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# Equity and Parity in Primary Education: A Study on Performance in Language and Mathematics Using Hierarchical Linear Models

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**Abstract:** Education plays a crucial role in the development and consolidation of equality in society, which is reflected in the SDGs of the UN 2030 Agenda. Knowing the educational performance of schools is necessary to diagnose needs, evaluate proposals and undertake improvements in education policies. This study pursued a twofold objective: (1) to assess the equity and parity of Andalusian schools in relation to the competencies of mathematical reasoning and linguistic communication and (2) to study the relationship among educational performance, equity and parity in these competences. Hierarchical linear model research was designed and implemented in a population of 79,806 schoolchildren and 2092 schools. The results confirmed differences in equity and parity among schools. A relation was found between higher effectiveness and higher parity. Nonpublic schools are not more efficient than public schools; rather, it is the average economic and sociocultural status of schools that controls for their effectiveness. In conclusion, the educational system does not guarantee the same opportunities for all children; thus, the equity and parity of educational systems should be key criteria for their evaluation, ensuring that quality education reaches everyone equally. Further implications are also discussed.

**Keywords:** educational evaluation; educational quality; educational accountability; student evaluation; academic achievement; educational efficiency; educational output; equal opportunity; social mobility; democratization of education



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## 1. Introduction

The welfare of a society is directly linked to the level of equality among its individuals [1]. An egalitarian society is a society prepared to achieve functional, sustainable growth and development based on democratic values [2]. For this reason, the United Nations has established the reduction of inequalities as one of the priority objectives in its 2030 Agenda for Sustainable Development [3].

Education plays a crucial role in the development and consolidation of equality in society [1,4,5]. In addition to the need to educate with equality, it is also essential to educate in the context of equality [6,7]. Achieving equal education is the first step on the path to sustainable development of a society, and this is directly related to the fourth Sustainable Development Goal (SDG) proposed in the 2030 Agenda: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" [3].

For these reasons, the evaluation of the quality of education has been a constant focus of public administrations. Knowing the educational performance of schools is necessary to diagnose needs, assess proposals and undertake the required changes in terms of educational policies [8–10].

Public administrations, aware of the importance of offering quality education, use standardized diagnostic tests administered in a given cycle and grade to evaluate the level

and evolution of educational quality in schools [11]. This type of large-scale evaluation allows the identification of factors that exert a significant impact on school effectiveness and educational performance [12,13], thereby providing schools and educational administrations with the opportunity to identify deficiencies and design improvement lines [14,15]. In this way, the suitability and effectiveness of educational policies and curricular plans can also be assessed [8].

The complexity of learning processes and the wide range of variables that influence them make it difficult to implement studies that yield generalizable results [16–18]. Diagnostic tests focus primarily on academic achievement and pay less attention to other contextual factors, whose impact on students' socio-educational development has been widely studied and should be considered in the evaluation of educational quality [9,19]. Currently, equity is included as a measure of school effectiveness in addition to excellence. Accordingly, to determine the level of school effectiveness, not only should academic performance be analysed but also the ability of schools to reduce differences among students that are derived from the economic and cultural contexts to which they belong [10,20,21]. Among studies that have sought to identify processes that improve educational practice in relation to academic performance and school effectiveness [22,23], it is worth highlighting the connection between progress in gender equality and improved academic results, which has been demonstrated in international tests. There is an even closer relationship between these factors than between performance and economic factors [24]. For that reason, parity constitutes, together with equity, one of the fundamental criteria currently used to assess the quality of the educational system, and both have been postulated as major criteria for educational intervention and evaluation [25,26].

## 2. State of the Art

The power of education as a socializing and democratizing instrument has been widely studied [27–29], as schools represent the most powerful tool for socioeconomic mobility [7,30]. Aspects such as family background—linked to economic, social and cultural status (ESCS)—and gender stand out for having received greater attention from the scientific community [14]. The ESCS is an index calculated from contextual questionnaires that accompany large-scale assessments. These include variables such as parents' work and academic level or access to certain material and cultural resources, among others. Such information is synthesised by performing a factor analysis [31]. The social background of students influences their academic performance [9]; however, schools have the potential to reduce these differences [1,32]. Therefore, it is the responsibility of schools to provide equal quality education that acts as a protector and social elevator, especially for students in more disadvantaged situations [33–35], by offering equal opportunities [7,36].

One connection found between ESCS and academic achievement establishes a relationship between students who repeat grades (frequently associated with school failure) and the ESCS characteristic of disadvantaged contexts [37]. This relation suggests that the socioeducational level of parents or guardians appears to be related to the educational level of their children [38], which means that educational systems are unable to guarantee students' upward social mobility. Some authors have proposed, as a solution, intervention in families with lower ESCS through occupational training and education [18,39].

It has been proven that, in addition to the ESCS associated with the student body, the average ESCS of schools also explains an important percentage of the variance corresponding to the educational performance of the student body [39–44]. Therefore, educational administrations must consider it an urgent objective to promote greater diversity in schools to avoid the high concentration of students with low ESCS [39,42].

The concept of equity has been widely discussed in the scientific literature from the perspective of socioeconomic inequalities; however, inequity can also occur and be studied within other dimensions, such as the existing differences in relation to the urban or rural environment, the subnational unit and racial or gender factors [45]. Parity—or gender equality—at the global level, specifically in the world of education, is one of the

most studied aspects at present and has received the most attention from educational administrations and international institutions. This aspect is reflected in 3 of the 17 SDGs that include a gender perspective: SDG 4, quality education; SDG 5, gender equality; and SDG 10, reducing inequalities [3].

Among the aforementioned SDGs, the fifth proposes the need to "achieve gender equality and empower all women and girls" [3]. Improvements in gender equality, translated into greater representation of women in politics, a decrease in the maternal mortality rate or a decrease in teenage pregnancies, would be related to improved results in international tests such as the PISA for both male and female students [24]. These results would allow us to infer that countries concerned with reducing the gender gap between male and female students would have greater educational success. Therefore, educating with equality represents a fundamental part of the legality established in the Spanish educational system [6,15], and for this reason, it is essential to evaluate gender equality in Andalusian schools to assess the quality and effectiveness of education. Differentiated academic performance between boys and girls could provide clues about the level of parity in schools; however, there are a series of sociocultural, psychobiological and neuroscientific variables that must be considered when assessing such differentiation in results [7,26,41,46–70].

First, it is necessary to consider the impact of sociocultural elements related to gender roles in the various communities existing in the national and supranational geography [46]. The lack or underrepresentation of intellectual female role models, or those with a marked academic relevance, in the sociocultural imagination of female students, could exert an impact on their perceptions and expectations, which would consequently be reflected in their academic performance [47,48]. In relation to social gender roles, [66] found that team sports—as a social activity—are more common among boys and are related to better cognitive performance. In contrast, participation in extracurricular social activities—sports or not—in girls has shown a direct benefit to their cognitive performance, regardless of the sports factor. That is, for boys, the relationship between social physical activities (such as team sports) and increased cognitive performance is more important than for girls, who can access the cognitive benefits of group membership through other social activities unrelated to sports (e.g., music). Another variable related to the situational context is the educational strategies of the environment in which the child develops during his or her early childhood stage (<5 years), which also influence the subsequent performance of the student body. Specifically, the relationship between effortful control by caregivers of 3-year-old children and the development of inhibitory control in the same children 2 years later has been studied. There are gender differences in such relationships as well, as such influence is more pronounced in boys than in girls [50].

From a psychobiological perspective, it has been found that, at very early ages (3 to 6 years), girls show, compared to boys, better motor, linguistic, social and cognitive development [51] and that this maturational advantage continues until their entry into puberty and adolescence [52]. From a theory-of-mind perspective [53,54], differences in cognitive and social maturational aspects have also been found between boys and girls. Studies have shown that both boys and girls attain the same outcomes, but girls develop these aspects earlier [53], especially those related to the ability to identify and attribute various kinds of perceptions (emotions, intentions, beliefs, etc.) and apply them in the understanding, prediction and explanation of behaviours, both their own and others [54], which exerts a highly significant impact on social [54] and cognitive [53] development.

From a neuroscientific perspective, differences have also been found between boys and girls that may influence their academic performance. As explained by Fox-Fuller et al. [55], the scientific literature suggests that the neural structures involved in working memory tasks may be different in boys and girls [56]. For example, while boys perform better on mental arithmetic, girls perform better on the digit span test [57]. The auditory working memory required in this type of test, on which girls seem to perform better [55], exerts a significant impact on the performance of reading comprehension tasks [71] and has also been related to verbal episodic memory [72]. Comparative studies conducted on

mathematical reasoning competence and communicative competence in boys and girls have found a correlation between worse results in mathematical reasoning and better performance in communicative competence in the case of female students in secondary education (12–16 years old) [7,41,46,58–65,68–70]. Notably, however, such differentiation seems to be absent at earlier stages [45,48], with female students' overall performance being higher in both competencies [67].

Against this backdrop, diagnostic assessments are a useful tool, as they serve as a reference for decision-making at different levels of the education system [73]. In the Spanish context, previous legislation established the improvement of results in large-scale evaluations as one of the lines of improvement [74]. Current Spanish legislation provides for diagnostic assessments to serve as a reference for promoting improvement plans in schools [75]. The Andalusian Agency for Educational Evaluation (Agencia Andaluza de Evaluación Educativa, AGAEVE) was created with the aim of improving Andalusian results and consolidating a demanded culture of evaluation [76]. This institution was extinguished in 2019, when its functions were taken over by the General Direction of Educational Planning and Evaluation [77]. The demands of Spanish educational legislation and its different autonomous communities have inspired the creation of a network of studies on school effectiveness and educational improvement, with research groups in regions such as La Rioja [62], Valencia [78], the Balearic Islands and the Basque Country, among others [79].

This study focused on Andalusia, an autonomous community in southern Spain with more than 550,000 students in primary education [80], which has historically shown below-average academic performance on national and international tests [81,82]. It should also be noted that the Andalusian Autonomous Community is one of the regions with the lowest socio-educational development in Europe [83], being also the Spanish region with the lowest level of upward intergenerational mobility and with the greatest differences between rich and poor [84].

For this reason, the following questions, which are linked to the proposed study objectives, were posed in this study: (1) Are Andalusian schools egalitarian and equitable? (2) Is educational funding (private, subsidized or public school) related to equity? To answer the questions posed, a nonexperimental and correlational study was carried out that pursued the following objectives:

Objective 1: To evaluate the equity and parity of Andalusian educational schools in relation to the competencies of mathematical reasoning (MR) and linguistic communication (LC).

Objective 2: To study the relationship among educational funding, equity and parity in MR and LC competencies.

Specifically, the aim was to determine whether the schools demonstrate parity and whether parity is demonstrated to a greater or lesser extent in public, subsidized or private schools. To this end, we chose to analyse the academic performance of boys and girls in the different types of schools.

## 3. Materials and Methods

### *3.1. Instruments*

Two instruments of the Andalusian Agency for Educational Evaluation (Agencia Andaluza de Evaluación Educativa, AGAEVE) were used to carry out the research. The ESCALA tests (Escritura CALculo y Lectura en Andalucía) consist of the administration of two standardized tests: one that assesses MR proficiency and another that assesses LC proficiency. They are administered in the second year of the primary education stage, i.e., between the ages of 7 and 8. The purpose of the assessment is to provide information about the education system to schools, inspectors and policy-makers [76]. The second instrument consists of a context questionnaire for families. The questions in the context questionnaire focus on the family's socioeconomic situation and other education-related aspects, such as involvement in the school or the time dedicated to schoolwork.

The following variables were used for the study:

- MR and LC competence levels: These two variables were used as indicators of students' educational performance. The standardized score provided by the AGAEVE was used, with a mean of 500 and a standard deviation of 100 for each case.
- Economic, social and cultural status (ESCSN1) of students: obtained from the factor analysis (PCA) of the variables of the context questionnaire referring to this aspect (see Table 1).

**Table 1.** Variables and values included in the context questionnaire conducive to ESCN.

| Variables | Questions | Answer Options |
|---|---|---|
| Amount of resources available at home | - room only for your daughter or son<br>- adequate place for study<br>- access to the internet<br>- educational software on the computer to facilitate learning<br>- electric dishwasher<br>- dryer<br>- digital book reader | dichotomous variable yes or no |
| Work | - inactive population<br>- domestic work in own household<br>- specialized personnel in agriculture and fishing, manufacturing industries, construction, mining and handicrafts<br>- personnel in catering, protection, sales and other services<br>- personnel in basic positions including security forces<br>- professional support technicians and technicians<br>- clerical and administrative employees<br>- small business<br>- professions requiring a university degree, and business management | ordinal scale |
| Level of study of both parents | - incomplete primary studies or did not attend school<br>- General Basic Education or Compulsory Secondary Education Degree<br>- Baccalaureate, First-Degree Vocational Training, BUP, COU, Intermediate Vocational Training or Arts<br>- Second-Grade Vocational Training or Higher-Level Vocational Training or Higher-Level Training Cycles in Vocational Training or the Arts, and Diploma, Bachelor's Degree, Degree, Doctorate | ordinal scale |
| Attendance at cultural activities | - cinema<br>- theatre<br>- museums or exhibitions | ordinal scale: not at all, a little, quite a lot, or a lot |
| Number of books owned | | number |

- Student sex (SexN1): A value of 0 was used to identify male students and 1 for female students.
- Type of school: nominal variable with 3 values (public = 1; subsidized = 2; private = 3).
- Economic, social and cultural status (ESCSN2) of school: average of the ESCSN1 variable for each school.

### *3.2. Population*

For the analysis of the educational performance of primary education students, we worked with census data corresponding to the 2016–2017 academic year, which were the latest available at the time at which the agreement with the AGAEVE was signed. After a data-cleaning process in which subjects with no scores on the independent variables and those belonging to schools with a response rate <11 were eliminated, the total used in the study was 79,806 students (49.1% M; 50.9% W), grouped into 2092 schools, of which 1598 were public and 494 were nonpublic (54 private and 440 subsidized).

### *3.3. Analytical Procedure*

For both objectives, linear hierarchical models were used, which allow for the consideration of the nested structure of the data, i.e., the student bodies within schools [85,86]. The null model, i.e., with no covariates, would be as follows [85,87] ($y_{ij}$: competence level; $\beta_0$: mean of the student's school competence level; $u_{0j}$: the residual associated with the school, i.e., how much school j deviates from the average of all schools; $e_{ij}$: the residual associated with the student, i.e., how far student i of school j deviates from the average of his or her school) [85,87]:

$$y_{ij} = \beta_0 + u_{0j} + e_{ij}$$

For Objective 1 (to evaluate the equity and parity of Andalusian educational schools in relation to RM and LC competencies), a random-effects model was used for each variable, in which the slopes and covariates were allowed to vary (Model A). The variable *parity* alludes to equality of opportunity in terms of gender, while the variable *equity* refers to equality of opportunity between different socio-economic contexts. The aim of this approach was to determine whether there was any relationship among slopes, intercepts and covariates. Hence, the variables sex and ESCSN1 were used as independent variables and RM and CL competences as dependent variables. The parentheses indicate the random effects of the model [85,86]. The resulting equation for this model would be:

$$\text{Competence\_levelN1}_{ij} = (\gamma_{00} + u_{0j}) + (\gamma_{10} + u_{1j})\text{SEX}_{ij} + (\gamma_{20} + u_{2j})\text{ESCSN1}_{ij} + e_{ij}$$

In the resulting equation, the coefficients represent:

- $\gamma_{00}$.—the grand mean of the intercepts, the mean of the means.
- $u_{0j}$.—the residual of each centre with respect to the intercept, i.e., the difference between the centre's intercept and the grand mean.
- $\gamma_{10}$.—the mean of the sex-associated slopes. The mean impact of sex on the dependent variable.
- $u_{1j}$.—the residual of each centre with respect to the mean of the sex slope, i.e., the difference between the impact that sex has on that centre and the grand mean of the sex-associated slopes.
- $\gamma_{20}$ and $u_{2j}$—the same but with respect to ESCSN1.
- $e_{ij}$—the residual associated with the student.

To respond to Objective 2 (to study the relationship among educational funding, equity and parity in RM and LC competencies), a fixed-effects model was employed in which ESCS was added as an interaction effect with the type of school (Model B) to evaluate the relationship between the type of school and its average ESCS. Again, the scores in each of the competencies were used as independent variables, while gender, ESCSN1, ESCSN2 and school type in interaction with ESCSN1 were used as dependent variables. This allowed us to find out whether the interaction of school type with ESCSN1 had an influence, as well as controlling for the average ESCS of the school by incorporating ESCSN2. The resulting equation was as follows:

$$\text{Competence\_levelN1}_{ij} = \gamma_{00} + \gamma_{01}\text{Type\_school}_j + \gamma_{02}\text{Type\_school*ESCSN1}_j + \gamma_{03}\text{ESCSN2}_j + \gamma_{10}\text{SEX}_{ij} + \gamma_{20}\text{ESCSN1}_{ij} + u_{0j} + e_{ij}$$

In the resulting equation, the coefficients represent:

- $\gamma_{00}$.—the grand mean of the intercepts, the mean of the means.
- $u_{0j}$.—the residual of each centre with respect to the intercept, i.e., the difference between the centre's intercept and the grand mean.
- $\gamma_{01}$.—the mean impact of type of school on the dependent variable.
- $\gamma_{02}$.—the interaction effect between the ESCSN1 mean and the type of school.
- $\gamma_{03}$.—the impact of the school's ESCS mean (ESCSN2) on the dependent variable.
- $\gamma_{10}$.—the mean impact of sex on the dependent variable.
- $\gamma_{20}$.—the mean impact of ESCSN1 on the dependent variable.
- $e_{ij}$—the residual associated with the student.

Schools with fewer than 11 students were discarded from the analysis because small schools are subject to greater sampling variability [88]. Taking the likelihood ratio criterion as a reference, the difference between the null model and Models A and B was calculated and was significant, indicating that the models with covariates fit better than the null model.

## 4. Results

The results of the descriptive statistics for the competencies and ESCS are presented below (see Table 2). It should be noted that the minimum score was lower in MR, although the means and standard deviations of both competencies presented similar values.

**Table 2.** Descriptive statistics for the MR, LC and ESCS competencies.

| | Minimum | Maximum | Mean | Standard Deviation |
|---|---|---|---|---|
| LC | 129.57 | 613.46 | 505.8 | 96.11 |
| MR | 77.02 | 600.07 | 504.64 | 96.19 |
| ESCSN1 | −2.87 | 3.06 | 0.06 | 0.99 |

To address objective 1, the MR Model a is presented first. Table 3 shows the results for the fixed-effects model. Table 3 shows that both sex and ESCSN1 were significant, representing a 2.833463-point increase in favour of female students and a 22.883478-point increase for ESCSN1. Next, the equation for the random-effects model is presented:

$$MRN1_{ij} = (\gamma_{00} + u_{0j}) + (\gamma_{10} + u_{1j})SEX_{ij} + (\gamma_{20} + u_{2j})ESCSN1_{ij} + e_{ij}$$

**Table 3.** Fixed-effects covariance parameter estimates for MR competence.

| Parameter | Estimation | Standard Deviation | gl | t | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Limit | Upper Limit |
| Intersection | 502.802273 | 1.022408 | 2025.364 | 491.783 | 0.000 ** | 500.797193 | 504.807354 |
| SEX | 2.833463 | 0.606094 | 1704.825 | 4.675 | 0.000 ** | 1.644696 | 4.022229 |
| ESCSN1 | 22.883478 | 0.401720 | 1771.237 | 56.964 | 0.000 ** | 22.095583 | 23.671373 |

Dependent variable: MR. ** $p < 0.01$.

The random model for sex and ESCS is presented in Table 4 below. As shown in Table 4, the values for UN (1,1), UN (3,1) and UN (3,3) were significant. The value UN (1,1) corresponded to the variance of u0j (1774.69); that is, schools differ in intersections, and therefore, some schools will be more efficient than others. UN (3,3) corresponded to the variance of the slopes associated with ESCS ($u_{2j}$ = 91.95); that is, some schools will be more or less equitable. Finally, UN (3,1) corresponded to the covariance between the residuals u0j (intercepts) and $u_{2j}$ (ESCS slopes), i.e., there was a relationship between effectiveness and equity, respectively. In this case, by taking negative values, higher values of u0j (more effectiveness) were associated with lower values of $u_{2j}$ (inequity), such that more efficient schools will be more equitable.

**Table 4.** Random-effects covariance parameter estimates for the MR competence.

| Parameter | | Estimation | Standard Deviation | Wald Z | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Limit | Upper Limit |
| Residue | | 6956.221627 | 36.017887 | 193.132 | 0.000 ** | 6885.984859 | 7027.174806 |
| Intersection + SEX + ESCSN1 [subject = SCHOOL] | UN (1,1) | 1774.697602 | 68.077368 | 26.069 | 0.000 ** | 1646.160917 | 1913.270778 |
| | UN (2,1) | −26.914757 | 29.610140 | −0.909 | 0.363 | −84.949566 | 31.120051 |
| | UN (2,2) | 9.426570 | 20.913597 | 0.451 | 0.652 | 0.121870 | 729.142113 |
| | UN (3,1) | −372.601192 | 20.521500 | −18.157 | 0.000 ** | −412.822593 | −332.379791 |
| | UN (3,2) | 10.561069 | 10.303724 | 1.025 | 0.305 | −9.633860 | 30.755997 |
| | UN (3,3) | 91.958649 | 9.872540 | 9.315 | 0.000 ** | 74.509025 | 113.494883 |

** $p < 0.01$.

Table 5 shows that both sex and ESCS were significant, with a 28.350793-point increase in favour of female students and a 23.153339-point increase for ESCS. The points of increase in the LC competence associated with sex and ESCS were greater than those for the MR competence, especially in the case of sex. The following equation was used for the LC model:

$$LCN1_{ij} = (\gamma_{00} + u_{0j}) + (\gamma_{10} + u_{1j})SEX_{ij} + (\gamma_{20} + u_{2j})ESCSN1_{ij} + e_{ij}$$

**Table 5.** Fixed-effects covariance parameter estimates for LC competence.

| Parameter | Estimation | Standard Deviation | gl | t | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Limit | Upper Limit |
| Intersection | 490.812449 | 1.083132 | 1997.425 | 453.142 | 0.000 ** | 488.688262 | 492.936635 |
| SEX | 28.350793 | 0.618624 | 1684.773 | 45.829 | 0.000 ** | 27.137441 | 29.564145 |
| ESCSN1 | 23.153339 | 0.388263 | 1700.924 | 59.633 | 0.000 ** | 22.391816 | 23.914862 |

Dependent variable: LC. ** $p < 0.01$.

The randomized model for this competence is presented in Table 6 below. In this case, as seen in Table 6, all values were significant:

- UN (1,1): variance of the residuals $u_{0j}$ associated with the intercepts, that is, schools differ in effectiveness.
- UN (2,1): covariance between residuals $u_{0j}$ (intercepts) and $u_{1j}$ (sex slopes). They showed a negative relationship, i.e., as the intercepts (effectiveness) increased, the slopes (parity) decreased, and the most effective schools were those with the highest parity. This result might suggest that schools offering higher-quality education could help combat the gender gap, which in this case would benefit female students.
- UN (2,2): variance of the residuals $u_{1j}$ associated with the gender slopes. Significance indicated that schools differ in parity, i.e., there are schools where girls score higher, others where boys score higher and others with no difference.
- UN (3,1): covariance between the residuals $u_{0j}$ (intercepts) and $u_{2j}$ (ESCS slopes), that is, there was a negative relationship between effectiveness and equity. Therefore, more effective schools are more equitable, suggesting that effectiveness improves the quality of education in terms of equity, meeting the demands of the SDGs.
- UN (3,2): covariance between the residuals $u_{1j}$ (gender slopes) and $u_{2j}$ (ESCS slopes). There was a positive relationship between parity and equity, such that the most equitable schools would also have the highest parity, and conversely, the least equitable schools would also have the lowest parity.
- UN (3.3): variance between residuals $u_{2j}$ (ESCS slopes). Schools differ in equity, so there will be schools that are more equitable than others.

**Table 6.** Random-effects covariance parameter estimates for the LC competence.

| Parameter | | Estimation | Standard Deviation | Wald Z | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Limit | Upper Limit |
| Residue | | 6731.823524 | 34.890583 | 192.941 | 0.000 ** | 6663.785401 | 6800.556325 |
| Intersection + SEX + ESCSN1 [subject = SCHOOL] | UN (1,1) | 2042.368371 | 77.076788 | 26.498 | 0.000 ** | 1896.752409 | 2199.163445 |
| | UN (2,1) | −342.653935 | 35.203493 | −9.734 | 0.000 ** | −411.651514 | −273.656356 |
| | UN (2,2) | 63.507950 | 22.640574 | 2.805 | 0.005 ** | 31.577291 | 127.726588 |
| | UN (3,1) | −315.263714 | 20.704933 | −15.227 | 0.000 ** | −355.844638 | −274.682791 |
| | UN (3,2) | 47.071656 | 10.387062 | 4.532 | 0.000 ** | 26.713388 | 67.429923 |
| | UN (3,3) | 74.014037 | 9.295574 | 7.962 | 0.000 ** | 57.864199 | 94.671277 |

** $p < 0.01$.

To address Objective 2, a fixed-effects model was used in which ESCS was added as an interaction effect with the type of school. The variables included were type of school, sex, ESCS, ESCS aggregate (ESCSN2) and the interaction among type of school, sex and ESCS. To illustrate the educational reality of the school types, their average ESCS, standard deviation (SD), maximum and minimum are shared in Table 7. As shown, the composition in relation to ESCSN1 and ESCSN2 differs by school type, with ESCSN1 and ESCSN2 being highest in private schools, followed by subsidized schools and, finally, lowest in public schools.

**Table 7.** Mean, standard deviation, maximum and minimum of ESCSN1 and ESCSN2 by school type.

| | Public | | Subsidized | | Private | |
|---|---|---|---|---|---|---|
| | ESCSN1 | ESCSN2 | ESCSN1 | ESCSN2 | ESCSN1 | ESCSN2 |
| M | −0.0760 | −0.0759812 | 0.4420 | 0.4419682 | 1.1616 | 1.1615616 |
| SD | 0.42173 | 0.95109861 | 0.51401 | 0.97024301 | 0.21071 | 0.69398796 |
| Min | −2.57 | −2.86954 | −1.38 | −2.86954 | 0.41 | −1.67283 |
| Max | 1.36 | 3.06001 | 1.57 | 3.06001 | 1.46 | 3.06001 |

Table 8 presents the variables that were found to be significant ($p < 0.05$) for MR competence. For MR competence, both ESCSN1 and sex were significant variables, increasing by 14.2 points for each unit increase in ESCSN1 and 2.9 points for girls. ESCSN2 increased by 6.3 points for each unit increase in the mean ESCS of the school. The type of school was not significant; however, its interaction with ESCSN1 was significant. How can we interpret this result as an indicator of equity? To do so, let us clarify the equation for this result:

$$MRN1_{ij} = \gamma_{00} + \gamma_{01}Type\_school_j + \gamma_{02}Type\_school*ESCSN1_j + \gamma_{03}ESCSN2_j + \gamma_{10}SEX_{ij} + \gamma_{20}ESCSN1_{ij} + u_{0j} + e_{ij}$$

The following equation corresponds to a public school:

$$MRN1_{ij} = 503.1 + 6.3*ESCSN2_j + 9.8*ESCSN1_j + 2.9*SEX_{ij} + 14.2*ESCSN1_{ij} + u_{0j} + e_{ij}$$

$$MRN1_{ij} = 503.1 + 6.3*ESCSN2_j + 2.9*SEX_{ij} + 24*ESCSN1_{ij} + u_{0j} + e_{ij}$$

Therefore, the influence of ESCS would add 9.8 points to 14.2 for a total increase of 24 points for each ESCS value. A subsidized school would have the following:

$$MRN1_{ij} = 503.1 + 6.3*ESCSN2_j + 5.6*\ ESCSN1_j + 2.9*SEX_{ij} + 14.2*ESCSN1_{ij} + u_{0j} + e_{ij}$$

$$MRN1_{ij} = 503.1 + 6.3*ESCSN2_j + 2.9*SEX_{ij} + 19.8*ESCSN1_{ij} + u_{0j} + e_{ij}$$

In this case, the total influence of ESCS would be 19.8 points for each increase in ESCS. Finally, a private school would have the following:

$$MRN1ij = 503.1 + 6.3*ESCSN2_j + 0*\ ESCSN1_j + 2.9*SEX_{ij} + 14.2*ESCSN1_{ij} + u_{0j} + e_{ij}$$

$$MRN1ij = 503.1 + 6.3*ESCSN2_j + 2.9*SEX_{ij} + 14.2*ESCSN1_{ij} + u_{0j} + e_{ij}$$

**Table 8.** Significant variables for MR fixed effects.

| Parameters | Estimation | Standard Deviation | gl | T | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Limit | Upper Limit |
| Intersection | 503.129865 | 1.035728 | 2461.410 | 485.774 | 0.000 ** | 501.098877 | 505.160852 |
| SEX | 2.932911 | 0.603793 | 78,192.708 | 4.857 | 0.000 ** | 1.749479 | 4.116342 |
| ESCSN1 | 14.228953 | 2.541797 | 38,153.222 | 5.598 | 0.000 ** | 9.246966 | 19.210941 |
| ESCSN2 | 6.287675 | 1.922029 | 2315.728 | 3.271 | 0.001 ** | 2.518598 | 10.056752 |
| [Type_schoolN2 = Public] * ESCSN1 | 9.818818 | 2.565481 | 37,886.520 | 3.827 | 0.000 ** | 4.790409 | 14.847227 |
| [Type_schoolN2 = Subsidized] * ESCSN1 | 5.558463 | 2.639664 | 38,161.813 | 2.106 | 0.035 * | 0.384654 | 10.732271 |
| [Type_schoolN2 = Private] * ESCSN1 | 0 | 0 | . | . | . | . | . |

Dependent variable: MR. This parameter is set to zero because it is redundant. ** $p < 0.01$. * $p < 0.05$.

The slopes associated with ESCSN1 decreased in the case of subsidized and private schools, suggesting that public schools could be considered less equitable. However, given that ESCSN2 was significant, it could be considered that students who share schools with peers with higher ESCSN1 would earn higher scores; therefore, the educational system would not be equitable. Furthermore, when the effect of ESCSN1 was controlled, the type of school funding had no influence, therefore implying that the sociocultural variables of the schools are responsible, to a greater extent than the funding type, for students' educational performance. The interaction effect of sex and school type was not significant, which could be interpreted as meaning that schools, taking the type of school funding as a reference, do not differ in parity.

Similar results were observed for LC competence (see Table 9). However, there were greater increases in the scores of female students and in ESCS at both levels, which could indicate that the influence of sex and ESCSN1 on LC competence would explain the greater variance (see Table 9). Likewise, subsidized and private schools would be more equitable than public schools, and the sociocultural composition of the schools would control for the effects of the type of school.

**Table 9.** Significant variables for the fixed effects of LC.

| Parameters | Estimation | Standard Deviation | gl | t | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Limit | Upper Limit |
| Intersection | 490.925842 | 1.020752 | 2435.289 | 480.945 | 0.000 ** | 488.924211 | 492.927473 |
| SEX | 28.462544 | 0.593910 | 78,182.553 | 47.924 | 0.000 ** | 27.298484 | 29.626603 |
| ESCSN1 | 13.313820 | 2.499462 | 38,221.188 | 5.327 | 0.000 ** | 8.414810 | 18.212830 |
| ESCSN2 | 14.662575 | 1.894280 | 2291.429 | 7.740 | 0.000 ** | 10.947894 | 18.377257 |
| [Type_schoolN2 = Public] * ESCSN1 | 10.294978 | 2.522806 | 37,952.831 | 4.081 | 0.000 ** | 5.350213 | 15.239743 |
| [Type_schoolN2 = Subsidized] * ESCSN1 | 7.253672 | 2.595784 | 38,227.078 | 2.794 | 0.005 ** | 2.165870 | 12.341474 |
| [Type_schoolN2 = Private] * ESCSN1 | 0 | 0 | . | . | . | . | . |

Dependent variable: MR. This parameter is set to zero because it is redundant. ** $p < 0.01$.

## 5. Discussion

The results obtained allow us to answer the questions initially posed in this study, satisfying the two proposed objectives. Regarding the first objective, which sought to evaluate the equity and parity of Andalusian schools in relation to the competencies of mathematical reasoning and linguistic communication, the data on effectiveness, equity and parity show differentiated behaviour for each type of competency.

In relation to MR competence, differences were found in the effectiveness and equity of schools. On the one hand, some schools are more effective than others. This result

disadvantages the student bodies who attend less effective schools, thereby failing to achieve equal educational quality for all schools [7]. On the other hand, some schools are more equitable than others, meaning that the educational system does not guarantee the same educational quality for all students. Finally, the most efficient schools are also more equitable, so higher educational quality would favour a more equitable system, making this an objective that should be pursued [40].

These results indicate that there are schools that are more equitable and/or more efficient than others, and thus, the educational system does not guarantee the same opportunities for all children. Furthermore, differences among schools indicate that their educational processes do not achieve the same results [12,62,88–90]. For the MR competency, the schools did not differ in parity. These results could suggest that schooling has greater implications for the MR competency, while LC competence could be conditioned by the stimulation that students receive from their environment [91,92], which would complicate the reduction of the existing gap between students with differing ESCS. Accordingly, early incorporation into the educational system could mitigate the incidence of ESCS discrepancies among pupils [93,94].

In contrast, with regard to the LC competency, the results revealed additional relationships. First, the schools differed in effectiveness and equity, as with the MR competency. Furthermore, the most effective schools were also the most equitable. Nonetheless, there were differences in school parity and a relationship between greater effectiveness and greater parity. That is, more effective schools could decrease and even mitigate the gender gap in achievement. Furthermore, a noteworthy result is that there was also a positive association between equity and parity; therefore, the schools with the highest parity would also be the most equitable [24]. This result suggests that improving educational processes in schools could improve the educational system in terms of social justice [3,7,30].

The second objective, which proposed to study the connection among educational funding, equity and parity in MR and LC competencies, was answered from different perspectives. The results obtained shed light on several aspects.

First, it was found that a high ESCS was associated with better results, i.e., students from a favourable family environment achieved better academic performance, while the performance of students from disadvantaged backgrounds was lower. This result is in agreement with numerous investigations [9,34,39–44]. Another noteworthy aspect in relation to ESCS is that no relationship was found between the type of school funding and school effectiveness when controlling for the average ESCS of schools. This result means that, contrary to what certain studies have suggested, the type of school funding per se does not exert an impact on student academic performance [95]. Subsidized and private schools are not more efficient than public schools; rather, it is the average ESCS of the schools that controls for their effectiveness. In this regard, it is relevant to consider that the level of student attendance in private schools is higher than in public schools, which also influences their performance; however, when controlling for individual student characteristics, such as emotional factors [96], genetic aspects, personality or family environment, the type of school seems to exert no impact on this issue [97]. This aspect calls for an important reflection on the differential value that private and subsidized schools would provide over public schools; why would someone opt for a fee-paid education (for part or all of schooling) in a private or subsidized school if a public school with a higher ESCS offered better performance? Although many answers could be found in response to this question (e.g., accompanying education with certain values—religious or secular—specific to a given educational institution; higher-quality infrastructure; or equipment and services of a higher quality), perhaps it is necessary for the managers and pedagogical coordinators of these private and subsidized schools to increase their efforts to offer higher academic performance as a differentiating factor, thereby centring school effectiveness in their educational proposals. This aspect is also related to the previous point, as it reiterates that ESCS would exert the greatest influence on the academic performance of the student body [7,98].

While it has been observed that individual factors and the out-of-school context exert a greater influence than the school itself on student academic performance [98,99], it has also been found that schools with higher average ESCS are more effective and achieve better results [40,42,44,100]. These findings mean that in public schools, larger achievement gaps would be observed among students based on their ESCS. Such discrepancies could be because access to private and subsidized schools, which are partially or totally fee-paid, could act as a filter that excludes families with a lower ESCS who would not be able to afford this type of education. Therefore, these differences could be due to a spurious correlation, as in these schools, ESCS would have a lower variance. Nevertheless, having a school population with high average ESCS could facilitate teaching work and favourably influence the reduction of the achievement gaps among students with differing ESCS [100,101]. Accordingly, it is advisable to promote educational policies that prevent the concentration of students with low ESCS in the same schools as a measure to ensure equitable access to quality education [40,42,44].

With regard to parity, the data revealed several interesting aspects. The results showed greater parity in private and subsidized schools than in public schools, i.e., in private and subsidized schools, the academic performance of boys and girls was more equal than in public schools. According to the results of this study, performance was higher for girls than boys in both MR and LC and in public as well as in private or subsidized schools. This differentiation could be due to girls' earlier maturational development than boys in biological, cognitive and social terms [51–53]. Girls' generalized greater self-discipline and impulse control [102] could also be a reason for their better academic performance, as these characteristics could increase their responsibility in accomplishing their homework and keeping up with studying [103].

Mechanisms associated with biological, cognitive and social maturation are attributed to the demands of the environment [104,105]. On such grounds, the poorer performance of children with lower ESCS could also be related to the influence of the family or educational environment (such as a low average ESCS of the school) on the child's maturational development.

## 6. Conclusions

This study provides answers to the current debate on equality and parity in education. National circumstances in this respect and recent changes in educational legislation have fuelled the debate on equal quality and on the relevance of large-scale educational assessment. Likewise, this study is aligned with research taking place in other regions of Spain, allowing a national mapping of this issue and broadening its implications for educational policy. This will allow the establishment of research networks whose results will help decision-makers in their efforts to ensure more equitable and egalitarian quality education systems.

In conclusion, the most relevant contributions of this research can be summarised in two main points. First, improved school effectiveness translates into greater equity and parity in student outcomes. Therefore, improving school effectiveness could improve the social mobility of underprivileged students, which in the Andalusian region is limited by their socio-economic background. Similarly, the more disadvantaged situation of women and their lower socio-economic mobility make it necessary for education to act as a social dynamiser. Secondly, the type of school (public, private or subsidised) is not significant when controlling for ESCS. However, it is significant in interaction with the ESCS, with the slope decreasing in subsidised and private schools, which could be interpreted as higher equity. However, this could be due to the composition of schools in terms of their ESCS, with smaller differences being found between students in subsidised and private schools. Therefore, the system by which students can enrol in different schools should be seriously questioned, as the selection of schools mainly linked to the geographical environment would configure schools according to ESCS, creating ghettos.

An education that does not reduce social gaps would perpetuate the stagnation of social classes and affect the upward mobility of the underprivileged. Such findings reinforce

the idea that it is necessary and urgent to pay more attention to schools with a higher concentration of children with low ESCS, as their unfavourable socioeconomic and cultural contexts could be conditioning worse academic development, which in turn would lead to fewer possibilities for educational, professional and personal development. Such situations could be interpreted as a failure of the educational system and schools in fulfilling their objective—and their function—of serving as a social elevator for children from more disadvantaged contexts.

Based on the above, educational innovations should be aimed not only at promoting excellence in education but also at improving equity and parity among students. That is, educators should seek to promote educational achievement and, at the same time, to reduce the social and gender gap among the school population [25,26]. Perhaps it is necessary to rethink the idea of curricular standardization, as in the search for systemic changes that achieve equitable quality education with equal opportunities for the entire educational community, it seems necessary to focus on addressing the gaps rather than on the results of achievement tests that assess educational success based on a standardized curriculum [18]. A resilient and sustainable society will be one that is cultivated, free of gaps among its youngest members and built on the basis of equal opportunities in education.

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