Parental Engagement as a Mediator of Educational Inequality

Evidence from Morocco

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Abstract. This article investigates the effect of parental involvement on the academic performance of Moroccan students using data from the 2018 PISA survey, through the application of Structural Equation Modeling (SEM). This approach enables the analysis of complex relationships between different forms of parental involvement both at home and at school while accounting for measurement errors, particularly those stemming from the reciprocal relationship between student achievement and parental engagement. The results highlight the central role of educational support within the family sphere in fostering student success, beyond formal school-based participation. The study also reveals the significant influence of socioeconomic status on parental practices, thereby exposing the impact of social inequalities on educational dynamics.From an educational policy perspective, these findings underscore the need to rethink parental support mechanisms, strengthen teacher training in family-school communication, and consider parental engagement as a strategic lever in the evaluation of school effectiveness.

Keywords: Parental involvement; Academic performance; Structural Equation Modeling.

1 Introduction

For over sixty years, the social sciences have sought to understand the mechanisms underlying educational inequalities and performance gaps among students. Early empirical studies, such as those conducted by Coleman in the United States during the 1960s, clearly demonstrated that academic success does not depend solely on internal school characteristics. Rather, it is strongly correlated with external factors, particularly social background, family resources, and most notably parental attitudes and

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behaviors toward education. Although this idea gained widespread recognition, research gradually shifted its focus away from the family sphere, concentrating instead on school-level factors such as institutional functioning, infrastructure quality, teaching effectiveness, and teacher training. This shift in perspective persisted until the 1980s, when several Anglo-Saxon countries brought the role of families back to the forefront of the educational debate, emphasizing the importance of strengthening school-family partnerships as a means to combat educational failure in a sustainable manner.

Today, it is widely acknowledged that a range of interrelated factors, including not only individual cognitive abilities but also the emotional and social environment in which they develop, influences students' academic achievement. Parental involvement, understood as the set of attitudes, behaviors, and practices adopted by parents to support their children's education, is recognized as a key determinant of educational success. However, despite broad consensus on its importance, the concept of parental involvement remains difficult to define in operational terms. It encompasses a variety of forms, from supervising homework and attending parent-teacher meetings to fostering a positive and supportive educational climate at home. This diversity makes it challenging to measure, particularly in contexts where parenting practices vary significantly depending on educational attainment, income level, and cultural norms. Recent research underscores the importance of distinguishing between parental involvement at home and that within the school setting, while also acknowledging the interdependence between these two spheres.

In the Moroccan context, the issue of parental involvement takes on particular significance. The national education system has been experiencing a profound crisis for several decades, characterized by persistent structural dysfunctions, low quality of learning, and an increasing gap between the reforms undertaken and the results achieved. According to the findings of the 2018 PISA survey, Moroccan students rank among the lowest performers among participating countries, with an average score of 359 in reading, 368 in mathematics, and 377 in science well below the OECD average, which exceeds 480 points in each of these subjects. These disparities not only reflect pedagogical and institutional shortcomings but also deep social and cultural inequalities that affect the educational trajectories of children.

In response to this alarming situation, public authorities have initiated several large-scale reforms. The 2015–2030 Strategic Vision, developed by the Higher Council for Education, proposes a comprehensive restructuring of the education system around three pillars: equity and equal opportunities, improvement of teaching quality, and the promotion of governance. This vision was translated into a legislative framework through the adoption of the 51.17 Framework Law in 2019, which for the first time in Moroccan legislation recognizes the active role of families in the educational process. However, the concrete implementation of these guidelines remains partial and uneven across different regions and social categories, raising questions about the effectiveness of family support mechanisms and the genuine integration of parents into the schooling process.

It is within this perspective that the present study is situated, aiming to rigorously examine the role of parental involvement in the academic performance of Moroccan

students. The approach adopted is based on the analysis of data from the 2018 Programme for International Student Assessment (PISA), with a dual purpose. First, to conduct an international comparison that situates Morocco relative to other countries with similar or contrasting contexts and second, to develop a robust explanatory model to assess both the direct and indirect effects of parental involvement on academic outcomes.

To address the complexity of this relationship, the methodology employed relies on Structural Equation Modeling (SEM), an approach particularly well suited for analyzing latent phenomena and accounting for the interrelationships between observed and unobserved variables. Unlike traditional econometric models, which often rely on strong exogeneity assumptions and the use of external instruments that can be difficult to justify, SEM allows for the simultaneous integration of causal and mediating dimensions of the relationships between variables, while correcting for measurement errors. This approach thus provides a coherent analytical framework for studying parental involvement as a mediating variable between family socioeconomic status and students' academic achievements.

In this context, the study aims to answer three main research questions. The first concerns the definition and conceptualization of parental involvement within the Moroccan context, taking into account cultural, social, and economic specificities. The second seeks to identify the various forms of parental involvement observable in the PISA data, and to understand how they differentially influence academic success. Finally, the third question is to what extent does parental involvement mediate the relationship between socioeconomic status and academic performance among Moroccan students?

To address these questions, the article is structured into sections. The first section provides a literature review that combines contributions from economics and education sciences on the determinants of academic success. The second section presents a comparative descriptive analysis of the PISA data. The third section develops the structural model used, detailing the data, variables, the model and its specification, hypotheses, and empirical implementation. Finally, the last section discusses the results in light of recent Moroccan educational policies and provides recommendations to strengthen the role of families in improving the national education system.

2 Literature Review

Parental Involvement as a Universal Lever for Academic Success

Parental involvement has been considered for several decades as a central lever in promoting educational success. Numerous studies have shown that forms of parental involvement whether it involves supervising homework at home, communicating with teachers, or participating in school activities significantly contribute to the cognitive and socio-emotional development of students (Pomerantz, Moorman & Litwack, 2007 [1]; Fan & Chen, 2001 [2]). The study by Wang and Sheikh-Khalil (2014) [3] highlights that this involvement enhances intrinsic motivation and academic self-esteem, while also reducing risk behaviors.

These findings are confirmed by data from large-scale international assessments such as PISA, which have documented the positive impact of parental involvement on performance in reading, mathematics, and science (OECD, 2019) [4]. Recently, Garcia-Crespo et al. (2022) [5] reminded us that the effect of parental involvement on academic success persists even after controlling for socio-economic and institutional factors.

Differentiated Effects Based on Socio-Economic Context

However, the effects of parental involvement are neither universal nor homogeneous. The sociological work of Bourdieu and Passeron (1970) [6] demonstrated that the cultural capital of families fosters alignment between parental practices and academic expectations, thereby reinforcing the reproduction of social inequalities. Lareau (2003) [7] distinguishes between forms of "concerted cultivation" typical of privileged families and "natural growth" more common in working-class families.

In developing countries, including Morocco, these differences are even more pronounced as inequalities in access to information, educational resources, and educational services deeply structure family practices. A study by El Azhari et al. (2019) [8] revealed that parental involvement varies significantly depending on parents' level of education, professional status, and place of residence. Parents living in rural areas, often with lower educational levels and greater distance from educational institutions, exhibit less structured involvement, which is less aligned with educational expectations.

The INEE report (2020) [9]highlights this divide, showing that urban students are more likely to benefit from active parental support, while those in rural areas are disadvantaged by a combination of vulnerabilities.

The Need for a Rigorous Analytical Framework: From Correlational Findings to a Causal Approach

Despite strong empirical evidence linking parental involvement to academic achievement, several scholars warn against purely correlational interpretations. Dearing et al. (2006)[10] emphasize the risk of selection bias, as more involved parents often have already advantaged children, leading to endogeneity concerns.

To address this issue, researchers have applied methods such as Propensity Score Matching (Rosenbaum & Rubin, 1983) [11], instrumental variables (Angrist & Pischke, 2009[12]), and regression discontinuity designs (Imbens & Lemieux, 2008 [13]). While these approaches strengthen causal inference, they remain limited by unobservable factors or strict identification requirements, particularly in Global South contexts (Duflo, 2001[14]).

Recent studies (e.g., Silinskas et al., 2020[15]) further highlight heterogeneous effects by gender and initial performance, underscoring the need for integrative frameworks capable of modeling direct, indirect, and contextual pathways simultaneously.

Latent Variable Models (SEM): An Integrative and Promising Approach

In response to the limitations of traditional approaches, Structural Equation Modeling (SEM) has emerged as a preferred method for analyzing the complex relationships between parental involvement and academic performance. SEM enables the integration of latent behavioral, motivational, and relational dimensions that are not directly observable (Byrne, 2010 [16]; Kline, 2016[17]).

Using PISA data, Avvisati et al. (2014)[18] show that parental expectations influence achievement through academic motivation, while Lee and Bowen (2021)[19] highlight the indirect effects of cognitive involvement via self-esteem and engagement. Multi-group SEM analyses further reveal cross-national differences in parental involvement dynamics (Xu et al., 2023 [20]). In Morocco, El Makrini and Chafi (2022)[21] confirm that emotional support and expectations operate differently across socio-economic and geographic contexts.

Overall, SEM is particularly valuable for modeling mediation mechanisms and testing structural differences across groups, offering deeper insight than conventional models.

Originality of the Proposed Article in relation to the literature

The originality of this study lies in its use of PISA 2018 data to model the effect of parental involvement on academic performance in Morocco through a Structural Equation Modeling (SEM) approach. While PISA provides rich data on educational determinants, few studies in Morocco have applied rigorous causal modeling that accounts for latent dimensions.

By moving beyond traditional correlational analyses, SEM allows the simultaneous estimation of direct and indirect relationships between parental involvement and student achievement, while incorporating latent constructs such as family learning climate, academic motivation, and perceived parental expectations.

This study contributes by modeling parental involvement as a mediating mechanism of educational inequality in Morocco. In a context marked by persistent socio-territorial disparities, it identifies the familial processes underlying performance gaps beyond material conditions alone. Using nationally representative data, the research offers evidence-based insights that can inform policies aimed at strengthening family engagement as a lever for improving equity and educational outcomes in Morocco.

3 Moroccan Context

PISA 2018 results place Morocco among the lowest-performing countries out of 79 participants. As illustrated in figure 1, Moroccan students scored well below the OECD average in reading (359 vs. 487), mathematics (368 vs. 489), and science (377 vs. 489), ranking around 75th position across all 3 domains. These disparities highlight the structural nature of educational inequality.

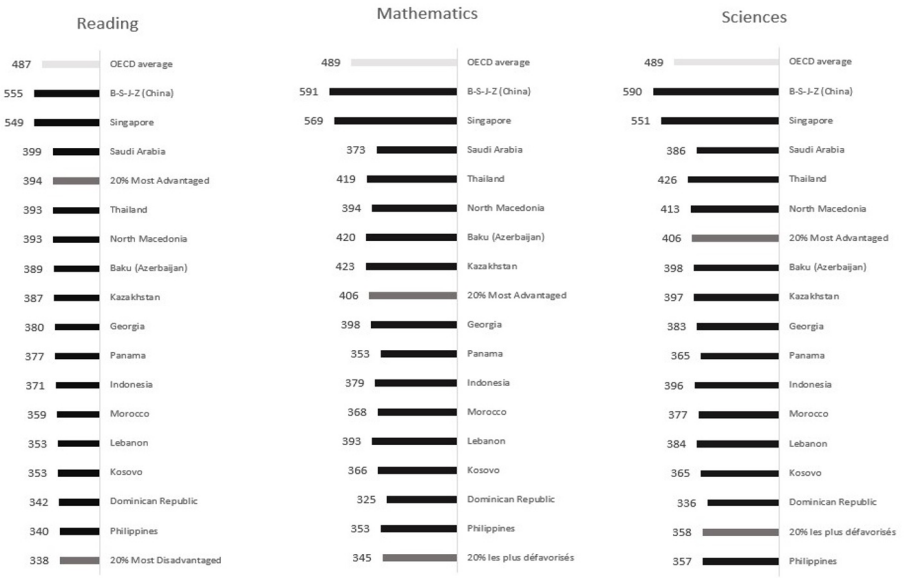


Fig. 1. Morocco's Results in Light of Other Education Systems
Source: PISA 2018

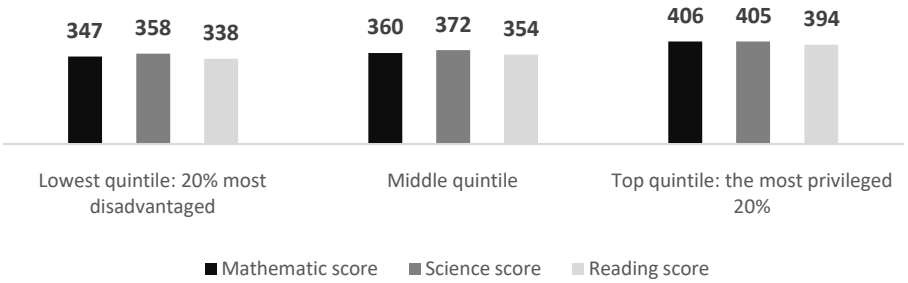
To examine the role of social background, the PISA Economic, Social and Cultural Status (ESCS) index was used. Based on parents' education, occupational status, and household wealth, this index enables comparisons across socio-economic groups. Students are categorized as advantaged (top 20%), disadvantaged (bottom 20%), or middle-status (remaining 60%), allowing the analysis of performance gaps linked to family background.The results are presented in table 1.

Table 1. Student Performance Based on the Economic, Social, and Cultural Status Index

Economic, Social, and Cultural Status Index	Mathematics	Science	Reading
Lower Quintile: 20% Most Disadvantaged	346.7	357.9	337.5
2nd Quintile: Next 20%	354.1	365.5	346.4
3rd Quintile: Next 20%	360.2	373.2	355.9
4th Quintile: Next 20%	366.8	375.7	359.2
Upper Quintile: 20% Most Advantaged	406.1	405.4	393.5
National Average	366.8	375.5	358.5
International Average	434.1	433.3	422.1

Source: Authors' calculations based on data from the 2018 PISA survey (Programme for International Student Assessment, OECD).

Fig. 2. Student Performance Based on Social Categories.



Source: Authors' calculations based on data from the 2018 PISA survey (Programme for International Student Assessment, OECD).

Socio-economic background is strongly associated with academic performance among Moroccan students.As illustrated in figure 2,the most disadvantaged 20% consistently score significantly lower than their more privileged peers across all domains.

In mathematics, scores range from 347 points for disadvantaged students to 406 for privileged ones. In reading, the gap is similarly pronounced (337 vs. 394 points), and in science, scores vary from 358 to 405 points. When positioned internationally, students from privileged backgrounds would rank substantially higher than those from disadvantaged families, who would be placed near the bottom of the global ranking.

These results underscore the magnitude of socio-economic performance gaps within Morocco, revealing deep internal inequalities that mirror broader structural disparities.

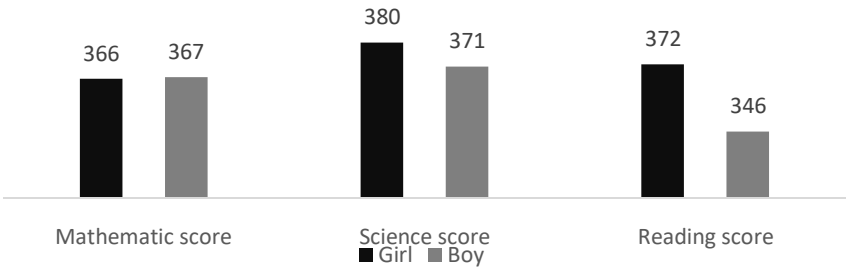
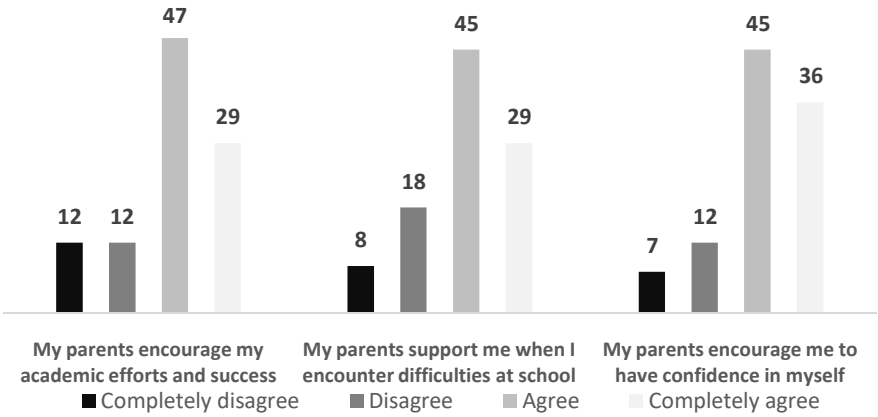


Fig. 3. Overview of Gender Performance Gaps.
Source: Authors' calculations based on data from the 2018 PISA survey (Programme for International Student Assessment, OECD).

An interesting observation from the 2018 PISA results concerns the performance of Moroccan girls, who outperformed boys in the domains of reading and science.As shown in figure 3,in reading, girls achieved an average score of 372 points, compared to 346 points for boys a 26-point difference, considered relatively significant. In science, girls also scored higher, with an average of 380 points versus 371 for boys. However, in mathematics, Moroccan boys slightly outperformed girls, with an average score of 367 points compared to 366 for girls a difference that is not statistically



significant.

Fig. 4. Percentage of Moroccan Students According to Parental Involvement Modes at Home
Source: Authors' calculations based on data from the 2018 PISA survey (Programme for International Student Assessment, OECD).

Figure 4 shows that Moroccan students recognize three key forms of parental engagement at home: encouragement of academic efforts, support in overcoming learning difficulties, and confidence-building. Together, these dimensions reflect essential emotional and academic support for students' development.

Strengthening collaboration between schools and families is therefore crucial. Parents can support learning by discussing school matters, monitoring progress, assisting with homework, and communicating with teachers.PISA 2018 data also indicate varying levels of parental involvement in school-related activities, including meetings with teachers, participation in governance, and volunteering.

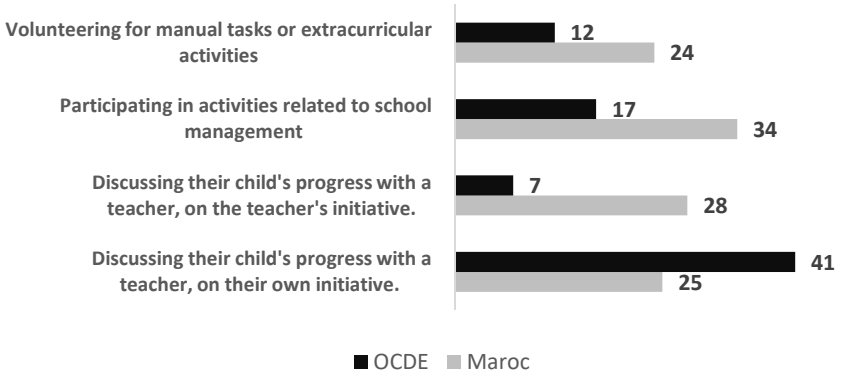


Fig. 5. Percentage of Moroccan Parents Contributing to School Activities.
Source: Authors' calculations based on data from the 2018 PISA survey (Programme for International Student Assessment, OECD).

As illustrated in figure 5, the rates of Moroccan parents' participation in school governance and manual or extracurricular tasks are 34% and 24%, respectively, figures that are significantly higher than the OECD averages of 17% and 12%. However, the rates of parents who discuss their children's academic progress with teachers, whether initiated by the teacher (28%) or by the parents themselves (25%), remain lower than the OECD averages, which are 57% and 41%, respectively.

4 Data

The Programme for International Student Assessment (PISA) is an international survey that evaluates the skills of 15-year-old students in three key domains: reading, mathematics, and science. Unlike other assessments that measure only disciplinary knowledge, PISA is distinguished by its approach, which evaluates students' ability to apply their knowledge to solve complex and contextual problems related to situations encountered in daily life. This approach provides a more comprehensive measure of young people's preparedness to face the challenges of the modern world. In 2018, Morocco participated in the PISA survey with a representative sample of 6,867 15-year-old students. These students were selected from 178 secondary schools across the country's 12 regional education academies. The sample was designed to be representative of the country's socio-economic and geographical diversity, including both urban and rural schools. The students were subjected to tests that assessed their competencies in three main areas: mathematics, reading comprehension, and science.

The mathematics tests assessed students' ability to solve mathematical problems in a variety of contexts and to apply mathematical concepts and techniques in real-life situations. The reading tests measured students' ability to understand and interpret written texts, extract information, and analyze the structure of the texts. Finally, the science assessments evaluated students' understanding of fundamental scientific con-

cepts, as well as their ability to apply scientific knowledge in practical and social contexts.

This assessment provides a clear picture of Moroccan students' competencies in comparison to those of other participating countries, while offering valuable insights into the impact of various contextual factors (socio-economic, geographical, etc.) on students' academic performance.

Both theoretical foundations and empirical validation guided the selection of variables. Student achievement was measured using PISA 2018 mathematics, reading, and science scores, computed as the average of the ten plausible values, following OECD recommendations. These indicators provide a reliable and internationally comparable assessment of cognitive performance.

Socioeconomic background was captured through the ESCS index, complemented by parental education (HISCED), parental occupation (HISEI), and home possessions (HOMEPOS), reflecting families' economic, cultural, and educational capital, in line with cultural capital theory (Bourdieu & Passeron, 1970 [6]) and prior PISA-based studies (OECD, 2019; Avvisati et al., 2014 [18]).

Parental involvement variables, parental support, parental interest in education, and parental communication with schools were selected to capture both affective and cognitive dimensions of family engagement emphasized in the literature (Fan &Chen, 2001[2]; Pomerantz et al., 2007 [1]). These items were combined into a latent construct, whose internal consistency was assessed using Cronbach's alpha, yielding satisfactory reliability ($\alpha > 0.70$).The detailed description of all variables used in the analysis is provided in Table 2.

School-level controls, including school assessment practices and school type (public/private), were included to account for institutional differences influencing student performance. Overall, this selection ensures theoretical coherence, empirical validity, and suitability for Structural Equation Modeling.

Table 2. Description of Variables

Variable	Type	Description	**Scale**
		Dependent Variables	
Mathematics score	Continuous	Indicator of student performance in mathematics, measured by the average of the scores obtained from the 10 plausible values provided by PISA. This variable reflects the ability of students to solve mathematical problems in different contexts.	Average of 10 plausible values
Science score	Continuous	Indicator of student performance in science, measured in the same way as mathematics scores, assessing students' ability to understand and analyze scientific phenomena.	Average of 10 plausible values
Reading score	Continuous	Indicator of student performance in reading, measured by the average of the scores obtained from the 10	Average of 10 plausible values

		plausible values provided by PISA. This variable evaluates text comprehension and critical analysis of written documents.	
		Independent Variables	
ESCS (Socioeconomic and Cultural Status)	Continuous	A composite variable that includes several factors related to the socioeconomic status of students and their families. It is used to measure the impact of the family context on academic performance.	Composite index
hisced (Parental Education Level)	Ordinal	The highest level of education achieved by the student's parents or guardians. This variable provides an indication of the family's educational capital, which can influence educational support and expectations for the child.	Ordinal (Scale from 1 to 6 based on education levels)
hisei (Parental Occupation)	Ordinal	The professional status of the parents, measured through an occupation index based on the socio-professional position of the parents. A higher professional status is associated with better economic resources and higher educational expectations for the child.	Ordinal (Scale from 1 to 7 based on the prestige of the profession)
Homepos (Cultural and Material Resources at Home)	Continuous	The number of material objects available at home (e.g., computer, books, etc.). This reflects access to material resources and living conditions that can support academic learning.	Number of objects
Parental Support	Ordinal	This variable measures the degree of support perceived by students from their parents when facing academic difficulties. This may include emotional support, homework assistance, or guidance on managing academic issues.	Ordinal (Scale from 1 to 4, from "Strongly disagree" to "Strongly agree")
Parental Interest in Education	Binary	Measures parents' interest in their children's education based on a question such as "My parents think studying is important." Parental interest can influence student academic engagement.	Binary (Yes/No)
Parental Communication	Continuous	Measures the frequency with which parents discuss their child's academic progress with teachers. Higher engagement is generally linked to better academic performance.	Percentage of parents
School Assessment	Ordinal	Variable measuring the frequency with which schools inform parents	Ordinal (Scale from 1 to 5 based

		about their children's academic progress. Regular evaluation is often associated with better student performance, as it allows parents to track their children's progress.	on frequency, from "Never" to "Always")
School Type	Binary	An indicator that classifies schools into two categories: public and private. The type of school may influence access to educational resources and the general school environment.	Binary (Public/Private)

Source: Authors

Missing data were addressed using Multiple Imputation models that were specified according to variable type: linear regression for continuous variables, logistic regression for binary variables, and ordinal logistic models for ordered categorical variables.

All variables included in the structural model were incorporated into the imputation procedure to satisfy congeniality between imputation and estimation stages. Estimates were pooled across imputed datasets following Rubin's rules. This approach assumes data are missing at Random (MAR) and provides less biased and more efficient estimates than list wise deletion.

5 Empirical strategies

This article relies on a Structural Equation Modeling (SEM) approach to analyze the role of parental involvement in students' academic performance. This model is particularly relevant as it allows for the modeling of complex relationships between latent variables while accounting for measurement errors and the multidimensional nature of the phenomena under study. The analyses were conducted in Stata 15.0 using robust Maximum Likelihood estimation (MLR). This estimator accounts for non-normality and complex survey design, with sampling weights applied accordingly.

The proposed conceptual framework articulates two main dimensions of parental involvement: home-based involvement and school-based involvement. These two latent constructs are measured through a set of observed indicators extracted from the PISA survey, such as perceived parental support (Parentsuppo), parental interest (Parentinterest), parent-teacher communication (Parentcomm), monitoring of students' progress by parents (Schassessm), and the type of school attended (Schltype). As shown in figure 6, academic performance is the dependent latent construct, operationalized through the scores obtained in mathematics, science, and reading.

To ensure the robustness of the SEM estimates, several diagnostic procedures were performed. Given the frequent violations of multivariate normality and homoscedasticity in large-scale PISA datasets, robust maximum likelihood estimation (MLR) was employed in Stata, together with school-level sampling weights to account for complex survey design and potential selection bias (Hair et al., 2019; Hu & Bentler,

1999). Multicollinearity diagnostics indicated no critical issues (VIF ranging from 1.30 to 1.91).

Measurement reliability and construct validity were established through Cronbach's alpha values exceeding 0.70; standardized factor loadings and Average Variance Extracted (AVE) above 0.50, and discriminant validity confirmed using the Fornell–Larcker criterion. Model identification requirements were satisfied, ensuring appropriate specification for SEM estimation.

In addition to statistical significance, standardized path coefficients (β) and coefficients of determination (R^2) were examined to evaluate the substantive magnitude of the relationships (Kline, 2016; Byrne, 2010 [17]).

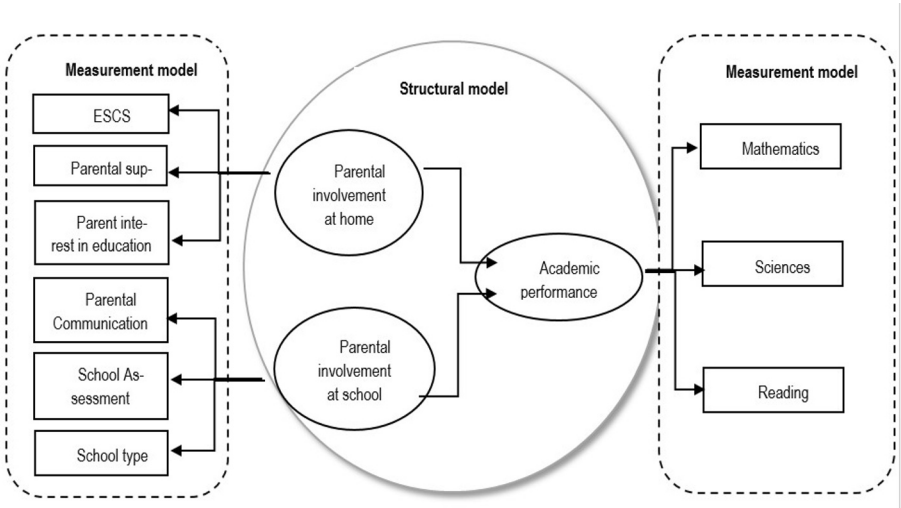


Fig. 6. Path **Diagram Representing the Structural Equation Model (SEM)**.
Source: Authors

The use of Structural Equation Modeling (SEM) offers several significant methodological advantages over conventional econometric approaches. First, unlike classical linear models or instrumental variable (IV) models, SEM allows for the simultaneous modeling of relationships between observed and latent variables, accounting for measurement errors associated with each indicator. This enhances the validity of estimates and minimizes biases related to the imperfect measurement of complex social variables, such as parental involvement or educational attitudes. Second, SEM enables the simultaneous estimation of multiple structural equations, allowing for the analysis of both direct and indirect effects. For instance, in our model, it is possible to distinguish the direct effect of home-based parental involvement on academic performance from the indirect effect transmitted through school-based involvement. Such fine-grained analysis is generally not accessible through approaches like Propensity Score Matching (PSM), which, although robust for mitigating selection bias, does not allow for explicit modeling of causal chains or mediating effects. Third, unlike Regression Discontinuity Design (RDD) models, which require an arbitrary assignment rule (threshold), SEM is based on a sound theoretical framework and enables the explana-

tion of underlying mechanisms through continuous, multidimensional relationships. This structural flexibility is particularly well-suited to educational phenomena, where parental behaviors and academic performance are influenced by a constellation of interdependent factors.

Moreover, SEM fits within an analytical approach that integrates both a confirmatory component (through the measurement model) and an explanatory component (through the structural model), making it a particularly relevant tool for testing complex theoretical hypotheses. This approach overcomes the limitations of standard econometric models, which often assume linear and exogenous relationships between observed variables without explicitly integrating latent causal structures.

Ultimately, the SEM specification adds substantial value to the analysis of the determinants of academic success. It not only captures the richness of the social and familial dynamics involved but also produces results that are more robust, theoretically grounded and empirically nuanced. This approach, therefore, represents a pertinent and rigorous methodological choice for educational research based on survey data such as PISA.

The Structural Equation Modeling (SEM) framework presented in this study allows for the simultaneous modeling of causal relationships between latent variables and the links between observed variables and their constructs (Kline, 2016; Hair et al., 2014). This approach is particularly relevant for studying the effects of parental involvement on academic performance, taking into account the multidimensionality of social and educational constructs (Byrne, 2010).

Table 3. Econometric Specification of the SEM Model

Measurement Model	Structural Model
The following latent variables are defined: • η_1 : Academic Performance • ξ_1 : Parental Engagement at Home • ξ_2 : Parental Engagement at School The measurement equations are specified as follows: **a) Indicators for ξ_1 – Parental Engagement at Home:** $x_1 = \lambda_1 \xi_1 + \delta_1$ (Parental support) $x_2 = \lambda_2 \xi_1 + \delta_2$ (Parental Interest in Education) $x_3 = \lambda_3 \xi_1 + \delta_3$ (Parental Communication) $x_4 = \lambda_4 \xi_1 + \delta_4$ (ESCS) **b) Indicators for ξ_2 – Parental Engagement at School :** $x_5 = \lambda_5 \xi_2 + \delta_5$ (School Assessment) $x_6 = \lambda_6 \xi_2 + \delta_6$ (School type)	The causal relationship between the latent variables is formalized as: $\eta_1 = \beta_1 \xi_1 + \beta_2 \xi_2 + \zeta$ Where β_1 measures the effect of parental engagement at home on academic performance and β_2 measures the effect of parental engagement at school. ζ is the structural error.

c) Indicators for η_1 – Academic Performance:

$y_1 = \lambda_7 \eta_1 + \varepsilon_1$ (Math Score)
$y_2 = \lambda_8 \eta_1 + \varepsilon_2$ (Science Score)
$y_3 = \lambda_9 \eta_1 + \varepsilon_3$ (Reading Score)

Source: Authors.

All latent variables are assumed to be centered and standardized, in accordance with the fundamental principles of Structural Equation Modeling (SEM). Furthermore, the measurement errors associated with the manifest variables, denoted δ_i and ε_j, are assumed to be uncorrelated both with each other and with the latent constructs, ensuring the validity of the obtained estimates, as specified in the equations presented in table 3. The model estimation can be carried out using different methods, including the Maximum Likelihood (ML) method, which is suitable for sufficiently large samples with normal distributions, or Partial Least Squares (PLS), which is recommended in cases of small samples or non-normality of the data (Hair et al., 2014; Kline, 2016). The choice of method thus depends on the empirical characteristics of the dataset and the complexity of the theoretical model. The major advantage of this approach lies in its ability to integrate both direct and indirect effects among variables, while offering analytical superiority over conventional econometric methods. Unlike instrumental variable models, Propensity Score Matching (PSM), or Regression Discontinuity (RD) models, SEM allows for the joint modeling of complex relationships between latent constructs, examining mediating mechanisms, and rigorously testing causal hypotheses, while accounting for measurement errors (Bollen, 1989; Pearl, 2009).

6 Results and Discussion

This study, based on Structural Equation Modeling (SEM), has allowed for a detailed analysis of the structural relationships between the various dimensions of parental involvement and students' academic performance in Morocco. By specifying an over-identified model, evaluating the internal validity of the scales ($\alpha = 0.74$), and testing direct, indirect, and total effects, the analysis sheds light on profound and multidimensional mechanisms of influence, which are rarely captured by traditional econometric approaches. This approach follows the work of Bollen (1989) [22], who emphasize the ability of SEM to integrate the complexity of causal relationships between latent constructs and observed variables while correcting for measurement errors.

As shown in table 4, empirical results show that parental involvement at home has a significant and slightly stronger impact on academic performance ($\beta = 0.43$, $p < 0.001$) compared to parental involvement at school ($\beta = 0.41$, $p < 0.001$). This hierarchical ranking of effects confirms that supporting learning at home is a key determinant of success, beyond the mere physical presence of parents in school settings. In this sense, it aligns with the findings of Fan and Chen (2001)[2] and Hill and Tyson (2009)[23], who highlight the crucial impact of homework supervision, the expression of high expectations, and the quality of communication between parents and children. The explanatory strength of this domestic engagement can be interpreted as a reflec-

tion of an informal "educational capital," mobilized within the private sphere, and often unevenly distributed across social backgrounds.

Table 4. Results of the Estimation by Structural Equations

Causal relationship	Coefficient	P value	Significance
Structural Model			
Home → Academic Performance	0,43	0,00	yes
School → Academic Performance	0,41	0,00	yes
Measurement Model			
Home→ Escs	1,00	0,00	yes
Home → Parental support	0,26	0,00	yes
Home → Parental Interest in Education	0,65	0,00	yes
School → Parental Communication	1,00	0,00	yes
School → School Assessment	0,002	0,00	yes
School →school type (Public)	-0,018	0,00	yes
Academic Performance→Math	1,00	0,00	yes
Academic Performance→Reading	1,11	0,00	yes
Academic Performance→ Science	0,97	0,00	yes

Source: Auteurs.

This interpretation is supported by the analysis of the determinants of parental involvement. Socioeconomic status (ESCS) is found to be strongly correlated with home involvement ($\beta = 1.00$), highlighting that families with cultural, financial, or symbolic resources are better positioned to support their children's learning. These results corroborate the work of Sirin (2005)[24], which emphasize the mediating role of social status in academic success, through access to cognitively stimulating environments, enriching extracurricular activities, and complex language practices. Thus, parental involvement, far from being solely an individual matter, appears to be deeply structured by mechanisms of social reproduction.

Regarding parental involvement at school, the most explanatory variable is the frequency of communication between parents and teachers ($\beta = 1.00$), highlighting the crucial role of school-family dialogue as a vector for co-education. This finding confirms Epstein's (2001) [25] contributions, which identify regular communication as one of the foundations of effective educational partnerships. However, other forms of involvement prove to be less relevant: the use of assessments to inform parents has only a marginal effect ($\beta = 0.02$), suggesting a low effectiveness of the current feedback mechanisms. This weakness could be attributed to a lack of clarity, contextualization, or gaps in understanding between education professionals and families, particularly those far removed from the school culture (Pomerantz, Moorman & Litwack, 2007 [1]).

A particularly concerning result is the negative effect of school type on parental involvement at school ($\beta = -0.018$, $p < 0.001$). Parents of students enrolled in the public sector appear less engaged, which may reflect the absence of formal consultation mechanisms, non-inclusive institutional communication, or a perception of inaccessibility of schools. These findings align with the analyses of the CSEFRS (2015)[26]

and the PISA 2018 surveys, which highlight deficits in collaborative culture in Moroccan public schools. More broadly, they echo the work of Reay (1998)[27] and Vincent (2001)[28] on the asymmetrical relationships between working-class families and educational institutions, fueled by implicit judgments about the educational legitimacy of parents from disadvantaged backgrounds.

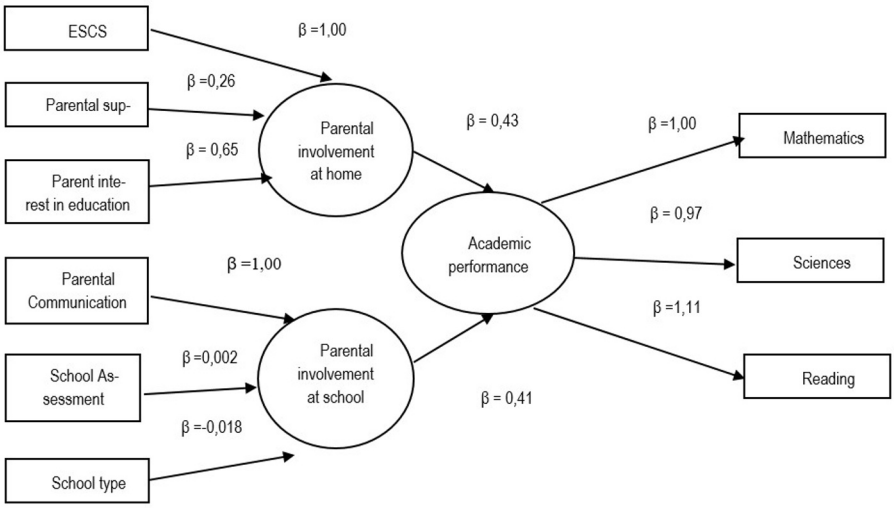


Fig. 7. Path Diagram of the Structural Model with Standardized Coefficients β.
Source: Auteurs.

The analysis of the variances of the latent variables allows for an assessment of the quality of the measurement and the explanatory capacity of the model. As illustred in figure 7, high variance levels, observed for the majority of the latent constructs in our study, reveal a strong heterogeneity of behaviors as well as the robustness of the selected indicators. This diversity suggests good sensitivity to real variations and stability of the construct over time, thus strengthening the robustness of the structural model used.

Moreover, the quality of the overall model fit was assessed using several statistical indicators. The RMSEA[1]reaches a value of 0.044, well below the threshold of 0.08, indicating very low approximation error. The comparative fit indices, namely CFI[2](0.988) and TLI [3](0.980), significantly exceed the critical threshold of 0.90, indicating excellent fit to the observed data. Additionally, the SRMR[4]is 0.034, reinforcing the consistency between the observed covariances and those estimated by the model.

1 Root Mean Square Error of Approximation

2 Comparative Fit Index

3 Tucker-Lewis Index

4 Standardized Root Mean Square Residual

The information criteria, AIC[5] (318,036.36) and BIC[6](318,254.80), also provide useful benchmarks for comparison with potential alternative models, although their interpretation is relative. Finally, the Coefficient of Determination (0.727) indicates a significant portion of the variance explained by the model, which reflects strong predictive power. These indices indicate excellent model fit and strong explanatory power.All these results converge towards a positive assessment of the model's quality, suggesting that it is a relevant tool for analyzing the economic relationships under study

Methodologically, SEM strengthens this study by addressing the limitations of conventional linear models. It enables the simultaneous estimation of direct and indirect effects, accounts for measurement error, and reduces endogeneity concerns, particularly regarding parental involvement. By modeling mediating and reciprocal relationships, SEM provides a more accurate representation of educational dynamics (Pearl, 2009 [29]; Kline, 2015[30]). From a policy perspective, the findings reveal a gap between institutional ambitions and practical realities in Morocco. Although national reforms emphasize strengthening school–family partnerships, parental involvement remains strongly shaped by social inequalities and insufficiently structured, especially in public schools. This highlights the need to rethink participation mechanisms in light of local sociocultural contexts (Benhenda, 2018[31]).

In conclusion, the findings of this study demonstrate that parental involvement operates as a mechanism through which social inequality translates into academic inequality, and advocate for several strategic recommendations: strengthening parental training programs in vulnerable areas; developing specific training for teachers, focusing on intercultural communication and welcoming families; and integrating parental involvement indicators into school evaluation systems. Beyond the Moroccan context, this research also offers a significant methodological contribution, demonstrating that SEM provides a better understanding of the complex interactions at the intersection of family, social, and institutional spheres, thereby offering a valuable framework for public policy action.

7 Conclusion

At the conclusion of this research, it is clear that parental involvement at home exerts a strong influence on the academic performance of Moroccan students, much more pronounced than involvement at school. This conclusion aligns with findings from various international studies, notably those by Fan and Chen (2001), who demonstrated that forms of educational support within the home such as encouragement, homework supervision, and the valorization of learning are fundamental drivers of academic success. Similarly, Hill and Tyson (2009) emphasize the importance of parent-child interactions around academic content, suggesting that these exchanges create an environment conducive to motivation, autonomy, and knowledge acquisition.so streng-

5 kaike Information Criterion

6 Bayesian Information Criterion

thening home-based parental support represents a cost-effective strategy for improving educational outcomes

In contrast, involvement at school, often limited to formal participation in certain activities or occasional meetings with teachers, produces much more modest effects. This highlights the structural limitations of current school-family collaboration mechanisms. Indeed, as Pomerantz, Moorman, and Litwack (2007) have pointed out, institutional communication is often top-down, poorly contextualized, and difficult to access, especially for families from disadvantaged backgrounds or those distanced from dominant school norms. Therefore, low parental involvement at school should not be interpreted as a lack of interest but rather as a reflection of a lack of institutional recognition, or even a form of symbolic exclusion, as discussed by Reay (1998) and Vincent (2001) in their analyses of how certain families are perceived within the school space.

Furthermore, the study highlights the transversal role of families' socioeconomic status, which acts as a latent structuring determinant of parental involvement. This close link between social capital and academic performance confirms the analyses of Sirin (2005), who argues that educational inequalities are less related to the school itself than to the diversity of resources available within the family environment, such as parents' education level, the richness of language, and the presence of a conducive study environment. This reality is also underscored by OECD (2020) reports, which remind us that performance gaps between students cannot be fully understood without considering the quality of parental support, often correlated with social background.

In this context, the political implications of these findings are significant for the Moroccan educational system. Although the Strategic Vision 2015–2030 from the Higher Council for Education, Training, and Scientific Research, along with Framework Law 51.17, have acknowledged the importance of family involvement, it is evident that concrete actions supporting this goal remain in their early stages and are insufficiently adapted to local realities. Current initiatives still often prioritize standardized forms of participation, without considering the sociocultural diversity of families or the constraints they face.

To address this issue, a paradigm shift is necessary, with a renewed focus on prioritizing parental involvement at home in educational policies. This requires not only recognizing the value of informal educational practices already present in households, but also developing parental support programs based on a thorough understanding of local contexts. It is also essential to train teachers in intercultural and inclusive communication practices, to facilitate respectful and constructive dialogue with all families, regardless of their social background.

Finally, parental involvement should be integrated into the performance indicators of schools, not merely as an administrative requirement, but as a strategic lever to enhance the quality of learning. By strengthening the synergies between the school, the family, and the community, and by working to reduce cultural and institutional barriers to parental involvement, it becomes possible to build a more equitable, more effective, and truly grounded educational system. Thus, this research contributes to renewing the reflection on educational policies in Morocco and offers concrete path-

ways for reconciling the school and family spheres with the shared goal of success for all students.

8 Limitations and Future Directions

While this study provides valuable insights into the role of parental involvement in Moroccan students' academic achievement using PISA 2018 data and Structural Equation Modeling (SEM), several limitations must be acknowledged. First, the reliance on self-reported data may introduce social desirability bias or recall inaccuracies, potentially affecting the measurement of parental involvement. Although SEM enables the modeling of complex latent relationships, its validity depends on correct model specification and the inclusion of relevant variables. Omitted factors, particularly cultural or regional characteristics specific to Morocco, may influence both parental behaviors and student performance, thus limiting generalizability.

Furthermore, the exclusive reliance on quantitative data restricts the exploration of qualitative dimensions of parental involvement. Informal educational support within households may vary according to sociocultural contexts, language practices, and local values, aspects that large-scale surveys capture only partially. Complementing quantitative findings with qualitative approaches such as interviews or ethnographic studies would provide a deeper understanding of these mechanisms.

The cross-sectional nature of PISA 2018 also limits the ability to examine how parental involvement evolves over time or to fully disentangle reciprocal dynamics between academic performance and parental behavior. Longitudinal research is needed to assess sustained effects and policy impacts. Future studies should also incorporate detailed cultural and regional variables to reflect Morocco's sociocultural diversity and explore collaborative practices between schools, families, and communities.

Overall, while this research highlights the importance of parental involvement in Morocco, addressing these methodological and contextual limitations through diversified and longitudinal approaches will be essential for informing more effective and equitable educational policies.

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