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The determinants of total factor productivity in Morocco: Econometric modeling with the ARDL model

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The objective of this article is to examine the relationship between total factor productivity (TFP) growth, financial development, foreign direct investment (FDI) and human capital in Morocco. To achieve this, an econometric approach was adopted, based on the estimation of an autoregressive distributed lag (ARDL) model to capture both short- and long-term effects on TFP. The results indicate that, in the short term, financial development negatively impacts productivity, likely due to institutional inefficiencies or resource disparities in the financial sector. FDI shows mixed effects, while human capital does not significantly impact productivity immediately. In the long term, financial development and human capital remain insignificant for TFP, whereas FDI displays a negative impact, possibly due to a focus on low-productivity sectors. These findings highlight the structural obstacles in Morocco's economy and the need for a strategic focus to enhance productivity sustainably.

Keywords: TFP growth, Foreign direct investment, financial development, human capital, ARDL

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1. Introduction

In an economic context marked by major challenges such as inflationary tensions, growing inequalities, and environmental pressures, Total Factor Productivity (TFP) plays a crucial role in the economic catch-up of countries.

Indeed, TFP measures the efficiency with which resources are used to produce goods and services. By improving TFP, countries can increase their productivity, stimulate economic growth, generate jobs, and increase incomes. This requires investing in innovation, skills, infrastructure, and institutions to maximize resource utilization and promote sustainable and balanced economic development.

Over the past few decades, Morocco has embarked on a process of economic and political modernization aimed at improving the efficiency of its economy and total factor productivity (TFP). Through the implementation of relevant reforms and policies, Morocco has succeeded in improving resource allocation and attracting productive investments.

However, despite these efforts, the recorded growth gains have remained modest compared to the rapid accumulation of capital. Indeed, several emerging countries such as Turkey and Colombia have achieved similar growth rates to Morocco but with significantly lower investment rates.

In 2020, the national economy was hit by the pandemic but began to recover in 2021. However, the Ukrainian crisis in February 2022 interrupted this recovery by disrupting supply chains and causing an increase in commodity prices.

Nevertheless, the country has shown great resilience in the face of this crisis and has taken financial support measures for key sectors of the economy, businesses, and households. These events have highlighted weaknesses in Morocco's current economic model and underscored the need to adjust the model to adapt to the new global economic reality.

Given this new economic reality, it is legitimate to ask the following question: what are the key economic drivers on which Moroccan public authorities must rely to promote increased total factor productivity, in order to overcome the period of economic recession and achieve sustainable and inclusive economic growth?

This article therefore contributes to the existing literature in two ways. First, to our knowledge, this study represents the first attempt to empirically examine the short- and long-term relationship between total factor productivity (TFP) growth, financial development (FD), foreign direct investment (FDI) and human capital (HC), in the context of Morocco.

Second, the cointegration test of the long-run relationship based on autoregressive distributed lag (ARDL) is used to study the long-run relationship, and the ARDL framework is applied to examine the long-run and short-run dynamics. Additionally, the Granger causality test is used to determine the causal relationship between the variables studied.

The rest of the article is organized as follows. Section 2 presents a literature review. Section 3 discusses the context of total factor productivity growth in Morocco. Section 4 describes the empirical specification and the data used. Empirical results are presented and discussed in Section 5, while the final section offers policy implications and concludes the article.

2. Literature review

As a measure of the efficiency with which resources are used to produce goods and services, TFP is a crucial indicator for assessing economic dynamism.

However, identifying the factors that influence TFP growth remains a complex and multidimensional challenge. This literature review looks at the different theoretical and empirical perspectives aimed at identifying and understanding the underlying determinants of TFP growth.

2.1. Foreign direct investments (FDI)

Foreign direct investments (FDI) are considered essential for total factor productivity (TFP) growth according to the literature. FDI brings benefits such as technology transfer, job creation, and positive externalities through links with local suppliers and customers, learning from foreign firms, and employee training.

However, obstacles to technology access and competition can generate negative externalities. Additionally, when FDI leads to substantial capital outflows in the form of profit and dividend transfers, productivity may be negatively affected. The relationship between TFP growth and FDI is a controversial research topic in economics with mixed evidence.

For instance, the results of Keller and Yeaple (2003) indicate that 14% of the productivity growth in US factories during the period 1987-1996 was attributed to spillovers from FDI. A similar finding was observed for the United Kingdom by Griffith et al. (2003) and Haskel, Pereira, and Slaughter (2002).

A study by Yasin and Sari (2022) examines the impact of foreign direct investment (FDI) on technical efficiency based on sectoral classifications of technological intensity in Indonesia. The results show that FDI, technological intensity, and absorptive capacity have a significant influence on firm production and efficiency.

Furthermore, according to Sugiharti et al. (2022), when a country has a low absorptive capacity for foreign direct investment (FDI), even if FDI has a positive spillover effect, this effect quickly reaches a critical value known as the saturation state. At this stage, FDI may displace local firms from the market, which can hinder total factor productivity (TFP) (Gui-Diby).

Li and Tanna (2019) provide new empirical evidence on the relationship between incoming foreign direct investment (FDI) and total factor productivity (TFP) growth using cross-national data for 51 developing countries from 1984 to 2010. The results suggest a weak direct effect of FDI on TFP growth.

However, when considering human capital and institutions as contingencies in the FDI-TFP relationship, a robust response of productivity growth dependent on these "absorptive capacities" is observed. The relevance of human capital diminishes when accounting for the effect of institutions, highlighting the importance of institutional improvement for productivity gains through FDI in developing countries.

Kariuki et al. (2021) find that FDI has a statistically insignificant negative linear effect on TFP growth in Sub-Saharan Africa. However, a positive nonlinear effect is observed, dependent on governance and human capital capacities. Improving these factors can enhance productivity gains from FDI. The study uses cross-national data for 34 SSA countries from 1996 to 2019, employing the GMM technique.

Similarly, Meniagoa and Lartey (2021) investigate the direct and indirect effects of foreign direct investment (FDI) on economic growth and total factor productivity (TFP) using data for 25 Sub-Saharan African countries during the period 1980-2014. The main findings reveal a largely negative direct effect of FDI on economic growth and TFP. Furthermore, the results suggest that the influence of financial development and human capital accumulation on the effect of FDI is negligible.

2.2. Financial development (FD)

In the literature, financial development promotes total factor productivity (TFP) growth by providing access to capital, facilitating technology and knowledge transfer, supporting small and medium enterprises, reducing operating costs and improving resource allocation. In summary, financial development is crucial for enabling firms to invest in technology and grow their businesses, thereby driving TFP growth.

Numerous empirical studies have examined the relationship between financial development and total factor productivity (TFP) growth. These studies have yielded varied results depending on the methodology, data, and countries under investigation.

However, several studies have found evidence of a positive impact of financial development on TFP growth. For instance, Inklaar and Koetter (2008) argue that not all financial development indicators will enhance TFP growth. Only the efficiency indicator of financial development significantly stimulates TFP growth, while traditional indicators do not.

Rioja and Valev (2004) show that the linkage between financial development and TFP is closely related to the stage of economic development. Financial development in developed countries will stimulate TFP growth, but this finding does not necessarily apply to developing countries. Nevertheless, there are also conflicting findings. A typical example is Huang and Lin (2009), who find that financial development has a more positive effect on TFP growth in developing countries.

Ali et al. (2022) find that knowledge diffusion enhances total factor productivity (TFP), independent of structural and institutional factors. Furthermore, in countries with a robust financial system, knowledge diffusion has a more significant effect on TFP. The results highlight the importance of policy complementarity for greater TFP and/or economic growth, emphasizing that knowledge diffusion alone is insufficient without complementary reforms.

In the other hand, Rehman and Islam (2022) analyze the role of financial infrastructure in TFP growth in BRICS economies. The results reveal a significant and positive role of financial infrastructure in both long- and short-term TFP, while outward foreign direct investment, trade openness, human capital, and innovation have comparable importance in BRICS countries.

The study conducted by Hsu et al. (2022) examines the impact of financial development, encompassing depth, access, efficiency, and diversity of financial services, on the relationship between trade and productivity growth. The results indicate that for wealthier countries, financial depth and access reinforce the effects of trade openness on growth. Conversely, for poorer countries, only financial efficiency is decisive. These findings suggest that the comparative advantage of financial development varies according to the income levels of countries.

On the other hand, Lau et al. (2023) investigate the impact of technological frontier on TFP growth in African countries. The results indicate that the technological frontier hinders TFP growth, particularly in regions with lower education levels. Higher education has a positive but insignificant impact on TFP growth. Additionally, financial development reduces TFP growth, while foreign direct investment has mixed effects. These results underscore the importance of education and training to enhance TFP growth in African economies.

2.3. Human capital

Paul Romer, a renowned economist, developed the idea that human capital is essential for the growth of total factor productivity (TFP). According to Romer, technological progress, influenced by investment in human capital, stimulates TFP growth.

Investments in education and training enhance knowledge and skills, promoting the development and adoption of new technologies. This improves the efficiency of the economy and stimulates TFP growth. By investing in human capital, countries and firms can increase their potential for TFP growth and foster economic development. Romer's ideas have had a significant impact on the understanding of the role of human capital in economic growth.

Patel's (2019) study examines the relationship between public spending on education and human resource development in India. Education policies recommend allocating 6% of GDP, but the actual expenditure averages at 3.77%. The lack of funding contributes to a low Human Development Index. The results demonstrate the positive influence of public spending on education on human resource development in India.

Männasoo et al.'s (2018) study investigates the determinants of total factor productivity (TFP) growth in 99 European regions across 31 countries from 2000 to 2013. The findings reveal that human capital endowment has a positive effect on TFP growth, particularly in advanced regions, while the impact of regions' own research and development (R&D) expenditures is largely absent.

The effects of human capital and R&D on TFP growth vary with the productivity gap. Additionally, a threshold effect in convergence is observed, where stronger TFP growth is associated with a larger productivity gap and a higher initial level of productivity. Spatial spillover effects have a positive impact on TFP growth.

Adnan et al.'s (2020) study focuses on Pakistan's TFP from 1970 to 2018. The impact of foreign direct investment (FDI), trade openness, and human capital on TFP is analyzed using the auto-regressive distributive lag (ARDL) bound testing approach. The study reveals a long-term relationship between TFP, FDI, and human capital. TFP, crucial for economic efficiency and growth, is measured as the productivity of capital and labor. ARDL bound tests and Granger causality tests are employed to examine the relationships among the variables.

Lau et al.'s (2023) study examines the impact of the technology frontier on TFP growth in African countries. The study incorporates the human capital channel (low and high education)

in the TFP growth function and includes net foreign direct investment inflows and financial development as control variables.

The long-run estimations indicate that the technology frontier hampers TFP growth, particularly in the low education channel. Surprisingly, high education has a positive but insignificant impact on TFP growth. It is also found that financial development decreases TFP growth, while net foreign direct investment inflows have mixed effects. These findings suggest that skilled labor embodied in a rich technology frontier requires proper training to enhance TFP growth in African economies.

However, Miller and Upadhyay (2000, 2002) were unable to find evidence supporting human capital (education). In fact, when they interacted human capital with trade to account for threshold effects, human capital had a negative impact on TFP growth. Their findings demonstrate that at low-income levels, human capital is negatively associated with TFP growth, while the effect is positive for countries with intermediate income levels.

3. Stylized Facts on Total Factor Productivity in Morocco

During the 1980s, large-scale economic measures and sectoral reforms implemented under the structural adjustment program, signed with the IMF and the World Bank in 1983, played a crucial role in stabilizing and strengthening the macroeconomic framework. The main objective of these reforms was to improve macroeconomic and budgetary management. The results of this program were remarkable, with better resource allocation, rationalization of public expenditures in general and investment spending in particular, as well as modernization and greater efficiency of the budgetary system.

These measures led to a significant improvement in the productivity of public investments, which contributed significantly to GDP growth in the 1980s. It is worth noting that this structural adjustment program marked the end of previous development plans, characterized by rigidity and excessive voluntarism disconnected from the country's actual capabilities.

The decade of the 1990s, commonly referred to as the "lost decade," was characterized by a slowdown in reforms following the positive outcomes achieved through the structural adjustment program in the previous decade. The policies implemented were insufficient to deepen and extend the structural adjustment reforms and capitalize on the economic momentum initiated in the second half of the 1980s.

In the absence of a formal framework ensuring coherence and relevance of policies and public actions, sectoral programs proved to be of little relevance as they did not clearly contribute to

the main development objectives of the time: modernizing the economy, enhancing economic openness, and fostering increased private sector participation.

Furthermore, these programs were often ineffective as the evaluation methods for strategic projects were inadequate or even non-existent. The selection process did not rely on rigorous analysis of the economic, social, and financial feasibility of these programs. They often aimed for overly ambitious goals compared to the country's capacities and context, and they were sometimes contradictory. Due to this inefficiency in resource allocation, economic productivity remained low or even negative during this period.

Over the past forty years, Morocco has embarked on an extensive process of economic and political modernization. Notably, it has succeeded in improving the management of macroeconomic and sectoral policies by introducing more competition within the political sphere.

This has resulted in economic and social development programs from major political parties that are more pragmatic, focusing on concrete reforms and more relevant and achievable strategies to address the country's main challenges. This more conducive management framework for designing and implementing relevant reforms and policies has led to a rapid increase in productive investments, particularly from abroad, and, most importantly, a significant improvement in resource allocation. This has gradually enhanced the efficiency of the economy and overall factor productivity.

However, certain major rigidities still persist, such as an incentive framework that generates economic distortions by directing investments towards underperforming sectors, as well as labor regulations that have not allowed for optimal allocation and utilization of human resources.

These factors explain the relatively low but nevertheless positive contribution of total factor productivity (TFP) to growth.

4. Methodology and model specification

Our work is a continuation of research aimed at elucidating the determinants of total factor productivity (TFP) growth in developing economies. The central objective of our research is to apprehend the short- and long-term effect of human capital, financial development and foreign direct investment (FDI) on TFP in Morocco.

To this end, we opt for the estimation of a staggered lag autoregressive model, in line with the methodology developed by Pesaran et al. (2001). This hybrid approach, which combines the features of autoregressive (AR) models and staggered lag or distributed lag (DL) models,

enables us to capture short-term dynamics as well as long-term effects for cointegrated or integrated series of different orders. When several integrated variables of various orders (I(0), I(1)) are available, the cointegration test of Pesaran et al. (2001), also known as the "cointegration test with bounds", is implemented.

In order to examine the impact of the above variables on TFP growth in Morocco, we exploit annual data covering the period from 1980 to 2019. These data are extracted in their entirety from the database of the International Monetary Fund and the Groningen Centre for Growth and Development. The model described above is used for the empirical tests.

$$LogY_t = \alpha_0 + \beta_1 Log\ HC_t + \beta_2 Log\ FDI_t + \beta_3 Log\ FD_t + \varepsilon_t$$

Where Y represents TFP growth, HC is human capital, FD is financial development and FDI is foreign direct investment.

The model used as the basis for the staggered delay cointegration test (Pesaran et al. (2001) is the following cointegrated ARDL specification:

$$\Delta \text{ Log } Y_t = \alpha_0 + \sum_{i=0}^{n} \Delta\ a_1 Log\ Y_{t-i} + \sum_{i=0}^{n} \Delta\ a_2 Log\ HC_{t-i} + \sum_{i=0}^{n} \Delta\ a_3 Log\ FD_{t-i} + \sum_{i=0}^{n} \Delta\ a_4 Log\ FDI_{t-i} + \beta 1 logY_{t-1} + \beta 2 logHC_{t-1} + \beta 3 logFD_{t-1} + \beta 4 logFDI_{t-1} + \varepsilon_t$$

With:

Δ: Designates the operator of first difference.

α_0: Represents the constant.

ε_t : The error term which is white noise.

The expressions, ranging from α_1 to α_5, represent the short-term dynamics of the economic growth function, and those associated with the parameters β_1 represent the long-term dynamics of the model.

To examine the cointegration relationship among these variables, we employ the methodology introduced by Pesaran et al (2001). This approach is grounded in the Fisher test, which assesses hypotheses regarding the absence of cointegration among variables (H0) versus the presence of cointegration (H1). We gauge the Fisher values against critical values (limits) simulated for various scenarios and diverse thresholds by Pesaran et al (2001).

5. Data analysis and discussions:

5.1. Unit root test

To analyze the stationarity of the variables studied, we use the Augmented Dickey Fuller (ADF) test:

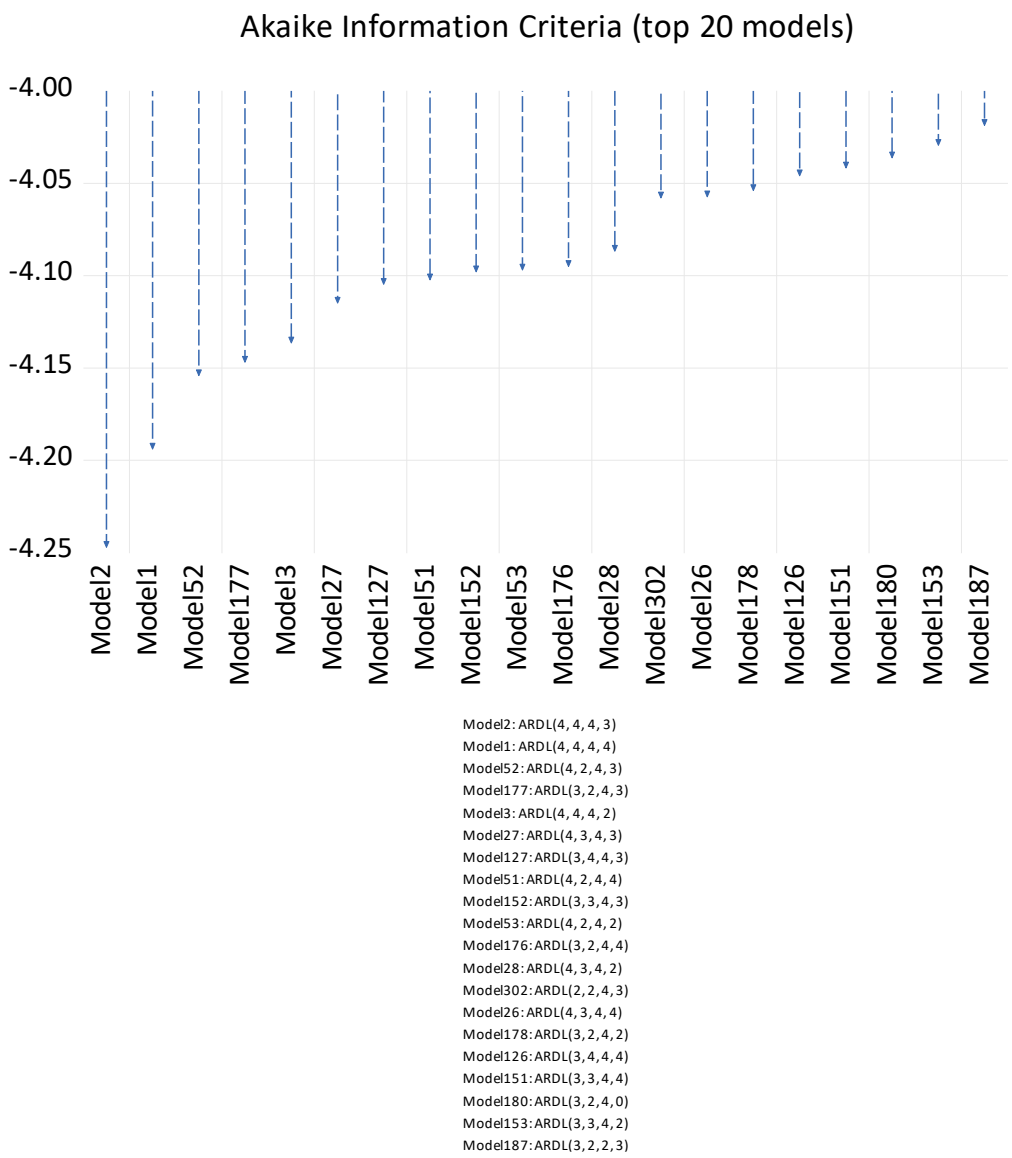
Table 1: Stationarity test of the variables

	At the level			ADF at first difference			ADF at second difference		
	Intercept	Trend et Intercept	None	Intercept	Trend et Intercept	None	Intercept	Trend et Intercept	None
Log (TFP)	-1.1923	-0.499	-0.691	-12.118	-12.558	-12.279	-11.411	-11.239	-11.572
	0.6671	0.9792	0.4106	**0.000*** **	**0.000*** **	**0.000*** **	**0.000*** **	**0.000*** **	**0.000*** **
Log (HCI)	-1.731	-2.105	-0.573	-1.098	-1.683	-0.333	-5.394	-5.454	-5.466
	0.407	0.526	0.4622	0.706	0.739	0.558	**0.000*** **	**0.000*** **	**0.000*** **
Log (FD)	-0.810	-1.935	-2.445	-6.322	-6.234	-5.717	-7.691	-6.433	-7.799
	0.805	0.616	0.015	**0.000*** **	**0.000*** **	**0.000*** **	**0.000*** **	**0.000*** **	**0.000*** **
Log (FDI)	-1.958	-2.812	-1.968	-10.210	-10.075	-10.327	-6.778	-6.777	-6.887
	0.303	0.201	0.048	**0.000*** **	**0.000*** **	**0.000*** **	**0.000*** **	**0.000*** **	**0.000*** **

Source: **Author's calculations**. Note:The optimal lag is determined from the Schwarz information criterion (SC). *** significant at 1%; **significant at 5%; *significant at 10%.

The ADF test analysis reveals that the variables in our study lack stationarity at the level. Consequently, we proceed to examine stationarity through first and second differences. The results indicate that our study's variables exhibit stationarity in the second difference at the 1%, 5% and 10% thresholds. Thus, to substantiate the appropriateness of using these variables, it becomes imperative to transform them into their second-order differentials.

5.2. Optimal offset



Source: Authors' calculations.

According to the analysis of the graph above and based on the AIC criterion, the ARDL (4, 4, 4, 3) model is identified as the most optimal among the 20 other models studied, as it displays the smallest AIC value. Therefore, this model is the one that produces statistically significant results. Once the ARDL (4, 4, 4, 3) model is selected as the most optimal, its estimation is presented in the table below:

Sample (adjusted): 1986 2019
Included observations: 34 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): DDLHCI DLFD DLFDI
Fixed regressors: C
Number of models evalulated: 500
Selected Model: ARDL(4, 4, 4, 3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
DLTFPG(-1)	-1.074018	0.204735	-5.245896	0.0001
DLTFPG(-2)	-0.213122	0.268210	-0.794609	0.4392
DLTFPG(-3)	0.689404	0.253752	2.716838	0.0159
DLTFPG(-4)	0.388715	0.212578	1.828576	0.0874
DDLHCI	-7.142624	6.022235	-1.186042	0.2541
DDLHCI(-1)	-20.27337	6.468168	-3.134329	0.0068
DDLHCI(-2)	-19.49027	7.700711	-2.530970	0.0231
DDLHCI(-3)	6.730483	7.778624	0.865254	0.4005
DDLHCI(-4)	13.27856	7.472309	1.777036	0.0958
DLFD	-0.235163	0.094968	-2.476244	0.0257
DLFD(-1)	-0.159416	0.089240	-1.786386	0.0943
DLFD(-2)	-0.010140	0.086573	-0.117127	0.9083
DLFD(-3)	0.100930	0.078904	1.279160	0.2203
DLFD(-4)	0.245633	0.079819	3.077361	0.0077
DLFDI	-0.011923	0.005334	-2.235092	0.0410
DLFDI(-1)	-0.015256	0.006146	-2.482435	0.0254
DLFDI(-2)	-0.017015	0.005956	-2.856781	0.0120
DLFDI(-3)	-0.008485	0.005098	-1.664455	0.1168
C	0.006506	0.007745	0.840111	0.4140

R-squared	0.844681	Mean dependent var	0.000922
Adjusted R-squared	0.658299	S.D. dependent var	0.042666
S.E. of regression	0.024940	Akaike info criterion	-4.245334
Sum squared resid	0.009330	Schwarz criterion	-3.392368
Log likelihood	91.17068	Hannan-Quinn criter.	-3.954448
F-statistic	4.531983	Durbin-Watson stat	1.549410
Prob(F-statistic)	0.002449		

*Note: p-values and any subsequent tests do not account for model selection.

Source: Authors' calculations.

5.3. Model Diagnostic Tests

To test the validity of the estimated model, the following diagnostic tests can be used: the residual white noise test, error autocorrelation test, error heteroscedasticity test, residual normality test, and model stability test.

Dependent Variable: D(LOGTFPG)				
Method: ARDL				
Number of models evalulated: 500				
Selected Model: ARDL(4,4,4,3)				
Sample (adjusted): 1986 2019				
Included observations: 34 after adjustments				
Hypothèses	Tests	Résultats	Proba	Confirmée
Correlation LM Test	Test Breusch-Godfrey	2.451342	0.1249	Non
Heteroskedasticity	Breusch-Pagan-Godfrey	1.165045	0.3865	Non
Normality Test	Test Jarque Bera	4.379642	0.111937	Oui

Source: Authors' calculations

Regarding these tests, we conclude by confirming the null hypothesis for all of them, so we can assert that both estimations are therefore statistically validated.

5.3.1. Long-term coefficients and short-term dynamics

5.3.1.1. Short-term dynamics:

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DLTFPG(-1))	-0.864997	0.200809	-4.307569	0.0006
D(DLTFPG(-2))	-1.078119	0.254961	-4.228557	0.0007
D(DLTFPG(-3))	-0.388715	0.169533	-2.292854	0.0367
D(DLFD)	-0.235163	0.073419	-3.203032	0.0059
D(DLFD(-1))	-0.336423	0.079823	-4.214610	0.0008
D(DLFD(-2))	-0.346564	0.079821	-4.341785	0.0006
D(DLFD(-3))	-0.245633	0.065854	-3.729967	0.0020
D(DLFDI)	-0.011923	0.004052	-2.942235	0.0101
D(DLFDI(-1))	0.025501	0.006909	3.690754	0.0022
D(DLFDI(-2))	0.008485	0.004186	2.027008	0.0608
D(DDLHCI)	-7.142624	4.978493	-1.434696	0.1719
D(DDLHCI(-1))	-0.518776	6.222735	-0.083368	0.9347
D(DDLHCI(-2))	-20.00905	6.353903	-3.149095	0.0066
D(DDLHCI(-3))	-13.27856	5.396976	-2.460371	0.0265
CointEq(-1)*	-1.209021	0.219796	-5.500660	0.0001

Source: Authors' calculations

Financial development has a significant negative impact, which could indicate that, in the Moroccan context, financial reforms do not immediately translate into improved productivity. This could be due to institutional inefficiencies or an unequal distribution of resources in the financial sector.

FDI shows mixed but significant effects: some values indicate a positive effect, others negative. This variability could be the result of differences in the nature of FDI or in the sectors where they are invested, leading to contrasting results on TFP in the short term.

Human capital, on the other hand, does not have a significant effect on productivity in the short term. This could suggest that investments in education and training have not yet reached a sufficient level to generate an immediate productive impact.

5.3.1.2. Long term effects:

Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.006506	0.007745	0.840111	0.4140
DLTFPG(-1)*	-1.209021	0.604961	-1.998511	0.0641
DLFD(-1)	-0.058156	0.256409	-0.226808	0.8236
DLFDI(-1)	-0.052680	0.015050	-3.500312	0.0032
DDLHCI(-1)	-26.89722	17.00545	-1.581682	0.1346
D(DLTFPG(-1))	-0.864997	0.537560	-1.609117	0.1284
D(DLTFPG(-2))	-1.078119	0.417148	-2.584499	0.0207
D(DLTFPG(-3))	-0.388715	0.212578	-1.828576	0.0874
D(DLFD)	-0.235163	0.094968	-2.476244	0.0257
D(DLFD(-1))	-0.336423	0.175144	-1.920839	0.0740
D(DLFD(-2))	-0.346564	0.122915	-2.819543	0.0129
D(DLFD(-3))	-0.245633	0.079819	-3.077361	0.0077
D(DLFDI)	-0.011923	0.005334	-2.235092	0.0410
D(DLFDI(-1))	0.025501	0.009254	2.755568	0.0147
D(DLFDI(-2))	0.008485	0.005098	1.664455	0.1168
D(DDLHCI)	-7.142624	6.022235	-1.186042	0.2541
D(DDLHCI(-1))	-0.518776	14.49675	-0.035786	0.9719
D(DDLHCI(-2))	-20.00905	11.58463	-1.727206	0.1047
D(DDLHCI(-3))	-13.27856	7.472309	-1.777036	0.0958

Source : Authors' calculations

Financial development has no significant impact, suggesting that financial reforms, while important, are yet to sustainably boost productivity. This lack of effect could be linked to structural obstacles or persistent inefficiencies in the Moroccan financial system.

Foreign direct investment (FDI), however, shows a negative and significant effect on productivity in the long run. This counterintuitive result could reflect the fact that FDI in Morocco is sometimes concentrated in low-productivity sectors or that it leads to technological dependence, hampering local innovation and the upgrading of industries.

Finally, human capital also does not seem to significantly affect TFP in the long run. This finding could be explained by a mismatch between the skills trained and market needs, thus limiting the impact of education and training on productivity.

5.4. Discussions

The analysis indicates that financial development in Morocco has not consistently led to productivity gains. In the short term, financial development shows a notable negative effect on TFP, suggesting that the financial sector may lack the capacity to effectively support productive investments. Institutional inefficiencies and poor resource allocation within the sector may be key obstacles, hindering financial reforms from boosting productivity in both the short and long run.

Similarly, FDI which typically introduces capital, technology, and management expertise expected to enhance productivity shows mixed short-term effects and a significantly negative impact over the long term in Morocco. This adverse long-term effect may be due to FDI focusing on sectors with limited productivity potential or relying heavily on foreign technology, which can impede local innovation and skill development.

On the other hand, human capital, usually a strong driver of productivity through improved skills and innovation, shows no substantial impact on TFP in Morocco. This result may indicate a disconnect between the skills developed through education and the actual needs of the job market, alongside limited opportunities for advancing workforce skills. Consequently, despite investments in education and training, the contribution of human capital to productivity remains constrained.

6. Conclusion

The objective of this article was to analyze the relationship between total factor productivity (TFP) growth and factors such as financial development, foreign direct investment (FDI), human capital, and investment rates within the Moroccan economy. To address this question, we first established a theoretical and empirical framework that guided our analysis, setting a foundation for our econometric approach.

While existing literature often suggests a positive link between these economic drivers and productivity, debates continue regarding the precise nature and strength of these relationships, partly due to country-specific characteristics and the econometric methods applied. Our study confirmed that such variability holds in the Moroccan context as well.

Our findings reveal that, in the short term, financial development negatively affects productivity, possibly due to structural inefficiencies in Morocco's financial sector. Similarly, FDI shows mixed impacts, and human capital investments have yet to demonstrate a significant productive effect in the immediate term.

In the long term, financial development and human capital remain insignificant for TFP, while FDI has a negative impact—likely due to investments being concentrated in low-productivity sectors. These results highlight the importance of adapting Morocco's economic policies to more effectively channel investment, improve financial systems, and align human capital development with market demands to foster sustainable productivity growth.

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