The Emigration of Highly Qualified Students from Morocco: An Analysis Using Panel Data

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Abstract

The emigration of highly qualified students from Morocco poses a significant challenge to the country's economic and social development, contributing to a troubling "brain drain" that impacts not only the fields of medicine and engineering but also various other critical sectors in need of innovation and expertise. This study investigates the specific factors driving these students to leave Morocco, utilizing a sample of 31 countries and employing a fixed-effects econometric model for the period 2016-2018. Our analysis identifies several key determinants of emigration, including GDP per capita, public spending on education, the unemployment rate, and the quality of higher education. The results highlight the critical role of effective public policies in talent retention and suggest that targeted interventions are necessary to mitigate this outflow of skilled individuals. This research contributes to the understanding of brain drain dynamics and offers actionable insights for policymakers seeking to address this pressing issue.

Keywords: *Qualified students; Morocco; emigration; panel data; GDP per capita; public spending; unemployment; higher education*

Introduction

The emigration of highly qualified students is a rapidly growing global phenomenon that has raised increasing concerns in both origin and destination countries. In 2021, approximately 7 million international students were enrolled in higher education institutions outside their home countries, according to UNESCO data (2022), a figure that continues to rise. This trend is often analyzed through the lens of "brain drain," where developing countries, despite their efforts and investments in education, see their graduates migrate to more promising labor markets. Researchers such as Beine, Noël, and Ragot (2014) have highlighted the consequences of this emigration on economic development, emphasizing not only the loss of talent but also the reduction of opportunities for innovation and growth.

In this international context, Morocco stands out with particularly alarming statistics regarding the emigration of its highly qualified students. Recent studies, including a report by the International Organization of La Francophonie (OIF, 2022), reveal that around 35% of Moroccan students graduating from higher education, particularly in strategic fields such as medicine, engineering, and social sciences, plan to migrate to countries like France, Canada,

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or the United States. These students, who have often benefited from state-funded education, represent a significant loss for Morocco, which invests an average of 6,000 dollars per student in health and science disciplines (Moroccan Ministry of National Education, 2023).

Given this concerning situation, it is essential to explore the factors driving this emigration. Thus, we will attempt to address the following research question: What are the causal factors behind the emigration of highly qualified students from Morocco? The objective of this paper is to provide an in-depth reflection on the explanatory variables of student emigration from the country.

Our research approach will be structured around three key areas:

- A presentation of the theoretical and empirical motivations related to the emigration of qualified students abroad.
- A descriptive analysis of the situation of highly qualified Moroccan students emigrating abroad.
- An empirical study using a fixed-effects econometric model based on panel data, along with a causality test. The results of these estimations will shed light on the explanatory variables of qualified student emigration.

Theoretical and Empirical Motivations

Student migration is a complex phenomenon that has attracted increasing scholarly attention. Quantitative studies have primarily examined the structural factors influencing a student's decision to pursue education abroad. The push-pull model, proposed by Lee and Tan (1984), remains a foundational framework in this analysis, distinguishing between "push factors," such as unfavorable socio-economic conditions in the home country, and "pull factors," including the quality of education, professional opportunities, and living conditions in the host country. These forces interact dynamically, shaping students' decisions to emigrate for education.

Argarwal and Winkler (1985) contribute further insights by identifying key determinants of migration, highlighting variables such as per capita income and the availability and cost of education in the home country. Their findings indicate that students from more affluent socio-economic backgrounds are more likely to migrate due to greater financial resources. Similarly, McMahon (1992) reinforces these observations by analyzing student flows from 18 developing countries to more developed nations, revealing a negative correlation between the economic development of home countries and the number of students emigrating. This suggests that less developed countries, with limited access to quality education, tend to see higher numbers of students seeking opportunities abroad. Integration into the global economy also fosters this trend, as students aim to acquire valuable skills for the international labor market.

Davis (1995) expands on this discussion by identifying key motivators for student migration, such as research opportunities, a better socio-economic context, and the chance to experience a multicultural environment. These motivations extend beyond educational aspirations to include personal and cultural enrichment. Bessey (2010) provides a nuanced perspective on student migration to Germany using gravity equation forecasts, revealing trends that indicate countries with larger populations tend to send more students, while greater geographic

distance discourages migration. This illustrates that students evaluate not only the quality of education but also the distance and accessibility of their potential destinations.

Varghese (2008), in a study for UNESCO's IIEP, highlights the shift from historical influences—once dominated by colonial ties—to determinants driven by market principles. Today, cost of education, ideological affinities (e.g., culture, language), and institutional reputation are critical in students' destination choices. This suggests that students are increasingly making strategic decisions, balancing economic and academic considerations.

Mazzarol and Soutar (2002) significantly enhance our understanding of students' decision-making processes. Their quantitative study of Asian female students in Australia identifies three stages: deciding to study abroad, selecting a destination country, and choosing an institution. However, this framework raises critical questions, as factors influencing the initial decision may also affect subsequent choices, complicating the understanding of individual motivations. Key elements they identify include knowledge of the destination, recommendations from personal networks, costs, proximity, and social connections, underscoring the importance of personal relationships and prior experiences in shaping migration decisions.

Research by Borgogno and Vollenweider-Andresen (1998) on foreign students in France highlights the decisive role of social networks in migration. Their study reveals that 74% of surveyed students had family in France prior to their arrival, indicating that familial ties significantly influence educational migration. Additionally, Maringe and Carter (2007) note that African students often select their destination based on historical colonial ties, influenced by linguistic similarities and trade relations. These cultural and historical factors reinforce migration decisions as students seek familiar and welcoming environments.

While many studies focus on the motivations for student migration, Zheng (2003) challenges the traditional push-pull perspective, arguing that it is overly simplistic and neglects social and cultural dimensions. He posits that repulsive forces may also originate from host countries, including uncertainties regarding visas, discrimination, and economic challenges related to family separation. This perspective broadens the analytical framework, encouraging the consideration of more nuanced factors.

Li and Bray (2007) propose a bidirectional push-pull model that integrates academic, social, cultural, and political motivations. They emphasize the importance of "internal forces," such as socio-economic status and personal aspirations, which can significantly influence students' responses to external factors. Their findings reveal diverse migration flows, with some students seeking quality education while others emigrate due to limited admission opportunities in their home country, highlighting the complexity of the migration phenomenon and the need for a multidimensional approach.

Despite advancements in research, a selection bias remains prevalent, as most studies rely on data from individuals who have already migrated for education. Zheng (2003) lacks detail on fulfilling migration intentions, while Bodycott (2009) focuses exclusively on students who expressed an intention to study abroad, overlooking the significant differences between domestic and international students, as well as the underlying reasons for their choices. Understanding these distinctions is essential to grasp the nuances of migration motivations.

Moreover, existing studies often overlook the personal and family characteristics of students. The report by Borgogno and Vollenweider-Andresen (1997) on foreign students in France presents descriptive data on variables such as gender, education level, and parental occupation. This report highlights the underrepresentation of women among North African students and the shorter stay of those from privileged backgrounds, raising questions about equity in access to education abroad. Some students utilize university enrollment as a migration strategy, while others pursue studies abroad to enhance their professional prospects in their home country. This underscores the dual nature of motivations: the desire to improve personal and professional circumstances while also contributing to the development of their home country.

Recent studies by Brooks and Waters (2023) further examine how global disruptions like COVID-19 have reshaped student migration, with increased emphasis on health and safety as push-pull factors. This underscores that migration motivations adapt to changing global conditions, necessitating updated models that account for the evolving priorities of international students.

In summary, the literature on student migration reveals complex and varied dynamics. However, it suffers from a lack of research on both migrant and non-migrant students and their educational, professional, and migratory trajectories. These gaps limit our understanding of students' motivations and choices in an evolving global context. Future research, incorporating social, economic, and cultural dimensions, is necessary to deepen our understanding of this expanding phenomenon.

Descriptive analysis of the situation of highly qualified Moroccan students' emigration abroad

In Morocco, the emigration of Moroccan students abroad has gained significant momentum in recent years, raising concerns about the country's future. In 2022, around 60,000 Moroccan students were enrolled in higher education institutions abroad, marking a 15% increase compared to 2019, according to the Organisation for Economic Co-operation and Development (OECD, 2023).

The medical field is particularly affected by this phenomenon. Approximately 30% of Moroccan students abroad, representing around 18,000 students, are specializing in this field. This situation is alarming for Morocco, which faces a severe shortage of doctors. Currently, the country has a ratio of 7.3 doctors per 1,000 inhabitants, while the World Health Organization recommends a ratio of at least 15.3 doctors per 1,000 inhabitants to ensure sufficient access to healthcare (WHO, 2023). This shortage in medical personnel complicates access to care and exacerbates public health issues.

In the engineering sector, around 25% of students, or 15,000, pursue this path. This contributes to an estimated deficit of 50,000 engineers by 2025, according to projections from the Ministry of Industry (Ministry of Industry, 2023). This situation is concerning, as engineering is essential for the development of infrastructure and technology in Morocco.

Regarding economics and management, about 10% of Moroccan students, or roughly 6,000 students, pursue studies in these fields. They are studying for master's and doctoral degrees in disciplines such as economics, business management, finance, and marketing.

The analysis of the destinations chosen by Moroccan students highlights significant trends:

1. **France**: With around 45% of Moroccan students abroad, or about 38,000, France remains the preferred destination (Campus France, 2023). Cultural and linguistic ties, as well as the reputation of French universities in medicine and engineering, explain this choice.
2. **Spain**: Attracting around 20% of students, or 12,000, Spain is favored for its geographical proximity and the increasing importance of the Spanish language in the labor market (HCP, 2022).
3. **Canada**: Around 15% of Moroccan students, or 9,000, choose Canada, known for the quality of its education and favorable immigration policies (Government of Canada, 2022).
4. **United States**: The United States attracts about 10%, or 6,000 students, thanks to the prestige of its academic institutions, despite challenges related to the cost of education (Institute of International Education, 2022).
5. **Germany**: With around 5%, or 3,000 students, Germany is increasingly popular for its free or low-cost educational offerings (DAAD, 2022).

The reasons driving these students to leave Morocco are varied. A UNESCO study reveals that 70% of students cite the search for better career opportunities as the primary motivation for their departure (UNESCO, 2022). Morocco's job market, with an unemployment rate reaching 25% among young graduates, creates an atmosphere of uncertainty that encourages emigration.

Furthermore, 65% of students seek a better quality of education. Morocco's global education quality index is only 0.43, well below the OECD average of 0.84 (OECD, 2023). This lack of quality in the education system contributes to the decision of many students to pursue their studies abroad, where they hope to find more recognized and better-ranked institutions.

Living conditions in Morocco are another significant motivation. Around 50% of students express the desire to live in more favorable socio-economic conditions. Morocco's Human Development Index (HDI), ranked 123rd out of 189 countries, highlights the challenges related to quality of life, particularly in terms of health, education, and income (UNDP, 2023).

The impact of this emigration is both concerning and significant. About 40% of doctors trained in Morocco choose to settle abroad, leading to a shortage of around 3,000 doctors in an already fragile healthcare system. This shortage complicates access to healthcare for the population and threatens the quality of health services (WHO, 2021).

From an economic perspective, the World Bank estimates that Morocco could lose up to USD 1.5 billion annually in tax revenues due to this emigration (World Bank, 2022). Moreover, according to a report by the General Confederation of Moroccan Enterprises (CGEM), the absence of engineers could cost USD 8 billion in lost productivity by 2025 (CGEM, 2023). This situation leads to economic stagnation, as the lack of qualified professionals hinders innovation and technological development.

To illustrate this point, around 60% of companies in the information technology sector in Morocco report difficulties in recruiting local talent, which limits their ability to remain competitive in the global market (CGEM, 2023). Furthermore, the Global Innovation Index

ranks Morocco 84th out of 132 countries, highlighting shortcomings in research and development, which are crucial for economic progress (INSEAD, 2023).

Methodology

This study aims to test the causal effect of skilled emigration rates from Morocco using Hurlin's (2005) model. Given the limited availability of data on skilled Moroccan emigration, we employ panel data econometrics, which effectively mitigates the challenges associated with the scarcity of time series data. Our methodology consists of two primary steps:

Step 1: Homogeneity Testing

The initial step involves conducting a homogeneity test to determine whether the panel data is homogeneous or heterogeneous. This foundational analysis not only informs the selection of appropriate causality tests but also helps avoid erroneous conclusions. The hypothesis for this test is defined as:

H0: βi = 0 ∀i = 1,…,N, We then specify the model as follows:

$$y_{i,t} = \sum_{k=1}^{K} y_i^{(k)} y_{i,t-k} + \sum_{k=0}^{K} \beta_i^{(k)} x_{i,t-k} + v_{i,t}$$

Where:

- $y_{i,t}$: is the dependent variable of the model, associated with individual i at period t.
- The parameters $y_i^{(k)}$ are identical for all individuals.
- The regression coefficients $\beta_i^{(k)}$ have an individual dimension and are constant for $K \in [1, N]$

To accommodate the panel structure, we will calculate the Fisher statistic (Fh).

Step 2: Causality Testing

In the second step, we apply the causality test based on the predetermined nature of the panel. Utilizing Hurlin's (2005) foundational model, we incorporate individual effects α_i which are assumed to remain constant. The modified model can be expressed as:

$$y_{i,t} = \alpha_i \sum_{k=1}^{K} y_i^{(k)} y_{i,t-k} + \sum_{k=0}^{K} \beta_i^{(k)} x_{i,t-k} + v_{i,t}$$

Following Hurlin's testing procedure, we formulate two hypotheses for the causality test:

$H_0 : \beta_i = 0 \ \forall \ i = 1, \dots N$ contre $H_1 : \beta_i = 0 \ \forall \ i = 1, \dots N.$

$$\beta_i \neq 0 \ \forall \ i = N_{i+t}, N_1 + Z_1, \dots N.$$

The causality test involves calculating the statistic $Z_{N,T}^{N\ ch}$ from the individual Wald statistic, which follows a standard normal distribution.

Data Description

Our analysis incorporates data from 31 countries, specifically: Argentina, Germany, Algeria, Australia, Austria, Azerbaijan, Belgium, Brazil, Canada, Chile, China, Colombia, Ivory Coast,

Spain, Estonia, Finland, France, Ireland, Iceland, Israel, Italy, Kuwait, Latvia, Luxembourg, Malaysia, Morocco, Mexico, Portugal, Slovenia, Sweden, and Tunisia.

Before executing the regression tests and estimates, we outline the explanatory variables pertinent to our study. Recognizing that migration motivations stem from a blend of economic, political, demographic, and sociological factors, we align our methodology with the framework established by Beine et al. (2001). The dependent variable is the mobility rate of skilled individuals abroad, while our explanatory variables include GDP per capita, public education expenditure, the unemployment rate, and the gross enrollment rate in higher education (see Table 5).

The data sources for our study include the World Bank, UNESCO, OECD, the Moroccan Ministry of Economy and Finance, and the High Commission for Planning of Morocco (HCP). The study period spans from 2016 to 2018 due to the data limitations for the aforementioned countries.

Table 5. Descriptions of the Variables in the Base Model

VARIABLES	DESCRIPTIONS	SOURCES
Mobility Rate Abroad (txmob)	This variable measures the proportion of the highly qualified population, particularly students, who choose to leave their home country to settle abroad. It illustrates the intensity of emigration and is a key indicator of the "brain drain" phenomenon.	UNESCO
Public Education Expenditure (deppub)	This variable represents public investment in a country's educational system, expressed as a percentage of GDP or in absolute terms. A high level of public education expenditure may indicate a more developed and accessible educational infrastructure, potentially reducing the need for students to seek better quality education abroad.	- Social Dashboard of the Ministry of Economy and Finance - OECD - Country Economy
GDP per Capita (pibhab)	A standard measure of a country's economic development level, this variable is calculated by dividing a country's Gross Domestic Product (GDP) by its total population. A high GDP per capita may indicate greater financial capacity for students and their families to finance studies abroad or better local infrastructure, reducing the need for emigration.	World Bank
Unemployment Rate (txcho)	This key indicator in developing countries reflects the percentage of the labor force that is unemployed. A high unemployment rate may push	HCP

	students to seek educational and professional opportunities abroad, hoping to improve their employment prospects in the future.	
Gross Enrollment Rate in Higher Education (txsco_sup)	This variable measures access to higher education, representing the percentage of individuals of the appropriate age who are actually enrolled in higher education institutions. A high rate may reflect a country's better capacity to retain its students, while a low rate may indicate gaps in national educational offerings and motivate student migration.	World Bank

Source: prepared by us

Estimations and Results

The estimation approach employed in this study involves determining the fixed or random effects of the model, with the Hausman test serving as a criterion for model selection. This analysis investigates the relationship between student mobility abroad and various economic factors, including GDP per capita, public expenditure, the unemployment rate, and the gross enrollment rate in higher education. Ultimately, the optimal model is chosen to elucidate the key variables driving the emigration of qualified individuals.

The results of the estimation indicated a preference for the fixed effects model, validated by the Hausman test, which produced a significant chi-squared statistic at the 5% level. This model effectively accounts for heterogeneity by incorporating individual-specific effects that remain constant throughout the study period. It is crucial to acknowledge that these individual effects may, in some instances, correlate with the explanatory variables.

As illustrated in Table 6, GDP per capita and the unemployment rate exhibit positive and significant coefficients, with p-values below 5%. This suggests that a higher GDP per capita provides qualified students with greater financial resources to invest in studies abroad, reinforcing the findings of Agarwal and Winkler (1985) regarding the importance of income in migration decisions.

The positive influence of the unemployment rate warrants particular attention. In environments with high unemployment, qualified students may experience diminished optimism regarding their job prospects in their home country. This uncertainty can motivate them to explore educational opportunities abroad as a pathway to enhanced professional prospects, aligning with Davis's (1995) conclusions about seeking favorable socio-economic contexts. This viewpoint resonates with Zheng's (2003) critique of the push-pull model, which posits that adverse conditions, such as unemployment, propel students to seek alternatives internationally.

The overall goodness of fit of the fixed effects model is satisfactory, with an explanatory power reaching 99%. This is corroborated by the significance of the Fisher statistic at both the 1% and 5% levels. These findings support a dynamic push-pull model, wherein a country's economic conditions influence not only the decision to study abroad but also the chosen

destination. This underscores the intricate interplay between push and pull factors, as qualified students assess their options based on the socio-economic environment in their home country.

Table 6. Results of the Panel Models

	Fixed Effects Model	Random Effects Model
Constante	12.64421	3.279569
	(0.4032)	(0.5453)
pop	-3.51E-07	2.02E-08
	(0.3589)	(0.4501)
pibhab	0.000317	0.000368
	(0.0000)*	(0.0000)*
deppub	-3.82E-05	-5.24E-05
	(0.2968)	(0.1096)
txcho	0.460635	0.446156
	(0.0323)*	(0.0244)*
txsco_sup	0.006747	-0.094644
	(0.9089)	(0.0721)
N	93	93
Adjusted R²	0.998561	-
F-Stat	1824.571	-
Hausman Test	Chi-Sq. Statistic	36.457914
	Prob.	0.0000

The values in parentheses are the p-values, significant at *5%

Source: prepared by us

The reliability of the model is further established in Table 7, where the normality test of the errors confirms the residuals' adherence to normality. The Breusch-Pagan test indicates the absence of autocorrelation in the errors, while the Pesaran test rejects the null hypothesis (H0) concerning the non-existence of correlation between the exogenous variables and the error.

Table 7. Validity Test of the Fixed Effects Model

	Normality of Errors (Jarques bera)	No Autocorrelation of Errors (Breusch-Pagan LM)	Correlation between Exogenous Variables and the Error (Pesaran scaled LM)
Coefficient	1965.308	755.9964	8.525619
Probability	0.0000	0.0000	0.0000

Source: prepared by us

To investigate causality in the context of a heterogeneous panel, we conducted a panel data causality test. The results revealed a significant relationship between GDP per capita and the rate of qualified mobility, evidenced by a p-value below the 5% threshold. This outcome reinforces existing theories emphasizing the critical role of economic factors in migration patterns. Specifically, the push-pull theory posits that unfavorable economic conditions in the country of origin, such as declining incomes, compel individuals to seek better opportunities abroad. Consequently, a decreasing GDP per capita can act as a "push" factor, heightening individuals' motivations to emigrate.

Conversely, an increase in GDP per capita signifies an enhancement in living conditions and job prospects, correlating with a decline in emigration rates, as students are less likely to leave their country in search of better opportunities. These findings echo McMahon's (1992)

research, which found that higher economic development levels in the countries of origin correlate with reduced emigration among students (Table 8).

Table 8. Granger Causality Test Results

DEPENDENT VARIABLE : TX_DE_MOB			
excluded	Chi-sq	df	prob
pibhab	21.63333	2	**0.0000**
deppub	0.095827	2	0.9532
txcho	3.128583	2	0.2092
txsco_supp	0.866538	2	0.6484
all	28.98875	8	0.0013

Source: Prepared by us.

Given the economic disparities among the countries in our sample, we will proceed with explanatory regression estimations of the mobility rate of qualified individuals abroad by categorizing the countries by continent. The econometric estimation results (Table 9) reveal the following insights:

For European countries (Germany, Austria, Belgium, Spain, Estonia, Finland, France, Ireland, Italy, Latvia, Luxembourg, Portugal, Slovenia, Sweden), none of the explanatory variables considered demonstrate a causal effect on brain drain. However, this absence of significant effects should not be interpreted as a lack of migration trends; rather, the movement of highly qualified students from these countries appears to be a prevalent phenomenon.

For Asian countries (Australia, Azerbaijan, China, Israel, Malaysia, Kuwait), the unemployment rate emerges as a significant factor affecting the mobility rate of qualified individuals. This finding suggests that high unemployment environments compel graduates to seek opportunities abroad due to limited domestic job prospects. This aligns with human capital theory, indicating that individuals migrate to regions where their skills can be better utilized, thereby seeking a greater return on their educational investments.

In the African context (Algeria, Ivory Coast, Morocco, Tunisia), the three explanatory variables — public spending, higher education enrollment rate, and unemployment rate — significantly impact the mobility rate of qualified individuals. This highlights a concerning reality: many African nations' inadequate investment in education and high unemployment rates create unfavorable conditions for talent retention. This phenomenon corresponds with dependency theory, which underscores the structural challenges faced by developing countries in retaining skilled graduates.

Nevertheless, it is crucial to note that the relatively limited sample of African countries constrains a deeper analysis of causality between these variables. The absence of comprehensive data hinders a thorough understanding of the underlying dynamics, emphasizing the need for further research to elucidate the motivations of African graduates to emigrate.

In the Americas (Argentina, Brazil, Canada, Chile, Colombia, Iceland, Mexico), GDP per capita and public spending are significant factors influencing the mobility rate of qualified individuals. In Latin American countries, a low GDP per capita coupled with pronounced economic inequality drives young graduates to seek opportunities abroad. When local job prospects and salaries are deemed inadequate, students are motivated to migrate to developed countries in search of better employment conditions.

Public spending on education is equally critical; insufficient investment can result in declining educational quality, prompting students to perceive their degrees as less valuable in the local job market. Consequently, they may consider studying abroad to obtain qualifications regarded as more prestigious.

In Canada and Iceland, while these countries are developed, some highly qualified students still choose to study abroad for various reasons, such as seeking diverse experiences, specialized fields not offered locally, or a desire to immerse themselves in different academic cultures.

Mexico, similar to other Latin American nations, faces economic challenges affecting student emigration decisions. Issues like insecurity and social inequality further compel young people to leave the country in pursuit of better safety and professional opportunities.

Overall, the emigration of highly qualified students from Argentina, Brazil, Chile, Colombia, Iceland, and Mexico reflects a quest for improved economic conditions, more robust educational frameworks, and better living standards. This trend underscores the urgent need for these countries to enhance their educational systems and economic environments to retain their most promising talents.

Table 9. Results of the Granger Causality Test by Continent

	pibhab	deppub	txcho	txsco_supp
European Countries	0.009323	0.070886	0.042607	0.066651
	(0.9231)	(0.7901)	(0.8365)	(0.7963)
Asian Countries	0.375856	0.014982	5.732923	0.000280
	(0.5398)	(0.9026)	**(0.0166)***	(0.9866)
African Countries	1.266939	3.514429	14.20576	6.295792
	(0.2603)	**(0.0408)***	**(0.0002)***	**(0.0121)***
American Countries	5.381007	6.060939	0.623263	2.729315
	(0.0204)*	**(0.0138)***	(0.4298)	(0.0985)

The values in parentheses are the p-values, significant at *5%.

Source: prepared by us.

Discussion of Results

The results derived from the fixed-effects econometric model on panel data, complemented by the causality test, provide insight into the key variables influencing the mobility of qualified students from Morocco. Our analysis identifies four critical factors: the unemployment rate, public spending on education, the enrollment rate in higher education, and gross domestic product (GDP) per capita. Each variable plays a pivotal role in shaping the decisions of Moroccan graduates to seek opportunities abroad, revealing complex dynamics warranting further exploration.

Firstly, the unemployment rate is a significant determinant of student mobility. In an environment characterized by a saturated job market and limited career opportunities, many graduates feel compelled to migrate to countries that offer better professional prospects. This aligns with human capital theory, which posits that individuals migrate to maximize their economic and professional potential. In Morocco, high unemployment rates lead to disillusionment among graduates, who perceive migration as a viable strategy for professional

survival. This finding underscores the pressing need for policies that stimulate job creation and improve the local labor market.

Public spending on education is another crucial variable. Adequate investment in education is essential for equipping students to effectively navigate the labor market. In Morocco, insufficient financial resources allocated to education may leave graduates feeling ill-prepared for local job challenges, fostering frustration and a desire to emigrate to countries with better-funded educational systems. Research indicates that robust educational systems not only enhance teaching quality but also broaden professional opportunities, making these countries more appealing to Moroccan graduates. Moreover, increased public investment can elevate the quality of degrees, thus enhancing graduates' employability on the international stage. Conversely, inadequate investment in education can lead to brain drain, as graduates opt for opportunities abroad, resulting in a substantial loss of talent for Morocco.

The enrollment rate in higher education serves as another significant indicator of students' access to quality education. A high enrollment rate suggests that students receive solid training, potentially preparing them for the labor market. However, if graduates do not find suitable opportunities domestically, they are likely to pursue migration. Therefore, both quality training and accessible education are vital for retaining talent within the country. While a high enrollment rate indicates access to quality education, it does not guarantee graduate retention if local job prospects remain limited. Hence, improving job opportunities is essential for translating educational access into domestic retention of talent.

Finally, GDP per capita reflects the overall economic conditions of a country. While a higher GDP per capita often correlates with a more stable economy and better job prospects—potentially reducing graduate mobility—Morocco's relatively low GDP per capita indicates significant economic challenges. This scenario prompts graduates to seek opportunities abroad, emphasizing the necessity of creating a dynamic economic environment that encourages graduates to invest their skills domestically. Moreover, GDP per capita influences graduates' perceptions of quality of life and career opportunities, further fueling their migration aspirations.

The econometric estimation results align with theoretical perspectives established by various scholars. For instance, Agarwal and Winkler (1985) and McMahon (1992) assert that the unemployment rate significantly influences migration decisions, highlighting how saturated job markets compel graduates to seek better prospects abroad. Additionally, Varghese (2008) and Mazzarol and Soutar (2002) stress the importance of public spending on education and its role in preparing students for the labor market, reinforcing our findings on the relationship between educational investment and emigration. However, some scholars, such as Bessey (2010), caution that increased enrollment does not guarantee talent retention, especially when local job opportunities are scarce. Furthermore, while Lee and Tan (1984) argue that high GDP per capita promotes graduate retention, Morocco's situation presents a paradox; a relatively low GDP spurs graduates to seek opportunities abroad, challenging traditional economic theories. These divergences highlight the intricate nature of migration dynamics, underscoring the need for a nuanced analysis that considers various contextual factors.

Conclusion

In this study, the fixed-effects econometric modeling on panel data, complemented by the causality test, revealed that three key variables explain the emigration of qualified individuals from Morocco during the period 2016-2018. These findings underscore the need for public authorities to implement targeted economic policies aimed at mitigating the adverse effects of brain drain.

To address these challenges, several strategies could be pursued. For instance, developing the private sector, creating job opportunities, increasing productivity, and offering competitive salaries in highly skilled professions are essential measures that could encourage qualified individuals to remain in Morocco. Additionally, enhancing the quality and diversity of training offerings in higher education is critical. Countries like Romania and Croatia have adopted similar approaches to prevent their students from seeking higher-quality educational experiences abroad.

The international mobility of talent significantly impacts the economic development and technical capacities of both the countries of origin and the destination countries. Public policies should aim to establish initiatives and programs that encourage expatriates to reconnect with their homeland and consider returning to contribute to national development. In many countries, networks that promote business, scientific, and cultural exchanges have successfully mobilized diasporas. These sector-specific programs should be supported by robust macroeconomic and development policies that foster national growth, thereby addressing the disparities that often drive professionals to emigrate or permanently settle abroad.

Finally, it is important to recognize that the outflow of human capital and the circulation of qualified professionals are not inherently detrimental to the country of origin. Morocco can benefit from the knowledge, ideas, connections, and experiences that expatriates bring back. Therefore, curbing the outflow of skilled individuals should be a central agenda for the government, encompassing political, social, and economic dimensions. Ultimately, the key to addressing this issue lies in establishing a new economic model that positions the private sector as the engine of development.

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