Management, Strategic Management, and Quality Assurance in the Education Sector: A Comparative and Econometric Analysis

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Abstract. This study investigates the roles of management, strategic management, and Quality Assurance (QA) in enhancing the resilience and competitiveness of the education sector, with a focus on Morocco's preparation for global educational leadership by 2030. Employing a mixed-methods approach; qualitative benchmarking against Finland and Singapore, and quantitative econometric modeling via the Generalized Method of Moments (GMM), we analyze educational performance indicators from 2007 to 2022, sourced from UNESCO, OECD, and Moroccan national databases. Findings reveal that strategic management significantly improves adaptability and resource allocation, evidenced by Morocco's enrollment growth from 6.8 million to 7.5 million students (2007-2019), driven by teacher qualifications and digital infrastructure. However, Morocco lags in QA frameworks, digital penetration (e.g., 25% in rural areas, 2019), and governance effectiveness compared to benchmarks. We recommend integrating technology-driven QA systems, fostering stakeholder collaboration, and aligning policies with Sustainable Development Goals (SDGs), particularly Goal 4 (Quality Education). Limitations include incomplete QA data and a focus on formal education, excluding informal systems. This research provides a robust framework for policymakers to enhance Morocco's educational competitiveness, offering practical implications for sustainable reform.

Key-words: Management; Strategic Management; Quality Assurance; Education Sector; Benchmarking; Econometrics; Sustainable Development Goals.

1. Introduction

Education is a foundational pillar of sustainable development, shaping human capital, fostering social cohesion, and driving economic progress. The UNESCO Education 2030 Framework forecasts that by 2030, over 50% of the global workforce will require advanced education to meet evolving labor market demands, necessitating resilient and adaptive educational systems (UNESCO, 2015). The COVID-19 pandemic exposed systemic fragilities, reducing global learning outcomes by an estimated 40% in 2020 and disproportionately affecting low-income

regions (OECD, 2021). In response, international bodies like the OECD and UNESCO have advocated for enhanced management practices, strategic planning, and Quality Assurance (QA) to rebuild education systems capable of addressing future challenges (OECD, 2021).

In Morocco, education is a strategic priority, contributing approximately 5.5% to GDP and employing over 280,000 educators as of 2019 (Ministère de l'Éducation Nationale, du Préscolaire et des Sports-MNEPS, 2020). Enrollment grew steadily from 6.8 million students in 2007 to 7.5 million in 2019, driven by successive policies such as Vision 2010 and Vision 2020, which aimed to universalize access and improve literacy rates (MNEPS, 2011; 2021). The Strategic Roadmap 2022-2026, launched in 2021, sets ambitious targets: enrolling 9 million students, digitizing 50% of classrooms, and training 100,000 teachers by 2026, with a particular focus on upgrading rural infrastructure (MNEPS, 2021). Despite these efforts, Morocco faces persistent challenges: aging school facilities, inconsistent QA mechanisms, and governance inefficiencies, as highlighted by the Court of Auditors (Cour des Comptes, 2021). For instance, only 25% of rural schools had digital access in 2019, and literacy rates, though improved to 67%, lagged behind regional peers like Tunisia (81%) (Observatoire de l'Éducation, 2020; UNESCO Institute for Statistics, 2020).

Morocco's ambition to co-host international educational summits by 2030 reflects its broader goal of transitioning from a developing nation to a regional and global educational leader, leveraging its strategic position in North Africa and a historical commitment to educational reform since independence in 1956 (MNEPS, 2020). However, achieving this vision requires overcoming structural barriers, including a centralized governance model that limits local adaptability, a pronounced digital divide disadvantaging rural populations, and a QA system that prioritizes compliance over measurable outcomes (Cour des Comptes, 2021; Ait Si Larbi, 2021). These challenges threaten Morocco's ability to align with global standards of educational excellence, as exemplified by leading systems like Finland and Singapore.

This study addresses a pivotal research question: *How can management, strategic management, and quality assurance be optimized to ensure sustainable educational excellence in Morocco by 2030?*

The significance of this question lies in its implications for Morocco's economic competitiveness, social equity, and international standing. Education is a key driver of Morocco's human development index (HDI), which improved from 0.531 in 2000 to 0.683 in 2019, yet remains below the global average (UNDP, 2020). Enhancing educational quality and access could accelerate this progress, aligning with SDG 4 (Quality Education) and supporting Morocco's broader developmental goals.

To answer this question, we adopt a mixed-methods approach:

- **Qualitative Benchmarking:** We compare Morocco's educational policies and practices with those of Finland and Singapore; two nations renowned for their educational excellence and contrasting management philosophies: Finland's decentralized, trust-based system and Singapore's centralized, data-driven model (Sahlberg, 2011; Ng, 2017).
- **Quantitative Analysis:** We employ the Generalized Method of Moments (GMM) to analyze panel data from 2007 to 2022, sourced from UNESCO, OECD, and Moroccan national databases, ensuring all data are historically verifiable up to April 2023.

Two hypotheses guide our investigation:

- **H1:** The Strategic Roadmap 2022-2026 incorporates essential elements for sustainable educational development and competitiveness by 2030, such as teacher training and digitalization.
- **H2:** The roadmap inadequately addresses QA, digitalization, and governance challenges compared to leading educational systems, limiting its effectiveness in achieving global standards.

This research contributes to the literature by integrating management theories with empirical evidence from a developing context, offering a comprehensive analysis of Morocco's educational system in relation to global benchmarks. By focusing on pre-2023 data, we ensure validity while providing a baseline for assessing the roadmap's potential impact.

The paper is structured as follows: Section 2 reviews the literature on management, strategic management, and QA; Section 3 examines Finland, Singapore, and Morocco; Section 4 details the methodology; Section 5 presents results; Section 6 discusses findings, implications, and limitations; Section 7 concludes; and appendices provide supplementary data.

2. Literature Review
a. Theoretical Foundations

Management in education entails coordinating human, financial, and infrastructural resources to achieve institutional objectives, balancing operational efficiency with equitable access (Bush, 2011). It encompasses planning, organizing, leading, and controlling educational activities to ensure effective delivery of learning outcomes. Strategic management extends this framework by aligning long-term goals with external dynamics (such as technological advancements, demographic shifts, and global economic demands) fostering adaptability and resilience (Mintzberg et al., 1998). It involves setting a vision, analyzing environmental factors, and implementing policies to achieve sustainable progress. Quality Assurance (QA) establishes standards for educational processes, ensuring accountability, improving student outcomes, and strengthening institutional credibility (Harvey & Green, 2000). QA mechanisms, such as evaluations and audits, monitor performance and drive continuous improvement.

Historically, educational management post-World War II focused on administrative efficiency, prioritizing enrollment expansion over quality enhancement, particularly in industrialized nations rebuilding their economies (Tyack, 1974). This approach was evident in the rapid expansion of schooling systems in Europe and North America during the 1950s and 1960s, often at the expense of pedagogical innovation. By the 1980s, the rise of knowledge-based economies spurred a shift toward strategic planning, as countries sought to prepare workforces for global competition (Drucker, 1993). The UNESCO (1997) report on higher education underscored QA as critical for maintaining standards amid rapid expansion, a priority reinforced by the SDGs, notably Goal 4, which targets inclusive and equitable quality education by 2030 (UNESCO, 2015). French scholar Le Boterf (1994) introduced "*compétence collective*" (collective competence), arguing that modern educational management requires collaborative skills across stakeholders (teachers, administrators, and communities) to address complex challenges (translated from French: Le Boterf, G. (1994). *De la compétence: Essai sur un attracteur étrange*. Paris: Éditions d'Organisation). This concept emphasizes the need for shared expertise in managing educational systems effectively.

b. Contemporary Frameworks and Global Perspectives

Contemporary educational systems emphasize sustainability and competitiveness as dual imperatives. Finland's decentralized, trust-based management model leverages teacher autonomy and community engagement, achieving PISA 2018 scores of 520 in mathematics, 526 in reading, and 522 in science, placing it among the top five globally (Sahlberg, 2011; OECD, 2019). This model contrasts with Singapore's centralized, data-driven approach, which aligns education with economic priorities, yielding PISA 2018 scores of 569, 551, and 551, respectively, making it the global leader (Ng, 2017; OECD, 2019). The OECD (2021) identifies three pillars for modern education systems: digitalization to enhance access and learning, stakeholder collaboration to ensure relevance, and continuous QA to maintain standards. These pillars align with Porter's (1990) theory of competitiveness, which emphasizes efficient resource use and innovation, and the Brundtland Report's (1987) sustainability principle,

advocating development that preserves resources for future generations (World Commission on Environment and Development, 1987).

Globally, educational management has evolved from a focus on inputs (e.g., buildings, teachers) to outcomes (e.g., learning, skills). The World Bank (2018) notes that in high-performing systems, strategic management integrates long-term planning with real-time adaptability, while QA ensures accountability through measurable indicators. For instance, Finland's approach minimizes standardized testing, relying on teacher-led assessments, whereas Singapore uses rigorous data analytics to monitor performance (World Bank, 2018). These contrasting strategies highlight the diversity of effective management practices, offering lessons for developing contexts like Morocco.

c. Regional and Contextual Perspectives

Many scholars provided critical insights into educational management in North Africa, particularly Morocco. El Mili (2018) argues that "*une centralisation excessive*" (excessive centralization) in Morocco stifles local adaptability, leading to inefficiencies in resource allocation and policy execution (translated from French: El Mili, N. (2018). *La gestion de l'éducation au Maghreb*. Revue Marocaine des Sciences de l'Éducation, 12(3), 45-62). This centralization, a legacy of colonial administration, concentrates decision-making in Rabat, often neglecting regional needs, such as rural infrastructure. Benkirane (2020) critiques Morocco's QA systems as "*fragmentées et peu systématiques*" (fragmented and unsystematic), noting a reliance on sporadic inspections rather than structured evaluation, which undermines educational quality (translated from French: Benkirane, S. (2020). *Assurance qualité dans l'éducation marocaine*. Rabat: Presses Universitaires Marocaines). These critiques resonate with broader challenges in developing contexts, where resource constraints and bureaucratic inertia hinder the adoption of advanced management frameworks.

In Morocco, educational management has historically prioritized access over quality, reflecting post-independence efforts to build a national system. The 1960s National Charter aimed to universalize primary education, followed by Vision 2010 and Vision 2020, which set quantitative targets (MNEPS, 2011; 2021). However, qualitative improvements; such as literacy and learning outcomes, have lagged, with only 67% literacy in 2019 compared to regional peers (UNESCO Institute for Statistics, 2020). This gap underscores the need for strategic management and robust QA to shift focus from inputs to outcomes.

d. Theoretical Models and Gaps

Theoretical models like Total Quality Management (TQM) and the Balanced Scorecard have been adapted to education. TQM, developed by Deming (1986), advocates continuous improvement through stakeholder feedback loops, emphasizing process optimization and quality control. The Balanced Scorecard, proposed by Kaplan and Norton (1992), integrates financial, customer, internal process, and learning perspectives to measure performance holistically. In education, TQM has been applied to improve teaching quality (e.g., in Japan's post-war system), while the Balanced Scorecard has guided strategic planning in institutions like the University of Leeds (Kaplan & Norton, 1992; World Bank, 2018). However, in Morocco, implementation is limited by insufficient teacher training, data scarcity, and centralized control, as noted by El Amrani (2022).

Gaps in the literature include limited studies on applying these frameworks in developing contexts with centralized governance, such as Morocco. While Finland and Singapore offer models of excellence, their socio-economic contexts differ significantly from Morocco's, necessitating adaptation. This study addresses these gaps by testing management and QA theories in Morocco, using benchmarking to explore transferable strategies.

3. Study of Finland, Singapore, and Moroccan Contexts
a. The case of Finland

Finland's education system is globally acclaimed for its decentralized management and high outcomes. The Basic Education Act (1998) established local autonomy, empowering municipalities to manage schools and granting teachers significant pedagogical freedom (Sahlberg, 2011). By 2019, 90% of classrooms had digital access, reflecting a strong commitment to technology integration (Finnish Ministry of Education and Culture-FMEC, 2021). The Education 2030 Strategy, launched in 2015, emphasizes equity, digital literacy, and lifelong learning, aligning with SDG 4 (FMEC, 2021). PISA 2018 scores (520 in mathematics, 526 in reading, and 522 in science) ranked Finland among the top five globally (OECD, 2019). Unlike many systems, Finland's QA relies on trust and self-evaluation rather than standardized testing, reducing administrative burdens while maintaining high standards (Sahlberg, 2011). This approach sustains excellence despite lower per-student spending than peers like the United States, highlighting efficient resource use and a culture of professional accountability (FMEC, 2021).

Finland's reforms began in the 1970s, shifting from a centralized model to one prioritizing teacher training and local governance, a process completed by the 1990s (Sahlberg, 2011). This strategic evolution transformed Finland from a middling performer to a global leader, with teacher education at the master's level becoming a cornerstone. By 2010, Finland had 5.5 million students enrolled across 3,000 schools, with a teacher-student ratio of 1:12, ensuring personalized attention (FMEC, 2021). However, its small population (5.5 million) and homogenous society contrast with Morocco's larger, more diverse context, suggesting adaptation challenges for decentralized strategies (UNESCO Institute for Statistics, 2020).

b. The case of Singapore

Singapore's education system exemplifies centralized strategic management and rigorous QA, aligning education with national economic goals. The Thinking Schools, Learning Nation initiative (1997) reoriented education toward critical thinking and innovation, while SkillsFuture (2015) emphasized vocational and STEM skills to meet workforce demands (Ng, 2017). By 2019, 85% of classrooms were equipped with digital infrastructure, supported by annual investments exceeding $50 million SGD (Singapore Ministry of Education-SMOE, 2021). PISA 2018 results (569 in mathematics, 551 in reading, and 551 in science) positioned Singapore as the global leader, reflecting a system optimized for competitiveness (OECD, 2019). The Singapore Quality Framework enforces accountability through regular audits, data analytics, and performance benchmarks, ensuring consistency across its 360 schools (SMOE, 2021).

Singapore's success stems from a post-independence strategy in the 1960s to transform a resource-scarce nation into a knowledge economy, with education as the cornerstone (Ng, 2017). Centralized planning enabled rapid policy execution, such as the 2010 Masterplan for ICT in Education, which boosted digital access and teacher training (SMOE, 2021). By 2019, Singapore had 550,000 students enrolled, with a teacher-student ratio of 1:16, supported by a highly trained workforce (SMOE, 2021). While effective, this top-down approach contrasts with Morocco's centralized system, where implementation lags due to bureaucratic delays (Cour des Comptes, 2021). Singapore's small size (5.7 million) and urban focus offer lessons in efficiency, though its high-income status limits direct comparability with Morocco's developing context (UNESCO Institute for Statistics, 2020).

c. The case of Morocco

Morocco's education policies trace back to the 1960s National Charter, which prioritized universal access following independence in 1956. The Vision 2010, launched in 2001, targeted 100% primary enrollment by 2010, achieving 92% through expanded infrastructure and teacher recruitment, increasing student numbers from 5.5 million in 2000 to 6.8 million by 2010 (MNEPS, 2011). Vision 2020, introduced in 2011, aimed for 100% enrollment across all levels and a 50% literacy improvement by 2020, but outcomes fell short at 85% and 42%, respectively, due to regional disparities, underfunding, and weak QA (MNEPS, 2021). By 2019, enrollment reached 7.5 million, with a teaching workforce of 280,000, yet only 25% of rural schools had digital access, and literacy rates hovered at 67%, below Tunisia's 81% (Observatoire de l'Éducation, 2020; UNESCO Institute for Statistics, 2020).

The COVID-19 pandemic in 2020 reduced enrollment by 12%, exposing digital divides and infrastructure gaps, with only 30% of students accessing remote learning (Observatoire de l'Éducation, 2020). The Strategic Roadmap 2022-2026, launched in 2021, aims to address these challenges by targeting 9 million students, 50% classroom digitization, and 100,000 trained teachers by 2026 (MNEPS, 2021). However, QA remains underdeveloped, relying on sporadic inspections rather than systematic evaluation, while governance suffers from centralized decision-making and limited local input (Cour des Comptes, 2021). French scholar Ait Si Larbi (2021) describes this as "*une approche bureaucratique qui freine l'innovation*" (a bureaucratic approach that hinders innovation), advocating for decentralized reforms to enhance responsiveness (translated from French: Ait Si Larbi, M. (2021). *Réformer l'éducation au Maroc*. Revue Éducation et Développement, 8(2), 33-49).

Morocco's historical focus on access has built a foundation, with primary enrollment rising from 52% in 1990 to 92% in 2010, yet secondary and tertiary levels lag at 69% and 36%, respectively (UNESCO Institute for Statistics, 2020). This quantitative progress contrasts with qualitative stagnation, necessitating a shift toward strategic management and robust QA to improve competitiveness.

4. Methodology
a. Research Design

This study employs a mixed-methods design to analyze management, strategic management, and QA in education from 2007 to 2022, combining qualitative benchmarking with quantitative econometric modeling. This approach allows for a comprehensive examination of both policy frameworks and empirical performance indicators. Thus, adhering to established methodological rigor standards in educational research. Throughout the integration of qualittaive insights from benchmarking and quantitative analysis using the Generalized Method of Moments (GMM), the study aimas at addressing the complex interplay between educational inputs and outcomes. This offers a robust franework for understanding Morocco's educational system in a comparative context.

b. Qualitative Benchmarking

Benchmarking compares Morocco's education policies with those of Finland and Singapore to identify best practices in management, strategic management, and QA. Thematic and content analysis, conducted via NVivo, follows grounded theory principles (Strauss & Corbin, 1990). The process involves:

- **Open Coding:** Identifying variables (e.g., teacher training, digitalization).
- **Axial Coding:** Grouping variables into categories (e.g., human resources, infrastructure).

- **Selective Coding:** Defining strategic axes (e.g., governance, QA).

Data sources include policy documents (e.g., MNEPS 2021, FMEC 2021), national reports (e.g., Observatoire de l'Éducation 2020), and academic literature from 2007-2022, ensuring historical accuracy and relevance.

Finland and Singapore were selected for their proven educational excellence, distinct management approaches, and relevance to Morocco's reform goals. However, the choice of these invites for criticial scrunity due to stark contextual disparities that problematize their applicability.

Finland's PISA 2018 scores (520 math, 526 reading, 522 science) reflect a high-quality system, ranking it among the top five globally (OECD, 2019). Its decentralized management, established by the Basic Education Act (1998), empowers municipalities and teachers, contrasting with Morocco's centralized inefficiencies (Sahlberg, 2011; Cour des Comptes, 2021). Trust-based QA via self-evaluation offers an alternative to Morocco's inspection-driven system (FMEC, 2021; Benkirane, 2020). With 90% digital classroom access by 2019, Finland aligns with Morocco's digital ambitions (MNEPS, 2021). Its small population (5.5 million) and rural education focus make it relatable to Morocco (36 million), despite socio-economic differences (Observatoire de l'Éducation, 2020). Additonally, Singapore's PISA 2018 scores (569 math, 551 reading, 551 science) demonstrate global leadership (OECD, 2019). Centralized strategic management refines Morocco's approach, integrating education with economic needs (Ng, 2017; Cour des Comptes, 2021). Rigorous QA through audits contrasts with Morocco's fragmentation (SMOE, 2021; Benkirane, 2020). With 85% digital coverage by 2019, Singapore informs Morocco's targets (MNEPS, 2021). Its rise from a developing economy mirrors Morocco's aspirations (El Amrani, 2022). Thus, Finland's flexibility and Singapore's structure address Morocco's centralized weaknesses, with robust data availability ensuring methodological rigor (El Mili, 2018; OECD, 2019).

However, the selection of the benchmark countries invites for critical scrunity due to strak contextual dispairites, that problemetize their applicability. For instance, Finland's small homogenous population (5.5 million) and high-income status ($ 48,712 GDP per capita in 2019) diverge from Morocco's 36 million ingabitants, rural-urban divide, and $ 3,204 GDP per capita. Singapore's urbanized high-income profile (5.7 million and $65,233 GDP per capita) reflects an economic transformation which is absent in Morocco (UNESCO Institute for Statistics , 2020; World Bank, 2020). Moreover, literacy rates with 99% in Finland and 97% in Singapore versus Morocco's 67%, further highlights this disparity. Thus, raising doubts about their relevance (UNESCO Institute for Statistics, 2020). Additonally, critics might argue that regional peers like Tunisia with 81% literacy rates, or Jordan with shared post-colonial challenges offer a more appropriate contextual benchmark, as their reforms align closer to Morocco's feasible trajectory (Benkirane, 2020). Hence, holding weight with Morocco's multilingualism, rural isolation, and resource contraints, which happen to be absent in both Finland and Singapore, rendering unttainable models without substantial adaptation. However, this gap is deliberately leveraged as a methodological strentght. Regional comparisions riks normalizing mediocrity, whereas Finland and Singapore's excellence; despite their divergence, expose systemic deficiencies (such as an excessive centralization that would demand radical reforms over incremental gains (El Mili, 2018)). These contrasting pradigms (decentralized flexibiltiy versus centralized efficiency) frame Morocco's potential reform spectrum, and pushes beyond parochial contraints to align with the 2020 global leadership vision of the country (MNEPS, 2021).

While this aspirational approach risks over-idealization, it justifies the selection by challenging Morocco to transcend its current state and provide adaptations account for Morocco's unique socio-cultural realities.

c. Quantitative Analysis
i. Data Collection

Panel data from 2007 to 2022 cover 20 countries, including Morocco, Finland, Singapore, France, and Spain, sourced from UNESCO, OECD, and MNEPS databases. Variables include:
- Enrollment Rates (ER): Annual student totals (e.g., 7.5 million in Morocco, 2019).
- Teacher Qualifications (**TQ**): Percentage of certified educators (e.g., 70% in Morocco, 2019).
- Digital Infrastructure (**DI**): Percentage of classrooms with ICT access (e.g., 25% rural Morocco, 2019).
- QA Frameworks (**QA**): Index (0-100), estimated from policy reports (e.g., Morocco ~ 40, 2019).
- Governance Effectiveness (**GE**): OECD governance index (0-10, e.g., Morocco ~ 4, 2019).

Data reliability is ensured by using verified pre-2023 sources, with missing values imputed via linear interpolation where necessary (UNESCO Institute for Statistics, 2020).

ii. Model Specification

The Generalized Method of Moments (GMM) addresses endogeneity in dynamic panel data, using lagged variables as instruments (Arellano & Bond, 1991). The model is:

$$ER_{it} = \alpha + \beta_1 LER_{-1it} + \beta_2 TQ_{it} + \beta_3 DI_{it} + \beta_4 QA_{it} + \beta_5 GE_{it} + \epsilon_{it}$$

Where:

ER_{it} is the Enrollment rate for country i at time t.

LER_{-1it} is the Lagged enrollment rate.

TQ_{it} is the Teacher qualifications.

DI_{it} is the Digital infrastructure.

QA_{it} is the Quality assurance frameworks.

GE_{it} is the Governance effectiveness.

ϵ_{it} is the Error term.

The GMM model suitabilities lies in its ability to gain persistence in enrollment rates, for instance $\beta_1 = 0.18, \rho = 0.000$ which is a key feature in Morocco's educational trajectory from 6.8 to 7.5 million students between 2007 and 2019 (MNEPS, 2020). The model also reduces errors and mitigates biases from un-observed heterogeneity and reverse causality. Variables such as TQ and GE may both influence and/or be influenced by enrollment. Hence, the GMM model's dynamic to hande effectively endogeneity throughout its instrumental variable approach (Hanushek, 2011). The model with its two-step system and robust standard errors, enhances efficiency over simpler models. This allowed for a perfect alignement with the study's 20-country, 16-year panel to test determinants like digital infrastrcure (Roodman, 2009).

It is also fair to acknowledge that GMM's adoption is not without critique. The reliance on 20 instruments, that matches country's count, risks over-identification and potentially inflating the J-statistic's ρ-Value. It also could potentially mask specification flaws, while $1.1E + 14$ suggesting unmodeled factors such as socio-economic disparities that the model struggles to resolve without richer data (Roodman, 2009). Therefore, other alternatives such as the fixed effect may simplify the interpretations, however, it fails to address endogeneity. The latter is a fatal flaw given Morocco's policy complexity (Wooldridge, 2010). The model's methodological superiority justifies its selection and offers a dynamic lens on Morocco's educational system. The complexity and data demands necessitate cautious interpretations and future validation with more granular inputs.

iii. Estimation Procedure

Analysis in EViews includes:
- **Stationarity Tests:** Levin-Lin-Chu test to ensure data stability.
- **Normality Tests:** Shapiro-Wilk test to assess distribution.
- **GMM Estimation:** Two-step system GMM with robust standard errors, tested at 5% significance.
- **Robustness Checks:** Alternative specifications (e.g., fixed effects) to validate results.

5. Results

GMM analysis (2007-2022) across 20 countries are presented in Table 1.

Table 1. GMM Parameters Estimation

Variables	Coefficient (β)	Std. Error	t-Statistic	ρ-Value
Lagged Enrollment (LER_{-1})	0.18	0.04	4.50	0.000
Teacher Qualifications (TQ)	0.30	0.09	3.33	0.002
Digital Infrastructure (DI)	0.25	0.08	3.13	0.005
QA Frameworks (QA)	0.10	0.11	0.91	0.38
Governance Effectiveness (GE)	0.15	0.09	1.67	0.09
Diagnostics				
J-Statistic	15.2			0.58
Instrument Rank	20			
Mean Dependent Var	5,200,000	S.D. Dependent Var	2,100,000	
S.E. of Regression	1,800,000	Sum Squared Resid	1.1E+14	

- **Lagged Enrollment** (LER_{-1}): $\beta_1 = 0.18$, $\rho = 0.000$ indicating persistence (e.g., Morocco's growth from 6.8 to 7.5 million, 2007-2019).

The coefficient of 0.18 shows that past enrollment strongly predict current enrollment. This reflects a stable growth trend across the 20 countries, notably in Morocco, where the number of students rose by 10.3% over the time (MNEPS, 2020). This persistence aligns with the GMM's dynamic panel design that uses lagged variables to capture historical patterns (Arellano & Bond, 1991). For Morocco, this suggests that prior investments in acess such as in the infrastructure expansion in the 2010 vision, continue to drive enrollment rates with an annual growth of approx. 0.46% (6.8 to 7.5 million over 16 years). The GMM's focus on persistence may in this case over-emphasize quantity, potentially masking quality stagnation (Morocco with 67% versus Finland with 99% literacy rates) due to its macro-level scope (UNESCO Institute for Statistics, 2020). The high significance ($\rho = 0.000, t = 4.50$) and thight standard error (o.oo4) reinforce this as a robust finding, however, the model's residual variance ($1.1E + 14$) hint at unmodeled factors such as socio-economic barries that could dilute this effect if being included.

- **Teacher Qualifications** (TQ): $\beta_2 = 0.30, \rho = 0.002$, a significant driver, reflecting the impact of certified educators.

The coefficient of 0.30 indicates that a 1% increase in certified teachers boosts enrollment by 0.30%, which is a substantial effect consistent with Morocco's 70% certification rate in 2019 and its roadmap goal of training 100,000 teachers by 2026 (MNEPS, 2021). This aligns with

educational research emphasizing teacher quality as a key input (Hanushek, 2011), supported by the GMM's ability to isolate TQ's effect while controlling for endogeneity, hence TQ influencing enrollment and vice versa. The significance ($\rho = 0.002, t = 3.33$) and standard error (0.09) suggest a reliable estimate, but the model's macro focus limits insights into how TQ translates to outcomes like literacy, where Morocco lags (Observatoire de l'Éducation, 2020). Compared to Finland's master's-level teacher training or Singapore's rigorous standards, Morocco's TQ impact may reflect quantity over quality, a nuance GMM captures imperfectly without micro-level data (Sahlberg, 2011; Ng, 2017).

- **Digital Infrastructure** (DI): $\beta_3 = 0.25$, $\rho = 0.005$, crucial for access, though limited in Morocco (25% rural, 2019).

A coefficient of 0.25 shows that a 1% increase in ICT-equipped classrooms raises enrollment by 0.25%, highlighting DI's role in access, especially post-COVID (OECD, 2021a). In Morocco, with only 25% rural digital coverage versus Finland's 90% and Singapore's 85%, this effect is significant but constrained (FMEC, 2021; SMOE, 2021; Observatoire de l'Éducation, 2020). The GMM's instrumental approach isolates DI's contribution ($\rho = 0.005, t = 3.13, SE = 0.08$),but its aggregate nature obscures rural-urban disparities, potentially overestimating DI's impact where access is uneven. Thus, the finding supports the roadmap's 50% digitization target, yet the residual variance suggests external factors such as electricity access, GMM can't fully address (El Amrani, 2022).

- **QA Frameworks** (QA): $\beta_4 = 0.10, \rho = 0.38$ not significant, consistent with Morocco's weak QA (Cour des Comptes, 2021).

The low coefficient (0.10) and lack of significance ($\rho = 0.38, t = 0.91$) indicate QA has little measurable impact on enrollment, aligning with Morocco's fragmented, inspection-based system. The GMM's reliance on an estimated QA index (~ 40 in 2019) from policy reports, rather than robust data, likely contributes to this weak result, reflecting data scarcity (Benkirane, 2020). Compared to Finland's self-evaluation or Singapore's audits, Morocco's QA lacks systematic influence, finding the model's high standard error (0.11) underscores as imprecise (FMEC, 2021; SMOE, 2021). This non-significance questions QA's role in access versus quality, an area GMM's macro lens struggles to clarify without detailed metrics.

- **Governance Effectiveness** (GE): $\beta_5 = 0.15$, $\rho = 0.09$, marginally significant, indicating governance challenges.

A coefficient of 0.15 suggests a modest effect, with a 1% GE increase raising enrollment by 0.15%, but its marginal significance ($\rho = 0.09, t = 1.67$) reflects Morocco's centralized governance struggles (Cour des Comptes, 2021). The GMM captures this dynamic, yet the standard error (0.09) and borderline ρ-value indicate uncertainty, possibly due to the OECD index's broad scope (~ 4 in 2019) missing regional variations (OECD, 2021). Compared to Singapore's efficient centralization, Morocco's bureaucratic approach limits impact, a nuance GMM's aggregate data may understate (Ait Si Larbi, 2021)

The J-statistic ($15.2, \rho = 0.58$) confirms instrument validity; high residual variance ($1.1E + 14$) suggests unmodeled factors like socio-economic disparities. The J-statistic's non-significant 0.58 $\boldsymbol{\rho}$-value validates the 20 instruments (matching country count), and supports GMM's robustness (Roodman, 2009). However, the high residual variance ($1.1E + 14$) indicates substantial unexplained variation, potentially from socio-economic factors such as poverty rates, or informal education not captured in the model (El Amrani, 2022). The mean dependent variable (5,200,000) and standard deviation (2,100,000) reflect the panel's scale, but the standard error of regression (1,800,000) suggests fit issues, reinforcing the need for richer data to refine these estimates (Wooldridge, 2010).

Moreover, GMM's dynamic design effectively isolates persistence ($\mathbf{LER_{-1}}$) and key drivers ($\mathbf{TQ}$, $\mathbf{DI}$), aligning with Morocco's access focus. However, the weak **QA** and **GE** results

highlight data limitations, as the estimated **QA** index and broad **GE** measure may dilute their true effects. The high residual variance and J-statistic's leniency (20 instruments) suggest GMM's complexity may overfit, missing nuanced factors like rural disparities critical to Morocco's context (Roodman, 2009), which underscores the methodology's robustness in capturing dynamics versus precision in a data-constrained setting.

a. Qualitative Findings

Benchmarking reveals Finland's self-evaluation QA and Singapore's data-driven governance outperform Morocco's fragmented, centralized approach. Finland's 90% digital coverage and Singapore's 85% contrast with Morocco's 25% rural access (FMEC, 2021; SMOE, 2021; Observatoire de l'Éducation, 2020). Morocco's focus on inputs like the number of teachers over outcomes such as literacy limits competitiveness (El Mili, 2018). This complements the GMM results, explaining QA's insignificance ($\beta_4 = 0.10$) and GE's marginality ($\beta_5 = 0.15$). Finland's self-evaluation fosters outcome-focused QA, absent in Morocco's compliance-driven system, while Singapore's governance efficiency outpaces Morocco's bureaucratic delays. The digital gap (25% vs. 90% & 85%) reinforces DI's significance ($\beta_3 = 0.25$), but Morocco's input focus (teacher numbers over literacy) aligns with TQ's strength ($\beta_2 = 0.30$), highlighting a quantity-quality disconnect (El Mili, 2018).

b. Robustness Checks

Fixed effects models yield similar results ($\beta_2 = 0.28, \rho = 0.003$ for TQ; $\beta_3 = 0.23, \rho = 0.006$ for DI), reinforcing findings. Excluding outliers like high-income countries, slightly increases QA significance ($\rho = 0.32$), but it remains weak. Additonally, the fixed effects confirm TQ and DI as key drivers, with coefficients close to GMM (0.28 vs. 0.30, 0.23 vs. 0.25), validating robustness despite endogeneity risks (Wooldridge, 2010). QA's slight p-value improvement (0.38 to 0.32) suggests high-income outliers for instance like in Finland and Singapore, may inflate variance, but its persistent weakness supports qualitative critiques (Cour des Comptes, 2021). These checks affirm GMM's findings, though the methodology's macro focus limits deeper quality insights.

6. Discussion
a. Hypothesis Testing

Table 2. Hypothesis Testing

2022-2026 Roadmap Axes	Study Implications	Support for H1/H2
Teacher training	Teacher qualifications	H1 (partial)
Classroom digitalization	Digital infrastructure	H1 (partial)
Enrollment expansion	Enrollment rates	H1 (partial)
Infrastructure investment	Governance effectiveness (partial)	H2
	QA frameworks	H2

H1 is partially supported by significant effects of teacher training and digitalization, aligning with roadmap goals. H2 is confirmed by QA and governance gaps, indicating inadequacies compared to Finland and Singapore.

b. Interpretation of Findings

The significant effect of lagged enrollment ($\beta_1 = 0.18$) reflects Morocco's access gains (6.8 to 7.5 million, 2007-2019), driven by teacher qualifications ($\beta_2 = 0.30$) and digital infrastructure ($\beta_3 = 0.25$), consistent with Bush (2011) on resource management. This persistence, along with an annual growth rate of approx. 0.64%, underscores the effectiveness of prior investments such as the ones present in the 2010 vision regarding infrastructure

expansion; a hallmark of strategic management captured by the GMM's dynamic design (Mintzberg et al., 1998). Yet, its focus on quantity may mask quality stagnation, as Morocco's 67% literacy rate lags far from Finland's 99% and Singapore's 97%. Thus creating a limitation of the model's macro-level scope (UNESCO Institute for Statistics, 2020).

However, QA's insignificance ($\beta_4 = 0.10$) and governance's weak impact ($\beta_5 = 0.15$) align with Harvey and Green (2000) on the need for robust QA, highlighting Morocco's quality stagnation (67% literacy) versus Finland (99%) and Singapore (97%) (UNESCO Institute for Statistics, 2020). The GMM's weak QA result, tied to an estimated index (~ 4 in 2019) and high standard error (0.11), reflects data scarcity rather than a true lack of influence, while GE's marginal significance suggests governance's modest role is understated by the broad OECD index (Cour des Comptes, 2021). This mirrors developing contexts where access outpaces quality (El Amrani, 2022). Moreover, the high residual variance ($1.1E + 14$) further indicates unmodeled factors, such as the socio-economic disparities, that could refine these findings and underscores the GMM's trade-off between dynamic robustness and precision in a data-constrained setting (Roodman, 2009).

Addtionally, the confirmation of H2 (highlighting deficiencies in QA and governance despite strengths in teacher qualifications and digital infrastructure) necessitates targeted policy interventions. Drawing on the benchmarking analysis and GMM results, the following recommendations aim to address these gaps and align Morocco's education sector with global standards.

c. Policy Implications

The findings of this study underscore the need for Morocco to adopt a multifaceted approach to strengthen management, strategic management, and Quality Assurance (QA) in its education sector, drawing on best practices from Finland and Singapore while tailoring them to its unique socio-economic and cultural context. Below, we elaborate on the four key policy recommendations, providing detailed strategies, theoretical grounding, and practical considerations for implementation.

i. Adopt Finland's Quality Assurance Model: Shifting to Self-Evaluation

Finland's decentralized QA model, which emphasizes self-evaluation over standardized testing, offers a transformative approach for Morocco to shift from a compliance-oriented system to one focused on educational outcomes (Sahlberg, 2011). In Finland, teachers and schools conduct regular self-assessments, guided by national guidelines but tailored to local contexts, fostering a culture of trust and professional accountability (Finnish Ministry of Education and Culture-FMEC, 2021). This contrasts with Morocco's current reliance on sporadic inspections, which prioritize procedural adherence over learning quality (Cour des Comptes, 2021).

Therefore, Morocco could initiate a pilot program in select regions, training teachers as assessors to evaluate classroom practices, student engagement, and learning outcomes using standardized rubrics adapted from Finland's model. This would require a capacity-building initiative, potentially supported by international partners like UNESCO, to equip educators with skills in formative assessment and data interpretation. Over time, self-evaluation could be integrated into a national QA framework, reducing administrative burdens and empowering teachers as key stakeholders in quality improvement. This aligns with Harvey and Green's (2000) concept of QA as a transformative process, emphasizing continuous improvement over mere accountability. It also draws on Bush's (2011) distributed leadership theory, where teacher autonomy enhances institutional adaptability.

Regarding challenges, they include resistance from centralized authorities accustomed to top-down oversight and the need for significant investment in teacher training. However,

Finland's success with modest per-student spending suggests that efficiency gains could offset initial costs (FMEC, 2021). Morocco could start with urban centers like Rabat and Casablanca, where infrastructure and teacher readiness are more advanced, before scaling to rural areas.

ii. Emulate Singapore's Governance: Leveraging Data Analytics & Decentralization

Singapore's centralized governance, underpinned by real-time data analytics, enables rapid, evidence-based decision-making, aligning education with economic and societal needs (Ng, 2017). By 2019, Singapore's Ministry of Education used data dashboards to monitor student performance across 360 schools, adjusting policies within months (Singapore Ministry of Education-SMOE, 2021). Morocco's centralized system, while structurally similar, lacks this agility due to bureaucratic delays and limited data utilization (Cour des Comptes, 2021). Thus, Morocco could establish a national education data platform, integrating real-time metrics on enrollment, teacher performance, and digital access. This would require decentralizing some authority to regional education councils, allowing them to adapt policies based on local data (e.g., increasing digital investments in rural areas with only 25% access). Partnerships with tech firms could accelerate platform development, drawing on Singapore's model of public-private collaboration (SMOE, 2021).

This reflects Mintzberg et al.'s (1998) strategic management framework, emphasizing responsiveness to environmental shifts, and Porter's (1990) competitiveness theory, where data-driven governance enhances resource efficiency. It also aligns with Ait Si Larbi's (2021) call for decentralization to overcome bureaucratic inertia (translated from French: Ait Si Larbi, M. (2021). Réformer l'éducation au Maroc. Revue Éducation et Développement, 8(2), 33-49). However, implementation faces hurdles such as data privacy concerns, technical capacity gaps, and resistance from centralized authorities. A phased approach; starting with pilot regions like Marrakech-Safi, could mitigate risks, building on existing urban infrastructure while testing scalability.

iii. Technology Integration: Expanding Digital Infrastructure

Morocco's digital infrastructure lags significantly, with only 25% of rural schools equipped with ICT access in 2019, compared to Finland's 90% and Singapore's 85% (Observatoire de l'Éducation, 2020; FMEC, 2021; SMOE, 2021). The Strategic Roadmap 2022-2026 targets 50% classroom digitization by 2026, but this remains insufficient to bridge the rural-urban divide and enhance educational competitiveness (MNEPS, 2021). Hence, Morocco should leverage Public-Private Partnerships (PPPs) to expand digital infrastructure beyond the current 25% rural penetration. For example, collaborating with telecom providers like Maroc Telecom could accelerate broadband deployment, while international donors (e.g., World Bank) could fund device provision. A tiered rollout (prioritizing rural regions like Drâa-Tafilalet) could ensure equitable access, supplemented by teacher training in digital pedagogy, mirroring Singapore's 2010 ICT Masterplan (SMOE, 2021). This aligns with the OECD's (2021) digitalization pillar, emphasizing technology as a driver of access and learning quality, and Drucker's (1993) knowledge economy framework, where digital tools enhance educational delivery.

Howver, financial constraints and rural connectivity challenges (e.g., terrain, electricity access) require innovative solutions, such as solar-powered ICT hubs. Singapore's $50 million SGD annual investment suggests Morocco could target a similar scale (e.g., 500 million MAD yearly) through blended financing.

iv. Stakeholder Collaboration: Engaging Diverse Actors

Finland and Singapore's success partly stems from robust stakeholder collaboration (parents, local authorities, and industry) ensuring education aligns with societal needs

(Sahlberg, 2011; Ng, 2017). Morocco's centralized system limits such engagement, with parents and local entities often excluded from decision-making (Ait Si Larbi, 2021).

Therefore, Morocco could establish regional education forums, involving parents, local councils, and industry leaders (e.g., tourism, agriculture sectors) to co-design curricula and policies aligned with SDG 4 (Quality Education). For instance, industry input could enhance vocational training, addressing Morocco's 36% tertiary enrollment gap (UNESCO Institute for Statistics, 2020). Community-led monitoring committees could complement QA efforts, drawing on Finland's trust-based model (FMEC, 2021). This reflects Kaplan and Norton's (1992) Balanced Scorecard, integrating customer (stakeholder) perspectives, and El Mili's (2018) call for localized adaptability (translated from French: El Mili, N. (2018). La gestion de l'éducation au Maghreb. Revue Marocaine des Sciences de l'Éducation, 12(3), 45-62). Moreover, cultural resistance to stakeholder empowerment and logistical challenges in rural areas (e.g., transport, literacy) require targeted outreach, such as mobile forums or digital platforms. Pilot projects in urban centers could refine this approach before nationwide expansion.

While these policy implications offer a pathway forward, their effectiveness is constrained by limitations in the study's data and scope, as evidenced by the GMM diagnostics (e.g., residual variance of $1.1E + 14$) and qualitative findings. These constraints are detailed below to contextualize the results and guide future research.

d. Limitations

The study's findings and implications are constrained by several limitations, which warrant careful consideration and suggest avenues for future research to strengthen the analysis.

i. QA Data Scarcity

A primary limitation is the scarcity of comprehensive QA data, particularly for Morocco, where systematic evaluation metrics are underdeveloped (Cour des Comptes, 2021). The QA variable in the GMM model (index 0-100, estimated ~ 40 for Morocco in 2019) relies on qualitative policy reports rather than robust, standardized datasets, reducing statistical precision ($\beta_4 = 0.10$, $\rho = 0.38$). This reflects a broader challenge in developing contexts, where data collection lags behind policy ambitions (Benkirane, 2020). For instance, unlike Finland's detailed self-evaluation records or Singapore's audit databases, Morocco's inspection-based system lacks granularity (FMEC, 2021; SMOE, 2021). This limitation weakens the ability to quantify QA's impact, potentially underestimating its role in educational outcomes.

ii. Focus on Formal Education

The study's exclusive focus on formal education systems excludes informal learning mechanisms, such as Quranic schools, which play a significant role in Morocco's educational landscape. Approximately 10% of Moroccan children attend these institutions, often in rural areas where formal access is limited (UNESCO Institute for Statistics, 2020). These schools influence literacy and cultural education but are not captured in enrollment rates or QA frameworks, skewing the analysis toward urban, state-run systems. This omission limits the study's applicability to Morocco's full educational ecosystem, particularly given the roadmap's rural focus (MNEPS, 2021). Comparative analyses of Finland and Singapore, which have minimal informal sectors, further highlight this gap (Sahlberg, 2011; Ng, 2017).

iii. Temporal Scope Constraints

The 2007-2022 timeframe, while ensuring data validity up to April 2023, omits the initial impacts of the Strategic Roadmap 2022-2026, launched in 2021 (MNEPS, 2021). This scope captures historical trends such as enrollment growth from 6.8 to 7.5 million, yet excludes

post-2022 outcomes, such as progress toward the 50% digitization target or 100,000 trained teachers. This limitation prevents a direct assessment of the roadmap's effectiveness, a critical gap given its centrality to Morocco's 2030 ambitions. The GMM's reliance on this timeframe reflects its design as a diagnostic baseline, hence capturing persistence ($\beta_1 = 0.18$) and key drivers like TQ ($\beta_2 = 0.30$), yet its exclusion of the post-2022 data limits insights into the roadmaps' early outocmes, such as rural digitization progress which is critical to addressing the 25% access gap (Observatoire de l'Éducation, 2020). Additionally, the timeframe misses longer historical shifts such as the pre-2007 reforms, potentially overlooking foundational influences on current challenges (Ait Si Larbi, 2021). Therefoere, a broader scope, 1990-2022 for instance, could contextualize these shifts, such as the 1960s National Charter's impact on centralization, but pre-2007 data inconsistencies across 20 countries constrained this option (UNESCO Institute for Statistics, 2020). Future extensions beyond 2022 are essential to test roadmap efficacy, as the current scope's empirical grounding, while robust, leaves quality dynamics unassessed (El Amrani, 2022).

iv. Additional Constraints

Methodologically, the GMM model's high residual variance ($1.1E + 14$) suggests unmodeled factors, such as socio-economic disparities or regional governance variations, which could refine the analysis (Arellano & Bond, 1991). This variance, alongside the J-statistic's leniency ($15.2\ \rho = 0.58$), indicates potential overfitting due to 20 instruments, limiting precision despite robustness (Roodman, 2009). The focus on macro-level data such as national enrollment, also excludes micro-level insights, like classroom dynamics or student-level outcomes, limiting granularity (El Amrani, 2022). Thus, future research should address these gaps to enhance precision and scope.

7. Conclusion

This study confirms that strategic management significantly enhances Morocco's educational adaptability, as evidenced by the robust enrollment growth from 6.8 million to 7.5 million students between 2007 and 2019, driven by teacher qualifications ($\beta_2 = 0.30, \rho = 0.002$) and digital infrastructure ($\beta_3 = 0.25, \rho = 0.005$) (MNEPS, 2020; Observatoire de l'Éducation, 2020). These findings underscore the effectiveness of targeted resource allocation, a hallmark of strategic management, in expanding access within a developing context (Bush, 2011; Mintzberg et al., 1998). However, the persistent weaknesses in QA frameworks ($\beta_4 = 0.10, \rho = 0.38$) and governance effectiveness ($\beta_5 = 0.15, \rho = 0.09$) reveal significant barriers to achieving educational competitiveness comparable to benchmarks like Finland and Singapore (Cour des Comptes, 2021). Finland's trust-based QA and Singapore's data-driven governance highlight systemic strengths absent in Morocco, where a compliance-focused, centralized approach limits quality outcomes (Sahlberg, 2011; Ng, 2017). The GMM's dynamic lens validates access gains, but its macro focus and data constarints obscure quality deficts, reinforcing H2's emphasis on systemic gaps.

The Strategic Roadmap 2022-2026, with its emphasis on inputs; such as training 100,000 teachers and digitizing 50% of classrooms, demonstrates ambition but falls short of addressing these systemic deficiencies (MNEPS, 2021). The roadmap's partial alignment with H1 (e.g., teacher qualifications, digitalization) is insufficient without comprehensive reforms to QA and governance, as confirmed by H2. This input-centric approach, while expanding access, mirrors historical patterns in developing contexts where quantity outpaces quality, leaving Morocco's literacy rate at 67% compared to Finland's 99% and Singapore's 97% (UNESCO Institute for Statistics, 2020; El Amrani, 2022). To bridge this gap and achieve its 2030 vision of global educational leadership, Morocco must transition from incremental adjustments to systemic

transformation, integrating best practices from high-performing systems while adapting to its unique socio-economic realities.

Future research should extend this analysis in several directions. First, assessing the post-2022 impacts of the roadmap; once data become available, will provide empirical evidence of its effectiveness, particularly in rural digitization and teacher training outcomes (MNEPS, 2021). Which is critical given the GMM's exclusion of post-2022 data, hence limiting direct evaluation of the roadmap's 50% digitization target against the current 25% rural baseline (Observatoire de l'Éducation, 2020) Second, incorporating informal education contributions, such as those from Quranic schools, could offer a more holistic view of Morocco's educational landscape, addressing the formal-system bias of this study (UNESCO Institute for Statistics, 2020). Third, micro-level studies exploring classroom dynamics, student performance, and teacher efficacy could complement the macro-level focus here, refining policy recommendations (El Amrani, 2022). Such studies could address the GMM's high residual variance ($1.1E + 14$), and identify unmodeled factors such as socio-economic disparities missed by aggregate data. Finally, longitudinal analyses beyond 2022 could evaluate the sustainability of reforms, testing whether strategic management gains translate into competitive educational quality aligned with SDG 4 (UNESCO, 2015).

In conclusion, this study highlights the dual challenge facing Morocco: leveraging its strategic management strengths to sustain access gains while overhauling QA and governance to elevate quality. The roadmap's current trajectory, while promising, requires a paradigm shift; embracing decentralized QA, data-driven governance, and stakeholder engagement, to position Morocco as a global educational leader by 2030. These reforms, grounded in lessons from Finland and Singapore, offer a pathway to sustainable excellence, ensuring education fulfills its transformative potential for Morocco's future. The GMM results, while robust for access, underscore the need for richer data and broader scope to fully assess "*Quality*", and guide Morocco toward a balanced educational transformation.

8. References

- Ait Si Larbi, M. (2021). *Réformer l'éducation au Maroc*. *Revue Éducation et Développement*, *8*(2), 33-49.
- Arellano, M., & Bond, S. (1991). Some tests of specification for panel data. *Review of Economic Studies*, *58*(2), 277-297. https://doi.org/10.2307/2297968
- Benkirane, S. (2020). *Assurance qualité dans l'éducation marocaine*. Rabat: Presses Universitaires Marocaines.
- Bush, T. (2011). *Theories of educational leadership and management* (4th ed.). SAGE.
- Cour des Comptes (2021). *Rapport annuel sur le secteur éducatif*. Rabat, Morocco: Cour des Comptes.
- Deming, W. E. (1986). *Out of the crisis*. MIT Press.
- Drucker, P. F. (1993). *Post-capitalist society*. HarperBusiness.
- El Amrani, F. (2022). Challenges of educational reform in Morocco. *Journal of North African Studies*, *27*(3), 451-470. https://doi.org/10.1080/13629387.2021.1895678
- El Mili, N. (2018). *La gestion de l'éducation au Maghreb*. *Revue Marocaine des Sciences de l'Éducation*, *12*(3), 45-62.
- Finnish Ministry of Education and Culture (2021). *Education policy report 2020*. Helsinki, Finland: FMEC.
- Hanushek, E. A. (2011). The economic value of higher teacher quality. *Economics of Education Review*, *30*(3), 466-479. https://doi.org/10.1016/j.econedurev.2010.12.006

- Hanushek, E. A. (2011). The economic value of Higher Teacher Quality. Economics of Education Review, 30 (3), pp. 466-479. https://doi.org/10.1016/j.econedurev.2010.12.006
- Harvey, L., & Green, D. (2000). Defining quality. *Assessment & Evaluation in Higher Education, 25*(1), 17-28. https://doi.org/10.1080/02602930050025060
- Kaplan, R. S., & Norton, D. P. (1992). The balanced scorecard. *Harvard Business Review, 70*(1), 71-79.
- Le Boterf, G. (1994). *De la compétence*. Paris: Éditions d'Organisation.
- Ministère de l'Éducation Nationale, du Préscolaire et des Sports (2011). *Évaluation de la Vision 2010*. Rabat, Morocco: MNEPS.
- Ministère de l'Éducation Nationale, du Préscolaire et des Sports (2020). *Rapport statistique 2019*. Rabat, Morocco: MNEPS.
- Ministère de l'Éducation Nationale, du Préscolaire et des Sports (2021). *Feuille de route stratégique 2022-2026*. Rabat, Morocco: MNEPS.
- Ministère de l'Éducation Nationale, du Préscolaire et des Sports. (2021). *Évaluation de la Vision 2020*. Rabat, Morocco: MNEPS.
- Mintzberg, H., Ahlstrand, B., & Lampel, J. (1998). *Strategy safari: A guided tour through the wilds of strategic management*. Free Press.
- Ng, P. T. (2017). *Learning from Singapore*: The power of Paradoxes. Routledge.
- Observatoire de l'Éducation (2020). *Statistiques éducatives 2019*. Rabat, Morocco: Observatoire de l'Éducation.
- OECD (2019). *PISA 2018 results*. OECD Publishing.
- OECD (2021). *Education at a glance 2021*. OECD Publishing. https://doi.org/10.1787/b35a14e5-en
- OECD. (2021). *Education policy outlook 2021*. OECD Publishing.
- Porter, M. E. (1990). *The competitive advantage of nations*. Free Press.
- Roodman, D. (2009). How to do Xtabond2: An introduction to difference and system GMM in Stata. The Stata Journal, 9(1), pp. 86-136. https://doi.org/10.1177/1536867X0900900106
- Sahlberg, P. (2011). *Finnish lessons*: *What can the world learn from educational change in Finland?* Teachers College Press.
- Singapore Ministry of Education (2021). *Education statistics digest 2020*. Singapore: SMOE.
- Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. SAGE Publications.
- Tyack, D. B. (1974). *The one best system: A history of American urban education*. Harvard University Press.
- UNDP. (2020). *Human development report 2020: The next frontier - Human development and the Anthropocene*. United Nations Development Programme.
- UNESCO (1997). *Higher education in the twenty-first century: Vision and Action*. UNESCO Publishing.
- UNESCO (2015). *Education 2030: Incheon declaration and framework for action*. UNESCO Publishing.
- UNESCO Institute for Statistics (2020). *Education data 2019*. UIS Database.
- Wooldridge, J.M. (2010). Econometric analysis of cross section and panel data (2nd ed.). MIT Press.
- World Bank. (2018). *World development report 2018: Learning to realize education's promise*. World Bank Publishing. https://doi.org/10.1596/978-1-4648-1096-1

- World Commission on Environment and Development (1987). *Our common future*. Oxford University Press.

9. Appendices

Appendix A: Data Sources

Variable	Source	Years
ER	MNEPS, UNESCO	2007-2022
TQ	MNEPS, OECD	2007-2022
DI	Observatoire de l'Éducation	2007-2022
QA	Estimated (MNEPS reports)	2007-2022
GE	OECD Governance Index	2007-2022

Appendix B: Robustness Check Results

Variable	Fixed Effects (β)	ρ-Value
TQ	0.28	0.003
DI	0.23	0.006
QA	0.12	0.32
GE	0.14	0.11

10. Acknowledgement