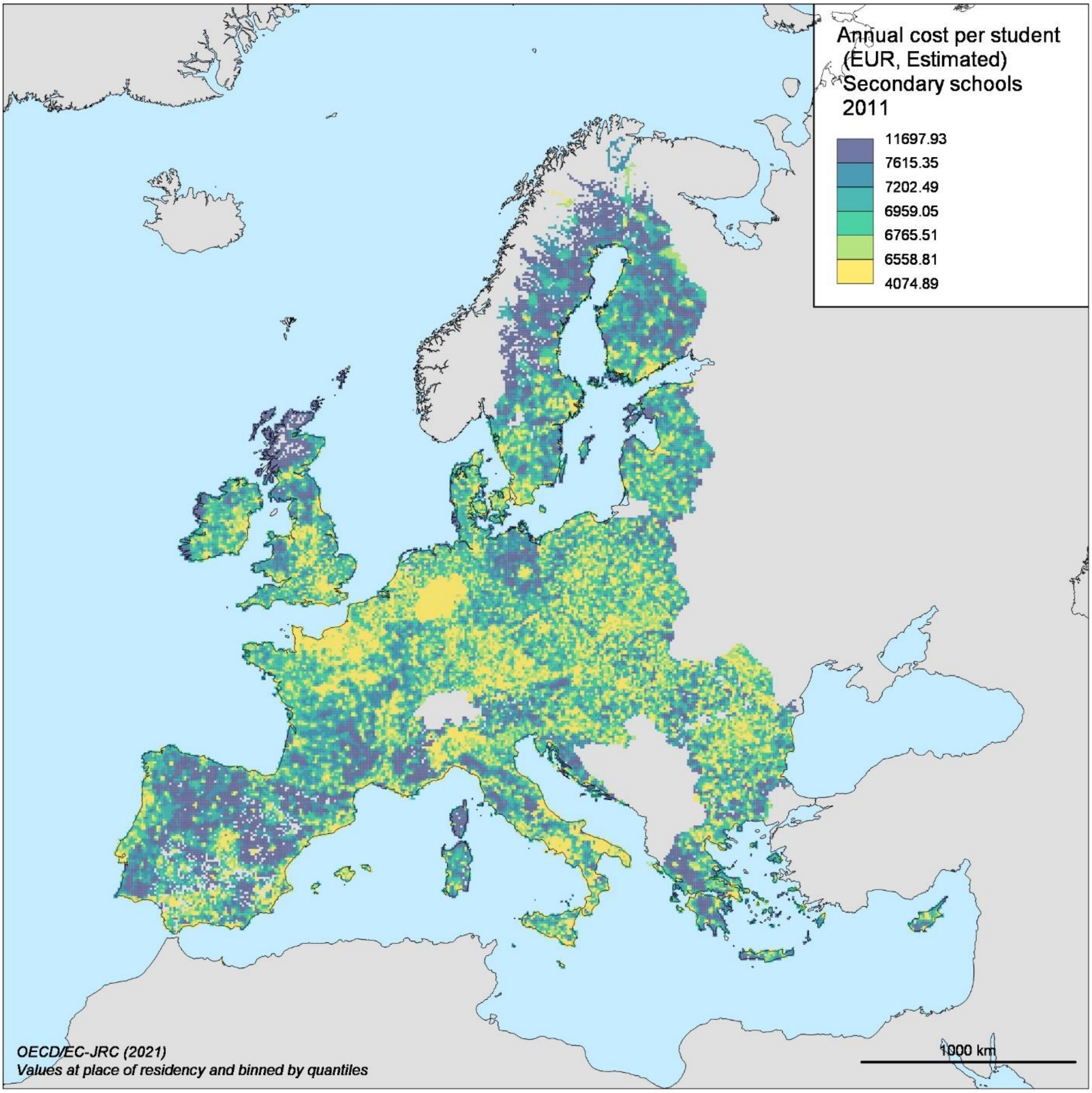
Figure 3.8. Annual costs per primary school student (estimated), EU27+UK



Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

Figure 3.9. Annual costs per secondary school student (estimated), EU27+UK

2011



Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

Present school costs across regions

Aggregating the results by TL3 region gives a first impression of how much geography affects the costs of provision. For the average of TL3 regions, annual costs per student in primary schools is EUR 4 034, with a minimum of EUR 3 242 (Paris) and a maximum of EUR 6 544 (Evrytania, Greece). The next regions with the lowest values are Hackney & Newham (United Kingdom) and Hauts-de-Seine (France) that like Paris are highly dense regions with a relatively high share of student-age population. Following Evrytania with high-cost values are Lozère (France) and Lochaber, Skye & Lochalsh, Arran & Cumbrae and Argyll & Bute

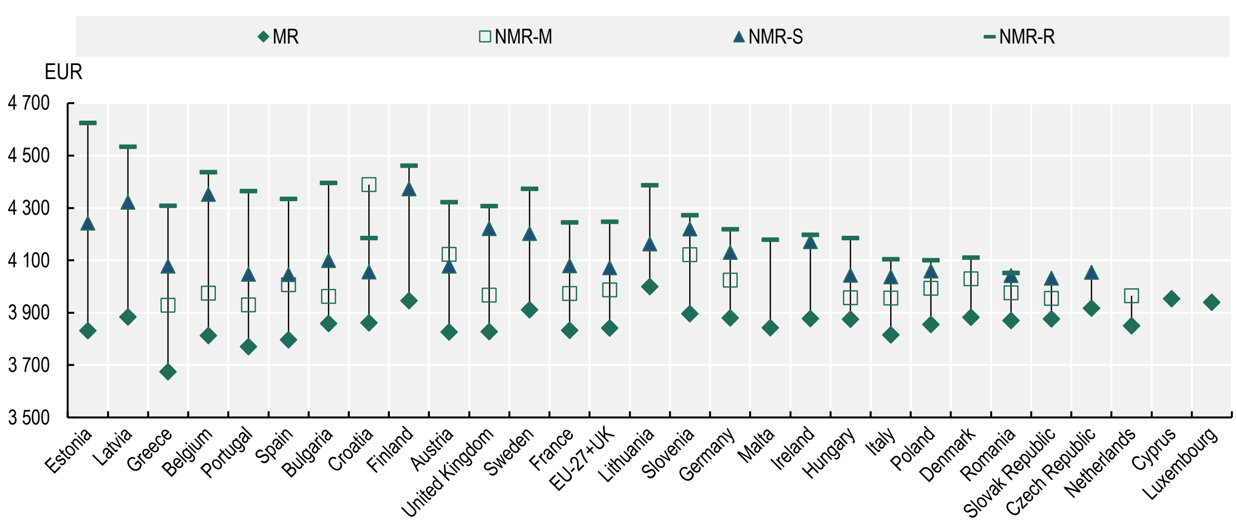
(United Kingdom) that as Evrytania are all remote and mountainous regions with a low share of primary-age school students.

The average annual cost by secondary school student across EU27+UK regions is EUR 6 571, and there is a difference of EUR 2 495 between Heinsberg (Germany) and Na h-Eileanan Siar (Western Isles) (United Kingdom). The results for secondary schools follow a similar geographical pattern compared to primary schools because they reflect geographical differences in density and demand. Variations between the two cases are driven by two factors: first, the different shares of secondary age school students (compared to primary school age shares); and second, the longer maximum travel distance allowed for secondary school students (see Chapter 2 for more details).

When aggregated by type of TL3 regions, for all countries with remote regions except Croatia,[4] costs per primary school student are lowest in metropolitan regions and highest in remote regions (Figure 3.10). The same holds for secondary school student costs except in Belgium (where per head costs in remote regions are as large as costs per head in regions close to a small city) and in Slovenia (Figure 3.11). Regional type differences in primary school costs per student are highest in Estonia, Latvia, and Greece and lowest in the Netherlands, Czech Republic, and Slovak Republic. For secondary schools, they are highest in Belgium, Greece and the United Kingdom, and lowest in the same countries as for primary schools.

Figure 3.10. Annual cost per primary school student (estimated) by country and type of TL3 region, EU27+UK

2011



Note: MR=Metropolitan Region; NMR-M=Non-Metropolitan Region Close to Metropolitan; NMR-S=Non-Metropolitan Region Close to Small Metropolitan; NMR-R=Non-Metropolitan Region Remote.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

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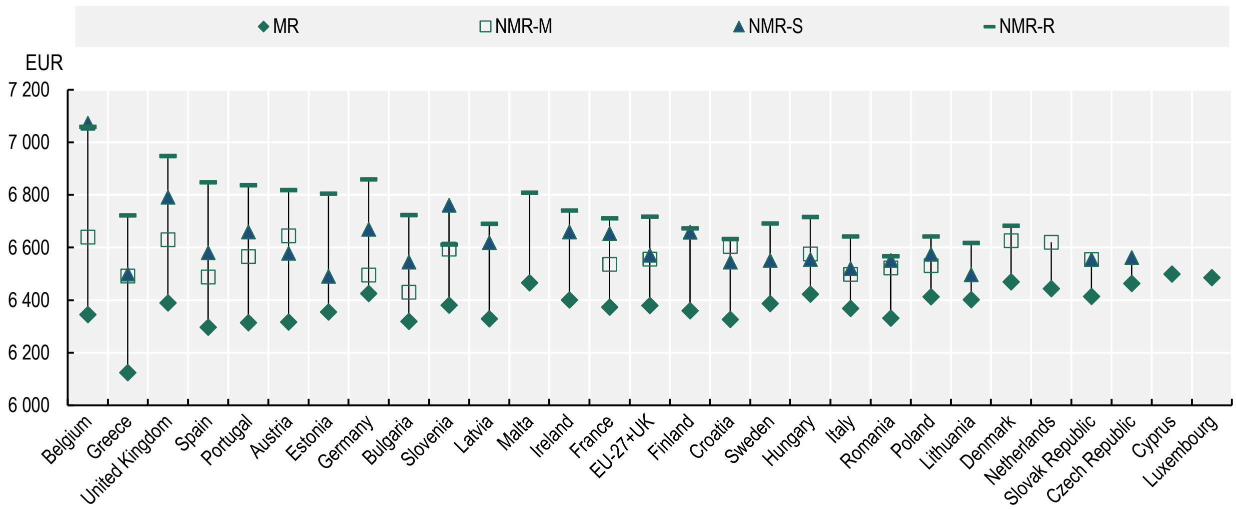
Figure 3.11. Annual cost per secondary school student (estimated) by country and type of TL3 region, EU27+UK

2011



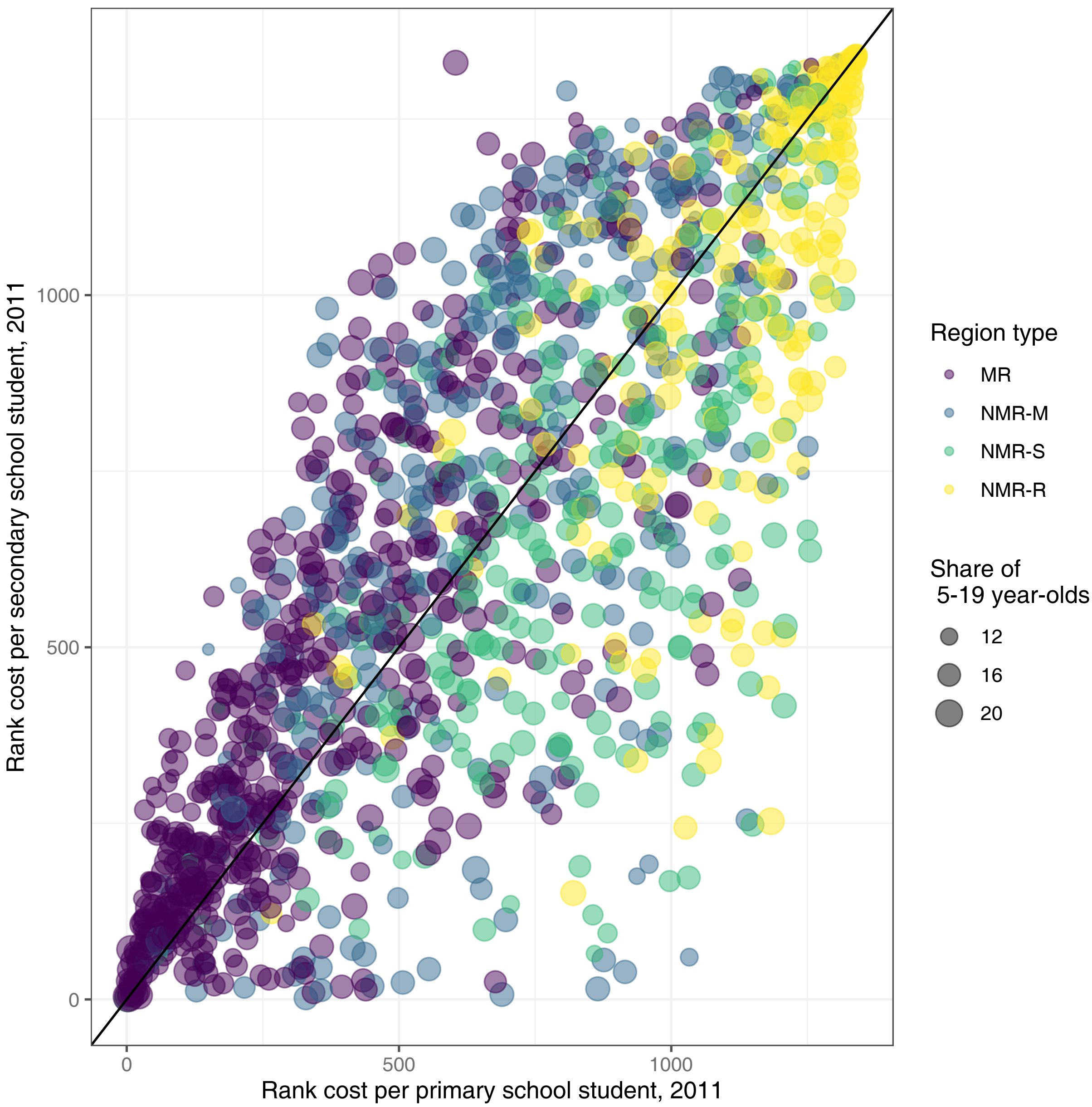
Note: MR=Metropolitan Region; NMR-M=Non-Metropolitan Region Close to Metropolitan; NMR-S=Non-Metropolitan Region Close to Small Metropolitan; NMR-R=Non-Metropolitan Region Remote.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

StatLink https://doi.org/10.1787/888934246108

Figure 3.12 plots the rank of cost per student (from lowest to largest) in primary versus secondary schools across 1 341 TL3 regions, with colours indicating the type of TL3 region. Proximity to the diagonal line in this plot - more recurrent at the top and bottom of the rank- indicates that a region with relatively high (low) primary school costs is likely to also have relatively high (low) secondary school costs. Although as expected metropolitan regions are more present closer to the axis, some metropolitan regions are among the regions with the highest costs per student in both primary and secondary schools. The top 10 metropolitan regions with the highest expenditure in primary schools are seven German regions, two Austrian regions and one Bulgarian region (Sofia) all with a relatively low share of people of school age.

Figure 3.12. Rank of (estimated) annual cost per primary vs secondary school students by type of TL3 region, EU27+UK

2011



Note: MR=Metropolitan Region; NMR-M=Non-Metropolitan Region Close to Metropolitan; NMR-S=Non-Metropolitan Region Close to Small Metropolitan; NMR-R=Non-Metropolitan Region Remote.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

The provision of primary education and the municipal level

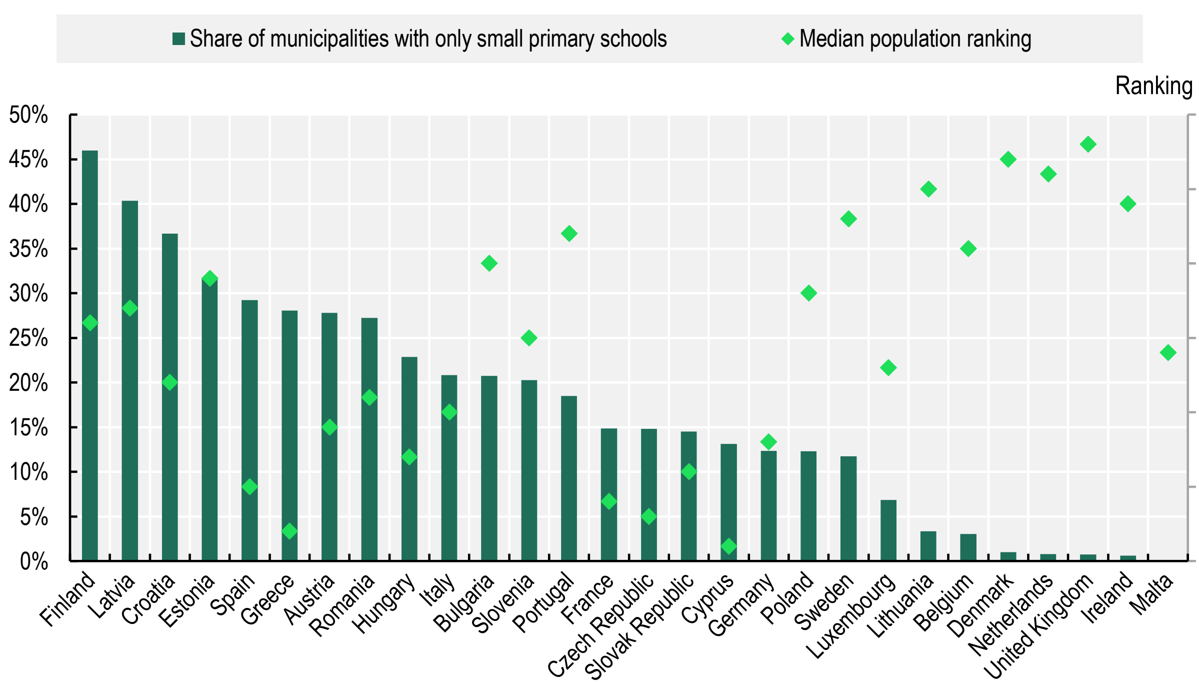
Across European countries, municipalities have an important role to play in the provision of primary education. In many countries, local governments have significant responsibilities with respect to the provision of primary education, sometimes including even its funding, for example in Sweden. Countries, however, have widely diverging arrangements with respect to the number and average size of municipalities: the median population per municipality varies from 222 people in Cyprus to 130 633 people in the United Kingdom.

Countries with strong municipal consolidation and, consequently, relatively large median municipal populations include the United Kingdom, Ireland, the Netherlands and Denmark (Figure 3.13). In these countries, the share of municipalities with only small schools is negligible because a larger number of students are hosted in larger municipal borders. At the other extreme, countries with high municipal fragmentation, including Cyprus, Greece, Czech Republic, France and Spain, have a relatively large share of municipalities with no schools or only small schools. In Spain, for instance, out of 8 124 municipalities, 45% do not have any school, 36% have only one school and 29% have only small schools. In countries with high municipal fragmentation, most municipalities that have only small schools have in fact only one school. This is the case in Spain (29% of municipalities with small schools versus 26% with only one small school), Greece (28% versus 27%) and France (15% versus 14%).

In large sparsely populated countries and small countries experiencing depopulation including Finland, Latvia, Estonia and Bulgaria, relatively high municipal consolidation for European standards is still associated with a relatively large share of municipalities with only small schools. In these countries, municipalities host more than one small school. For instance, in Finland, 46% of municipalities have only small schools, but only 5% have only one small school (Figure 3.13). There is a similar discrepancy between the share of small schools and the share of only one small school in other relatively consolidated countries including Latvia (40% versus 3%) and Estonia (32% versus 4%).

Figure 3.13. Share of municipalities with only small primary schools vs. median municipality size ranking by country, EU27+UK

2018 LAU2 boundaries and population; 2011 school data

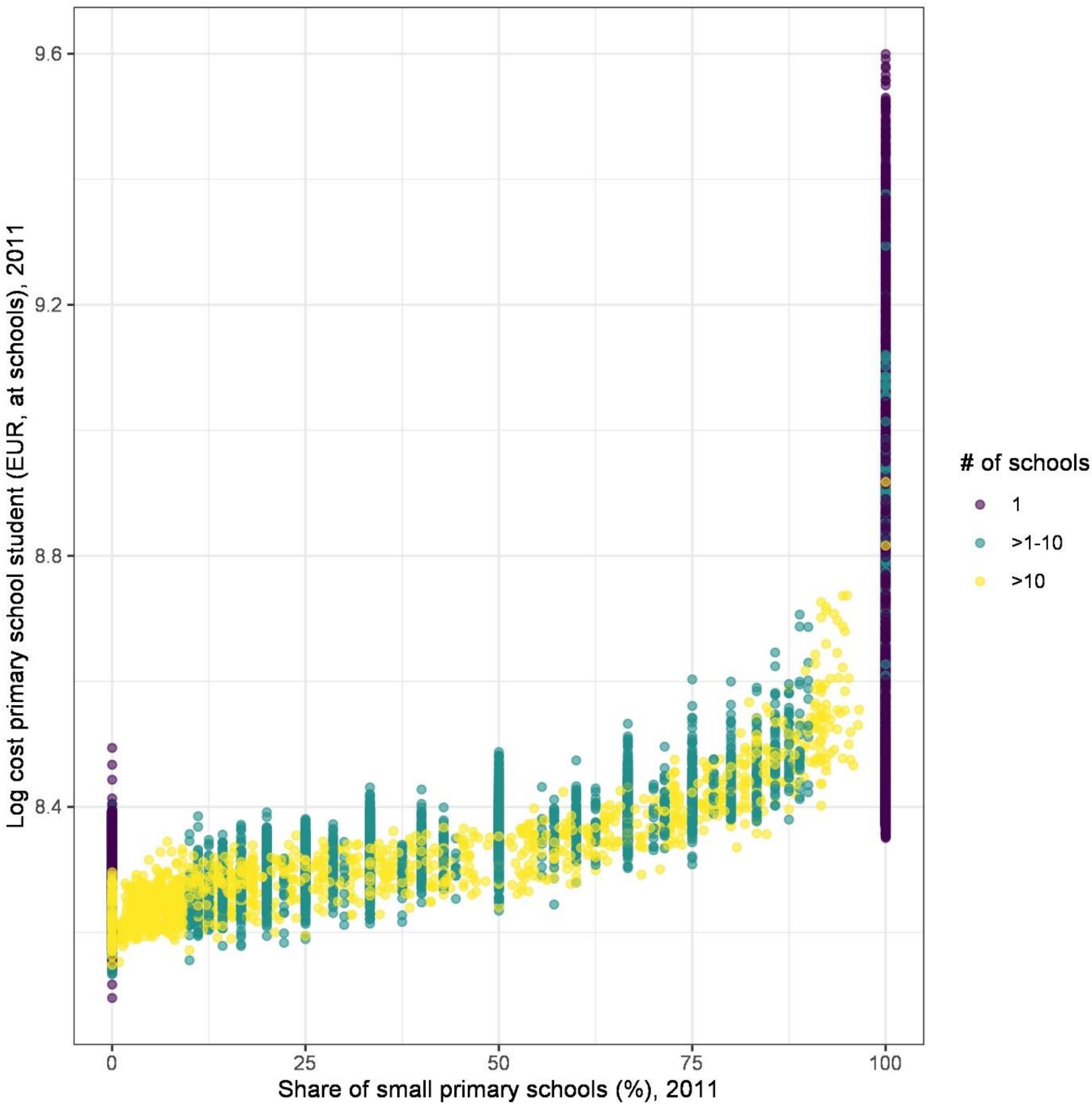


Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

StatLink https://doi.org/10.1787/888934246127

A higher share of small schools in a municipality drives up the costs measured at primary schools (instead of the place of residency of students). As Figure 3.14 illustrates, school-based costs per primary school student by municipality increase when at least half of the municipality schools are small. Extreme cases - with costs over four times the average expenditure - all occur in municipalities with one small school. The top three extreme cases are all municipalities with less than 200 inhabitants, and a single small school, each serving less than 8 students.

Figure 3.14. Annual cost per primary school student versus share of small primary schools by municipality, EU27+UK



Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

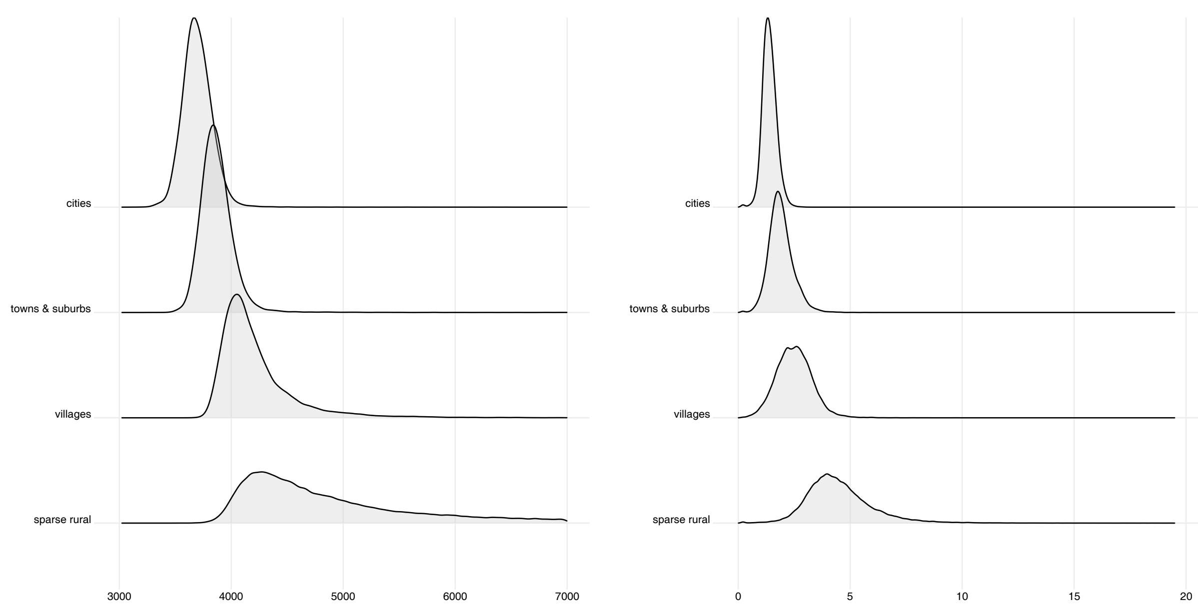
While municipal consolidation can help reduce the number of municipalities operating one small school at high costs, the room for further school consolidation and the consequences for travel will depend on the initial level of municipal fragmentation of the country and its geography. The next section will discuss in more detail the changes in accessibility following changes in the school network.

Present costs and access by degree of urbanisation

To get a sense of the variation of the results across degrees of urbanisation, Figure 3.15 and Figure 3.16 plot the density distribution of cost and distance travelled per student across all simulated schools in Europe. In primary and secondary schools, both the means and the dispersion of costs and distance travelled per student increase with sparsity, with the lowest mean and variation in cities, and the largest in sparse rural areas. The larger dispersion in costs in sparse rural areas and smaller differences in travelled distance between primary and secondary schools happens because secondary school students can travel longer travel distances than primary school students, which decreases the likelihood of very small secondary schools with very high cost per student. In other words, the results reflect the larger geographical concentration of secondary schools compared to primary schools.

Figure 3.15. Distribution of annual cost and distance travelled per primary school student (estimated, at schools) by degree of urbanisation

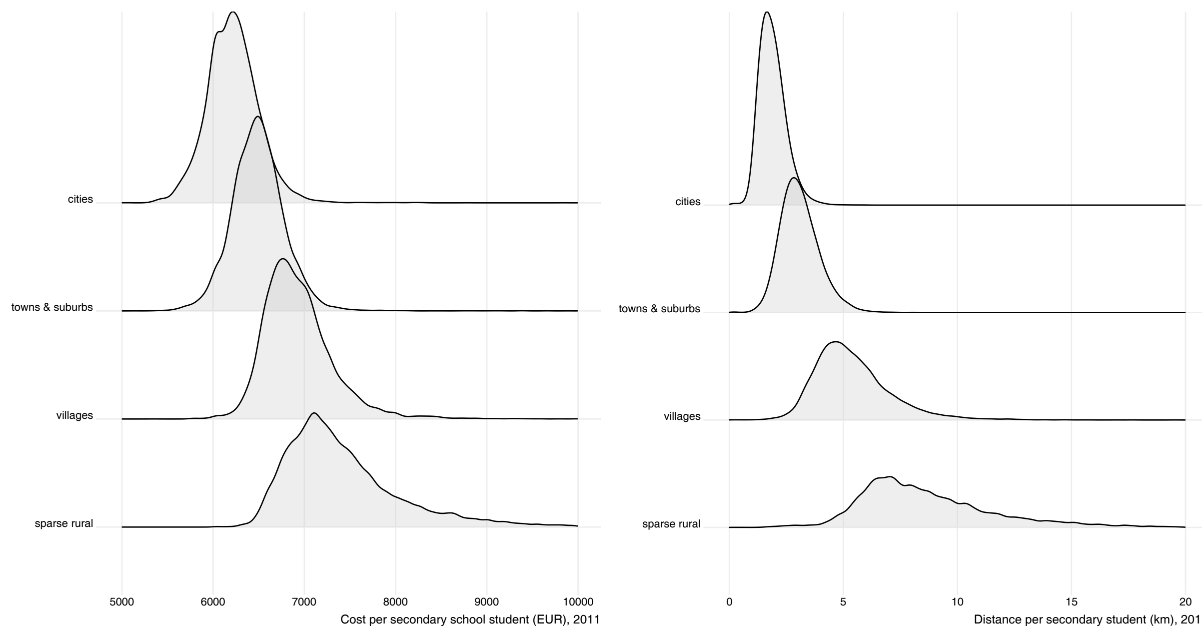
2011



Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

Figure 3.16. Distribution of annual cost and distance travelled per secondary school student (estimated, at schools) by degree of urbanisation

2011



Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

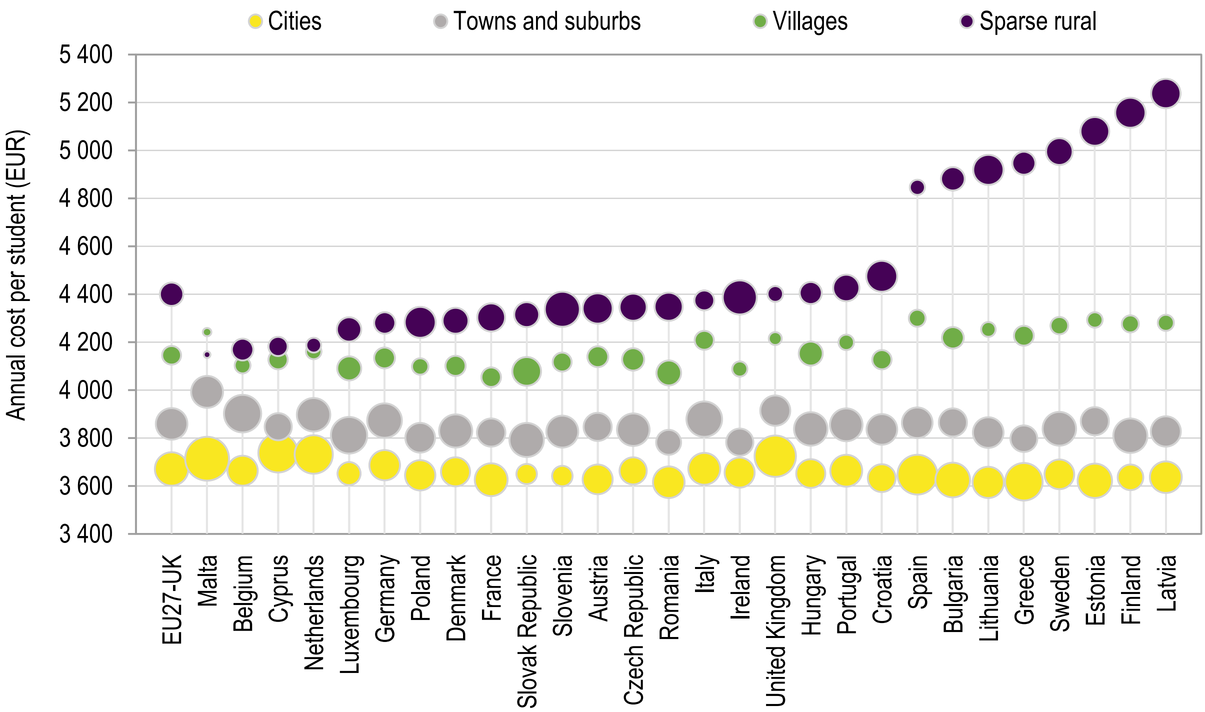
Costs

Figure 3.17 and Figure 3.18 show annual costs per student estimates by degree of urbanisation and by country. For primary schools, costs per student tend to go down as density goes up (Figure 3.17). They are highest in sparse rural areas and lowest in cities. For EU27+UK, the difference in annual cost per student between cities and sparse rural areas is about EUR 650 per student. The cost gap between cities and sparse rural area is EUR 1 000 or more in Spain, Bulgaria, Lithuania, Sweden, Greece, Estonia, Finland, and Latvia. In these countries, the difference in costs per primary student between villages and cities is about half that between sparse rural areas and cities. In the other countries, the costs per head in sparse rural areas are only slightly higher than in villages.

For secondary schools, annual costs per student also decrease with increasing density, with a difference of EUR 681 between cities and sparse rural areas (Figure 3.18). However, the difference between costs in villages and sparse rural areas is smaller than for primary schools. In fact, in Cyprus, Italy, Belgium, the Netherlands, Malta, and the United Kingdom, costs per head are lower in sparse rural areas compared to villages. The cost gap between cities and towns and suburbs are larger in secondary schools than in primary schools. The gap is larger than EUR 400 in Malta, Spain, Belgium, Austria, Slovenia, and the United Kingdom, while they are always below EUR 290 for primary schools. For EU27+UK, the difference in cost per student in secondary schools between cities and sparse rural areas is about EUR 670 per student. The cost gap between cities and sparse rural areas is also quite substantial for the case of secondary schools in many countries including Spain, Greece, Bulgaria, Luxembourg, Sweden and Estonia, although it stays below EUR 1 000.

Figure 3.17. Annual cost per primary school student (estimated) by country and degree of urbanisation, EU27+UK

Bubble areas represent the share of national population, 2011



Note: Costs at place of residency. Bubble areas represent the share of national population.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

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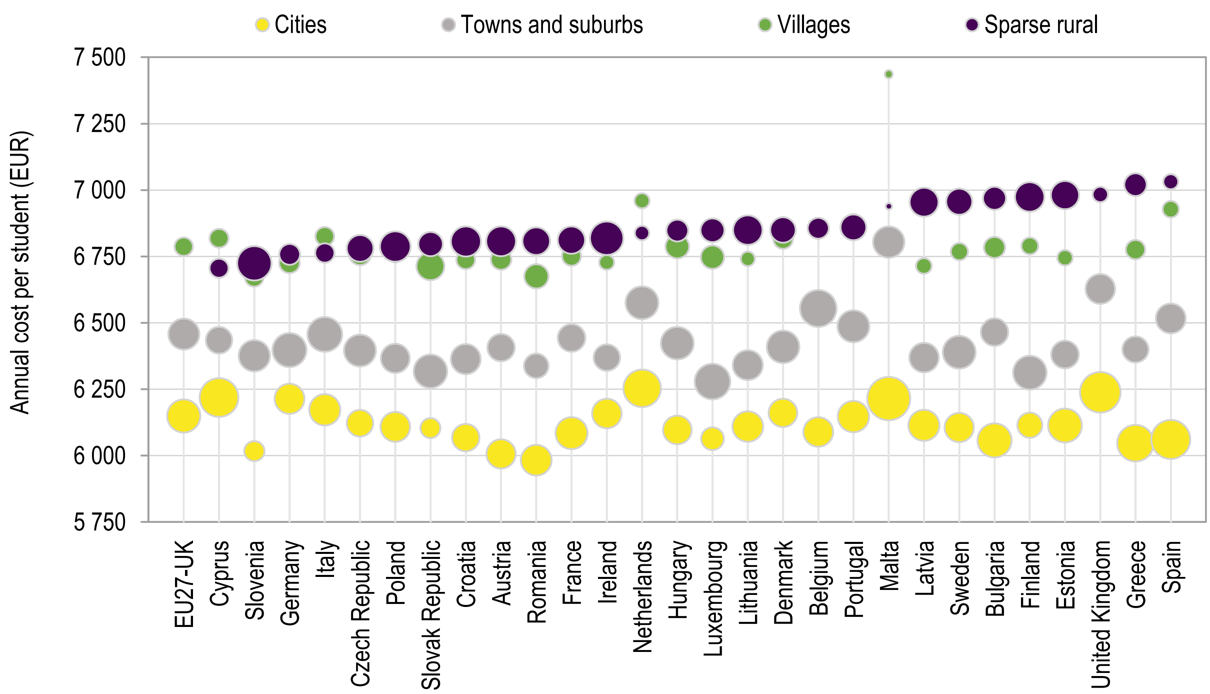
Figure 3.18. Annual cost per secondary school student (estimated) by country and degree of urbanisation, EU27+UK

Bubble areas represent the share of national population, 2011



Note: Costs at place of residency. Bubble areas represent the share of national population.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

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Access

How far do students have to travel and where do they travel to when attending schools? Box 3.2 explains the measurement and interpretation of travelled distance in this report.

Box 3.2. How are school transport costs measured in this report?

Primary and secondary schools transport costs are expressed using average students' travelled road distance to their schools. The analysis in this chapter uses residence-based, not school-based, travel distances, unless specified.

The reported travel distances do not always reflect the minimum travel distance for each student. This is because in the model, while closer schools have a much larger preference in student's choices, a portion of students would attend farther schools because of the balancing mechanism described in Chapter 2. This means that the reported average travelled distances are typically correlated, but slightly higher than often measured distances to nearest facilities (Milbert et al., 2013[28]) (Papaioannou, 2018[29]).

Calculating travel costs involves monetizing the value of time lost, as well as defining the costs of opportunities missed because of travel. Because of the complexity involved in these calculations, this report uses travelled distance as a limited approximation of travel costs (Jara-Diaz, S., 2020[30]) (Liu, Q., Jiang R., Liu R., Hui Z. and Gao Z., 2020[31]).

Table 3.1 summarises residence-to-school mobility flows across degrees of urbanisation for all students in simulated primary and secondary schools in EU27+UK countries. In both primary and secondary schools, villages have the largest share of students coming from other types of settlements: 39% (54%) of all primary (secondary) students attending school in villages do not come from villages. The large majority of these students actually comes from sparse rural areas. Across countries, the share of students in primary schools in villages coming from another area is highest in Slovenia (54%), Poland (51%), Ireland (49%) and Belgium (48%), and lowest in Spain (26%), Bulgaria (29%), Slovak Republic, and Hungary (both 31%).

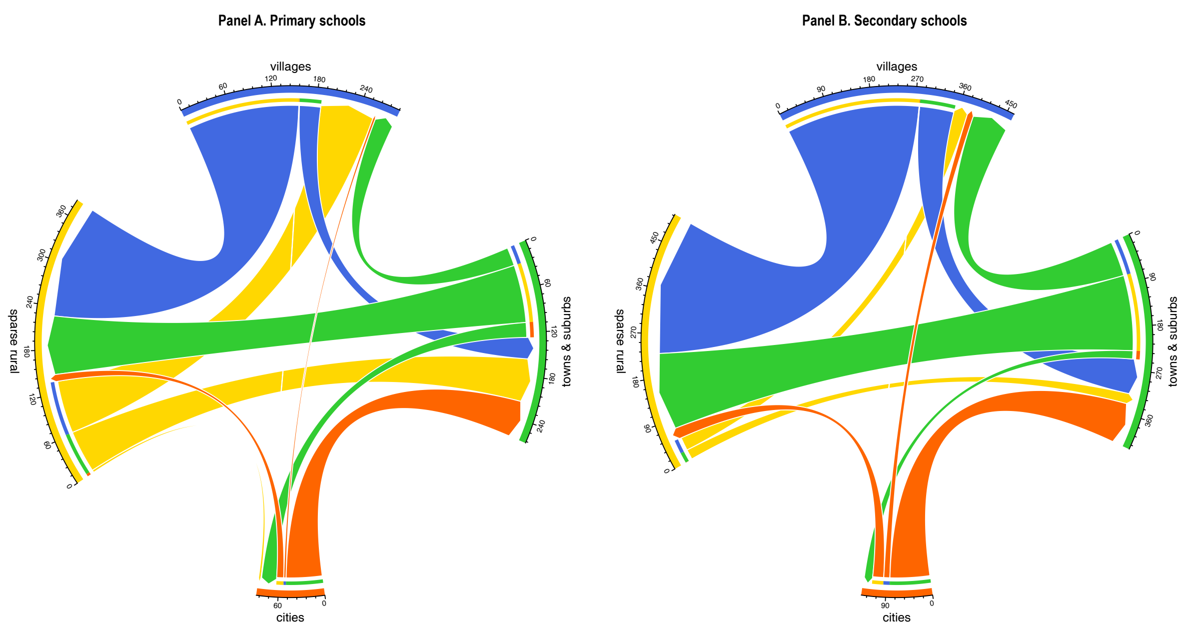
Table 3.1. Primary and secondary student flows shares by degree of urbanisation

Type	Share of students coming from other areas (%)	Share of origin places of students coming from other areas (%)			
		Share from sparse rural	Share from villages	Share from towns and suburbs	Share from cities
Primary schools					
Sparse rural	29%	0%	54%	43%	2%
Villages	39%	84%	0%	16%	0%
Towns and suburbs	13%	64%	20%	0%	16%
Cities	5%	15%	5%	79%	0%
Secondary schools					
Sparse rural	25%	0%	57%	43%	1%
Villages	54%	79%	0%	20%	0%
Towns and suburbs	22%	64%	30%	0%	7%
Cities	9%	19%	11%	70%	0%

Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

Figure 3.19 shows a visualisation of the total outflows and inflows of students per degree of urbanisation. For instance, across EU27+UK countries, the over 1 862 000 students attending primary schools in villages come mostly from sparse rural areas (in the diagram represented by a thin yellow line below the blue line representing the total amount of flows in villages, and the largest blue arrow indicating village students coming from sparse rural areas). A much lower number of students that live in villages go to primary school in sparse rural areas and towns and suburbs, with a similar pattern observed for secondary schools. In this sense, villages act as hubs for schooling. This is to a lesser degree also true for towns and suburbs, which host students coming from all other areas. Cities on the other hand show much more limited inflows and outflows of students, and thus serve mostly students living in cities.

Figure 3.19. Primary and secondary student flows by degree of urbanisation

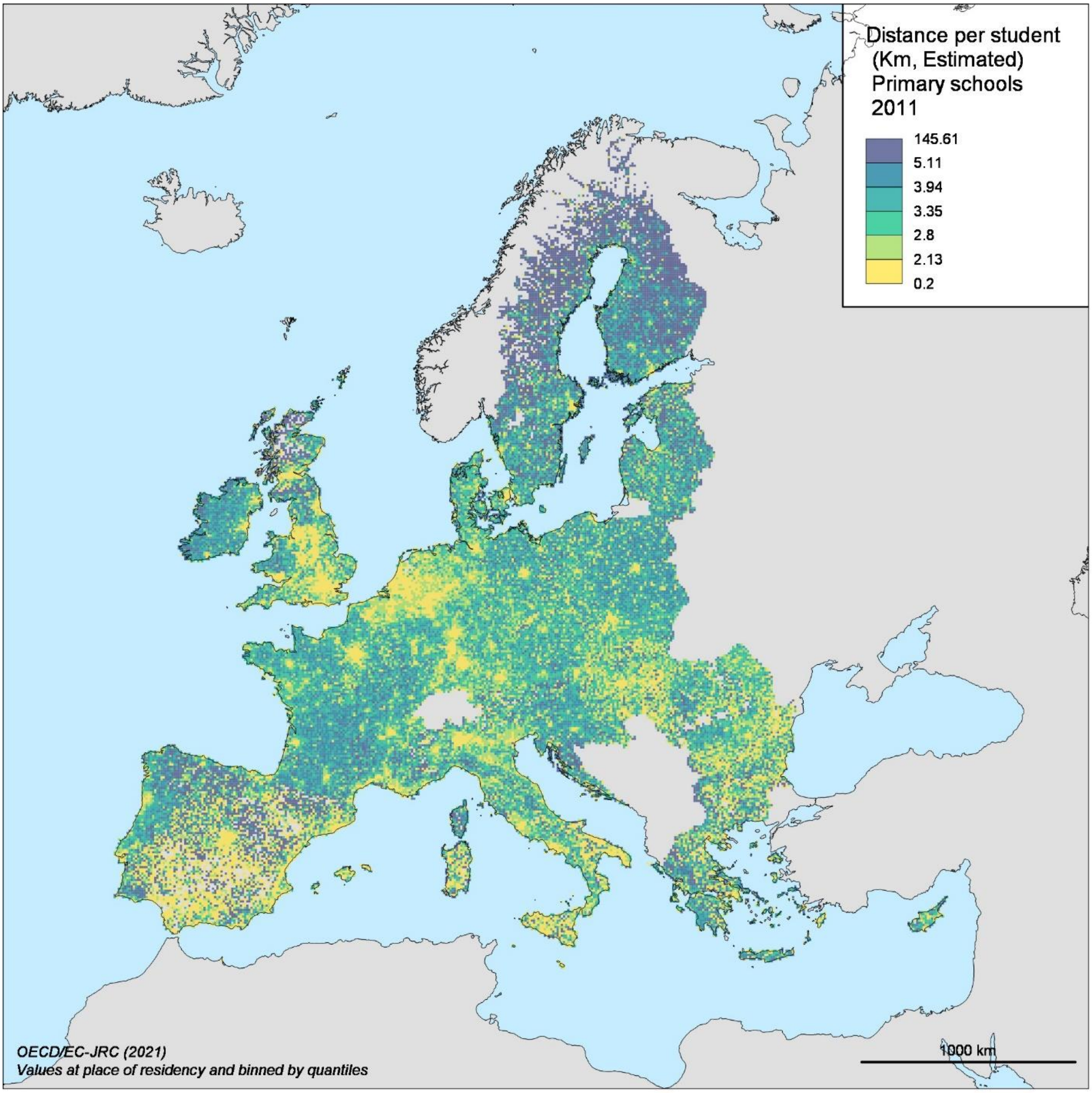


Note: Flows per 10 000 students. Arrows point to the origin of flows, colour coded by destination.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

Figure 3.20 and Figure 3.21 show the average distance travelled by students for primary and secondary schools in EU27+UK countries. For both primary and secondary schools, the lowest travelled distances correspond to cities, while the highest distances occur in sparsely populated areas, in particular in the north of Scandinavia. While the median distance for primary schools (3.3 km) is about half that of secondary schools (6.5 km), the overall patterns of school access are similar regardless of school type, with some exceptions including Eastern Bulgaria and Greece, where primary schools are close and secondary schools far. Demographic differences, and in particular the share of students of each type (Figure 3.5 and Figure 3.6), drive these differences.

Figure 3.20. Travelled distance to primary and secondary schools per student (estimated), EU27+UK

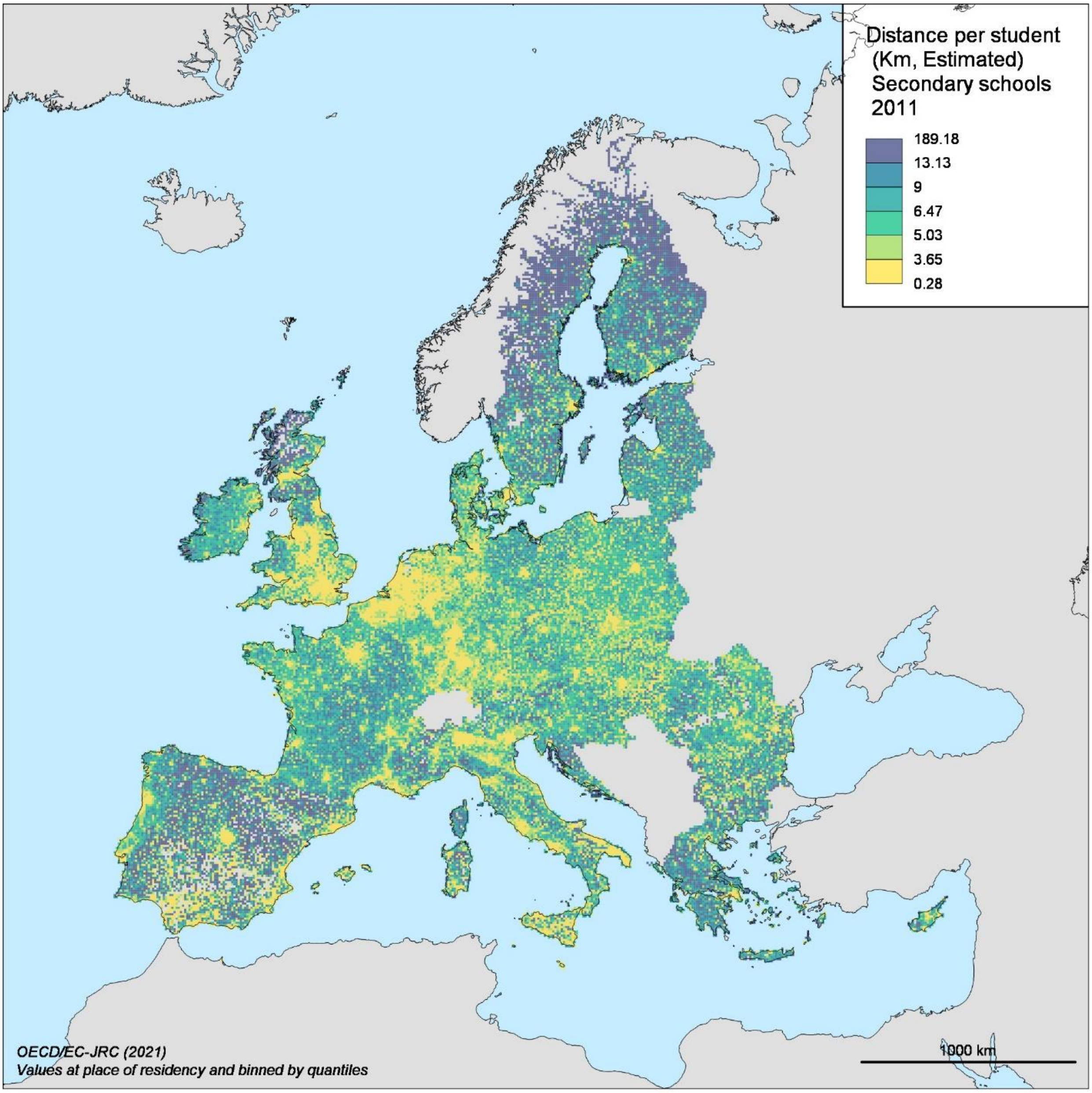
2011



Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

Figure 3.21. Travelled distance to secondary schools per student (estimated), EU27+UK

2011

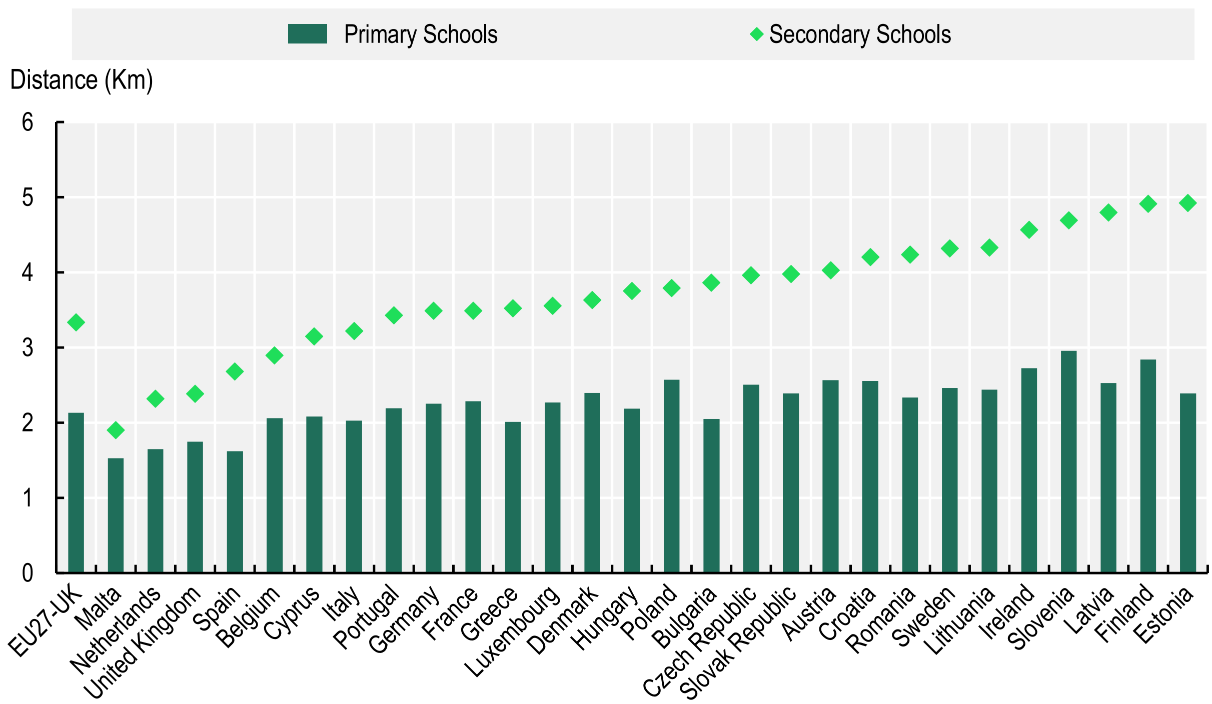


Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

Comparing primary and secondary schools show that for EU27+UK, the average secondary school student needs to travel 1.5 km more, thus a 75% longer distance than the average primary school student (Figure 3.22). These differences are due to less restrictive maximum distances and, consequently, the larger sizes of secondary schools, which increase the geographical concentration of secondary schools. The differences are substantial across countries. In highly urbanised countries including Malta, the Netherlands, the United Kingdom, and Spain, distance to schools is lower than the EU27+UK average. In contrast, in countries such as Ireland, Slovenia, Latvia, Finland and Estonia, distance to schools is larger due to their relatively large share of population in rural and sparsely populated areas. In these countries, the ratios between the primary and secondary schools' distance become even wider, and can be as high as 2-2.5 times.

Figure 3.22. Travelled distance to primary and secondary schools per student (estimated) by country, EU27+UK

2011



Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

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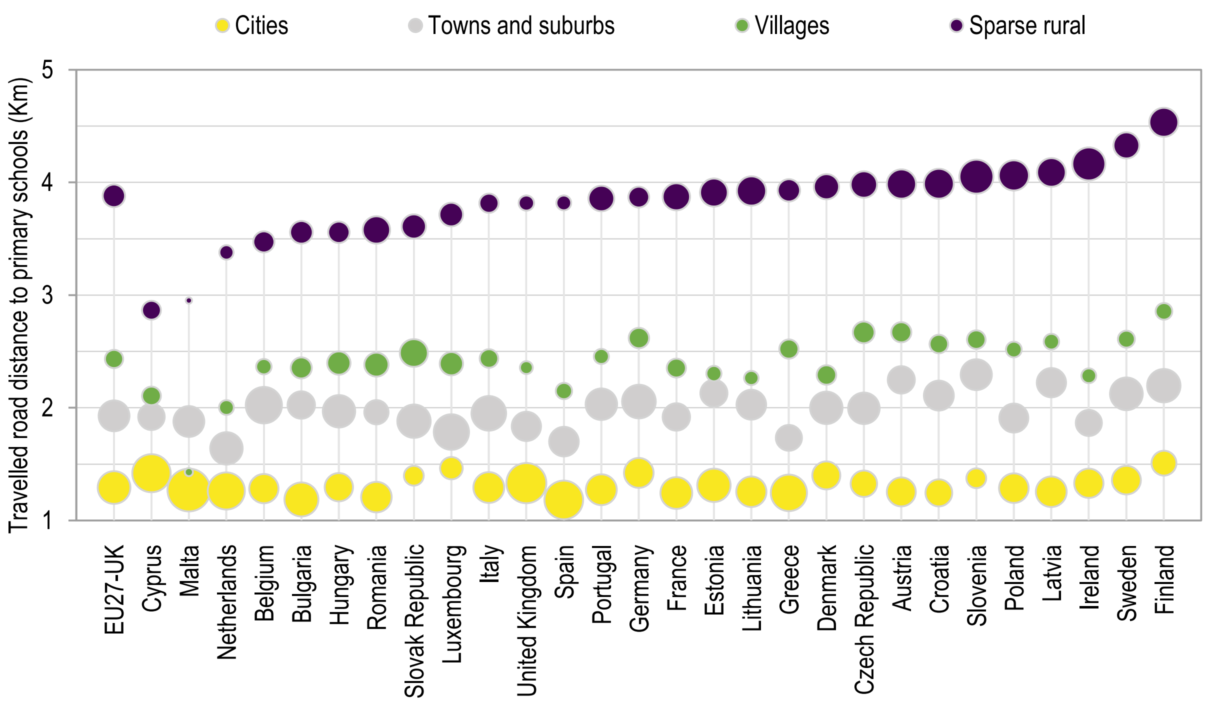
Higher density clearly decreases distance to primary schools, as most students from cities travel less than 2 km to primary and secondary schools, and students from towns and suburbs only slightly more (Figure 3.23). While villages show slightly higher distances, primary school students in sparse rural areas travel on average four to five longer distances than students in cities. These results are in line with recent studies (Kompil et al., 2019[32]); (ESPON, 2018[33]) that show that, in general, cities, towns and suburbs provide better access to public services such as schools.

Average distances across countries are similar in cities, towns and suburbs, and in villages, and these distances are in fact all roughly similar to EU27+UK averages (Figure 3.23). In contrast, distances to primary schools in sparse rural areas display large variation across countries, as expected from the difference in human settlement patterns and in particular the presence of sparsely populated areas (see Chapter 1). For instance, while in Cyprus the distance to primary schools in sparse rural areas is only 2 km longer than in cities, for Finland the difference is double that at 4 km.

Differences in distances to secondary schools across degrees of urbanisation are larger because secondary schools are more concentrated in space, with average distances roughly 7 km higher in sparse rural areas in Finland, Latvia and Estonia, more than four times the distances travelled by students in the cities in those countries (Figure 3.24).

Figure 3.23. Travelled distance to primary schools per student by country and degree of urbanisation (estimated), EU27+UK

2011



Note: Bubble areas represent the share of national population.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

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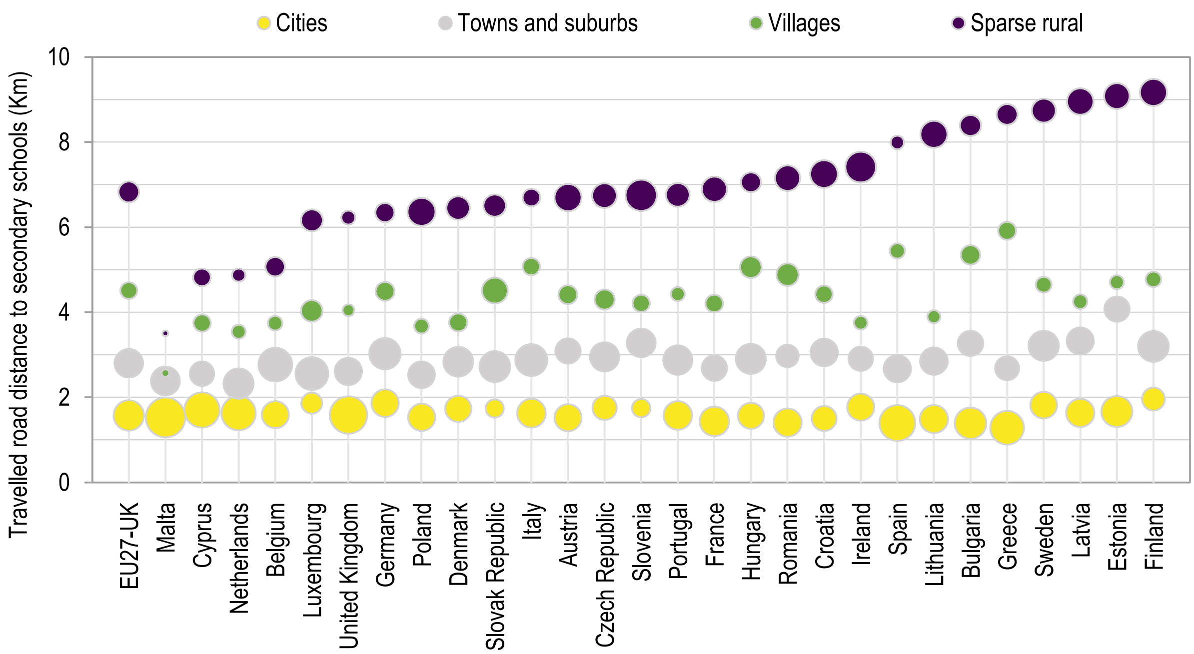
Figure 3.24. Travelled distance to secondary schools per student by country and degree of urbanisation (estimated), EU27+UK

2011



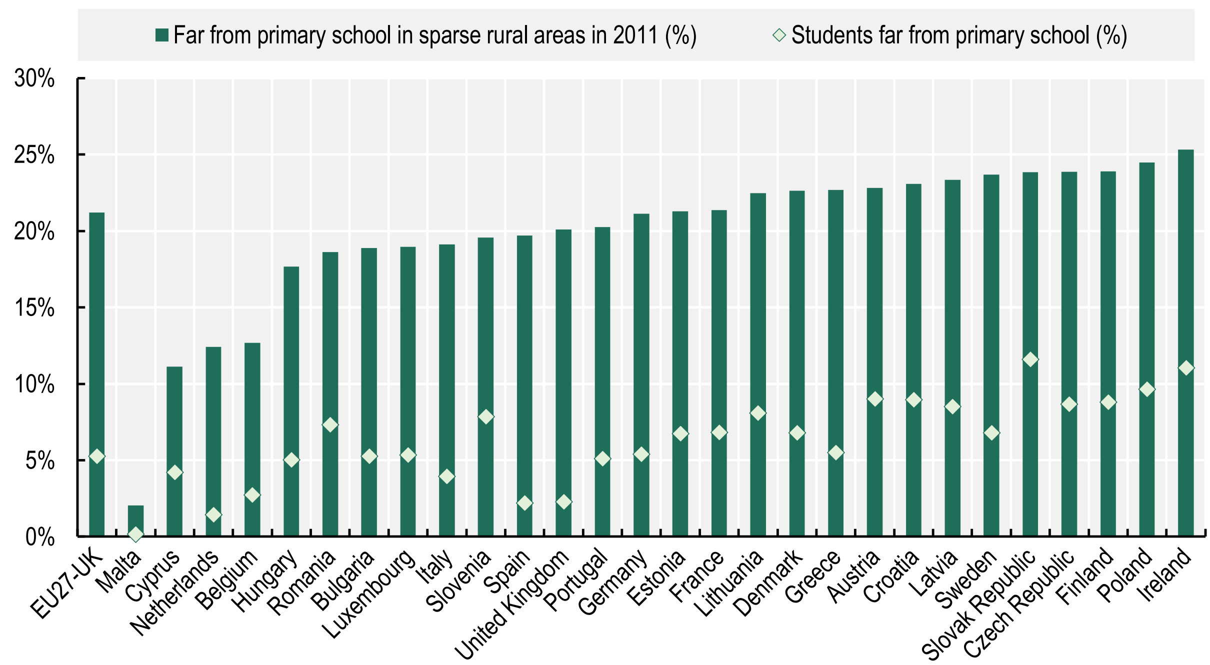
Note: Bubble areas represent the share of national population.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

StatLink https://doi.org/10.1787/888934246222

To understand equity impacts of travel distances for students, Figure 3.25 and Figure 3.26 plot the percentage of students in sparse rural areas that are far from a school in each country. Students are considered far from school if their travelled distance is more than twice the distance travelled on average to attend primary or secondary schools, respectively. In the majority of countries, more than half of the primary school student population in sparse rural areas has to travel far to go to school. Although country-wide percentages are much lower, in some countries a considerable share of students needs to travel long distances to go to school. Compared with primary schools, the differences are even larger for secondary schools, and in some countries, over 30% of sparse rural students have to travel long distances.

Figure 3.25. Share of total and sparse rural areas population that travels far to primary schools (esimated) by country, EU27+UK

2011

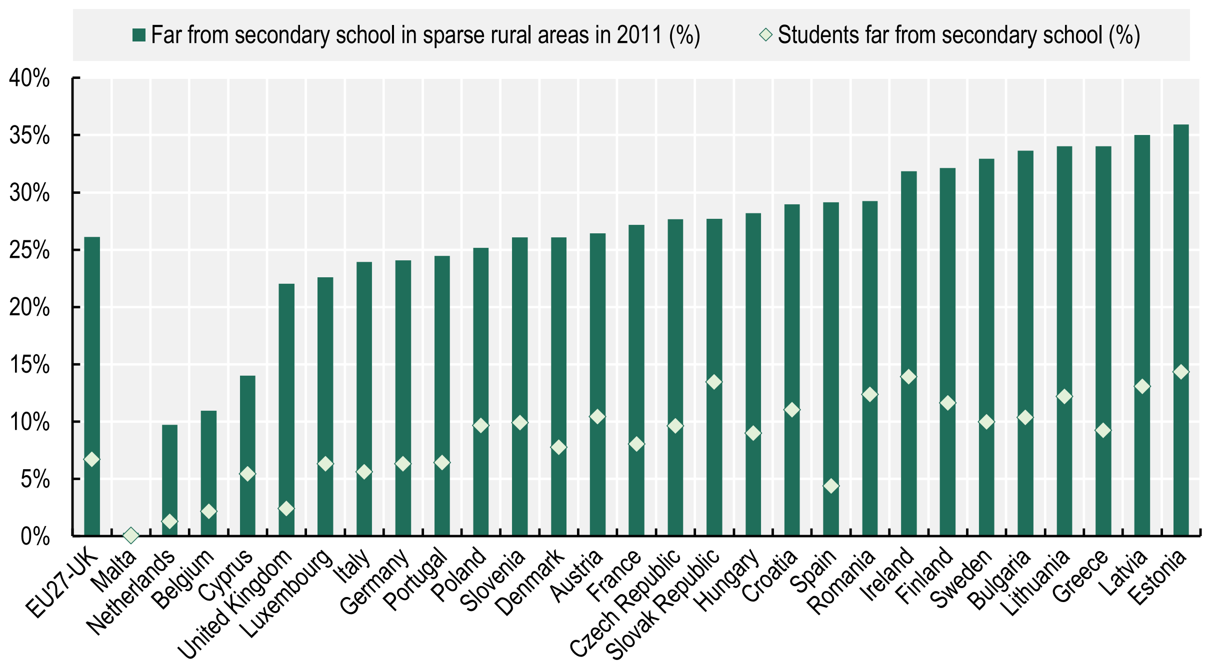


Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

StatLink https://doi.org/10.1787/888934246241

Figure 3.26. Share of total and sparse rural areas population that travels far to secondary schools (esimated) by country, EU27+UK

2011



Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

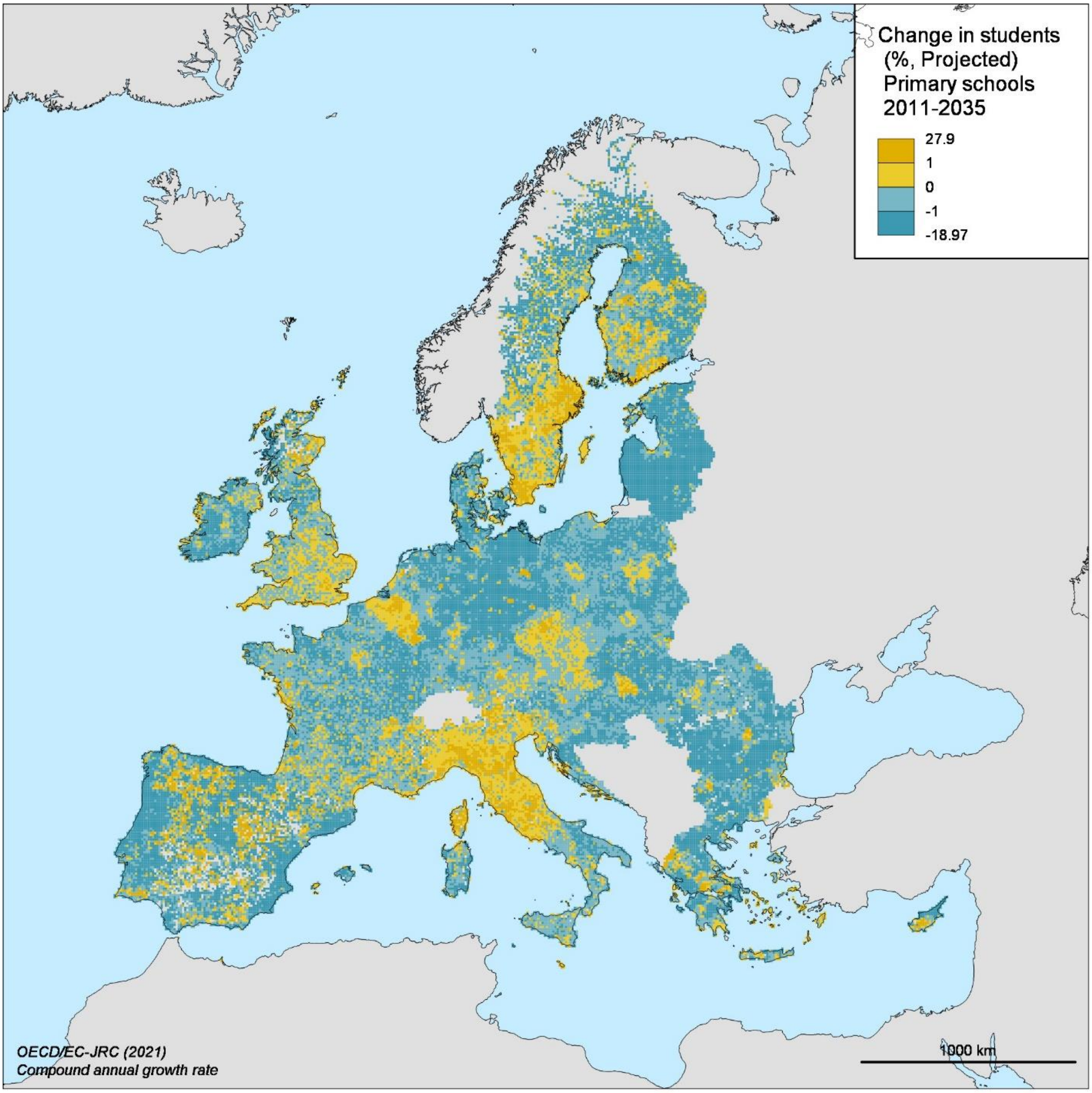
StatLink https://doi.org/10.1787/888934246260

Future school costs and access

Available population projections allow understanding the changes in demand for primary and educational services across EU27+UK countries, that will have an impact not only on the demand for school sites, resources and teachers, but if it affects school supply, also on access to school. According to available projections, parts of Europe and the United Kingdom are projected to become even more sparsely populated (see Chapter 1), with significant variations in the prospective demand for both primary and secondary schooling across countries (Figure 3.27 and Figure 3.29).

Figure 3.27. Projected change in population in primary school age, EU27+UK

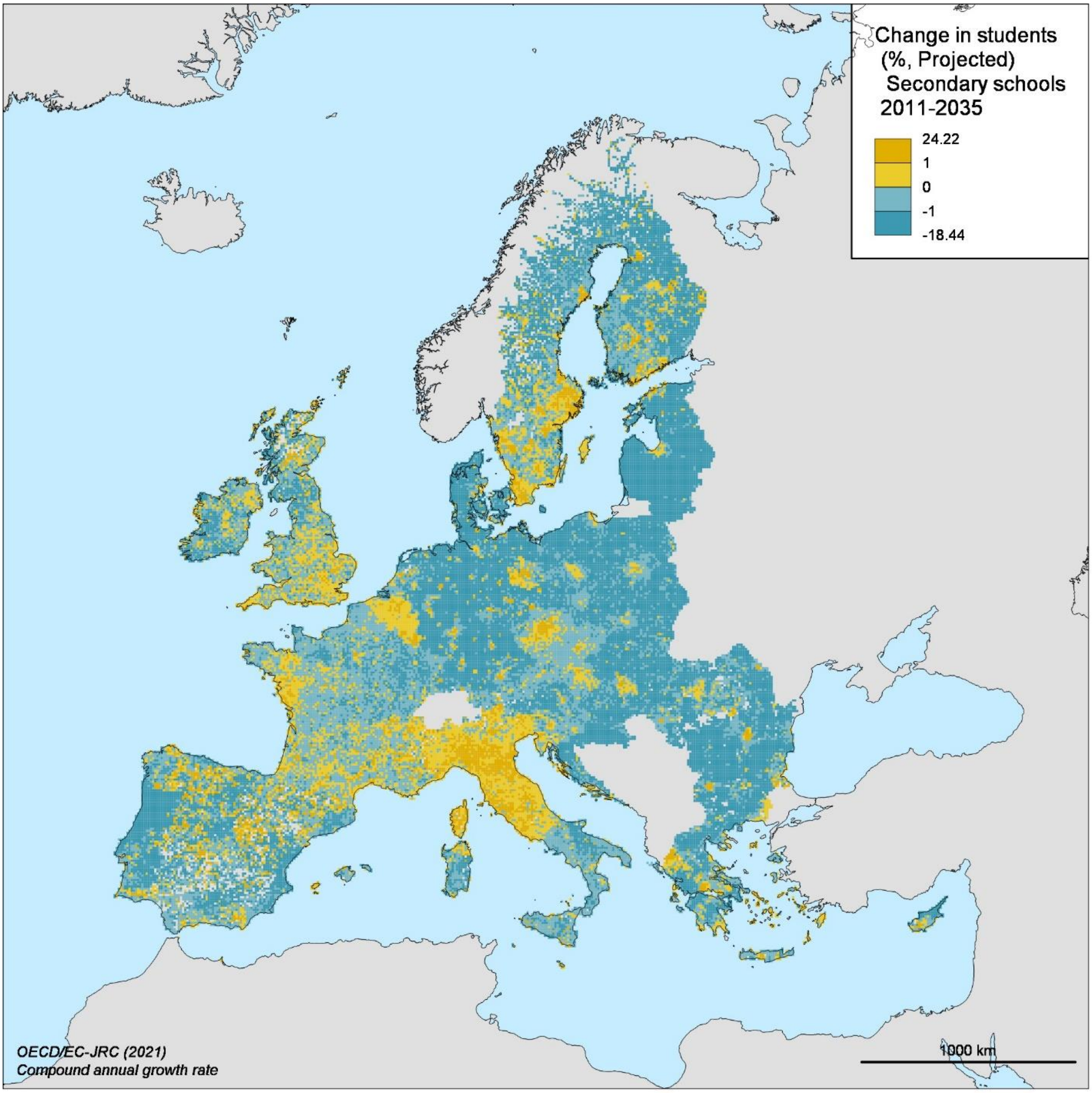
2011-35



Note: Change is calculated as compound annual growth rate in 2011-35.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

Figure 3.28. Projected change in population in secondary school age, EU27+UK

2011-35

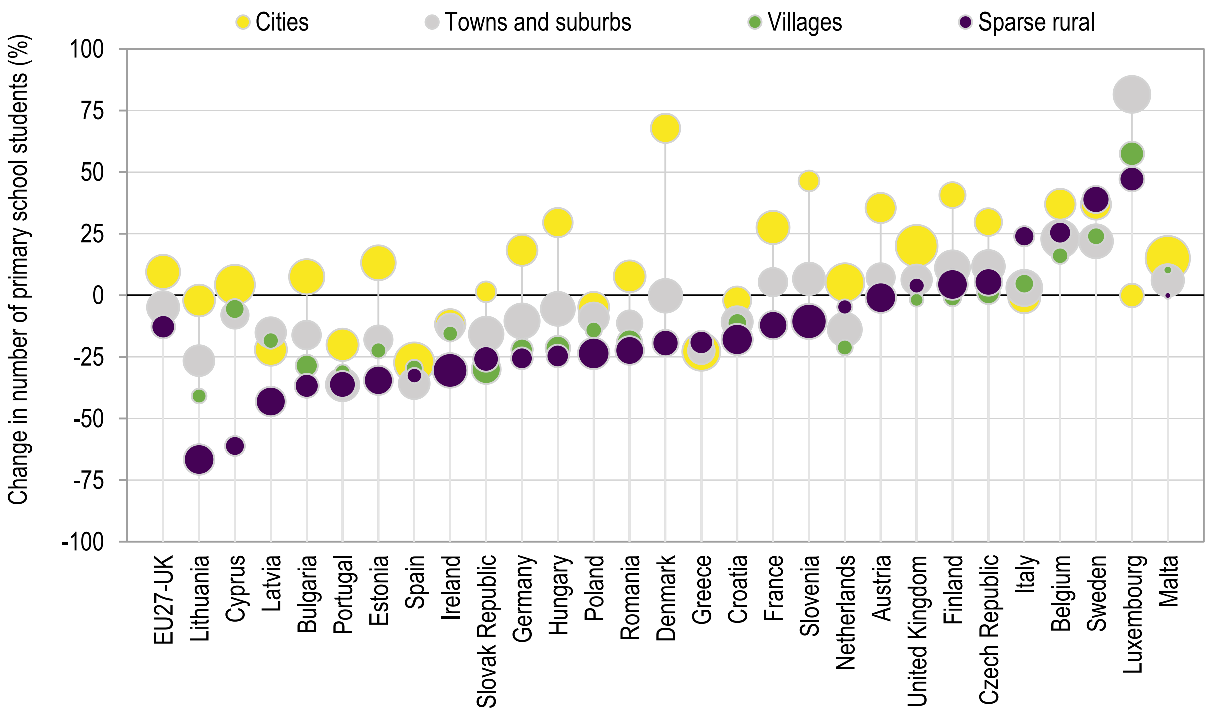


Note: Change is calculated as compound annual growth rate in 2011-35.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

The projections for 2035 using the degree of urbanisation for each EU27+UK country (Figure 3.29) show that in general, projected changes in student numbers lead to considerable additional demand for schools in cities, and a demand shift from rural to urban areas, in particular in Eastern, Central and North-western Europe.

Figure 3.29. Change in primary school students by country and degree of urbanisation (estimated), EU27+UK

2011-35



Note: For readability, a few values above 100% are not shown in the graph. Bubble areas represent the share of national population.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

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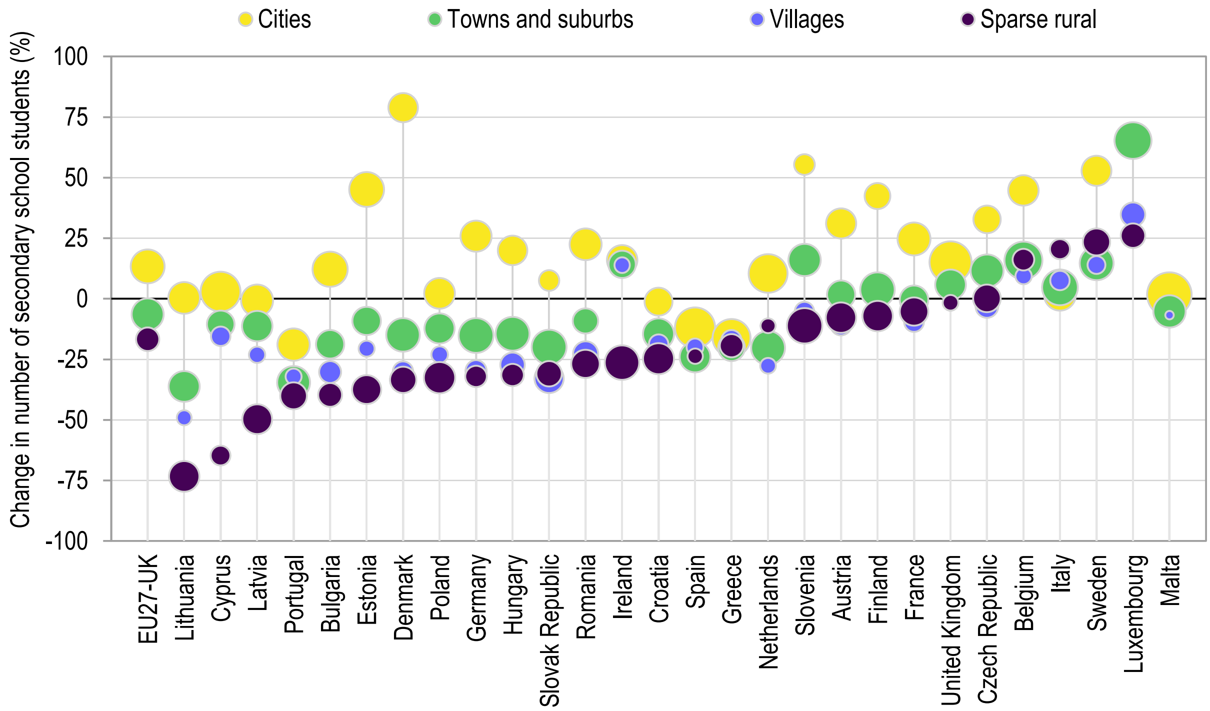
Figure 3.30. Change in secondary school students by country and degree of urbanisation (estimated), EU27+UK

2011-35



Note: For readability, few values above 100% are not shown in the graph. Bubble areas represent the share of national population.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

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This section presents cost implications of two future scenarios based on population projections and different school networks for primary and secondary education. The first uses the projected supply of schools, and the second uses current supply of schools. This allows measuring a gap between a forward-looking scenario with one that does not estimate changes in the future supply of schools. The analysis then measures the gap between the two. The two scenarios are as follow:

1. **First scenario based on 2035 school supply and 2035 students**: This scenario replicates the approach used to obtained present costs and distances to schools but using projected demand for primary and secondary education in 2035 (i.e. the projected number of students in each grid-cell in 2035).
2. **Second scenario based on 2011 school supply and 2035 students**: This scenario assumes that the primary and secondary school network remains as in 2011 while it allocates students projected for 2035 (i.e. it assumes all 2011 schools remain in place and open).

First scenario based on 2035 school supply and 2035 students

In this scenario, the school network is reallocated using the projected student population distributions in 2035. Across most EU27+UK countries, projected changes in student population lead to considerable additional demand for schools in cities, and lesser demand in rural areas for both primary and secondary schools (Figure 3.31 and Figure 3.32).

Figure 3.31. Change in primary schools counts (estimated) by country and degree of urbanisation, EU27+UK

2011-35

Country name	Sparse rural	Villages	Towns and suburbs	Cities
EU27-UK	-3925	-1320	-1104	1735
Germany	-884	-417	-530	433
Poland	-688	-88	-149	-65
Spain	-404	-228	-758	-647
France	-396	-293	166	591
Romania	-371	-138	-73	38
Lithuania	-368	-15	-31	-4
Latvia	-222	-5	-11	-17
Ireland	-199	-11	-28	-18
Bulgaria	-187	-44	-37	19
Portugal	-169	-35	-243	-91
Finland	-153	-9	52	58
Greece	-147	-27	-85	-107
Hungary	-137	-35	-36	59
Slovak Republic	-81	-50	-40	3
Denmark	-79	-33	-19	105
Estonia	-76	-4	-11	7
Austria	-72	4	43	64
Cyprus	-62	-1	-3	4
Croatia	-52	-9	-18	-4
Slovenia	-18	2	16	10
Netherlands	-4	-71	-146	79
Malta	4	0	1	4
Luxembourg	5	15	29	12
United Kingdom	13	12	219	904
Czech Republic	41	2	39	56
Belgium	59	38	238	108
Sweden	229	33	129	115
Italy	493	87	182	19

Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

StatLink https://doi.org/10.1787/888934246317

Figure 3.32. Change in secondary schools counts (estimated) by country and degree of urbanisation, EU27+UK

2011-35

Country name	Sparse rural	Villages	Towns and suburbs	Cities
EU27-UK	-1473	-2194	-1081	1574
Poland	-439	-335	-219	-19
Romania	-128	-239	-53	53
United Kingdom	-99	-23	106	501
Lithuania	-98	-35	-49	-4
Bulgaria	-82	-76	-27	16
Germany	-71	-748	-304	518
Spain	-71	-154	-348	-192
Ireland	-71	-5	19	8
Latvia	-59	0	-13	-2
Portugal	-59	-79	-164	-65
Greece	-44	-35	-44	-48
Croatia	-42	-29	-23	-4
Cyprus	-37	-6	-2	-1
Denmark	-37	-84	-42	50
Finland	-35	-15	6	45
Slovak Republic	-31	-99	-45	2
Austria	-28	-28	-2	38
France	-27	-147	22	255
Hungary	-20	-116	-69	32
Estonia	-18	-9	3	11
Slovenia	-15	-6	13	11
Czech Republic	-7	-10	44	55
Netherlands	-7	-80	-165	29
Luxembourg	-1	5	22	10
Italy	1	113	65	71
Malta	1	0	-1	1
Belgium	3	29	113	84
Sweden	48	17	76	119

Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

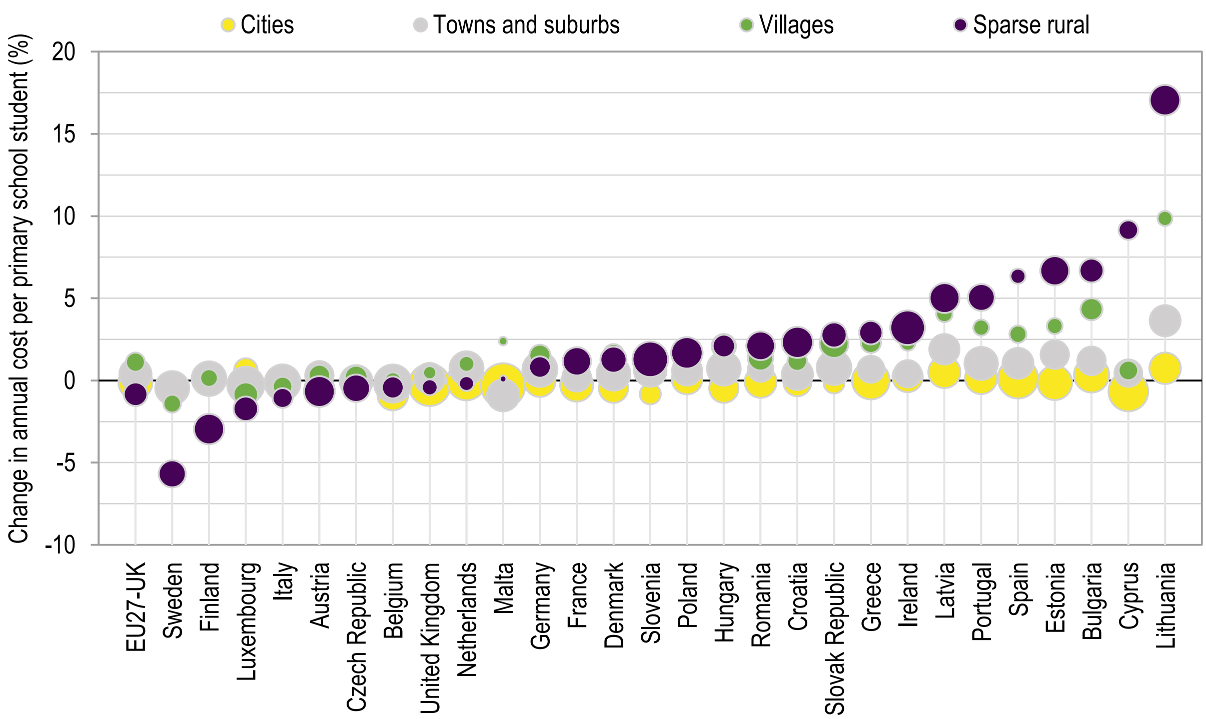
StatLink https://doi.org/10.1787/888934246336

Figure 3.33 and Figure 3.34 show the projected changes in cost per student due to changes in the demand for schooling, as well as the geographical distribution of students, by country and degree of urbanisation. For the average of EU27+UK countries, changes for primary schools are close to zero in all areas except sparse rural areas, where costs per primary school student are expected to increase by 2.6% (Figure 3.33). Costs per primary school student are expected to increase in the sparse rural areas of all countries except in Malta, Sweden, Luxembourg and Belgium, where they are expected to decrease following an increase in the number of students in sparse rural areas in those countries (Figure 3.29). The expected increase in costs in sparse rural areas is considerably larger in countries with considerable sparsity that are also expecting a drop in demand for primary education, including Lithuania, Estonia, Bulgaria, Spain and Latvia. Unlike sparse rural areas, the expected changes in costs per primary school student in villages are not so pronounced and do not vary so much across countries, with the exception of relatively large expected decreases in Finland and Sweden.

The results for secondary schools follow a similar pattern with less pronounced variations across countries in expected cost per student increases in sparse rural areas, and more variation in cities and towns and suburbs (Figure 3.34). In countries such as France and Denmark that expect a substantial increase in secondary school demand in rural areas, accompanied by an increase in cities (Figure 3.29), costs per secondary school student in cities are expected to decrease while at the same time they are expected to increase in sparse rural areas.

Figure 3.33. Change in annual cost per primary school student (estimated) by country and degree of urbanisation, EU27+UK

2011-35

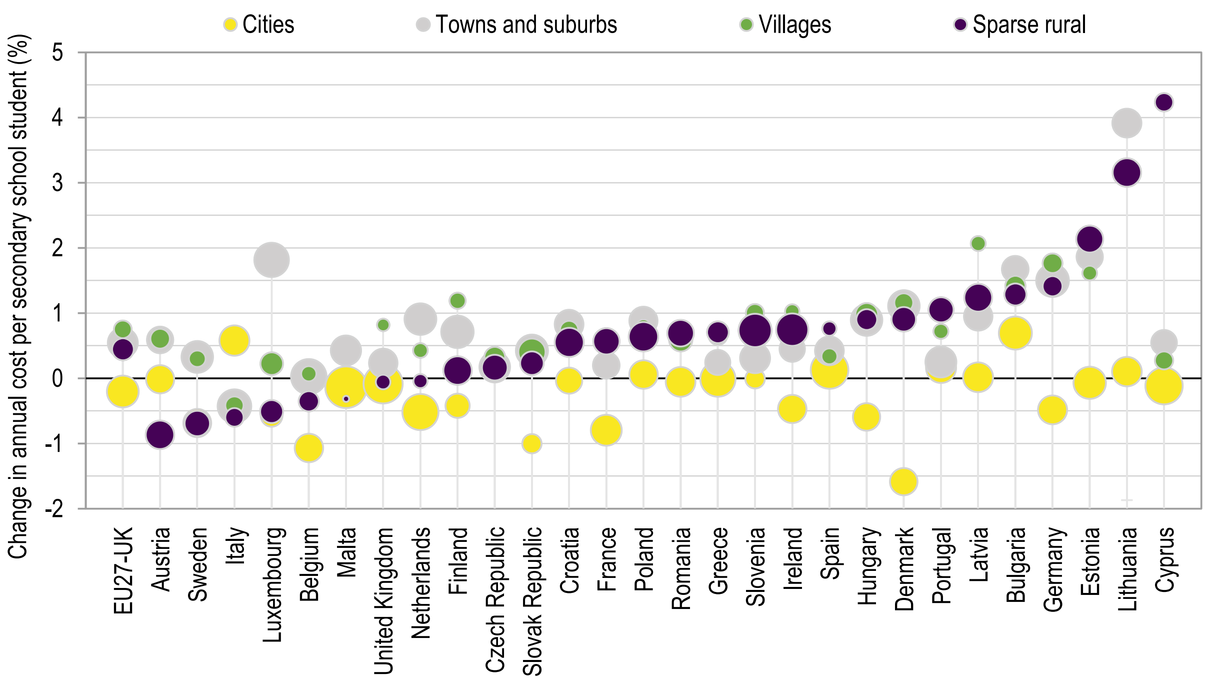


Note: Bubble areas represent the share of national population.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

StatLink https://doi.org/10.1787/888934246355

Figure 3.34. Change in annual cost per secondary school student (estimated) by country and degree of urbanisation, EU27+UK

2011-35



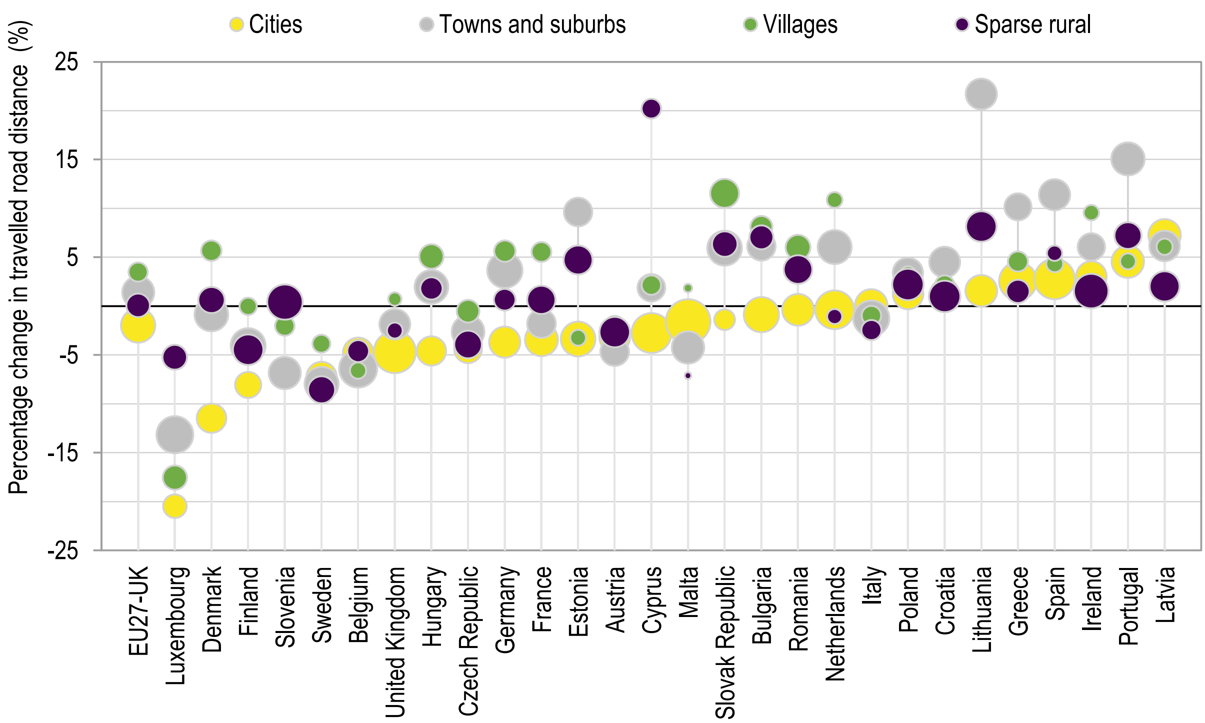
Note: Bubble areas represent the share of national population.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

StatLink https://doi.org/10.1787/888934246374

Changes in demand affect school access and travelled distances considerably. Figure 3.35 and Figure 3.36 show changes in travelled road distance to primary and secondary schools between 2011 and 2035. Average distance to primary and secondary schools in 2035 increases in sparse rural areas (primary 0.2% versus secondary 2%), villages (4.8% versus 9.3%), and towns and suburbs (1.9% versus 2.1%) and decreases in cities (2.6%) compared to 2011 (Figure 3.35). Countrywide distances to primary schools increase in Spain, Ireland, Portugal and Latvia, while Lithuania, Cyprus, Portugal and Latvia face increases in average distance to secondary schools, in particular for sparse rural areas (Figure 3.36). Cities in Luxembourg, Denmark, Finland, and Sweden record the highest decreases in average distance to both primary and secondary schools.

Figure 3.35. Change in travelled distance to primary schools per student (estimated) by country and degree of urbanisation, EU27+UK

2011-35

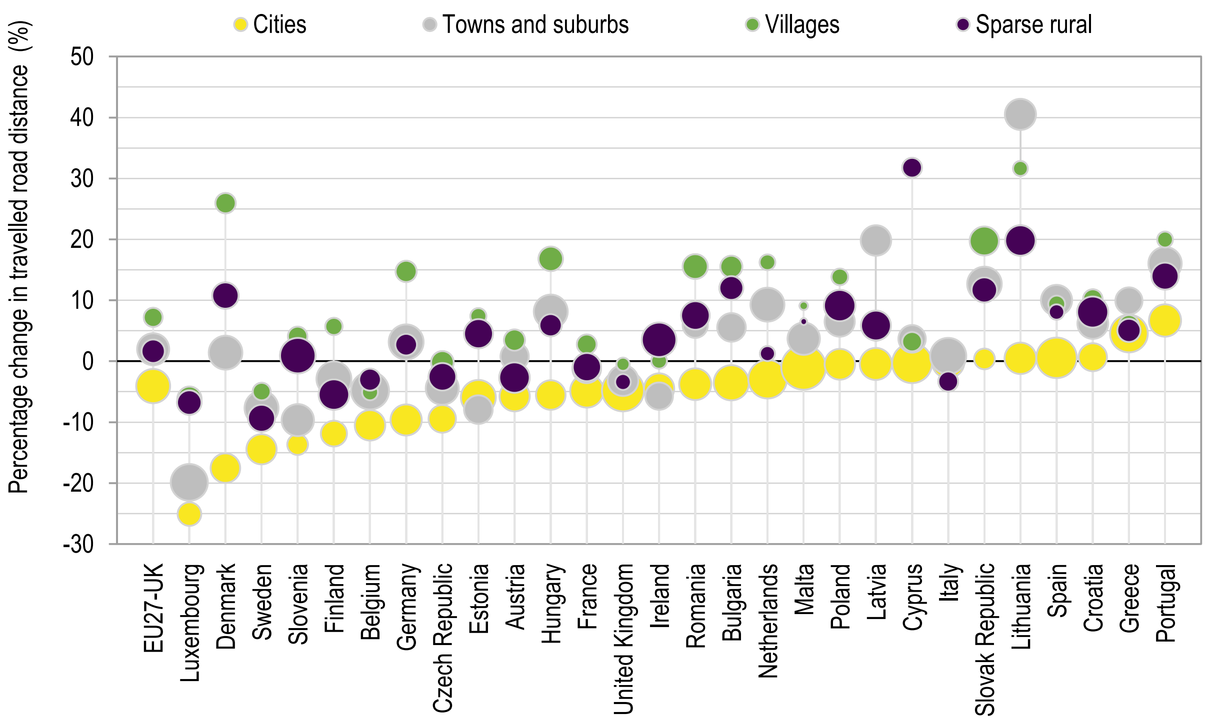


Note: Bubble areas represent the share of national population.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

StatLink https://doi.org/10.1787/888934246393

Figure 3.36. Change in travelled distance to secondary schools per student (estimated) by country and degree of urbanisation, EU27+UK

2011-35



Note: Bubble areas represent the share of national population.
Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

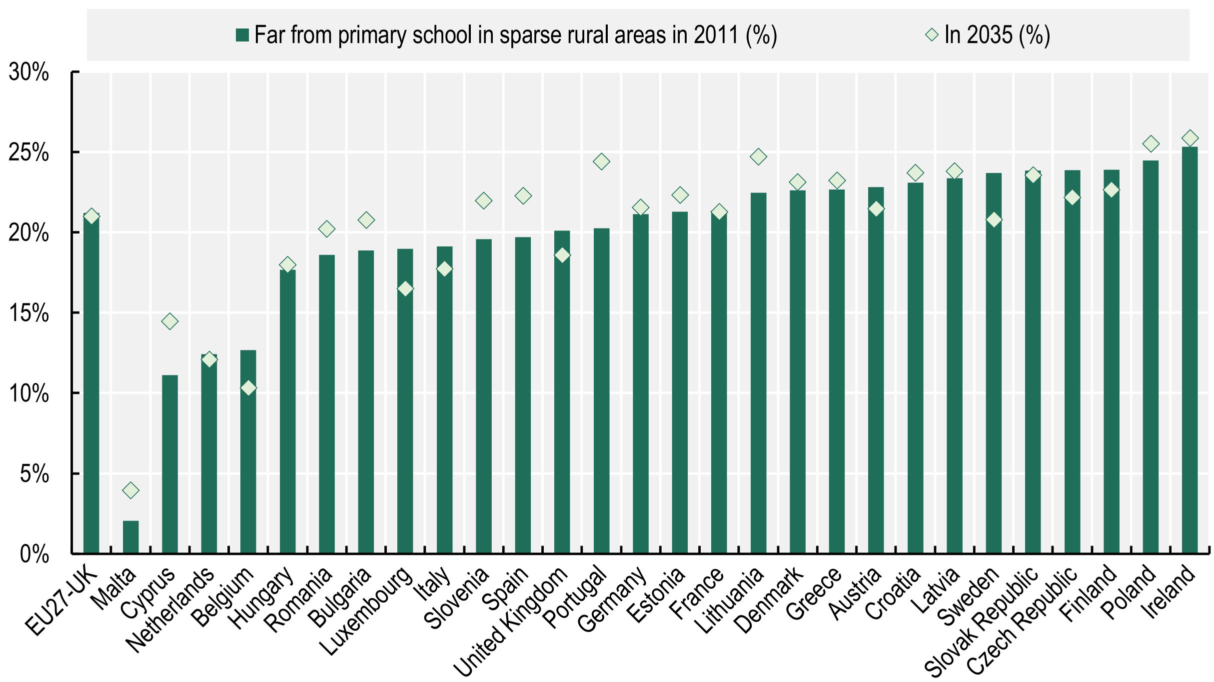
StatLink https://doi.org/10.1787/888934246412

In countries where an increase in student populations is foreseen including Belgium, Luxembourg and Sweden, the share of primary school students in sparse rural areas that have to travel far is expected to decrease slightly (Figure 3.37). In contrast, in countries such as Cyprus, Slovak Republic, and Portugal, the share of the sparse rural student population is expected to increase, in some cases quite considerably. In some countries expected to face depopulation, including Estonia and Latvia, the percentage of sparse rural population that needs to travel far is not expected to change. In these countries, it is possible that travel distances to schools are already large to start with, so the adjustment happens through reduced school size, as evidenced by their larger expected increases in expenditure per student.

Compared with the results for primary schools, the effects of school redistribution are even more marked for secondary schools, with growing number of students travelling far in the vast majority of countries (Figure 3.38). As is the case with primary schools, the dominant increase in far-travelling sparse rural students is in line with expected student population decline in those sparse rural areas.

Figure 3.37. Share of primary school students that have to travel far to school (estimated) by country, EU27+UK

2011-35

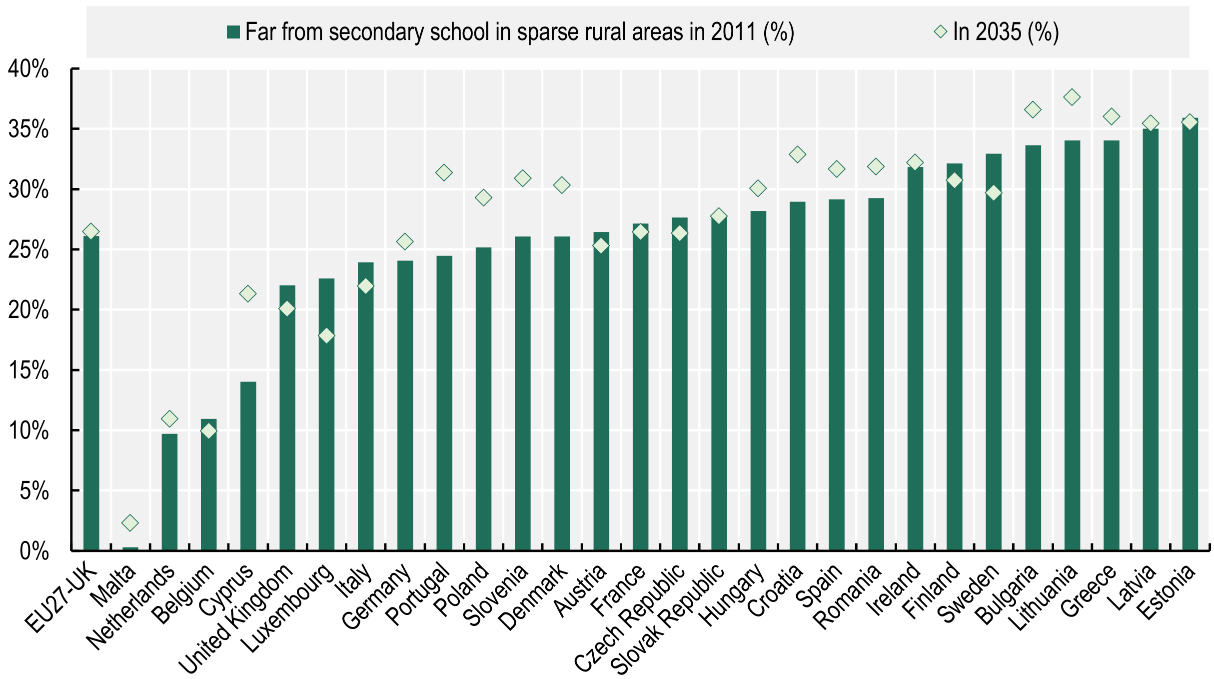


Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

StatLink https://doi.org/10.1787/888934246431

Figure 3.38. Share of secondary school students that have to travel far to school (estimated) by country, EU27+UK

2011-35



Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

StatLink https://doi.org/10.1787/888934246450

Second scenario based on 2011 school demand and 2035 students and gaps

Figure 3.39 shows a comparison per degree of urbanisation and country of the expected changes in costs per primary and secondary school student under the 2035 schools – 2035 students and the 2011 school and 2035 student scenarios. The results show the additional costs brought by keeping the 2011 school network the same in the future, even though it may not be the most efficient network for the future volume and distribution of students.

The results for primary schools indicate that keeping the 2011 primary school network in 2035 instead of having a new network allocated to provide for the future number of students implies for the average of EU27+UK countries:

- Additional costs of about EUR 36 per student in sparse rural areas (with allocating a new network, costs increase with EUR 37, when keeping the 2011 school network, costs increase with EUR 73), EUR 31 in villages (increase of EUR 46 versus increase of EUR 77).
- A small decrease in towns and suburbs (EUR 0.6) and cities (EUR 21), potentially signalling crowding issues in the 2011 network.

Across countries, the additional costs of maintaining the 2011 school network into the future are more substantial in:

- Sparse rural areas of Lithuania (EUR 1 243 per student), Latvia (EUR 741), Cyprus (EUR 431), Estonia (EUR 330) and Bulgaria (EUR 285), all countries with the largest changes under the 2035 students – 2035 school scenario.
- In villages in the same group of countries, although for villages the differences are smaller in magnitude.

- Towns and suburbs of, Lithuania, Portugal, and Spain.

For secondary schools, keeping the 2011 primary school network implies for the average for EU27+UK countries:

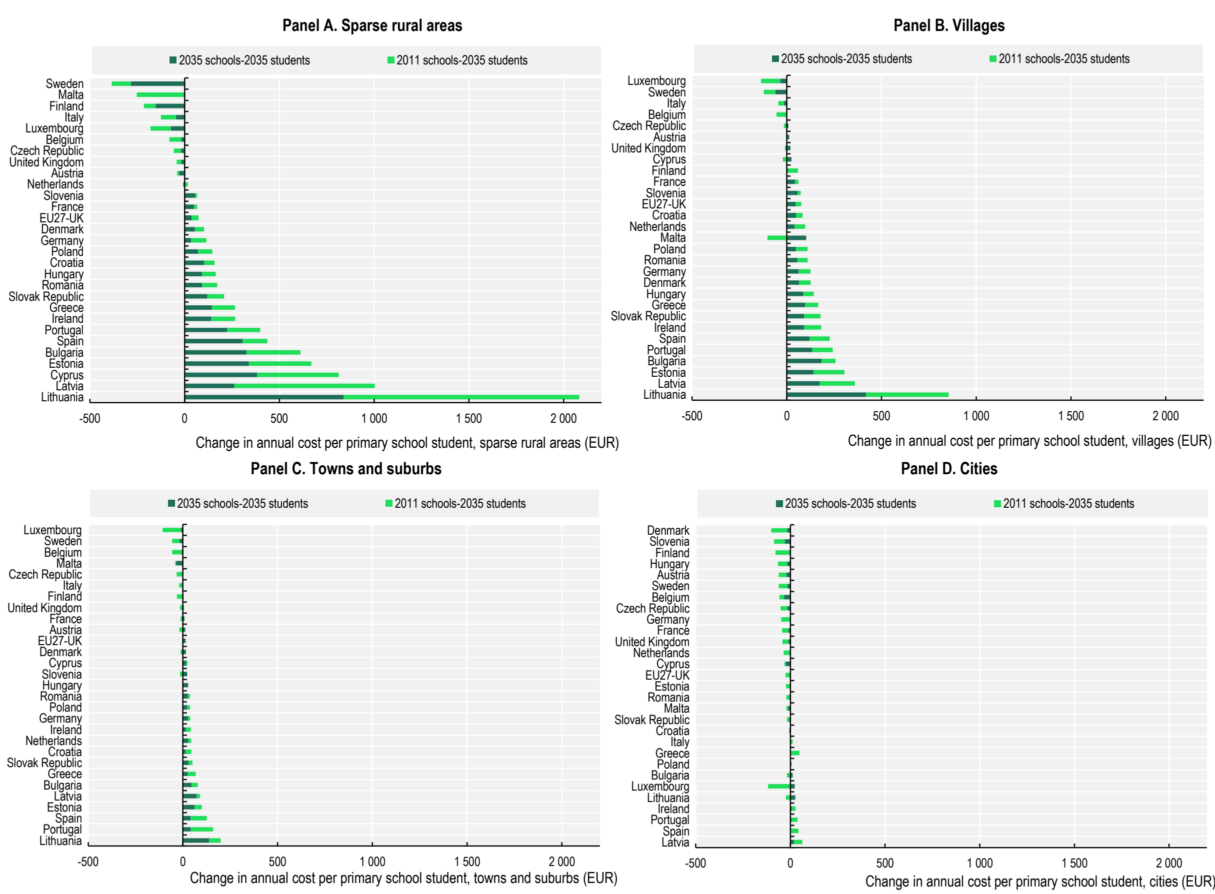
- Small additional costs of about EUR 6 per student in sparse rural areas (from EUR 31 increase to EUR 37 increase), EUR 12 in villages (from EUR 51 increase to EUR 63 increase).
- In towns and suburbs it implies an increase of EUR 3 (from EUR 35 increase to EUR 32 increase) and in cities, it implies an increase of EUR 52 (from EUR 12 decrease to EUR 64 decrease).

Across countries, keeping the 2011 school network to serve 2035 students implies the largest additional costs increases on costs per students in:

- Sparse rural areas of Lithuania (EUR 546), Cyprus, (EUR 297), Latvia (EUR 255) and Bulgaria (EUR 161).
- Villages of Lithuania (EUR 312), Slovak Republic (EUR 129) and the Netherlands (EUR 102).
- Towns and suburbs of Portugal (EUR 145), Lithuania (EUR 70), and Slovak Republic (EUR 55).

Figure 3.39. Comparison of changes in annual cost per primary school student under two scenarios (estimated) by country and degree of urbanisation, EU27+UK

2011-35

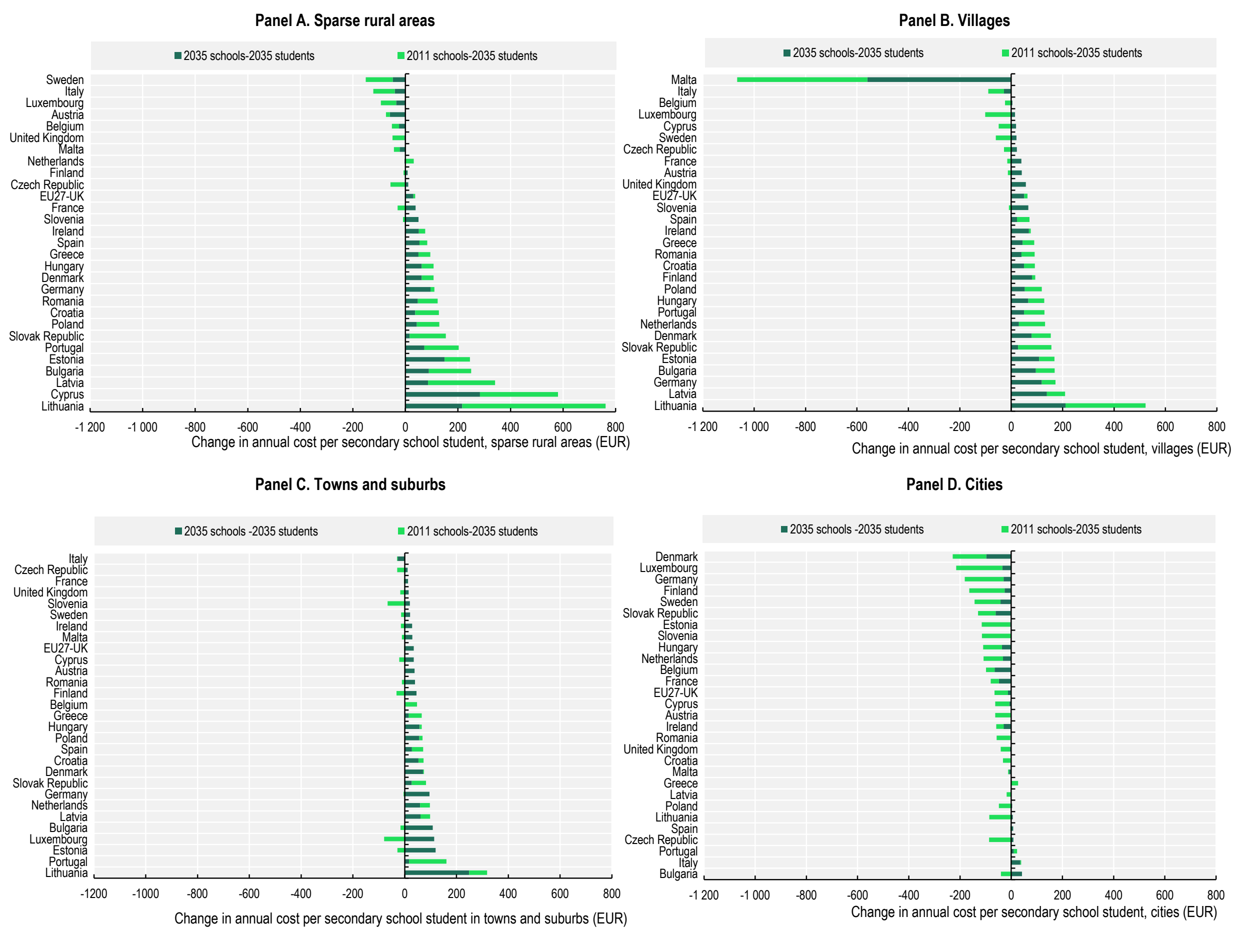


Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

StatLink https://doi.org/10.1787/888934246469

Figure 3.40. Comparison of changes in annual cost per secondary school student under two scenarios (estimated) by country and degree of urbanisation, EU27+UK

2011-35



Source: Authors' elaboration based on (Goujon et al., 2021[2]; Jacobs-Crisioni et al., n.d.[3]).

StatLink https://doi.org/10.1787/888934246488

Conclusions

This chapter shows how the spatial and demographic differences between countries could impact the distance travelled to school and the costs of providing education. The method used in this chapter to locate schools and attribute students to these schools does not require students to go to the closest school or the school in the same municipality. Students have some freedom to choose a school taking into account distance and the number of students attending nearby schools. Next, each school's current expenditure is estimated taking into account their number of students.

The analysis shows that costs per student tend to go up as density goes down. In most countries, costs are highest in sparse rural areas, and lowest in cities. On average in the EU27+UK, the cost per student in sparse rural areas is EUR 650 higher than in cities. In some more sparsely populated countries, this difference can be as high as EUR 1 000. For primary schools, costs are similar between cities and towns and suburbs. As secondary schools are larger, cities have a bigger cost advantage as compared to towns and suburbs.

A striking result is that villages can play a vital role in the provision of primary level schooling. The distance to these schools is only slightly higher than cities and half the distance in sparse rural areas. For secondary schools, towns and suburbs may be a key area of interest as they serve a mix of students from all areas, including cities, and are located closer to the students.

This analysis goes beyond the bulk of current literature by linking demography projections with school provision and costs. The projections for 2035 show that changes in student numbers will lead to considerable additional demand for schools in cities, and in some countries, a reduction in demand in rural areas. In the 2035 scenario with future school placements, changes for primary schools are close to zero in all areas except sparse rural areas, where costs per primary school student are expected to increase by 2.6% on average for EU27+UK countries, while distances are expected to increase in all areas except cities, and distances are expected to increase the most in villages. The results for secondary schools follow a similar pattern with lower increases in expected cost increases, but higher distance increases. The results also show that keeping the 2011 primary school network – and consequently maintaining distances to schools similar to the present scenario - implies even larger average cost increases for EU27+UK countries, of about EUR 36 per student in sparse rural areas and EUR 21 in villages, with substantial variations across countries depending on their expected change in future demand.

This chapter acknowledges that school closures may also have a broader impact on communities that are already in decline. It consequently seeks to identify, besides the average effect of demographic change on costs and access, the areas that are at high risk of having both very high distances and costs per student due to their low density of demand for education services. In this chapter, the results by municipality already showed that countries with high fragmentation have many municipalities without schools, and many more with only small schools that are likely to experience high unavoidable costs of smallness. In these cases, policy strategies can focus on increasing scale and capacity, for instance through school clusters or municipal consolidation, while reconciling the service needs of small rural communities.

Finally, while the estimations in this chapter concern EU27+UK countries, the method and analysis can be applied to any country with available population grids by age classes.

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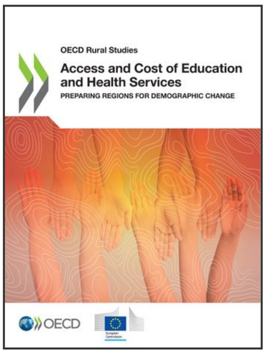
Notes

[1] School competition is a multi-faceted concept, affected by such factors as local school markets, school performance, affordability or teaching model. Regarding differences in how parents choose schools for their children, a safe school environment or school’s good reputation are the most important criteria when choosing a school for their child, even more than the criterion “high academic achievement of students in the school”. Increases in school choice may exacerbate segregation and territorial disparities through self-selection mechanisms (Fjellman, Yang Hansen and Beach, 2018[36]). This report does not develop these aspects of school choice.

[2] This results from the so-called Modifiable Areal Unit Problem (Mobley, Kuo and Andrews, 2007[34]); (Stępniak and Jacobs-Crisioni, 2017[35]).

[3] The consideration of local communities is in line with literature suggesting that local communities have a stake in obtaining and maintaining a school when taking into account access, expected population consequences and broader social benefits (Barakat, 2014[22]) (Elshof, van Wissen and Mulder, 2014[23]) (Salant, P. and Waller, A., 1998[25]) (Lyson, Thomas A., 2002[24]).

[4] Costs are highest in the region County of Karlovac, the only NMR-M region in Croatia.



From:

Access and Cost of Education and Health Services

Preparing Regions for Demographic Change

Access the complete publication at:

https://doi.org/10.1787/4ab69cf3-en

Please cite this chapter as:

OECD/European Commission, Joint Research Centre (2021), “Present and future school costs and access”, in *Access and Cost of Education and Health Services: Preparing Regions for Demographic Change*, OECD Publishing, Paris.

DOI: https://doi.org/10.1787/5205c25b-en

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