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INVESTING BETTER: EFFICIENCY AND INEQUALITIES IN BRAZILIAN EDUCATION FINANCING

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RESUMO

This article critically examines the relationship between public resources invested in Brazilian education and the resulting school performance and teaching quality. The analysis draws on official data from INEP, OECD statistics, PISA 2022 results, and the evolution of IDEB across different regions of the country. Although Brazil allocates a significant share of its budget to education—approximately 5% of GDP—the data reveal low efficiency in the use of these resources. About 80% of spending is devoted to the remuneration of teachers and other education professionals, limiting essential investments in school infrastructure, pedagogical materials, and technological innovation. In annual per-student spending, Brazil invests roughly three times less than the OECD average, a gap that directly corresponds to significantly lower learning outcomes. Additionally, deep regional inequalities persist, with marked disparities in resource access and teaching quality across the country's regions. The study concludes that the combination of allocative inefficiency and territorial inequality constitutes a structural barrier to improving educational quality in Brazil. Addressing this challenge requires reforms that emphasize equity and the strategic use of resources.

Keywords: Education; Investment; Efficiency; PISA; IDEB; Brazil; OECD.

1. INTRODUCTION

1.1 EDUCATION AS THE FOUNDATION OF ECONOMIC AND SOCIAL DEVELOPMENT

Education is widely recognized as one of the essential pillars for sustainable economic and social development. It is more than a universal human right; it forms the foundation of human capital, driving productivity, innovation, social cohesion, and international competitiveness. A more highly qualified population is better equipped to generate creative solutions, adapt to new technologies, and propel collective progress.

The human-capital theory developed by scholars such as Schultz and Becker shows that investments in education yield significant returns at both individual and macroeconomic levels. Countries with robust educational systems tend to experience faster growth, greater innovation, and stronger institutional stability. Education also plays a crucial role in reducing inequality by expanding opportunities and breaking cycles of social exclusion.

International examples illustrate education's transformative impact. Finland combines excellence and equity through strong teacher status and flexible curricula. South Korea underwent an educational revolution by prioritizing infrastructure and rigorous teacher training. Singapore built a highly efficient system focused on meritocracy, long-term planning, and a high-performance culture, using data intensively to guide public policy.

These experiences suggest that strategic allocation matters more than sheer resource volume. Policies aimed at teaching quality, equitable access, and pedagogical innovation are fundamental for education to act as a true driver of economic and social transformation in the twenty-first century.

1.2 OVERVIEW OF EDUCATIONAL INVESTMENTS IN BRAZIL

Over the last two decades, Brazil has significantly strengthened its legal and institutional framework for financing education. The 1988 Federal Constitution, supported by subsequent legislation, set mandatory minimum spending levels for the Union, states, and municipalities. The creation of Fundeb[1] in 2006—and its renewal and expansion in 2020—represented a major

1 **FUNDEB (Fund for the Maintenance and Development of Basic Education and the Valorization of Education Professionals)** is a key financial mechanism in Brazil designed to ensure equitable funding for public basic education—from preschool through high school. Established in 2007 and made permanent in 2020, FUNDEB pools resources from federal, state, and municipal governments, redistributing them to reduce disparities and support schools in underserved regions. It plays a crucial role in financing teacher salaries, infrastructure, and educational programs, representing a cornerstone of Brazil's commitment to universal and quality education.

milestone. As the primary redistributive mechanism for basic education funding, Fundeb has helped reduce inter-governmental disparities, expand school coverage, and enhance the status of education professionals, especially in socioeconomically vulnerable regions.

During the 2000s and 2010s, both absolute and GDP-related education spending rose substantially. Structural policies such as extending compulsory basic education from ages 4 to 17, conditional-cash-transfer programs (Bolsa Família[2] and more recently Auxílio Brasil), and the expansion of school infrastructure drove enrollment growth and reduced educational exclusion.

However, quantitative gains have not translated into consistent quality improvements. Structural challenges persist, including weak resource management, fragmented educational policies, and a rigid budget that allocates roughly 80 percent of expenditure to personnel costs. This concentration limits investment in critical areas such as adequate infrastructure, up-to-date pedagogical resources, educational technology, and effective in-service teacher training.

Significant regional disparities continue to hinder educational equity in Brazil. Although certain areas have seen modest improvements in IDEB scores, many still struggle with low student proficiency, poor infrastructure, and a lack of qualified educators. Additionally, Brazil's performance in recent PISA assessments reflects this imbalance—despite increased investments, learning outcomes remain consistently below the OECD average. These challenges emphasize the pressing need to reassess not just the volume of investment, but more importantly, the effectiveness and strategic use of educational resources.

1.3 CENTRAL QUESTION: DO INVESTMENTS YIELD THE EXPECTED RETURNS?

Against this backdrop, a critical question arises: are the current resources invested in Brazilian education truly delivering the expected improvements in teaching quality and equity? Despite substantial financial inputs, the outcomes remain disappointing, suggesting a disconnect between investment volume and actual results—both on national and international benchmarks.

2 **Bolsa Família and Auxílio Brasil** are conditional cash transfer programs in Brazil aimed at reducing poverty and promoting social inclusion. Bolsa Família, launched in 2003, provided financial aid to low-income families contingent on school attendance and health checkups. In 2021, it was replaced by Auxílio Brasil, which expanded benefit amounts and eligibility criteria while maintaining similar conditionalities. Both programs are central to Brazil's social protection strategy and have shown measurable impacts on education, health, and income inequality.

This observation demands a rigorous assessment of allocative efficiency, focusing not only on spending levels but on how and where funds are deployed—and what tangible impacts they have on student learning and the reduction of educational inequalities.

1.4 STUDY OBJECTIVE

This article aims to conduct a comparative analysis of the relationship between public education funding in Brazil and student performance outcomes. The research draws on up-to-date data from INEP[3], OECD, PISA 2022, and IDEB, examining both budget distribution and average per-student costs across different educational stages.

By contrasting Brazil's investment-outcome coherence with that of OECD countries and Latin American peers that achieve higher educational indicators under similar budgetary structures, the study seeks to inform public-policy design. Our goal is to provide evidence-based recommendations for more strategic, equitable, and efficient use of available resources to raise educational quality.

2. THEORETICAL FRAMEWORK AND CONCEPTUAL FOUNDATIONS

The link between educational investment and economic development is well established in the economics of education literature. Various theoretical models argue that education should be viewed not merely as a consumption good or a social policy, but as a strategic lever for sustained economic growth, with direct and indirect impacts on productivity, innovation, social equity, and international competitiveness.

At the heart of this debate lies the concept of human capital, introduced by Theodore W. Schultz (1961) and further elaborated by Gary S. Becker (1964). Schultz contended that resources devoted to schooling and vocational training yield measurable returns by enhancing individuals' cognitive and productive skills. Becker systematized this view, empirically demonstrating that each additional year of schooling is associated with significant increases in future earnings, employability, and adaptability to technological change. He also emphasized the aggregate social benefits: higher economic output, increased public revenues, reduced crime and informality, and lower expenditures

3 **INEP (National Institute for Educational Studies and Research Anísio Teixeira)** is a federal agency linked to Brazil's Ministry of Education responsible for collecting, analyzing, and disseminating data on the country's education system. It oversees key assessments such as the IDEB and the national exam ENEM, playing a central role in educational planning and policy evaluation.

on compensatory social programs.

Building on this model, education operates as a growth engine not only at the individual level but also at the macroeconomic scale. Societies with greater stocks of human capital tend to absorb new technologies more efficiently, reallocate productive resources more rationally, and sustain stronger long-term growth trajectories. Hanushek and Woessmann (2015) reinforce this point by arguing that merely extending years of schooling is insufficient; learning quality must be guaranteed for education to exert a meaningful effect on long-run growth.

Complementing human-capital theory, endogenous growth models (Lucas, 1988; Romer, 1990) provide a sophisticated framework for understanding education's central role in modern development. Lucas introduced the notion of human-capital externalities, showing that education's benefits extend beyond the directly educated individuals by boosting average workforce productivity and fostering more dynamic economic environments. Romer argued that technological progress, the key driver of global competitiveness, is directly fueled by a country's capacity to generate knowledge, innovation, and new technologies, all of which stem from a solid educational base.

These converging theories underscore that education is not merely an intermediate input but an autonomous driver of sustainable economic growth. International case studies vividly illustrate this logic. South Korea, which in the 1950s and 1960s had low educational attainment and per-capita income, embarked on a systematic, coordinated investment in basic and higher education, aligning education policy with industrial and technological strategies. This effort produced a qualitative leap in human capital that manifested in high levels of innovation and productivity. Finland, by contrast, prioritized equity, flexible curricula, and rigorous teacher training to build a cohesive, efficient system that underpins its knowledge-based economy.

These examples demonstrate that the key differentiator is not absolute spending levels but strategic allocation and public policies oriented towards quality, equity, and innovation. In Brazil's case, however, the returns on educational investment have been limited. Despite allocating roughly 5 percent of GDP to educational level on par with international standards, about 80 percent of those funds go to payroll, leaving scant margin for investments in school infrastructure, technology, pedagogical innovation, and ongoing teacher development.

This configuration exemplifies technical and allocative inefficiency as defined by Farrell (1957). Technical efficiency refers to the capacity to achieve maximum output from available resources; allocative efficiency involves deploying resources where they yield the greatest impact. World Bank (2018) and OECD (2023) studies indicate that without a deep revision of educational management and spending priorities, the marginal returns on new investments are likely to be lower or even negligible—for student performance and the development of relevant skills.

Accordingly, the challenge is not merely to increase expenditure but to improve their quality. This requires establishing impact-monitoring mechanisms, revising budget allocation criteria, strengthening institutional capacities, and, above all, aligning education policy with a long-term vision centered on human-capital development.

Thus, the theoretical foundation of this article holds that Brazil's low educational-investment efficiency undermines not only student achievement but also the country's prospects for economic advancement, technological innovation, and competitive integration in an increasingly knowledge-intensive global economy. Investing better in education is therefore a necessary condition for Brazil to overcome its structural constraints and build a sustainable, inclusive development trajectory.

3. METHODOLOGY

3.1 RESEARCH TYPE AND APPROACH

This study is classified as applied research because it seeks to generate knowledge aimed at solving practical problems related to the efficiency of educational investments in Brazil.

It is both descriptive and exploratory in relation to its objectives:

- Descriptive, as it characterizes and quantifies resource distribution, per-student spending, and school performance outcomes.
- Exploratory, since it comparatively analyzes different national contexts to generate hypotheses and identify patterns of efficiency or inefficiency.
- From the methodological standpoint, the approach is quantitative and comparative.
- The quantitative dimension measures the impact of investments in terms of per-student cost, budget allocation, and learning indicators.
- The comparative dimension confronts Brazil's performance with OECD member countries and South American neighbors, highlighting similarities, discrepancies, and potential lessons.

3.2 DATA SOURCES

To conduct the analysis, three primary data sources were used:

- Distribution of educational resources in Brazil – INEP (2022) data detailing public allocations to teacher and administrative salaries, school infrastructure, instructional materials, and educational management.
- Average per-student expenditure – OECD (2023) data enabling comparison of Brazil's annual spending per student against the OECD average across primary, secondary, and tertiary levels.
- Performance indicators – PISA 2022 (Mathematics, Reading and Science) and IDEB (2019–2023) results, providing objective metrics of educational quality. The PISA assesses student proficiency internationally, while the IDEB tracks basic education progress regionally within Brazil.

3.3 DATA TREATMENT

The collected data underwent both descriptive and comparative analyses.

- Descriptive analysis organized and interpreted the data, outlining patterns of resource distribution and their reflections on performance indicators.
- Comparative analysis juxtaposed Brazilian results with OECD averages and reference South American countries, uncovering structural differences and gaps in converting investments into learning gains.

To examine the relationship between per-student investment and PISA 2022 performance, the following steps were taken:

1. Compiled average spending per student and mean scores in Mathematics, Reading, and Science for Brazil, Finland, and South Korea.
2. Conducted simple linear regression using per-student spending as the independent variable and subject scores as dependent variables.
3. Calculated the coefficient of determination ($R^2 \approx 0.88–0.90$ for Mathematics and Science) and Pearson's correlation coefficient ($r \approx 0.92$) to assess the strength and direction of linear association.
4. Developed predictive models estimating that a hypothetical increase of USD 10 000 in per-student investment would yield projected gains of 100–110 points in Mathematics and Science.

Finally, the study critically evaluated its limitations, including the small sample size, exclusion of Singapore due to data absence, and the inability to infer direct causality from observed correlations.

Through these procedures, the methodology aims not only to assess the absolute volume of investments but above all to evaluate the effectiveness of their application across quantitative variables and international contexts.

4. RESULTS

4.1 RESOURCE DISTRIBUTION

The analysis of public spending on Brazilian education in 2022 reveals a structural pattern that significantly constrains qualitative advances in teaching. Approximately 80% of the education budget was allocated to teacher and administrative staff salaries, demonstrating a heavy concentration of expenditure on payroll. While professional remuneration is essential, this excessive proportion compresses the margin available for equally strategic investments.

Only 5% of resources were dedicated to instructional materials and another 5% to school management, indicating neglect of key elements that stimulate learning and support effective school operations. This pattern undermines pedagogical renewal, hampers access to technological resources, and limits the development of adequate learning environments—critical factors for fostering innovative practices and improving educational outcomes.

In contrast, OECD member countries display a more balanced distribution of educational investments. There, a larger share of funds is directed toward school infrastructure, procurement of high-quality teaching materials, and deployment of educational technologies. Furthermore, more dynamic school-management policies and a focus on innovation enable more efficient use of public resources.

This structural disparity between Brazil and OECD nations highlights how the Brazilian model's low spending diversification contributes to inefficiency and limits the positive impact of investments on educational quality. Overcoming these obstacles will require rethinking budget-allocation logic to expand investments that promote effective learning, reduce regional inequalities, and prepare the education system for contemporary challenges.

4.2 EXPENDITURE PER STUDENT

The comparison shown in Table 1 highlights a troubling gap in annual per-student spending between Brazil and OECD member countries. Although Brazil allocates a substantial share of its GDP to education, the actual funding per student remains well below the international average, undermining multiple dimensions of instructional quality.

Table 1 | Annual Expenditure per Student: Brazil vs. OECD Average by Education Level (USD)

Stage of Education	Brazil (USD/student/year)	OECD Average (USD/student/year)	Difference (%)
Primary Education	3,668	11,914	~223% higher in OECD
Lower Secondary Education	3,745	13,260	~254% higher in OECD
Upper Secondary Education	4,058	12,713	~213% higher in OECD
Tertiary Education	13,569	17,138	~26% higher in OECD

Fonte: OCDE (2024)

Table 1 compares the annual per-student expenditure in Brazil and the OECD average, segmented by education level. The data reveals a significant mismatch between the invested amounts, especially in basic education.

In primary education, Brazil spends an average of USD 3,668 per student per year, while the OECD average is USD 11,914 — approximately 223% higher. In lower secondary education, the gap is even more pronounced: USD 3,745 in Brazil versus USD 13,260 in the OECD, corresponding to about 254% more. In upper secondary education, the disparity remains high, with USD 4,058 invested in Brazil compared with USD 12,713 in OECD countries (213% more).

The only level where the percentage difference is smaller is in higher education, where Brazil invests USD 13,569 per student per year, compared to USD 17,138 in the OECD — a difference of approximately 26%.

These figures demonstrate that although Brazil allocates a significant portion of its budget to education, the effective per-student amount remains well below international standards, especially in basic education. This gap limits investments in infrastructure, teacher training, and educational resources, directly impacting the quality of learning and the country's educational competitiveness.

4.2.1 PRACTICAL IMPLICATIONS OF THE MISMATCH

The insufficiency of annual per-student spending in Brazil compared with international standards leads to a series of practical consequences that directly affect the quality of public education.

- Deficient school infrastructure Low per-student investment hinders the modernization of school buildings, the adaptation of technological environments, and the creation of learning-friendly spaces such as well-equipped laboratories and up-to-date libraries.
- Teacher training and valorization Budget constraints limit the provision of ongoing professional development for educators and reduce incentives for the teaching profession, undermining teacher motivation and professional growth.
- Low pedagogical innovation Scarce resources prevent the adoption of active methodologies, digital technologies, and inclusive practices, making it difficult to build a more dynamic, equitable education adapted to contemporary challenges.
- Intensified regional inequalities States and municipalities with lower revenue-generating capacity suffer more acutely from underfunding, deepening educational disparities across different areas of the country and perpetuating cycles of exclusion, thus limiting the potential for social transformation through education.

4.2.2 STRATEGIC REFLECTIONS

Despite allocating a significant share of its GDP to education, Brazil's budgetary expressiveness has not translated into concrete equity and efficacy outcomes in the education system. Disproportionate resource allocation to payroll—especially salaries and administrative charges—considerably reduces the capacity to invest in vital areas for pedagogical transformation, such as infrastructure, teaching materials, educational technology, and teacher training.

Given this scenario, it is imperative to redefine education financing strategies to enhance the efficiency of public resources. A reconfiguration of the budget model is needed, balancing commitments to remuneration with structural and pedagogical investments that can sustainably raise educational indicators.

Establishing progressive targets for increasing per-student spending, with special attention to basic education and less developed regions, represents a strategic measure to address historical disparities and strengthen equity in access to quality education. Such measures require not only political will but also improvements in management and evaluation mechanisms to ensure that available resources generate real impacts in everyday school life.

4.3 PISA PERFORMANCE (2022)

The results of the 2022 Programme for International Student Assessment (PISA) underscore Brazil's structural challenge in converting invested resources into concrete learning gains. In the Mathematics assessment, Brazilian students scored an average of 379 points, significantly below the

OECD average of 420 points. The gap is even more pronounced in Reading: Brazil achieved 410 points versus the OECD average of 476 points, a 66-point difference that reflects substantial shortfalls in text comprehension and critical interpretation skills.

These performance gaps cannot be attributed solely to lower per-student spending but also to a range of structural issues that undermine the effectiveness of public investment. Among these factors are:

- problems in school management
- lack of consistent policies for initial and ongoing teacher training
- unequal access to quality pedagogical resources
- weaknesses in systematic monitoring of student performance

The PISA findings indicate that simply increasing the education budget—without changing allocation criteria or implementing more efficient management and monitoring strategies—is unlikely to yield substantial improvements in educational outcomes. Resources must be allocated more strategically, prioritizing continuous teacher development, pedagogical innovation, modern infrastructure, and high-quality learning materials to drive real gains in proficiency and equity.

Table 2 | PISA Scores by Discipline: Brazil Compared to High-Performing Countries

Country	Mathematics	Reading	Science
Brazil	~379	~410	~403
Finland	~484	~511	~511
South Korea	~527	~515	~528
Singapore	~575	~543	~561

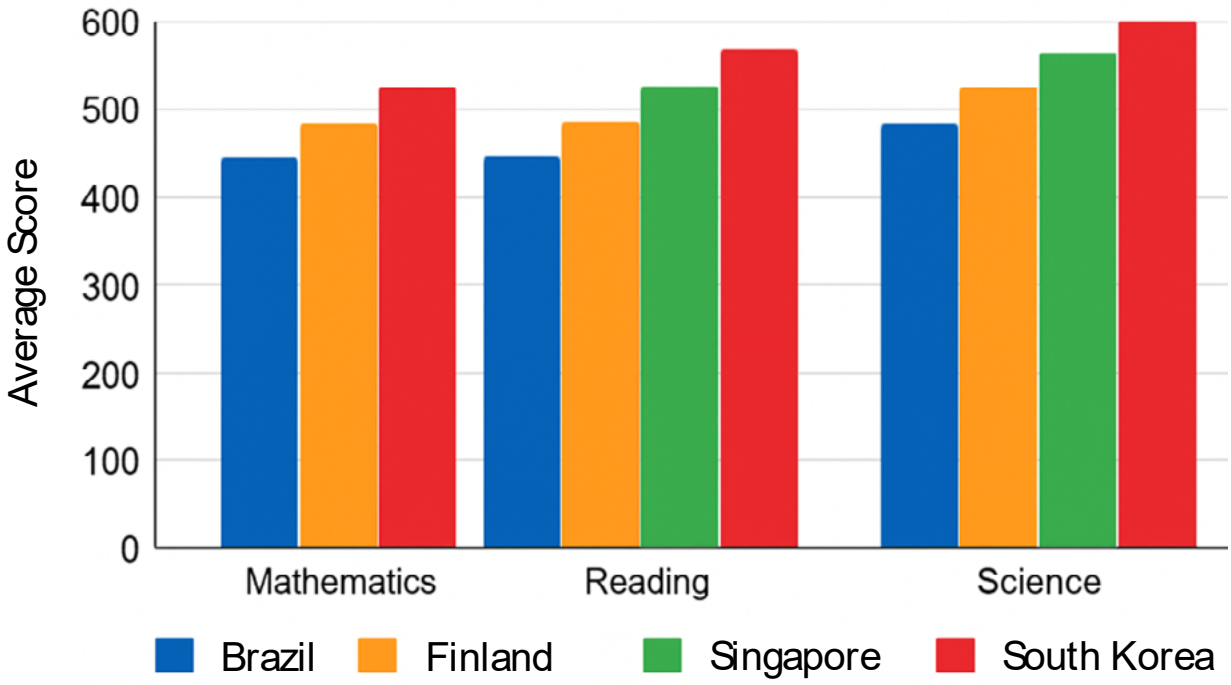
The most recent PISA data (2022) reveal a considerable gap between Brazil's performance and that of benchmark education systems such as Singapore, South Korea, and Finland. In Mathematics, Brazilian students averaged about 379 points, whereas Singapore scored around 575 points—a difference of nearly 200 points, equivalent to approximately five years of schooling according to the OECD. This pattern holds in Reading and Science, where Brazil posted averages of 410 and 403 points, respectively, far below the 540–560 point range achieved by top-performing countries.

Only 27% of Brazilian students reach the baseline proficiency level (Level 2) in Mathematics, compared with 69% across OECD countries, underscoring the scale of the challenge.

Singapore leads globally in all three disciplines with scores of 575 in Mathematics, 543 in Reading, and 561 in science. South Korea also performs exceptionally, particularly in Mathematics (527) and Science (528), along with a strong Reading score (515). Finland, despite a slight decline since 2018, remains above the OECD average with 484 in Mathematics and 511 in both Reading and Science.

These disparities reflect more than just differences in funding levels. They highlight the importance of strategic resource allocation, high-quality teacher preparation, continuous student assessment, and balanced investments in curriculum, infrastructure, and innovation. Brazil's lower performance signals an urgent need for reforms that go beyond simply increasing spending and instead focus on how educational resources are deployed to improve learning outcomes.

Table 3 | Average PISA Performance by Subject Area: Comparison among Brazil, Finland, South Korea, and Singapore



Fonte: PISA 2022 Results (Volume I)

The comparison of PISA results among Brazil, South Korea, Finland, and Singapore reveals stark disparities in educational performance. Singapore consistently ranks at the top across all three domains—Mathematics, Reading, and Science—affirming its status as a global reference in education.

Both South Korea and Finland also achieve scores well above the OECD average, standing out for their balanced and effective educational systems. In contrast, Brazil records the lowest performance among the four countries in all three areas, remaining consistently below the OECD average. The gap is particularly pronounced in Mathematics, where Singapore's average score is nearly double that of Brazil. Although the gaps in Reading and Science are somewhat smaller, Brazil's results still fall far short of those of the top-performing nations.

What sets the high-performing countries apart is the consistency of their outcomes across all areas. These systems value both mastery of core content and the development of critical thinking skills. Despite allocating a considerable share of public spending to education, Brazil's low performance suggests inefficiencies in the use of resources. The country's educational outcomes indicate the need for more strategic investments, especially in teacher training, school infrastructure, and the provision of instructional materials.

Ultimately, the data highlight a disconnect between investments and learning outcomes in Brazil. To narrow this gap and approach the standards of Singapore, Finland, and South Korea, the country needs to reassess its budgetary priorities, tackle regional inequalities, and strengthen the quality of basic education, with a focus on improving teaching and learning conditions.

Table 4 | International Comparison of Average Expenditure per Student in Basic Education

Country	Spending per Student (USD, approx.)	Source / Notes
Brazil	3,668	OECD data: average per-student spending at the primary education level
South Korea	15,900	OECD statistics: among the highest in the OECD for primary/secondary education
Finland	~11,900	Near OECD average; Finland among the wealthiest countries in the OECD
Singapore	*Data not available*	Singapore is not part of the OECD; official per-student spending not regularly published

Table 4 presents the approximate per-student expenditure values for the countries analyzed, highlighting the significant discrepancies between Brazil and more advanced education systems such as South Korea and Finland.

Beyond the absolute figures, it is essential to understand how these investments translate into educational outcomes. In this regard, Table 5 seeks to establish a statistical relationship between per-student investment and the average PISA scores in Mathematics, Reading, and Science, illustrating the potential impact of educational funding on learning.

Table 5 | Statistical Relationship between Investment per Student and PISA Performance by Subject Area (Linear Regression Models and Coefficients of Determination – R^2)

Subject	Model Equation	R-squared
Mathematics	Score ≈ 368 + 0.01 × Spending	~0.88
Reading	Score ≈ 421 + 0.007 × Spending	~0.72
Science	Score ≈ 381 + 0.009 × Spending	~0.90

(The numbers above are approximate and illustrative of the observed relationship.)

Analyzing average per-student investment and PISA 2022 performance data for Brazil, Finland, and South Korea reveals a strong statistical link: education systems with higher financial investments per student tend to achieve superior scores. A linear regression between spending per student and the averages across the three assessed domains (mathematics, reading, and science) yielded coefficients of determination (R^2) between 0.88 and 0.90 for mathematics and science, and the Pearson correlation coefficient was approximately $r \approx 0.92$.

Predictive modeling indicates that an increase of US$ 10 000 in investment per student could be associated with gains of roughly 100 to 110 points in mathematics or science. In practice, Brazil, which allocates about US$ 3 670 per student, obtained an average score of 395, while Finland (approximately US$ 11 900) reached 513.33, and South Korea (around US$ 15 900) scored 519.67.

However, these findings should be interpreted with caution. The sample includes only three countries and excludes Singapore due to the absence of expenditure data. Correlation does not imply causation: pedagogical, cultural, school management, and public policy factors also shape

learning outcomes in ways that cannot be captured solely by financial figures.

In short, although the relationship between per-student investment and PISA performance is strong in this limited analysis, how resources are allocated—such as in ongoing teacher training, laboratories, and instructional materials—may be even more decisive. For Brazil, increasing the effectiveness of these investments is essential to close the gap with benchmark systems and progress toward higher educational standards.

4.4 EVOLUTION OF THE BASIC EDUCATION DEVELOPMENT INDEX (IDEB) (2019–2023)

The analysis of the Basic Education Development Index (IDEB) from 2019 to 2023 reveals a scenario of modest advances, stagnation, and even setbacks in some regions of the country, highlighting the complexity and heterogeneity of the Brazilian educational system.

In the northern region of the country, the index increased from 3.9 to 4.1, while in the Northeast it rose from 4.0 to 4.1, indicating marginal improvements that, although positive, remain far below national and international quality benchmarks.

In the Central-West region, performance essentially stagnated, dropping from 4.5 to 4.4, which signals a lack of progress and raises questions about the effectiveness of implemented policies. Meanwhile, in the Southeast—Brazil's most economically developed region with better structural conditions—the IDEB fell from 4.4 to 4.3, indicating that even more favorable socioeconomic contexts do not automatically translate into learning gains.

These results confirm the persistence of regional inequalities, which manifest both in historically vulnerable areas—such as the North and Northeast, where improvements are gradual—and in wealthier regions that have failed to sustain progress. The causes behind this situation include disparities in school infrastructure, differences in teacher training and recognition, challenges in accessing pedagogical resources, and the lack of regionally tailored policies adapted to local realities.

This analysis underscores the need for equity-driven educational public policies that not only increase investment but also tailor strategies according to regional conditions, ensuring that progress is consistent and sustainable across the national territory.

5. DISCUSSION

5.1 INEFFICIENCY IN RESOURCE ALLOCATION

The data analysis reveals a strong concentration of Brazilian education resources in payroll, which accounts for approximately 80% of the total education budget. While adequate salaries for teachers and administrative staff are essential for workforce retention and motivation, this overly concentrated allocation undermines the system's capacity to make strategic investments in other areas that are equally crucial for improving teaching quality.

Areas such as school infrastructure, procurement of quality teaching materials, integration of educational technology, and implementation of pedagogical innovation programs end up receiving limited funds, hindering significant progress. A concrete example can be seen in the public school networks of states like Maranhão and Pará, where schools still operate in buildings with substandard facilities, overcrowded classrooms, and no science or computer laboratories. In these regions, even with substantial spending on salaries, the physical environment and pedagogical resources remain insufficient to support modern and engaging educational practices.

In contrast, higher-performing education systems, such as Finland and South Korea, employ a more balanced budget allocation. In addition to competitive salaries, they dedicate substantial portions to the ongoing modernization of school facilities, technology upgrades, library renewals, and structured continuous teacher training programs. These complementary investments ensure that teacher recognition is matched by adequate material and pedagogical conditions for teaching.

In Brazil's case, the current budgetary configuration limits the system's ability to adapt to new educational demands, such as incorporating digital technologies into the curriculum, adopting active learning methodologies, and preparing students for twenty-first-century competencies. Without a strategic overhaul of resource allocation, public education risks remaining confined to a static model, unable to keep pace with ongoing social and economic transformations.

Chart 1 | Education Budget Allocation: Brazil vs OECD

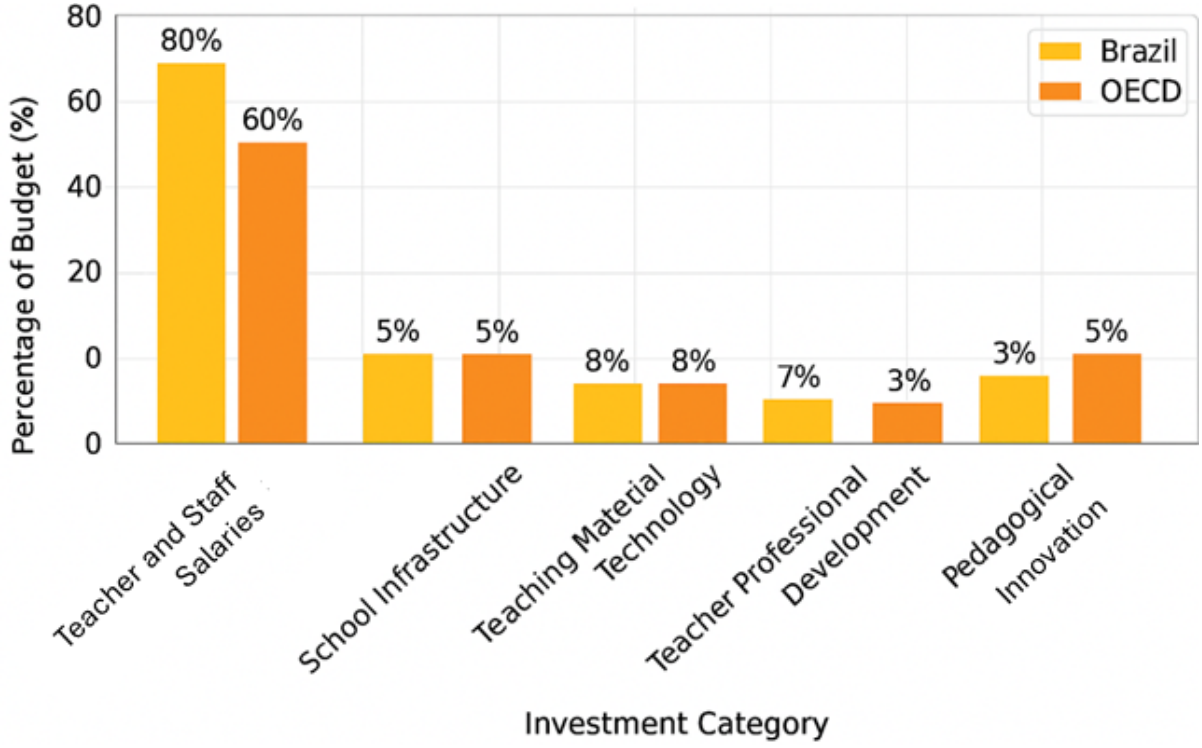


Chart 1 compares the budget allocation for education between Brazil and the OECD average, highlighting significant differences in how resources are distributed. In Brazil, spending on teacher and staff compensation accounts for 80% of the total education budget. By contrast, the OECD average allocates about 60% to the same category, maintaining a more balanced distribution across other strategic areas.

School infrastructure—which is essential for a quality learning environment—receives only 5% of Brazil's resources, whereas OECD countries invest around 15% in this area. This discrepancy can directly affect the modernization and upkeep of Brazilian schools.

Investment in instructional materials is also limited in Brazil at 5%, compared to 8% in the OECD, and spending on educational technology is just 3% in Brazil versus 7% in the OECD. These figures indicate that the Brazilian system does not yet sufficiently prioritize tools and resources that can innovate and diversify the teaching–learning process.

Continuing teacher professional development, considered crucial for improving pedagogical practice, receives 4% of Brazil's budget, below the OECD average of 5%. Finally, investment in pedagogical innovation amounts to only 3% in Brazil, contrasted with 5% in the OECD.

This analysis suggests that Brazil's budget model is highly concentrated on salary costs, leaving little room for strategic investments in infrastructure, technology, and innovation—areas that, according to successful international experiences like those of Finland and South Korea, are decisive for boosting student performance and teaching quality.

5.2 LOW RETURN ON PERFORMANCE

The analysis of Brazil's PISA 2022 results, presented in Section 4.3, makes clear that simply increasing resources—even when they represent a high percentage of GDP—does not automatically translate into better learning outcomes. Although Brazil allocates education investments at levels comparable to OECD countries, its students remain below average: 379 points in mathematics (against 420 in the OECD) and 410 in reading (476 in the OECD).

This gap reveals that the core issue is not necessarily the absolute insufficiency of resources but rather their low efficiency of application. Funds that could be directed toward strategic areas—such as ongoing teacher development, acquisition of quality instructional materials, modernization of school infrastructure, and integration of educational technologies—end up being distributed without clear criteria or concentrated in expenditures that do not directly impact learning.

The lack of a robust educational planning framework, linked to clear and measurable performance targets, exacerbates the situation. Moreover, weak monitoring and evaluation policies—at the school, state, and municipal levels—prevent managers from promptly identifying bottlenecks and making effective adjustments.

In this regard, the experience of top-performing PISA countries like Finland and South Korea shows that the quality of educational management and the implementation of evidence-based policies are as or more relevant than the absolute volume of investment. These nations use continuous evaluation mechanisms, align curricula and teacher training with clear learning objectives, and ensure that resources are applied to high-impact pedagogical areas.

Therefore, Brazil's scenario suggests that priorities should shift from a predominantly budget-centric focus to a strategic and managerial approach, where teaching quality, public spending efficiency, and rigorous result-tracking form the central axis of educational policies—ensuring that every real invested yields real proficiency gains and greater equity.

5.3 REGIONAL INEQUALITY

The IDEB 2019–2023 data highlight persistent structural disparities in Brazil's education system. Historically vulnerable regions like the North and Northeast showed only modest improvements, the Central-West stagnated, and the Southeast—despite its stronger economic development—experienced a decline. These outcomes indicate that uniform educational policies are insufficient to address such diverse realities. A differentiated approach is needed, one that considers socioeconomic factors, available infrastructure, and teacher training adapted to local needs. Without targeted actions, disparities in performance and opportunity between regions are likely to persist.

5.4 INTERNATIONAL COMPARISON

Comparisons with South American peers such as Chile and Uruguay demonstrate that better educational outcomes can be achieved with investment levels similar to or even lower than Brazil's. These countries stand out for more efficient resource management, greater emphasis on teacher quality, robust continuing-education programs, and the adoption of innovative teaching methodologies. In addition, they consistently use data to monitor and adjust public policies, ensuring that investments translate into tangible learning improvements. The contrast underscores that governance and strategic resource management matter more than the sheer volume of spending.

6. CONCLUSION

The statistical link between per-student investment and PISA outcomes is robust: systems that commit more resources per learner tend to report higher scores. Yet, this association masks the crucial role of resource efficiency. Linear regression and Pearson correlation analyses confirm that without strategic allocation—focusing on high-impact areas—additional funds risk being absorbed by routine costs without translating into learning gains.

Brazil's budgetary landscape is dominated by payroll expenses, which account for approximately 80% of total education spending. This emphasis on salaries, while necessary to attract and retain quality staff, constrains the system's capacity to invest in physical and pedagogical infrastructure. Comparative evidence from Finland and South Korea illustrates that balanced funding—where competitive salaries coexist with sustained investment in facilities, instructional

materials, and technology—yields substantial dividends in student achievement.

Regional IDEB trajectories from 2019 to 2023 expose persistent inequities. The modest improvements in the North and Northeast, the plateau in the Central-West, and the downturn in the Southeast demonstrate that a one-size-fits-all policy approach falls short. Tailored interventions, sensitive to each region's socioeconomic realities, infrastructure deficits, and human resource challenges, are indispensable for narrowing performance gaps and fostering uniform progress.

International benchmarks further reinforce the principle that governance quality often outweighs sheer spending volume. Chile and Uruguay, with investment levels comparable to Brazil, outperform through rigorous planning, transparent monitoring, and continuous professional development for teachers. These systems align curriculum objectives with measurable targets, deploy data analytics to detect and address bottlenecks, and foster a culture of accountability at every administrative tier.

To drive a paradigm shift in Brazil's educational outcomes, policymakers should prioritize:

- Equitable funding formulas that channel additional resources to historically underserved regions
- Strategic capital investments in school buildings, laboratories, libraries, and digital infrastructure
- Sustained support for teacher learning communities, peer mentoring, and technology-enhanced pedagogy
- The creation of clear, outcome-oriented performance frameworks with real-time monitoring and feedback loops
- Mechanisms for stakeholder engagement—inviting input from educators, families, and local leaders to co-design solutions

Future research agendas must broaden international comparisons to include a diverse array of education systems, integrate in-depth qualitative studies of classroom practice, and conduct longitudinal evaluations of targeted resource reallocations. Cost-effectiveness analyses, case studies of successful regional initiatives, and explorations of the social returns on education investment will provide the nuanced evidence base needed to refine policy.

By coupling adequate funding with strategic management, localized policy design, and rigorous accountability, Brazil can ensure that every real invested yields measurable improvements in equity, proficiency, and long-term social development.

The analysis of investments made in Brazilian education shows that the resources applied have not produced the expected results in terms of learning, equity, and efficiency. Although there have been advances in expanding school coverage, a gap remains between the volume of investments and the tangible impacts on the quality of education, which underscores the need to rethink policies and management strategies.

REFERENCES

WORLD BANK. *A Fair Adjustment: An Analysis of the Efficiency and Equity of Public Spending in Brazil*. Washington, DC: Banco Mundial, 2018.

WORLD BANK. *World development indicators: education*. Washington, DC: Banco Mundial, 2022.

WORLD BANK. *Great Teachers: How to Raise Student Learning in Latin America and the Caribbean.* Washington, DC: World Bank, 2018. Disponível em: https://www.worldbank.org. Acesso em: 2 ago. 2025.

BARBER, Michael; MOURSHED, Mona. *How the World's Best-Performing School Systems Come Out on Top.* McKinsey & Company, 2007. Disponível em: https://www.mckinsey.com. Acesso em: 2 ago. 2025.

BECKER, G. S. *Human capital: a theoretical and empirical analysis*. Chicago: University of Chicago Press, 1993.

FARRELL, M. J. *Measurement of productive efficiency*. *Journal of the Royal Statistical Society. Series A (General)*, London, v. 120, n. 3, p. 253–290, 1957.

HANUSHEK, Eric A.; RIVKIN, Steven G. The quality and distribution of teachers under the No Child Left Behind Act. In: LOEB, Susanna; COCHRAN-SMITH, Marilyn; PETERSON, Kenneth (ed.). *Handbook of research on teacher education: Enduring questions in changing contexts.* 3. ed. New York: Routledge, 2010. p. 421–444.

HANUSHEK, E. A.; WOESSMANN, L. *The knowledge capital of nations: education and the economics of growth*. Cambridge: MIT Press, 2015.

INEP. *Índice de Desenvolvimento da Educação Básica (IDEB) [Basic Education Development Index (IDEB)]*. Brasília: Ministério da Educação, 2023.

INEP. *Relatório do PISA 2022: resultados do Brasil [PISA 2022 Report: Brazil's Results]*. Brasília: Ministério da Educação, 2023.

LUCAS, R. E. On the mechanics of economic development. *Journal of Monetary Economics*, Amsterdam, v. 22, p. 3–42, 1988.

OECD. *Education at a glance 2023: OECD indicators*. Paris: OECD Publishing, 2023.

ROMER, P. M. Endogenous technological change. *Journal of Political Economy*, Chicago, v. 98, n. 5, p. S71–S102, 1990.

SCHULTZ, T. W. Investment in human capital. *American Economic Review*, Nashville, v. 51, p. 1–17, 1961.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