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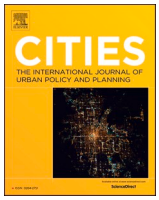

# Subsidised private education and public education. A reflex of the neighbourhood inequalities in Seville (Southern Spain)

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ABSTRACT

In this research, we analyse whether the commitment to subsidised private education in secondary education is adapted to real educational needs. For this purpose, we carried out a socio-territorial analysis of the distribution of public and subsidised private schools and their school results in the city of Seville by means of a contextual study and the application of a multilevel regression model. Our results show, firstly, the unbalanced distribution of private subsidised schools in the wealthier areas of Seville; they also show how the better results of private subsidised schools are related to the more favourable social contexts in which they are located. Finally, we highlight the better academic results of public schools in less favoured social environments. Based on these results, we make a reflection on where the current models of public funding of the education system should be heading.

## 1. Introduction

Numerous studies have confirmed the worldwide increase in social differences (e.g., Piketty, 2020). Similarly, there is a growing trend in Europe in general, and in Spain in particular, to promote subsidised private education as the predominant model of education (e.g., Larsen et al., 2023; Olmedo, 2013). Proof of this is that in the different administrative areas of Spain, the number of these schools has increased at both a regional and a local level (Zancajo et al., 2022). However, this model of subsidised private education usually puts its own economic interests before its role as a key institution for training and educating all members of society with equal opportunities, regardless of their origin or social situation.

In fact, there is a traditional preference of middle-class families for social and ethnic homogeneity in schools, which in the specific case of Spain reinforces a growing tendency to increase aid to subsidised public schools (Boterman, 2013; van Zanten, 2009). In the case of Spain, although some regions—such as Valencia, Galicia, and the Community of Madrid—have recently relaxed their school admission criteria, the public education system still does not guarantee genuine freedom of school choice. The school catchment area determines a pupil's school according to his or her place of residence (Oberti & Savina, 2019). Thus, the increasing socio-residential segregation experienced in European cities takes the form of clear school segregation (e.g., Boterman, 2013; Maloutas, 2007; Ramos Lobato & Bernelius, 2023), which is partly reinforced by the significant growth of private schooling. Private schooling widens the gaps in socio-economic achievement because it segregates pupils from different social classes, and may also be associated with greater segregation, although again this seems to depend on whether the funding is public or private (Alegre & Ferrer, 2010; Jenkins et al., 2006).

In this regard, the growing development of subsidised private education indirectly favours families in their search for a greater consolidation of the social capital they pass on to their descendants by opting for schools where the environment ensures contact with pupils from a similar social stratum (Bourdieu, 1989; Gaddis, 2013). In addition, studies show that the different filtering mechanisms of state-subsidised schools highlight the social and ethnic segregation of these schools, with the result that public schools have to bear the main burden of educating pupils from vulnerable backgrounds and immigrant pupils. Although the effect of the high concentration of immigrant population has generated a debate in which no definitive conclusions have been drawn (e.g., Garrido-Medina & Cebolla-Boado, 2010; Zinovyeva et al., 2014), there are numerous studies that show how public schools have to

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shoulder the main responsibility for educating immigrant pupils (Bonal et al., 2019; Lubián, 2021). However, studies are unanimous in considering that socio-economic status is a factor with a greater impact on pupil outcomes than ethnic segregation (e.g., Chmielewski and Reardon, 2016; Murillo & Belavi, 2021).

In this context, it is worth noting that in Spain, subsidised education was originally justified as a way of being able to cater for the entire population of educational age in the post-dictatorship period, while nowadays it is maintained under the idea of freedom of choice for families when it comes to choosing a school, preferably in an administrative area close to the pupils' home (Merchán Iglesias, 2021). Despite the importance of the current situation of the Spanish education system, however, there are few studies at local level that analyse the effect of subsidised private schools on educational outcomes from a socio-territorial point of view. In fact, while most of the national or international studies that deal with this problem focus on pupil segregation, they do little to analyse the effect of inequality and social segregation on pupil outcomes, let alone compare this effect between public and subsidised private schools.

For this reason, this paper proposes, for the first time, a socio-territorial analysis of the incidence of social and cultural factors on the academic results of pupils at a local level, comparing them by the type of school ownership. This research does not therefore attempt a classic study on residential or student segregation as its main focus, but centres rather on the relation between the students' academic results and the type of school management and the socio-economic characteristics of its context. In this context, this paper is more in line with recent studies that analyse the presence of public services as a cohesive element at the local level from a spatial or social perspective (Iglesias-Pascual et al., 2023; van Melik & Merry, 2021).

Firstly, we analysed the social divisions in the city of Seville by constructing a series of social clusters, followed by a study of the influence of variables such as the socio-cultural level of families and the type of school ownership on the pupils' level of mathematical and linguistic competences, as well as how their results had improved recently. By focusing the research on the socio-territorial incidence of a specific city, the novelty of this study is that it shows how the contextual incidence of schools with different types of ownership affects pupils' results.

To achieve this objective, the research was based on three questions:

RQ 1. Is there equity in the distribution of schools in the city according to their ownership?

RQ 2. What role do neighbourhood context and socio-residential inequalities play in shaping pupils' academic performance?

RQ 3. Do the results, when analysed by type of school, demonstrate that schools act as perpetuators of social inequalities or as mechanisms for upward social mobility?

These research questions, combined with the analysis of students' academic outcomes at the local level—comparing them by type of school ownership and the socioeconomic context of each school—enable us to develop what is, to the best of our knowledge, a particularly novel approach to understanding the relationship between schools, public investment, and socio-educational inequality in neighbourhoods.

In order to develop this analytical proposal, we first present a review of the literature on the emergence and function of subsidised private schools in Spain and the role of social segregation and human capital in school outcomes. We then explain the context, data and methodology used, and finally discuss the strengths and weaknesses of the private grant-aided school system in the city, using these findings to develop recommendations for educational planning.

## 2. A theoretical approach

### 2.1. Evolution of subsidised private education in Spain

From the mid-19th century on, the establishment of a contemporary educational system in Spain was an extended and gradual process, defined by the dominant influence of the Catholic Church and minimal intervention from the State. Prior to the declaration of the Second Republic in 1931, schooling had been chiefly reserved for the well-off minority and mainly managed by religious congregations and orders (Viñao, 2004). In the 1931 Constitution, Republican reformers attempted to change this by declaring that education was an essential responsibility of the state, prohibiting the Church from administering educational institutions, and launching an ambitious plan for building new schools. As is well known, the coup and subsequent civil war disrupted this programme, leading to a lengthy period of right-wing dictatorship under Franco. Between 1939 and 1970, education went back to the 19th-century system, with two different models of schools existing side by side. The first, the state system, catered for the less well-off, and was underfunded, while private schooling was controlled by the Catholic Church, and effectively enabled the elites and emerging middle class to progress on to higher education.

The economic and social transformations that occurred in the 1960s demanded major changes in an education system that was clearly obsolete, especially considering how capitalism had developed in Spain. To approach this, the General Education Law (LGE) of 1970 aimed to bring about comprehensive reform in the education system, setting up free, obligatory primary education from 6 to 14 years of age, known as EGB - Basic General Education.[1] According to law, education would be considered a 'fundamental public service' (Article 3). This raised concerns within the Catholic Church, which saw its key position in the educational system under threat, despite the fact that the LGE did not challenge the existence of private schools and even agreed to provide them with state funding. Indeed, articles 94 and 96 stated that the government would establish partnerships with private EGB institutions, providing the subsidies required for cost-free education at this level. Consequently, if basic education was free in public schools, it would also be free in private schools.

The failure of the LGE to achieve its objectives is widely acknowledged. The political turmoil of the final years of the Francoist dictatorship, coupled with the economic woes of the 1970s, rendered the provision of free education, even to minimum standards of quality, unfeasible. Nonetheless, the policy of subsidising private institutions continued in the following years, despite the fact that the agreed formula was never fully implemented, while application of the ruling was discretionary, and there was minimal regulation. The education system therefore became one of the central topics of debate during the Democratic Transition period (Muñoyerro González, 2022; Puelles & Currás, 2018). In June 1978, the Union of the Democratic Centre government (conservative party) swiftly introduced the LOECE bill, which ensured that subsidised private institutions could continue free from state control. Following this, the same government passed a bill regarding the financing of compulsory education, which introduced the formula of the educational voucher (Sevilla Merino, 2016).

However, the subsidies proposed by the Spanish right for private institutions lacked a sufficiently clear, well-defined formula. The current model, which reintroduced the agreement outlined in the 1970 General Education Law (LGE), was established by the first government of the PSOE[2] in 1985, through the Organic Law of the Right to Education (LODE) (González, 2021). Nevertheless, despite the law's provisions, the recently approved educational agreement brought in strict criteria for receiving public funding, emphasising the role of private schools as a

[1] First-level Vocational Training (ages 14–16) would also be offered free.
[2] Spanish Socialist Workers' Party.

supplementary element in the public education system. The state entered into agreements with private institutions for the provision of public education services, and these institutions willingly accepted certain conditions, particularly the requirement to align with the educational program established by the administration (Merchán Iglesias, 2021). In this way, a peculiar educational system emerged with a triple network of schools: public, subsidised private and non-subsidised private schools. In turn, this system has further consolidated the influential role of the Catholic Church in the Spanish education system, as it owns the vast majority of the private state-subsidised schools. A different education school system has therefore been shaped than in the rest of the European countries, except for the cases of Belgium, Holland or Ireland.

Since then, alternating periods of conservative and progressive governments have resulted in different legislative approaches. Conservative governments have facilitated the expansion of subsidies to private institutions and relaxed agreement terms. In contrast, progressive governments have prioritised making more places available in public schools and have attempted to restrict the expansion of subsidies to private institutions (Viñao, 2016). Such alternation of policy is facilitated by the ambiguous wording of Article 27 of the Constitution, which places the right to education and freedom of teaching on the same level (Menor Curras, 2018; Puelles, 2018). According to the current data available for the academic year 2020–21, in Compulsory Secondary Education (ESO) throughout Spain, 66 % of pupils attended public institutions, with 30 % attending private institutions which received subsidies (the remaining 4 % attended private non-subsidised institutions). In the region of Andalusia, these percentages were 76 %, 20 %, and 4 %, respectively (Ministerio de Educación y Formación Profesional, 2023).[3]

To fully understand this data, it is crucial to explore the distinctive characteristics of subsidised private schools and the profile of the pupils enrolled there. These institutions are predominantly located in urban areas, with 63 % of private schools in Spain (subsidised and non-subsidised private schools are not differentiated) situated in urban centres with over 100,000 inhabitants, while for public schools, the figure is only 28 % (Ministerio de Educación y Formación Profesional, 2023). In the case of Seville, 55 % of ESO pupils attend public schools, while 42 % attend subsidised private schools, and 3 % attend private non-subsidised schools.[4]

### 2.2. Role of the cultural capital of families in academic outcomes

In general, pupils attending subsidised private schools have a specific, distinct profile, characterized by residing in large cities and belonging to the middle class.[5] Thus, one of the key areas this paper analyses is whether this profile affects their academic performance and if there are any significant differences compared to pupils attending public schools.

The factors influencing school performance have been widely explored, particularly within the field of educational sociology. The origins of these studies can be traced back to the celebrated Coleman Report, which presented the findings of a study conducted in 1966 on the education system in the USA (Coleman et al., 1966). This report highlights the significance of the socio-cultural context of pupils when considering the factors influencing in their academic results. In fact, after this report questioned the advantages of school desegregation, an important body of literature grew up around the benefits and drawbacks of school desegregation (e.g. Clark & Maas, 2012). Following this line of research, the analysis by Bourdieu and Passeron (1970) delved into the relation between the different types of capital (cultural, social, economic, etc.) available in family contexts, and the resulting academic outcomes. Several studies currently support the claim that the pupil's socio-cultural background is the most significant predictor of academic achievement.[6]

One of the most important recent studies on school performance is the Programme for International Pupil Assessment (PISA), promoted by the OECD and conducted triennially since the year 2000. In these studies, the PISA presents the ESEC as an indicator to establish the sociocultural context of schools and their pupils, which is calculated by considering the parents' educational level, occupation, and household educational resources. Using this indicator, the results obtained in the studies carried out to date emphasize that socioeconomic and cultural status is indeed a highly relevant factor in a pupil's academic achievement.

The latest of these reports (Ministerio de Educación y Formación Profesional, 2019) also examines the potential impact of school ownership (public or private) on the results achieved by pupils in various subjects. In this regard, results from Mathematics tests show that ‘on average across OECD countries pupils from private schools (512) score 26 points higher in Mathematics than those from state-run schools (486) and, in the total EU, the difference is 24 points (public, 481; private, 513)’ (p. 104 of the Spanish report). In the case of Spain, ‘the average score in Mathematics for public school pupils is 472 points and for those from private schools, 499 (a difference of 27 points)’ (p. 104 of the Spanish report). The results are much the same for the Science test: private school pupils achieve better results than those from public schools.

Based on these studies, the question raised in this research is whether these differences should be strictly associated with the ownership of the schools or merely reflect the influence of the sociocultural factors mentioned earlier. In this regard, Choi and Calero (2012) argue that the superior academic achievement of private schools is linked to the particular social composition among their pupils compared to those attending public schools. Indeed, the latest PISA report (Ministerio de Educación y Formación Profesional, 2019) addresses this issue and reaches the same conclusions. In general, taking into account the effect of the ESEC, it can be seen that the differences between the estimated average scores in public and private schools are lower in all cases, although, in some cases, they are higher in public schools (p. 108 of the Spanish report). Therefore, it is evident that the lack of equity in the allocation of pupils to different types of educational institutions (public or private) has a significant impact on their unequal academic performance and, as a result, varying levels of social, economic, and cultural segregation persist. In this context, Murillo and Martínez-Garrido (2018) have studied the extent of school segregation in Spain and its autonomous communities, comparing it with EU data. One of their conclusions is that the Community of Madrid is the one with one of the highest rates of segregation, noting that the policy of promoting private education developed by the ruling right-wing Popular Party is one of the main causes of high levels of school segregation by socioeconomic level. A more recent study (Murillo & Guiral, 2024) confirms the role of private schools as a relevant factor in this school segregation.

### 2.3. Role of social and residential segregation in academic outcomes

A large number of studies show a close link between the level of

[3] The current landscape of subsidised education in Spain can be explored in Pulido-Montes and Lázaro (2023) and, particularly, in Zancajo et al. (2022).

[4] These data correspond to the academic year 2021–22. Source: Open data, Regional Government of Andalusia in https://www.juntadeandalucia.es/datosabiertos/portal/dataset/alumnado-matriculado-por-centro-educativo-no-universitario-en-andalucia/resource/f8b2cb97-fcf6-437d-b0b7-01e13290dbdc

[5] In this regard, Olmedo and Santa Cruz (2010) noted that middle-class families preferred this type of school when choosing a school for their children.

[6] Many of these studies have examined in detail how the socio-cultural context functions as a determinant of academic outcomes (See, for example, Stull, 2013; Bernardi & Cebolla, 2014).

social, residential and ethnic segregation of pupils and school performance (e.g. Nieuwenhuis & Hooimeijer, 2016; Oberti & Savina, 2019; Ramos Lobato & Bernelius, 2023), with neighbourhood characteristics and their spatial location in the city playing a particularly important role in understanding this relationship (Bernelius & Vaattovaara, 2016; Carlson & Cowen, 2015). In this regard, the growing processes of social segregation experienced by societies within the neoliberal economic model are reflected from the educational point of view in a clear differentiation of academic results according to the socio-economic level of neighbourhoods (Boterman, 2019; Van Zanten & Kosunen, 2013). In response to the growing social and ethnic inequality and diversity, there has been a further trend among the middle classes to move away from public schools, where pupils are assigned to the school by catchment area, towards subsidised private schools, which have greater flexibility in the selection of pupils (Oberti & Préteceille, 2013; Oberti & Savina, 2019). Thus, already worrying levels of social segregation are reinforced and perpetuated by school segregation (Murillo & Belavi, 2021). Similarly, the academic literature has shown how segregation of the ethnic and immigrant population has a major influence on the academic outcomes of both native and foreign pupils (e.g., Danzer & Yaman, 2016; Dronkers & Van Der Velden, 2010). However, depending on the methodology, areas and scales analysed, these studies have produced divergent results that do not allow us to make generalisations (e.g., Garrido-Medina & Cebolla-Boado, 2010; Zinovyeva et al., 2014). As a proof of this, several papers focusing on the relationship between segregation and school outcomes have highlighted how, for the most part, results in Reading and Mathematics were unrelated to levels of segregation, or how family background and lower cultural capital may be more important than neighbourhood poverty in explaining student outcomes (e.g. Clark & Maas, 2012; Troost et al., 2023).

Based on these theoretical grounds, this research analyses the distribution of public and subsidised private schools in the city of Seville in order to discover whether the socio-spatial location of the school and its type of management have an impact on the educational outcomes of pupils at the local level. To achieve this, we believe that the clearest way to visualise the impact on educational outcomes of the variables addressed is by conducting a case study at the local level, developed at a sub-municipal scale and with analysis at the census tract level.

## 3. Context, data and methodology

### 3.1. Context

Seville, with a population of around 700,000 inhabitants in the period 2006–2008, is the capital of Andalusia, the southernmost region of Spain. Since the end of the 19th century, Andalusia has traditionally been one of the poorest and most vulnerable regions in Spain and the EU. In particular, this problem is clearly illustrated in the city of Seville, which according to Urban Audit indicators is home to some of the poorest neighbourhoods in the whole of Spain (INE, 2008). In turn, as the regional capital and most highly-populated city in Andalusia, Seville reflects the general dynamics of social segregation and the extension of public and private education originating at the beginning of the 20th century in southern Spain. Although differences have now become less marked, these tendencies are still largely maintained in the city (Almuedo Palma & García, 2023).

### 3.2. Data

To conduct our analysis, we used a series of statistical indicators on school and socio-territorial outcomes taken from various sources:

i) School outcome data for the years 2006–2008 for all pupils in public and subsidised private schools in Seville in Language and Mathematics proficiency tests were obtained from the Andalusian Agency for Educational Evaluation (AGAEVE).[7] Data on the Socioeconomic and Cultural Index (ISC)[8] was also obtained from the same agency, showing the position of each school with respect to the economic and cultural level of the pupils' families, compared with the Andalusian average.
ii) Demographic variables, such as the percentage of the population under 19 and over 64 years of age and of economic migrants,[9] were obtained for 2008 from the Continuous Municipal Population Register of the Spanish National Statistical Institute (INE).
iii) Socio-economic variables, such as average household income and the percentage of the population residing in households above 160 % of the median income, are based on 2015 data from the Spanish Household Income Distribution Atlas of the Spanish National Statistical Institute (INE).
iv) Finally, data on dwellings in dilapidated, poor or substandard condition were obtained for 2011 from the Atlas of Residential Building in Spain produced by the Ministry of Transport, Mobility and Urban Agenda.

It is important to clarify that the use of data from different years in this study is determined by the availability and characteristics of the information required. The data on educational outcomes are drawn from a set of standardized student assessments that sparked considerable controversy in Spain, particularly in the region of Andalusia. Following the public release of the initial results, no further data from these assessments were published. These data were collected as part of a research project commissioned by the Andalusian regional education authorities and are available only for the period 2006–2008.

The socio-economic data used in this study are from 2015. These represent the closest temporal match to the educational data, as detailed socio-economic indicators at the census tract level were not available in Spain before this date. Accordingly, we rely on the 2006–2008 educational data due to their singular nature, and on the 2015 socio-economic data because they offer the best possible approximation in temporal terms. While we recognize that the use of data from different years may be perceived as a limitation, it is important to consider the broader socio-economic context. Spain was among the countries most severely affected by the 2008 financial crisis. The resulting economic contraction had long-lasting effects, and existing research (Goerlich, 2016) suggests that socio-economic conditions in 2015 remained broadly comparable to those of 2008. This supports the validity of using the 2015 data as a proxy for the socio-economic context during the earlier period.

### 3.3. Methodology

Our empirical analysis was based on a two-step approach. In the first step, we conducted a contextual analysis at the census tract level. To do this, we applied a non-hierarchical cluster analysis using the K-means method to classify the 552 census tracts that form the municipal area of Seville into a smaller number of homogenous and spatially contiguous

[7] This type of tests on the level of students' mathematical and linguistic competence are developed following the PISA report models.

[8] This index is used by the administration with educational competence in Andalusia, adapting the ESEC developed by PISA to analyse the cultural and social context of pupils. For more details see:

Gil-Flores, J. (2011). The socioeconomic status of families and students' educational achievement. Culture and Education, 23(1), 141–154. doi: 10.1174/113564011794728597

Gil Flores, J. (2013). Medición del nivel socioeconómico familiar en el alumnado de Educación Primaria. https://hdl.handle.net/20.500.12799/1246.

[9] Understood as cheap labour competing for the hardest and lowest-paid jobs, generating a strong sense of economic competition among the native population with lower income levels in Spain (e.g. Corkill, 2001; De Oliveira Neves et al., 2019).

clusters. For this, we used four indicators related to socio-economic characteristics and level of wealth of each census tract: the percentage of young people; the percentage of economic migrants; the percentage of population with income per unit of consumption above 160 % of the median income; and the percentage of dwellings in dilapidated, poor or substandard condition.[10] The spatial constraints strategy was based on the geographical coordinates of the geometric centroids of each census tract, used as weighting variable. All the input variables were standardized to a Z distribution and the Euclidean distance was used as a distance function. We obtained 4 spatially contiguous clusters.

The results of this first step allowed us (*i*) to analyse the socio-economic structure of the neighbourhoods of Seville and to detect the existence of spatial disparities at the sub-municipality level and (*ii*) to obtain the second level units for the multilevel regression analysis. The latter represents the second step of the empirical approach applied here. Before that, it was necessary to run a geoprocessing procedure in order to assign each school (represented by a point identified by x and y geographical coordinates) to a given census tract and, therefore, to a specific cluster. On the basis of the results obtained, we carried out a first descriptive analysis about school distribution and type (public or subsidised private school) per cluster. Next, we ran a multilevel regression model with interaction effects (second step of the empirical analysis).

The model is based on two levels: schools (first level, 102 statistical units), and clusters of census tracts (second level, 4 statistical units). The dependent variable (*y*) is the "score" achieved in the scientific test (Maths and Science) by pupils of each school in 2008. As independent variables (*x*) we used the index of the cultural and social level of the pupil's household (ICS), and two dummy variables, the former related to the type of schools (public or subsidised private school), while the latter is related to the clusters which each school belongs to. In the regression analysis, cluster 4 acts as a comparison level.

The models can be formally defined as:

$$Y = \alpha + \beta ICS + \gamma(ICS{*}PU) + \delta PU + \theta_1(PU{*}ICS{*}CL1) + \theta_2(PU{*}ICS{*}CL2) + \theta_3(PU{*}ICS{*}CL3) + \varepsilon$$

where:

*Y* is the dependent variable, i.e., the scores obtained by pupils in Mathematics and Science observed at N schools with $i = 1,..,N$ for a total of 102 schools; ICS is a continuous independent variable that represents the cultural and social level of the pupils' households. This variable is related to each school; PU is a dummy independent variable with a value of 1 if the school is public and 0 otherwise; CL1, CL2, and CL3 are dummy independent variables that tell us which cluster the school belongs to; $\varepsilon$ is the error of the model. The model has been estimated using the Mean Square Error approach.

In this way, we can summarise that the model uses 4 variables, 1 dependent (y) and 3 independents (x_i). The dependent variable (y) is the score achieved in the scientific test (Maths and Science) by pupils of each school in 2008. This variable is measured at the pupil level but is aggregated by school, with data available for 102 schools in Seville. Descriptive statistics for this variable are presented in Table 1.

The independent variables (x), are:

A. Socioeconomic and Cultural Index (ISC): is a continuous variable and it is measured with regard to the household of the pupils in each school. This means that we have an ISC value for each of the 102 schools in Seville. Table 2 presents descriptive statistics for this variable

B. A dummy variable on the type of school: public (1) or not (0)
C. A dummy variable on the type of cluster to which the school belongs to: CL1 (1/0); CL2 (1/0); CL3(1/0); as obvious CL 4 remains out (as is included in the model as benchmark).

**Table 1**
Descriptive statistics about the dependent variable.

| Number | Min. | Max. | Mean | Standard deviation |
|---|---|---|---|---|
| 102 | 334.1 | 651.5 | 514.9 | 51.3 |

## 4. Results

### 4.1. Cluster analysis

Before presenting the results of the cluster analysis, it is important to describe the spatial distribution of the four indicators selected for analysis. As can clearly be seen on the maps in Fig. 1, each indicator is characterized by a certain spatial variability related to the social geography of the city. As proved by several recent contributions about the social and economic inequalities of Spanish urban context, Spanish cities are characterized by deep-rooted spatial inequalities that are linked with the different social structures and hierarchies of the urban fabric, very often revealing the existence of a dual space: the city of the rich and the city of the poor (Benassi & Iglesias-Pascual, 2023; Iglesias-Pascual et al., 2023).

This also holds in the case of Seville. As can be seen from the maps, young people tend to be concentrated on the "border" of the city especially in the north-west quadrant. In contrast, there is a high percentage of economic migrants in the city centre and on the eastern outskirts of the municipality. The high-income population is essentially concentrated in some parts of the city centre and, in general, in the southern quadrant of the city. Finally, the worst housing conditions are found in the north-eastern part of the city.

The results of the cluster analysis are presented in Fig. 2 and Table 3. The K-means method is a non-hierarchical clustering approach, so that the researchers had to set a number of clusters beforehand. To establish the number of clusters, we followed the suggestions made by Vickers and Rees (2007). We tested different solutions (i.e., different number of clusters) to see which of them guaranteed a better performance in terms of classification and, most importantly, in terms of interpretation of the results achieved (e.g., usefulness). On this last point, one important dimension to consider is the knowledge of the spatial context in which the analysis is carried out. We finally agreed on the 4-cluster model as the best solution.

The percentage ratio of the between-cluster sum of squares to the total sum of squares is about 40 %. Cluster 1 is the largest in terms of number of census tracts (178) and its main characteristic is the very high percentage of population, with an income per unit of consumption above

**Table 2**
Descriptive statistics about the ISC.

| Number | Min. | Max. | Mean | Standard deviation |
|---|---|---|---|---|
| 102 | −1.4 | 1.4 | 0.3 | 0.6 |

[10] The initial number of indicators was higher and equal to 9. A correlation analysis based on Pearson's linear correlation coefficient was used to select a set of indicators which were not correlated with each other. The results are available from the authors upon request.

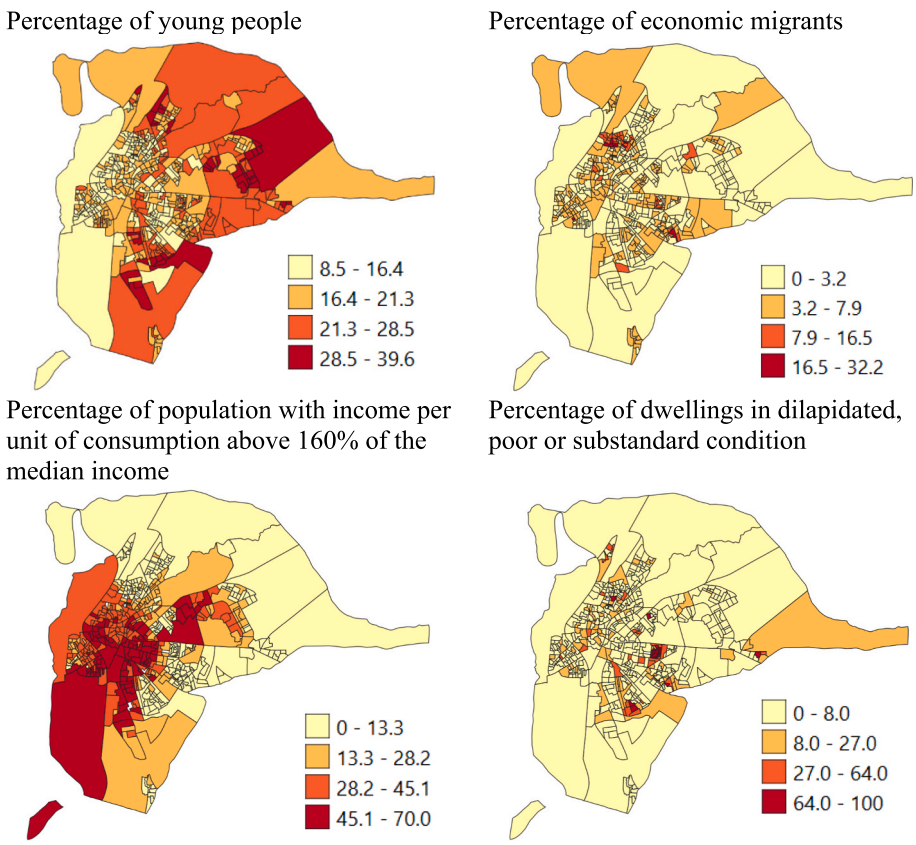


**Fig. 1.** Spatial distribution at the sub-municipality level (census tracts) for the four indicators used in the cluster analysis ('Natural breaks' maps).

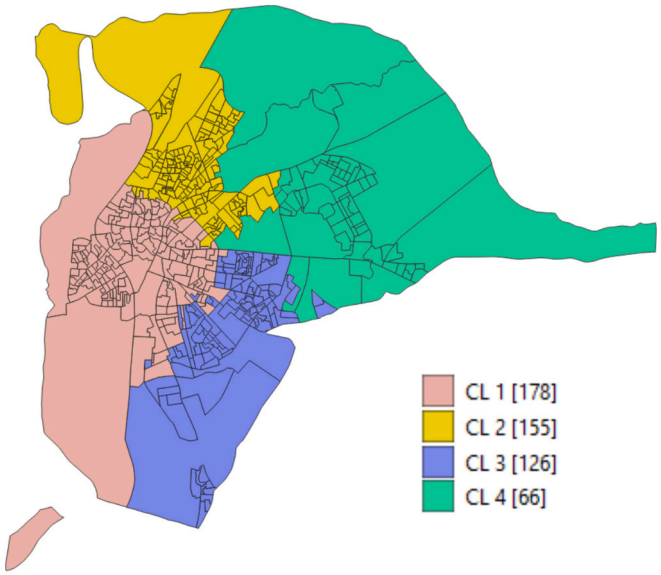


**Fig. 2.** Clusters obtained [with number of census tracts per cluster].

160 % of the median. This is, basically, a "rich cluster", containing the lowest level of percentage of dwellings in poor condition, which evidences the comparative high quality of the environment, thus creating a better habitat. Indeed, the percentage of young people that reside in this cluster is the lowest, and the percentage of economic migrants resident in this cluster is negligible. Cluster 1 starts in the city centre and extends over the south-eastern quadrant of the city. Cluster 2 is made up of 155 census tracts, and is located on the north-eastern quadrant of the city. It contains the highest percentage of economic migrants, making it,

**Table 3**
Analysis of clusters.

| Clusters | Percentage of young people | Percentage of economic migrants | Percentage of population with income per unit of consumption above 160 % of the median | Percentage of dwellings in dilapidated, poor or substandard condition |
|---|---|---|---|---|
| 1 | 17.12 | 2.92 | 43.05 | 4.38 |
| 2 | 17.74 | 4.91 | 14.83 | 5.20 |
| 3 | 20.43 | 4.14 | 10.48 | 16.70 |
| 4 | 25.80 | 2.34 | 16.61 | 4.39 |
| Seville | 20 | 3.7 | 24.4 | 7.5 |

essentially, the "migrants' cluster", where, in addition, the percentage of poor-quality housing is comparatively high. Meanwhile, Cluster 3 is composed of 126 census tracts mainly concentrated in the south-western part of Seville, with a high percentage of young people, but, most significantly, a high level of poor-quality housing (the highest level of all the clusters), making a relatively poor-quality habitat. In this cluster, the percentage of economic migrants is also high. The last cluster, 4, is the smallest one, with 66 census tracts, and is located across the north-western part of the city of Seville. It is mainly characterized by a high percentage of young people, the lowest percentage of economic migrants and comparative high level of population with income per unit of consumption above the 160 % of the median income.

### 4.2. *Spatial distribution of schools in clusters*

The distribution of school supply may differ from one cluster to another, not only in terms of number of schools, but also in terms of the type of school (public or subsidised private school). Thus, analysing how schools (by type) are distributed in the suburban space of Seville can

help us to understand the spatial relationship between the socio-economic profile of the clusters and the quantity and quality of the supply of secondary education.

From the spatial distribution of schools inside each cluster, interesting spatial disparities can be observed. First of all, the distribution is centripetal, in that the majority of the schools are concentrated in the city centre. Secondly, subsidised private schools appear to be more scattered compared to public schools (Fig. 3).

The indicators shown in Fig. 4 allow us to explore the spatial disparities in terms of school distribution and type between clusters. Cluster 1 records the highest number of schools (42 schools equal to 41.2 %), while the lowest number of schools is found in Cluster 4 (16 schools equal to 15.7 %). This seems fairly obvious, since Cluster 1 is the largest in terms of census tracts, while the opposite is true for Cluster 4. However, we are more interested in the composition of schools by type than simply the stock per cluster. The richest clusters (CL1) record the highest proportion of subsidised private schools per cluster, while the lowest value for this indicator is found in Cluster 2, which is a comparatively fragile cluster (characterized by the highest percentage of economic migrants).

Moreover, Cluster 1, records the highest concentration of subsidised private schools (more than half the total number of private schools in Seville are included in this cluster). Cluster 2, in contrast, records the lowest percentage of these schools. To measure the imbalance between public and subsidised private school supply within each cluster, we propose a simple yet informative metric: the Imbalance Index of School Supply (ISS). This index ranges from −1.0 to +1.0, where +1.0 indicates that all schools in the cluster are subsidised private, and −1.0 indicates that all are public. A value of 0.0 represents a perfectly balanced distribution between the two types. The ISS effectively highlights the uneven distribution of school types across clusters.

### 4.3. Multilevel regression models with interaction effects

Finally, after analysing the characteristics of each cluster from a social perspective and examining the distribution of educational centres by type of management (public or subsidised private), the regression model allows us to explore the relationship between local socio-educational variables and pupil performance in Language and Mathematics tests. The model also accounts for the effect of the cluster in which each school is located. The explanatory power of the model is relatively strong, with an $R^2$ value of 0.69. The results are presented in Table 4.

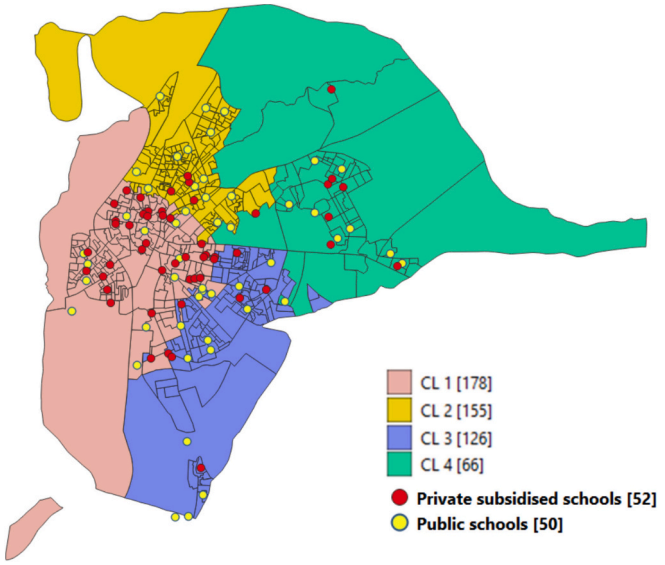


**Fig. 3.** Schools by type (public or subsidised private school) in each cluster.

The cultural and social level of the households has a positive estimated coefficient $\beta$. This means that when the value of this variable is higher, the same holds for the score in scientific test from a general point of view, considering all the schools regardless of the cluster which they belong to.

The coefficient $\delta$ of the dummy variable PU (which should be compared only with the constant of model $\alpha$) is negative. This means that, on average, the average score obtained by pupils in public schools in Maths and Science tests, all other condition being equal, is lower.

Coefficient $\theta_2$ shows that the interaction between the cultural and social level of the households and the public schools has a positive effect on y only in cluster 2. This is due to the interaction with CL2 and CL3 not being statistically significant ($p > 0.05$), while the one related to CL4 (e.g., ICS*PU) is not statistically significant either ($p > 0.05$).

To sum up, the social and cultural level of the pupils' households have a direct (positive) effect on y. Being enrolled in a public school, on the contrary, has a negative effect on y. This holds for Seville as a whole and in all the clusters with the exception of Cluster 2. In this cluster, as we can clearly see, the interaction between ICS and PU is positive, so that being enrolled in a public school, all conditions being equal, has a positive effect on y.

## 5. Discussion and conclusions

This research was based on three research questions that initially questioned i) whether the distribution of subsidised private schooling in Seville was balanced and therefore present in all social areas of the city, and ii) the role of neighbourhood contex and socio-residential inequalities in educational outcomes. In this regard, there is an initial paradox: there is clearly a major imbalance in both the number of schools according to their type of management, public or subsidised private, and in their distribution, with more subsidised private schools than public ones, and the former are mainly concentrated in the wealthier areas of the city. It can therefore be seen that the strategy employed by successive regional governments to try to achieve a balanced, public and socially equitable education system seems to have failed (Bonal et al., 2019). In fact, it is clear that the model based on the development of subsidised private schools has not managed to solve the imbalances that were already evident in Seville from the beginning and middle of the 20th century (Almuedo Palma & García, 2023).

Like previous research (Boterman, 2019; Murillo & Belavi, 2021; Reardon, 2016), this research at the local level shows that the pupils' social and family environment is a crucial element in understanding their differences in school results, with pupils living in wealthier clusters generally performing better. This tendency is even more pronounced if we consider the results of pupils in subsidised private schools.

Finally, our last research question examined the extent to which the current educational model contributes to social reproduction and the perpetuation of social inequalities at the local level. In this regard, it is clear that, despite the limitations of our contextual approach, the better results obtained by pupils in wealthier clusters and especially in subsidised private schools show that the distribution of schools in the city and the school admissions system has not managed to reduce the segregating effect of the tendency of middle-class families to seek schools where the profile of pupils is as socially homogeneous as possible (Ramos Lobato & Bernelius, 2023; van Zanten, 2009; Van Zanten & Kosunen, 2013). Thus, we can consider that the social function of education to facilitate upward mobility is rendered ineffective if such problems persist.

In general, the literature used in this paper has shown a common pattern in the European and American context of increasing school segregation and social inequality, the growing weight of private and subsidised private education, cuts in public education and its relation with inequalities in students' academic results. Examples of this can be found in the United States (e.g. Reardon & Owens, 2014), different

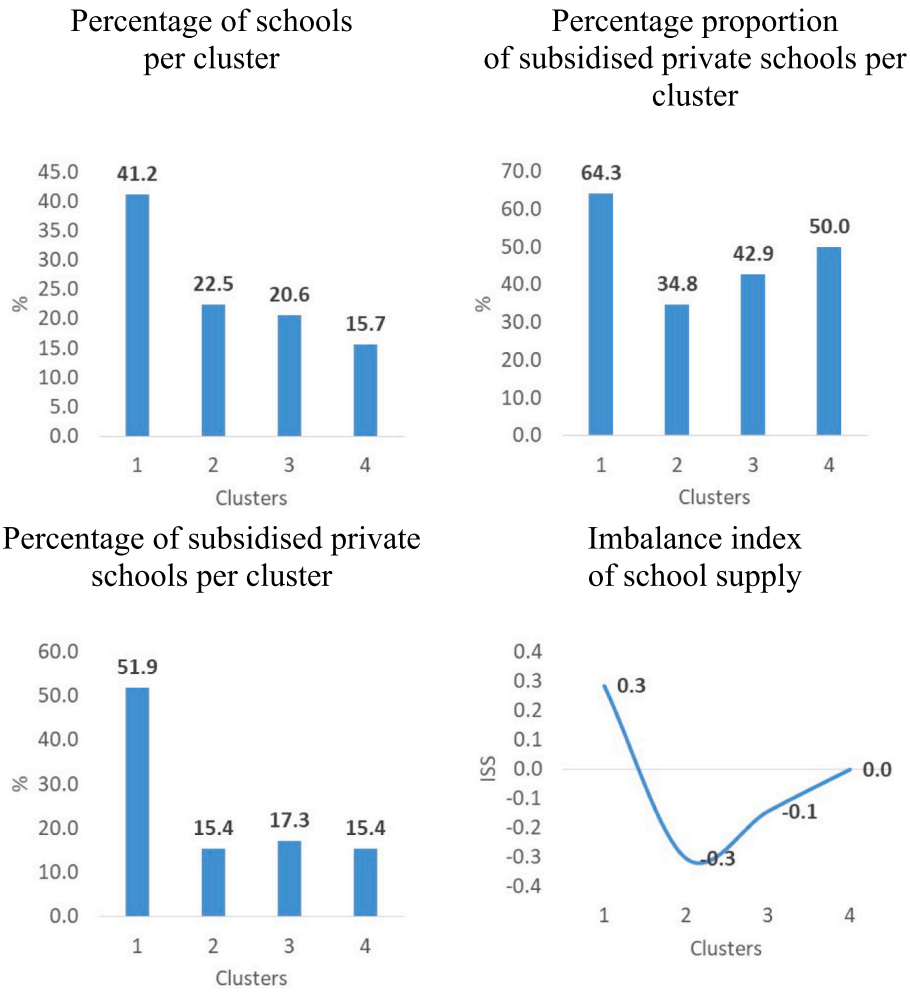


**Fig. 4.** Some indicators about secondary schools and socio-economic clusters in the city of Seville.

**Table 4**
Results of the multilevel model with interaction effects.

| Model | Unstandardized | Standard Error | Standardized[a] | t | p |
|---|---|---|---|---|---|
| (Intercept) | 517.886 | 5.512 | | 93.949 | < 0.001 |
| ICS | 45.318 | 7.034 | 0.593 | 6.443 | < 0.001 |
| ICS*PU | 20.386 | 17.035 | 0.164 | 1.197 | 0.235 |
| PU | −37.938 | 7.859 | | −4.827 | < 0.001 |
| PU*ICS*CL1 | −3.538 | 20.225 | −0.016 | −0.175 | 0.862 |
| PU*ICS*CL2 | 88.078 | 35.955 | 0.177 | 2.450 | 0.016 |
| PU*ICS*CL3 | −20.260 | 21.396 | −0.098 | −0.947 | 0.346 |

[a] Standardized coefficients can only be computed for continuous predictors.

European countries (e.g. Boterman, 2019; Maloutas et al., 2019), Argentina (Serrati, 2024), Brazil (da Cunha et al., 2009) and in OECD countries generally (Chmielewski and Reardon, 2016; Wang & Wu, 2023). It is therefore clear that the trend is not exclusive to Seville or Spain.

However, our results from the Seville case study at the local level allow us to reflect on whether the efforts made by the different Spanish educational administrations have been able to reverse the educational inequalities existing after thirty-nine years of dictatorship. Although this case study does not allow us to generalise about the Spanish and European education system in general, the socio-territorial approach developed at the census tract level allows us to highlight at least two deficiencies that should be taken into account. Firstly, it is clear that an equitable distribution of schools in the territory has not been achieved, nor has the territorial inequality whereby the majority of schools were located in the most prosperous areas of the city been reversed. Secondly, it can be seen that these deficiencies are particularly striking in disadvantaged areas, where more investment in education is needed to compensate for these inequalities of origin.

In fact, this issue is once again paradoxical, especially when our results show that in poorer areas where there are fewer subsidised private schools, the educational outcomes of pupils in public education are better. This appears to show that a greater support for the development of public education to the detriment of subsidised private education might generate a much more equitable, fairer and quality education system, especially if we take into account that, in many cases, the attractiveness of subsidised private schools is based exclusively on their social filter. Moreover, in addition to the public subsidy, these schools often charge families extra fees, especially for extracurricular activities, which to a large extent make it impossible for low-income families to

access these types of schools. Additionally, the supposedly better educational results of these schools are sometimes based on an artificial, unrealistic inflation of pupils' grades by teachers in order to achieve greater prestige (https://elpais.com/educacion/2023-05-04/el-defensor-del-pueblo-de-navarra-pide-investigar-si-dos-colegios-del-opus-inflan-las-notas-del-bachillerato.html).

Considering all this, it is clear that in Spain in general and in Andalusia in particular, there is a need for an educational strategy that reinforces the public education system as a fundamental element to reverse or at least counterbalance the growth of social polarisation occurring in Western societies. Until now, the Spanish education system in general, through its different autonomous policies, has been committed to a system in which subsidised private education carries a great weight, especially because it is cheaper to finance. Thus, whether due to savings in public spending or for ideological reasons, in Spain, as in other Western countries, there is a growing trend towards public funding of private education (Beavis, 2004; Larsen et al., 2023). However, our results show that despite the neoliberal tendency to reduce public spending, alternative measures should be applied in disadvantaged neighbourhoods to reinforce social capital and improve school results (Dahan, 2011). In this context, enhancing existing services such as school support programmes and the use of schools in the afternoons, or strengthening social infrastructures such as libraries as a space for boosting cultural and educational standards could reinforce school results and social capital in socially-vulnerable areas (Álvarez et al., 2018; Bonal et al., 2015; Rowe & Perry, 2020; van Melik & Merry, 2021).

Even in Andalusia, where the demographic decline and ageing is beginning to tell in a reduction in the number of pupils, the largest number of classroom closures is occurring in public education, while subsidised private education has been affected little (https://elpais.com/educacion/2021-04-29/cientos-de-familias-andaluzas-rodean-el-parlamento-por-el-cierre-de-aulas-publicas.html). In this context, the decline in pupil numbers could be a great opportunity for a realignment of the distribution of Andalusian and Spanish education funding to strengthen public education. The possibility of lowering the pupil/classroom ratio while maintaining the number of teachers opens up the possibility of redressing the imbalances that this study on Seville has highlighted.

All in all, we can consider that our results show that in the wealthier areas of the city, studying in a subsidised private school is linked to obtaining better results, while in areas where subsidised private schools are less common and public education has a higher profile, the results are better in public schools, despite being located in a particularly vulnerable environment. This urges us to reflect on the need for change in the educational policy of the Spanish state and the autonomous regions to reinforce public education over private education as a fundamental means of ensuring that education is an agent of social change, especially in vulnerable neighbourhoods. Thus, our results show how with this model, public funding would be used to perpetuate social and educational differences and not to reduce them, which, after all, is the theoretical aim of education in general and public education in particular. It is clear that the current model of subsidised private schools has not fulfilled its original function, as it has focused on the most favoured areas and reinforced the concentration of pupils in the areas where the wealthiest families live, therefore contributing to perpetuating educational segregation and social differences.

## CRediT authorship contribution statement

**Ricardo Iglesias-Pascual:** Writing – review & editing, Writing – original draft, Supervision, Funding acquisition, Data curation, Conceptualization. **Carmen Merchán-Hernández:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis, Data curation. **Federico Benassi:** Writing – review & editing, Writing – original draft, Software, Methodology, Formal analysis, Data curation.

## Declaration of competing interest

None.

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## Data availability

Data will be made available on request.

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