



Impact of Remittances, Foreign Direct Investment, and Official Development Assistance on Economic Growth in Morocco: An ARDL approach

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Abstract This article examines the impact of foreign direct investment (FDI), migrant remittances, and official development assistance (ODA), as well as control variables such as gross fixed capital formation and trade openness, on economic growth in Morocco between 1980 and 2022. The analysis uses the ARDL (Autoregressive Distributed Lag) model to capture short-and long-term dynamics. The results of the cointegration test confirm the existence of a long-term relationship between the variables. Moreover, the empirical results show that, in the long term, FDI and remittances contribute positively to growth, while ODA has a negative effect. In contrast, in the short term, none of these financial flows have a significant impact on growth. The article proposes recommendations aimed at maximizing the effect of financial flows, such as encouraging productive investment, improving financial inclusion, and promoting institutional reforms. Finally, it proposes directions for future research, including the use of nonlinear models and sectoral analysis of financial flows.

Keywords Foreign direct investment (FDI), Remittances, Official development assistance (ODA), Morocco, ARDL

AMS 2010 subject classifications 91G70, 62G05, 91B84.

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1. Introduction

With the advent of globalization, international capital flows, including remittances, foreign direct investment (FDI), and official development assistance (ODA), have grown significantly in recent decades. These flows constitute three essential components of foreign capital inflows [70]. These external capital flows are now considered major catalysts for economic development and sustainable development, particularly in emerging and developing economies where domestic resources are often insufficient to meet investment needs. They play an important role in stimulating economic growth and human development [30, 76]. Moreover, these financial contributions represent an essential strategic option for filling budget deficits and supporting the productive investments necessary for sustainable growth [48, 81]. In 2023, remittances to low- and middle-income countries reached a record high of \$669 billion [83]. However, FDI to these countries declined to around \$841 billion (UNCTAD [80]). Official development assistance (ODA) reached a historic high of US \$223.3 billion in 2023 [58]. However, the role of foreign capital in promoting economic growth remains a subject of debate. Some studies, such as that by Pal [61], point out that these financial contributions can both support and hinder growth. Nevertheless, it is widely accepted that these external flows are essential for strengthening the financing capacity of recipient countries and contributing to their human development. In Morocco, remittances, official development assistance (ODA), and foreign direct investment (FDI) are essential components of external financing. These flows play a decisive role in balancing the balance of payments and supporting development initiatives. As automatic stabilization mechanisms,

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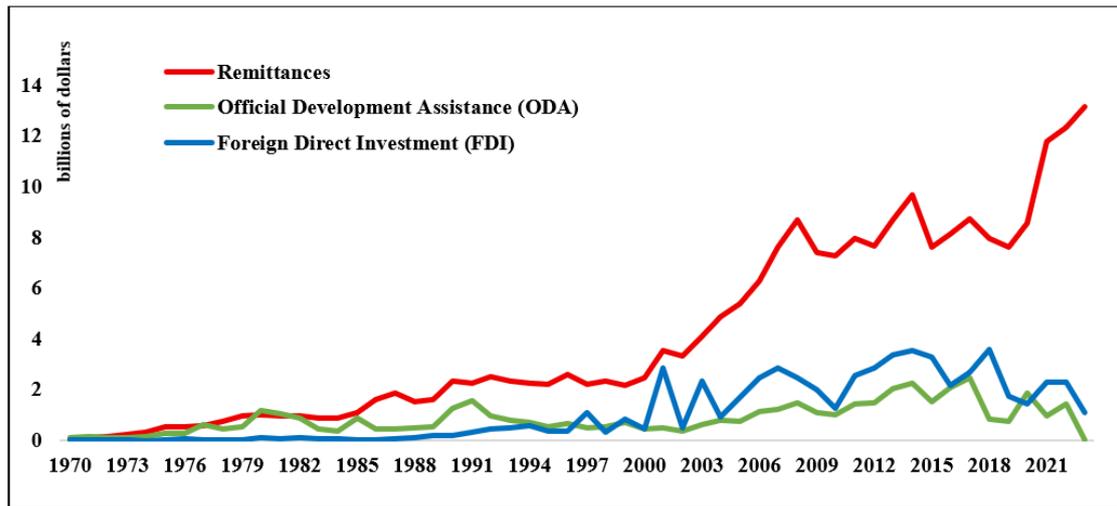


Figure 1. Migrant remittances and other financial flows to Morocco (in billions of dollars)

these flows help mitigate the effects of economic cycles by ensuring a steady flow of financial resources. Given the large number of Moroccans living abroad and the sustained momentum of labor migration, remittances to Morocco reached approximately \$11.7 billion (or MAD 115.3 billion) in 2023, representing nearly 8.6% of national GDP and an increase of 4.1% over the previous year (Office des Changes, [56]). By comparison, foreign direct investment (FDI) fell sharply, totaling only \$1.1 billion, a decline of more than 50% compared to 2022, according to the same source. With regard to official development assistance (ODA), the most recent data available indicate that Morocco received \$1.41 billion in 2022. Figure 1 shows the evolution of Morocco's main external financial flows.

The considerable scale of these financial flows explains the large number of studies seeking to determine their influence on economic growth and development. However, most existing research analyzes these three sources of financing independently. Few studies have looked at their combined impact, and among those that have, some consider only two of these flows rather than all three. By isolating these sources of foreign capital, existing research risks overlooking their interconnected impacts, which could distort their true influence on economic growth.

To our knowledge, despite their growing importance in terms of both volume and economic weight, the combined effect of FDI, migrant remittances, and foreign aid on economic growth remains insufficiently explored, particularly in the Moroccan context. To fill this gap, this article analyzes the dynamic effect of these three sources of financing on Morocco's economic growth. This research makes an important contribution to the empirical literature by answering the following question: to what extent do these external financial flows actually stimulate economic growth in Morocco? Are their effects short- or long-term? To this end, we use the autoregressive distributed lag (ARDL) method to analyze the short- and long-term effects, while taking into account both the integration of variables and the complex dynamics of their relationships [16, 7]. The rest of the article is structured as follows: Section 2 reviews the literature on the effects of foreign capital flows on economic growth. Section 3 describes the research methodology, including data sources and analytical techniques. Section 4 presents and interprets the empirical results. Finally, Section 5 summarizes the main findings and offers policy recommendations, as well as directions for future research.

2. Literature review

2.1. The Relationship between Remittances and Economic Growth

Unlike other external financial flows such as official development assistance (ODA) and foreign direct investment (FDI), remittances from the diaspora are characterized by their stability and low volatility. These funds are mainly

used for consumption, education, and health, with different uses depending on the country [86]. While their importance for low- and middle-income countries is recognized, theoretical and empirical literature remains divided on their economic effects [44, 73, 26]. This lack of consensus can be explained in particular by the diversity of uses of these transfers (consumption or investment) [37], but also by methodological differences, analytical approaches, data sources, units used, variables employed, and other contextual factors. Some research has shown a beneficial effect of remittances on economic growth [24, 32, 57]. Conversely, other empirical studies have found no significant or negative relationship between remittances and economic growth [20, 75]. For example, using an ARDL model with economic data from Vietnam from 2000 to 2018, Minh [46] demonstrated that a 1% increase in remittances leads to a 4.16% increase in GDP per capita in the long term and a 0.8% increase in the short term. Similarly, Eggoh et al. [24], in their analysis of a panel of 49 developing countries from 2001 to 2013, identified a favorable impact of remittances on economic growth. Islam [32] used generalized least squares (GLS) and fully modified ordinary least squares (FMOLS) techniques to show that remittances promoted economic growth in several Asian countries between 1986 and 2019. Furthermore, using an ARDL panel model applied to a sample of 20 sub-Saharan African countries over the period 2000–2015, Olayungbo and Quadri [57] concluded that migrant remittances promote economic growth in both the short and long term. Similarly, Jushi et al. [34] used a VAR model to assess the role of personal remittances in the economic growth of various Western Balkan countries between 2000 and 2017. The authors found that these transfers had a positive effect on economic activity. However, other studies report contrasting results. For example, Ngong et al. [51] used an ARDL model and cointegration techniques to analyze a panel of eleven emerging African economies from 1990 to 2022. Their research findings revealed a significant negative impact of remittances on growth rates. Similar results were obtained by Oteng-Abayie et al. [60] and Mawutor et al. [43], who used the same ARDL approach in their studies conducted in Ghana. In South Africa, Nyasha and Odhiambo [55], using a comparable approach, found a negative short- and long-term effect on economic growth between 1970 and 2019. In Asia, Roy [68] observed that remittances have a negative effect on long-term growth in India. Sutradhar [75] identified negative effects in Bangladesh, Pakistan, and Sri Lanka, but a positive effect in India. Raza et al. [66] showed that remittances not directed toward productive uses have a negative effect on economic growth in Asia. Akter et al. [5] found that in some parts of South Asia, these flows reduce GDP because they are mainly spent on consumption rather than productive investment.

2.2. The Relationship between foreign direct investment and economic growth

Studies examining the relationship between foreign direct investment (FDI) and economic growth have reached divergent conclusions. Some studies have shown that foreign direct investment (FDI) has a positive effect on economic growth [4, 27]. In contrast, other research has found no significant relationship, or even a negative effect [35, 23]. In their study, Azam and Feng [11] used cross-sectional data covering the period 1985 – 2018, encompassing 37 developing countries classified as lower-middle-income or upper-middle-income countries. Their analysis reveals that foreign direct investment (FDI) has a positive and significant influence on economic growth in lower-middle-income countries, while it has a negative impact in upper-middle-income countries. For their part, Liang et al. [38] studied the link between FDI and economic growth using a panel covering 2000–2019. Their econometric approach used Hausman’s fixed effects model and the two-stage least squares method incorporating instrumental variables. They confirmed the beneficial influence of FDI on economic growth. Moreover, Rashid et al. [65] observed that in India, FDI and exports contribute positively to short-term economic growth. Dinh et al. [23] analyzed the influence of FDI on economic growth in developing countries from 2000 to 2014, using VECM and FMOLS methodologies. The results indicate a negative short-term effect of FDI on growth, while revealing a favorable long-term effect. Nguyen [52] conducted a study on the effect of FDI on economic growth in Vietnam from 1997 to 2018. The results highlight a substantial and positive impact of FDI on growth. In South Africa, Khobai et al. [35] used quantile regressions to assess the effect of FDI on economic growth from 1970 to 2016. Their results confirmed a significant negative impact of FDI at the lower extreme quantiles, while no effect was detected at the upper quantiles. Similarly, in a study conducted in Kenya, Mutai et al. [49] used an ARDL model to analyze annual data covering the period from 1973 to 2021. The authors noted a negative but statistically insignificant effect of FDI on growth in the short term; however, in the long term, FDI appears to be an important factor influencing economic growth. Ayenew [10], applying the PMG/ARDL model to panel data from

22 sub-Saharan African countries between 1988 and 2019, showed that foreign direct investment has a positive and significant impact on long-term economic growth, but not a significant impact in the short term. Furthermore, Adams and Opoku [2] assessed the effects of FDI on economic growth in 42 sub-Saharan African countries from 1990 to 2003. The authors concluded that FDI has a negative effect on domestic growth. Using an ARDL model on data covering the period 1995–2021, Yeboah [88] demonstrated that FDI has a positive short-term but negative long-term effect on economic growth in nine European countries. Yimer [87] observed that in African economies oriented toward investment and factor accumulation, foreign direct investment has a positive and significant effect on long-term economic growth. Bashir and Sana [13] showed that FDI has a negative effect on economic growth in BRICS countries.

2.3. The Relationship between official development assistance and economic growth

Over the past few decades, numerous empirical studies have analyzed the effect of official development assistance (ODA) on economic growth in developing countries. However, the results remain mixed. Several studies have highlighted a positive impact of ODA on economic growth [22, 11]. Conversely, other studies have found a negative effect [3, 89], or even no significant effect on growth [74, 9]. Orchi and Ahmed [58] used ARDL and NARDL models to estimate the effects of official development assistance (ODA) on Kenya's economic growth over the period 1999–2015. The empirical results reveal that ODA has a positive impact on economic growth, both in a linear and non-linear approach. For his part, Moloi [47] studied the relationship between ODA, FDI, and economic growth in 30 African countries. The results of this study also revealed that ODA is negatively associated with growth. Using a two-stage least squares (2SLS) estimation, Awino and Kioko [9] found that official development assistance (ODA) has a positive but insignificant effect on economic growth in Kenya between 1960 and 2019. However, ODA contributes favorably to domestic savings over the entire period. Using FMOLS and DOLS methods, Yahyaoui and Bouchoucha [84] analyzed the effect of foreign aid on economic growth in 48 African countries between 1996 and 2014. Their results revealed an overall negative impact of aid. However, in the DOLS model, this effect becomes positive in the presence of good governance. Kitole [36] explored the link between official development assistance (ODA) and economic growth in Tanzania over the period 1988 – 2022. Using a vector error correction model (VECM) and the fully modified ordinary least squares (FMOLS) method, the empirical results confirmed a positive and significant long-term relationship between ODA flows and gross domestic product (GDP). More specifically, a 1% increase in ODA results in a 28.01% increase in GDP, while the short-term effects appear statistically insignificant. Using GMM estimation techniques, Adedokun and Folawewo [3] examined the impact of aid on economic growth in sub-Saharan Africa between 1996 and 2012. The authors demonstrated a negative but insignificant impact of aid on growth. Finally, Abate [1] established an inverted U-shaped relationship between foreign aid and economic growth. Using the generalized method of moments (GMM) on a panel of 44 developing countries covering the period 2002 – 2019. He identified an optimal aid threshold above which aid begins to have a negative impact on economic growth, set at 9.7% of Gross National Income (GNI). More specifically, aid has a positive effect on growth as long as it remains below this threshold. Conversely, Yiew and Lau [85], through an analysis of 95 developing countries, observed a U-shaped relationship between aid and economic growth, indicating that the effect of aid is negative when its volume is low, but positive at high levels.

2.4. Combined effect of external financing on economic growth

Many studies have examined the effects of various external financial flows on economic growth and human development in developing countries. According to Njangang et al. [53], who used the Pooled Mean Group (PMG) method over the period 1980–2016, only FDI showed a significant long-term effect on growth in Africa, while no significant long-term relationship was observed for ODA and remittances. Maheswaranathan and Chesika [41], using an ARDL model on data from 1980 to 2022, showed that all flows (FDI, ODA, and remittances) contribute positively and significantly to Sri Lanka's long-term economic growth. Similarly, using the same econometric approach, Tasinda et al. [78] studied the impact of these flows on human capital growth in five African countries (Nigeria, Kenya, Ghana, South Africa, and Morocco) over the period 2009–2018. Their results revealed a positive and significant long-term effect of these financial flows on human capital, although no significant short-term effect was identified. Using a dynamic spatial lag model, Nwaogu and Ryan [54] analyzed the effect of FDI, foreign aid,

and remittances on economic growth in 53 African countries and 34 countries in Latin America and the Caribbean. They concluded that when the three financial flows are analyzed simultaneously, only FDI contributes to growth in Africa, while remittances are the only factor with a significant effect in Latin America and the Caribbean. For their part, Benmamoun and Lehnert [15], applying a GMM model to panel data covering the period 1990 – 2006, showed that these external financial resources contribute to growth only in low-income countries. In contrast, Bird and Choi [18], examining 51 countries between 1976 and 2015, observed that while FDI has a positive effect, remittances have a negative impact, and ODA is generally negligible. For sub-Saharan Africa, Belesity [14] used the PMG/ARDL model on a panel of 22 countries from 1988 to 2019. He found that only FDI has a positive and significant effect on GDP growth, while ODA and remittances have a negative impact. In the case of Pakistan, Javaid [33] identified an overall positive impact of FDI and ODA on GDP between 1973 and 2014 in both the short and long term. Using a dynamic panel data approach, coupled with the generalized method of moments (GMM) method, applied to annual data from 1990 to 2016 for a set of developing countries, Zardoub and Sboui [89] observed that FDI and remittances contribute positively and significantly to economic growth, while ODA has a negative effect. In India, Marwan et al. [42] studied the effect of foreign capital flows on economic growth between 1975 and 2022, using the ARDL model and a decomposition of the variance of forecast errors. The study found that exports and ODA have a positive impact on growth, while FDI, remittances, and trade openness have negative effects. Similarly, a study conducted by Das and Sethi [22] examined the impact of FDI, remittances, and ODA on economic growth in India and Sri Lanka over the period 1980 to 2016, using a VECM model, Granger causality test, decomposition of forecast error variance, and impulse response function. Their results indicated that growth in India is mainly influenced by FDI and remittances, while in Sri Lanka, ODA and remittances play a significant role. In conclusion, empirical findings regarding the impact of foreign capital flows on economic growth remain mixed. While some studies show positive effects, others highlight limited or even non-existent impacts. These discrepancies indicate that the influence of these flows on growth is neither systematic nor uniform; their effects depend largely on the economic context, governance capacities, country-specific characteristics, the sectors concerned, and the periods studied.

3. Data and methodology

3.1. Study data and variables

This study uses annual data covering the period from 1980 to 2022, extracted from the World Bank database. The period chosen is based on the availability of data for the selected variables. Due to the unavailability of higher frequency data (monthly or quarterly), annual time series were used. Nevertheless, the scope of the data is sufficient to guarantee the degrees of freedom necessary to estimate the dynamic relationships between the variables studied. Table 1 provides an overview of the variables used, their measurements, and the expected effects.

3.2. Model Specification

The main objective of this study is to analyze the impact of remittances, foreign direct investment (FDI), and official development assistance (ODA) on Morocco's economic growth over the period 1980–2022, by taking real GDP as a proxy for economic growth and as the dependent variable in the model. In addition, standard explanatory variables from the growth literature are included, notably gross fixed capital formation (GFCF) and trade openness (TO). The choice of all these variables is based on widely recognized theoretical and empirical foundations. The general form of the model is as follows:

$$GDP = f(REM, FDI, ODA, GFCF, TO)$$

Its econometric specification is defined as follows:

$$GDP_t = \beta_0 + \beta_1 REM_t + \beta_2 FDI_t + \beta_3 ODA_t + \beta_4 GFCF_t + \beta_5 TO_t + \mu_t$$

In order to improve the reliability of empirical estimates and facilitate the interpretation of coefficients, all variables were transformed into logarithms, in accordance with the methodology adopted by Ridzuan et al. [67].

Variables	Symbol	Measurement	Expected Sign	Data Source
Economic Growth	GDP	Real GDP growth (% annual)		World Bank
Remittances	REM	Foreign remittances as a percentage of GDP	Positive/ Negative	World Bank
Foreign Direct Investment	FDI	Foreign direct investment as a percentage of GDP	Positive/ Negative	World Bank
Official Development Assistance	ODA	Official development assistance as a percentage of GDP	Positive/ Negative	World Bank
Gross Fixed Capital Formation	GFCF	Gross fixed capital formation as a percentage of GDP	Positive	World Bank World Bank
Trade Openness	TO	Ratio of the sum of exports and imports to GDP	Positive	World Bank

Table 1. Descriptions of variables, measurements, and expected signs

This transformation also reduces the variance of the series, which helps to mitigate heteroscedasticity issues. The equation, estimated in logarithmic form, can be expressed as follows:

$$\ln GDP_t = \beta_0 + \beta_1 \ln REM_t + \beta_2 \ln FDI_t + \beta_3 \ln ODA_t + \beta_4 \ln GFCF_t + \beta_5 \ln TO_t + \mu_t$$

3.3. Estimation approach

The ARDL (AutoRegressive Distributed Lag) model, based on the bounds testing approach developed by Pesaran et al. [62] and subsequently extended by Pesaran, Shin, and Smith [63], has established itself as a benchmark methodological tool for analyzing dynamic relationships between economic variables. Its main advantage lies in its ability to handle integrated series of different orders, $I(0)$ or $I(1)$, provided that none are of order $I(2)$ [71]. This flexibility makes the model particularly suitable for empirical studies, especially those involving small samples of between 30 and 80 observations, for which it provides robust and reliable estimates [50, 82]. ARDL also has the advantage of mitigating endogeneity biases by incorporating lags of the explanatory variables, which are all assumed to be endogenous [44, 69]. Haug [29] also highlights its effectiveness in processing short-term data. The autoregressive distributed lag (ARDL) model used for estimation is written as follows:

$$\begin{aligned} \Delta \ln GDP_t = & \beta_0 + \sum_{i=0}^k \beta_1 \Delta \ln GDP_{t-i} + \sum_{i=0}^k \beta_2 \Delta \ln REM_{t-i} + \sum_{i=0}^k \beta_3 \Delta \ln FDI_{t-i} \\ & + \sum_{i=0}^k \beta_4 \Delta \ln ODA_{t-i} + \sum_{i=0}^k \beta_5 \Delta \ln GFCF_{t-i} + \sum_{i=0}^k \beta_6 \Delta \ln TO_{t-i} + \lambda_1 \ln GDP_{t-1} \\ & + \lambda_2 \ln REM_{t-1} + \lambda_3 \ln FDI_{t-1} + \lambda_4 \ln ODA_{t-1} + \lambda_5 \ln GFCF_{t-1} + \lambda_6 \ln TO_{t-1} + \mu_t \end{aligned}$$

Δ represents the difference operator, β_0 is the constant term, while β_1 to β_6 correspond to the short-term coefficients and λ_1 to λ_6 to the long-term coefficients. The term $t - i$ indicates the optimal lags used in the model, k represents the lags of the regressors, and μ_t denotes the error residuals. The analysis of the parameters makes it possible to detect the possible existence of a long-term cointegration relationship between the variables. In the event of cointegration, the short- and long-term dynamics are then studied. The null and alternative hypotheses of the ARDL bounds cointegration test are as follows:

The null hypothesis of the equation is tested using the F-statistic developed by Pesaran, Shin, and Smith [63] and modified by Narayan [50], comparing the calculated statistic to the critical values of the lower and upper bounds proposed by Pesaran et al. [63]. When the F-statistic exceeds the upper bound at the 5% threshold, the null hypothesis is rejected, revealing the existence of a long-term relationship between the variables. Conversely, if the

	LNGDP	LNREM	LNFDI	LNODA	LNGFCF	LNTO
Mean	24.67081	21.97899	20.13278	20.57815	23.32178	-0.515112
Median	24.56267	21.91702	20.61046	20.56138	23.11479	-0.587857
Maximum	25.67781	23.23217	21.98863	21.61019	24.34330	0.011097
Minimum	23.41956	20.57582	13.21619	19.64378	22.04439	-0.783677
Std. Dev.	0.723156	0.818880	1.830015	0.533876	0.763773	0.192172
Skewness	-0.188270	-0.173540	-1.477629	0.124429	-0.039548	0.565502
Kurtosis	1.695118	1.717234	5.840073	2.009324	1.551549	2.419759
Jarque-Bera	3.304728	3.164001	30.09922	1.869371	3.770143	2.895060
Probability	0.191596	0.205564	0.000000	0.392709	0.151818	0.235150
Sum	1060.845	945.0966	865.7097	884.8604	1002.837	-22.14981
Sum Sq. Dev.	21.96408	28.16368	140.6560	11.97097	24.50065	1.551062
Observations	43	43	43	43	43	43

Table 2. Descriptive statistics of variables

value obtained is below the lower bound, no long-term relationship is observed. Finally, when the F-statistic lies between the two bounds, the results are inconclusive.

- H0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$
- H1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$

If the cointegration test reveals a relationship between the variables, an error correction model (ECM) is estimated to analyze short- and long-term dynamics and determine short-term coefficients. The error correction model (ECM) equation is then specified as follows:

$$\begin{aligned} \Delta \ln GDP_t = & \theta_0 + \sum_{i=1}^k \theta_1 \Delta \ln GDP_{t-i} + \sum_{i=0}^k \theta_2 \Delta \ln REM_{t-i} + \sum_{i=0}^k \theta_3 \Delta \ln FDI_{t-i} \\ & + \sum_{i=0}^k \theta_4 \Delta \ln ODA_{t-i} + \sum_{i=0}^k \theta_5 \Delta \ln GFCF_{t-i} + \sum_{i=0}^k \theta_6 \Delta \ln TO_{t-i} + \varphi ECM_{t-1} + v_t \end{aligned}$$

In this specification, θ_0 corresponds to the constant term, while θ_1 to θ_6 capture short-term effects. The term ECM_{t-1} represents the error correction mechanism, whose coefficient φ measures the speed at which the system adjusts toward long-term equilibrium and is expected to be negative and statistically significant. Finally, v_t denotes the random error term.

In the context of this study, which is based on 42 observations, the use of the ARDL model is particularly relevant for testing the existence of a long-term cointegration relationship between the variables while ensuring the statistical robustness of the results.

4. Results and discussions

4.1. Descriptive statistics and correlation matrix

Table 2 illustrates the descriptive characteristics of the variables examined. The standard deviation, which measures the variation of the variable observed relative to its mean, FDI (Foreign Direct Investment), with a value of 1.83, proves to be the most volatile variable. Conversely, the openness rate (TO), with a standard deviation of 0.19, is the most stable variable. With the exception of the FDI variable, all the variables studied follow a normal distribution at the 5% threshold, as indicated by the Jarque-Bera test probability (p-value > 0.05).

The correlation matrix (Table 3) shows that the dependent variable (GDP) is strongly and positively correlated with all explanatory variables, particularly gross fixed capital formation (0.993), remittances (0.981), foreign

	LNGDP	LNREM	LNFDI	LNODA	LNGFCF	LNT0
LNGDP	1.000000	0.980879	0.855077	0.610803	0.992656	0.765650
LNREM	0.980879	1.000000	0.820080	0.621887	0.974589	0.791129
LNFDI	0.855077	0.820080	1.000000	0.518554	0.846794	0.572997
LNODA	0.610803	0.621887	0.518554	1.000000	0.658898	0.631187
LNGFCF	0.992656	0.974589	0.846794	0.658898	1.000000	0.811983
LNT0	0.765650	0.791129	0.572997	0.631187	0.811983	1.000000

Table 3. Correlation matrix

Variables	Level		First Difference		Order of Integration
	ADF	PP	ADF	PP	
LNGDP	-2,5132 (0, 3205)	-2,9081 (0, 1704)	-5,9833 (0, 0001)***	-6,0768 (0, 0001)***	I(1)
LNREM	-2,3946 (0, 3769)	-2,5196 (0, 1377)	-6,0436 (0, 0001)***	-6,0785 (-0,0001)***	I(1)
LNFDI	-2,4581 (0, 3461)	-4,0164 (0, 0156) **	-10,2094 (0, 0000) ***	-14,2527 (0, 0000) ***	I(1)
LNODA	-3,7396 (0, 0304)	-3,7095 (0, 0326) **			I(0)
LNGFCF	-2,1014 (0, 5300)	-2,4701 (0, 3405)	-4,2958 (0, 0078) ***	-4,2238 (0, 0094) ***	I(1)
LNT0	-2,1807 (0, 4875)	-2,1580 (0, 4997)	-6,8341 (0, 000) ***	-10,3386 (0, 0000) ***	I(1)

Table 4. Unit root test results

(.): Probabilities

Significance level ***1%, **5%, *10%;

One-tailed p-values according to MacKinnon [40].

direct investment (0.855), and openness (0.766). On the other hand, official development assistance shows a more moderate correlation (0.611). These results confirm the positive influence of financial flows, investment, and trade openness on economic growth in Morocco.

4.2. Unit root test

Before any empirical estimation, it is essential to check the stationarity of the selected variables in order to avoid biased results due to non-stationary series [12, 25]. To this end, the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were applied. In accordance with the recommendations of Pesaran et al. [63], the application of the ARDL model requires that the variables be integrated of order I(0) or order I(1), but excludes any variable of type I(2) or higher order.

The results of the unit root test (Table 4) show that all series are non-stationary at their level. However, at the first difference, they become stationary. The exception is LNODA, which is stationary at the level. This confirms the absence of second-order integrated (I(2)) series and shows that only I(0) and I(1) series are present, which justifies the use of the ARDL model to model the relationship between the variables.

4.3. Determining the optimal number of lags

In the ARDL method, choosing the appropriate lag order is essential to avoid serial correlation problems. In accordance with the recommendations of Liew [39], a lag of 4 periods was selected based on the Akaike

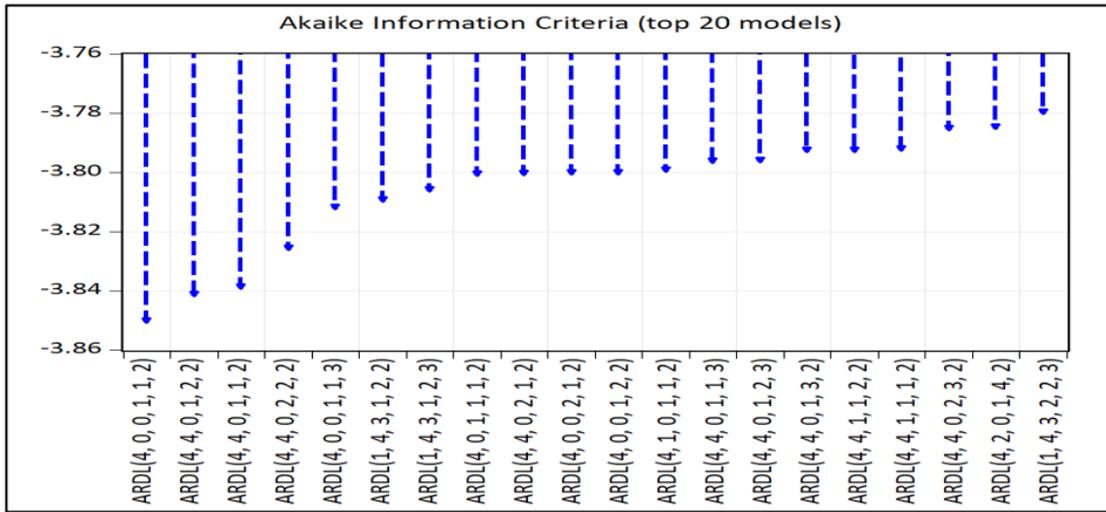


Figure 2. Optimal selection of the lag length for the ARDL model

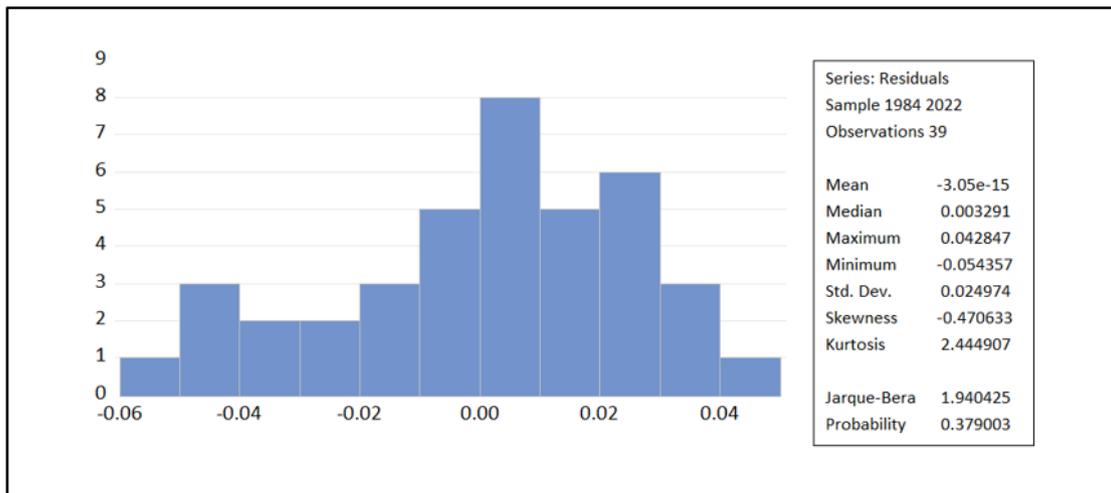


Figure 3. Normality Test Result

information criterion (AIC) in order to improve the reliability of the results. The choice of AIC is explained by its recognized ability to determine the optimal length of lags, particularly in the case of small samples [31, 71].

Among the 20 ARDL model specifications presented in Figure 2 above, the ARDL (4, 0, 0, 1, 1, 2) model is the most optimal, as it minimizes the Akaike information criterion (AIC).

4.4. Diagnostic tests

4.4.1. Normality test The model hypothesis is written as follows:

- H0: the residuals follow a normal distribution
- H1: the residuals do not follow a normal distribution

The Jarque-Bera test gives a statistic of 1.94 with an associated probability of 0.379 greater than 5%. This means that the residuals follow a normal distribution, as illustrated in Figure 3.

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.280071	Prob. F(2,23)	0.2971
Obs*R-squared	3.906298	Prob. Chi-Square(2)	0.1418

Table 5. Autocorrelation test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.485044	Prob. F(13,25)	0.9129
Obs*R-squared	7.855385	Prob. Chi-Square(13)	0.8529
Scaled explained SS	2.331999	Prob. Chi-Square(13)	0.9995

Table 6. Heteroskedasticity test results

4.4.2. *Autocorrelation test* The model hypothesis is written as follows:

- H0: the residuals are not autocorrelated
- H1: the residuals are autocorrelated

The Breusch-Godfrey (LM) test was conducted to verify the absence of autocorrelation up to the second order. The probabilities associated with the test ($p = 0.2971$ for the F-statistic and $p = 0.1418$ for the χ^2) exceed the 5% threshold. These results indicate that the residuals are not correlated, as shown in Table 5.

4.4.3. *Heteroscedasticity Test* The model hypothesis is written as follows:

- H0: Homoscedasticity
- H1: Heteroscedasticity

The Breusch-Pagan-Godfrey test was applied to detect any potential heteroscedasticity in the model's residuals. This method is preferred because it allows for easy detection of heteroscedasticity in a linear regression model, while assuming that the error terms follow a normal distribution. The p-values obtained (0.9129 for the F statistic and 0.8529 for the χ^2) are well above the 5% threshold. These results indicate that the model does not suffer from heteroscedasticity, as presented in Table 6.

4.4.4. *Model specification test: Ramsey's RESET test* Ramsey's RESET test ([64]) is a widely used diagnostic tool for assessing the validity of the functional form chosen in a regression model. In particular, it can detect possible specification errors resulting from the omission of relevant variables or nonlinear relationships not taken into account in the model. The null hypothesis (H_0) assumes that the model is correctly specified and that no relevant variables or nonlinear relationships have been omitted. In contrast, the alternative hypothesis (H_1) argues that the model has a specification error, which may be due to excluded explanatory variables, an incorrect functional form, or ignored nonlinear relationships.

As shown in Table 7, the p-values associated with the t and F statistics, as well as with the likelihood ratio test (0.8815, 0.8815, and 0.8478, respectively), are greater than 5%. Therefore, the null hypothesis is not rejected. This indicates that the model is correctly specified, i.e., it has no specification errors or biases related to omitted variables.

4.4.5. *Model stability tests* The CUSUM and CUSUMSQ tests proposed by Brown et al. [19] were applied to assess the stability of the model coefficients at the 5% significance level. According to Tanizaki [77], the parameters

Ramsey RESET Test			
Equation: UNTITLED			
Omitted Variables: Squares of fitted values			
Specification: LNGDP LNGDP(-1) LNGDP(-2) LNGDP(-3) LNGDP(-4)			
LNREM LNTO LNFDI LNFDI(-1) LNFDI(-2) LNGFCF LNGFCF(-1)			
LNODA LNODA(-1) C			
	Value	df	Probability
t-statistic	0.150642	24	0.8815
F-statistic	0.022693	(1,24)	0.8815
Likelihood ratio	0.036859	1	0.8478
F-test summary:			
	Sum of Sq.	df	Mean Squares
Test SSR	2.24 E -05	1	2.24 E -05
Restricted SSR	0.023700	25	0.000948
Unrestricted SSR	0.023678	24	0.000987
LR test summary:			
	Value		
Restricted LogL	89.07502		
Unrestricted LogL	89.09345		

Table 7. Ramsey RESET Test

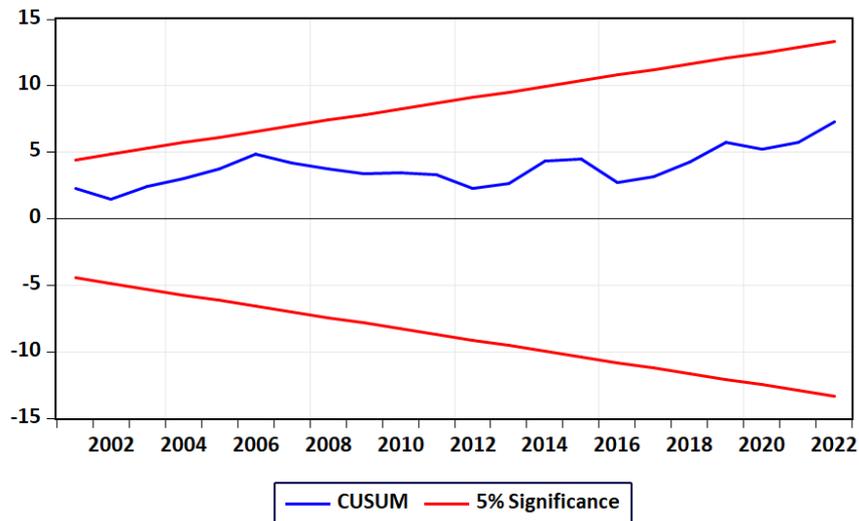


Figure 4. Stability test (CUSUM)

are considered stable if the curves remain within the 5% critical bands. The results presented in Figures 4 and 5 show that the curves fall well within these limits. This indicates that the model is stable over time and that the relationship between growth and the explanatory variables remains stable both in the short and long term.

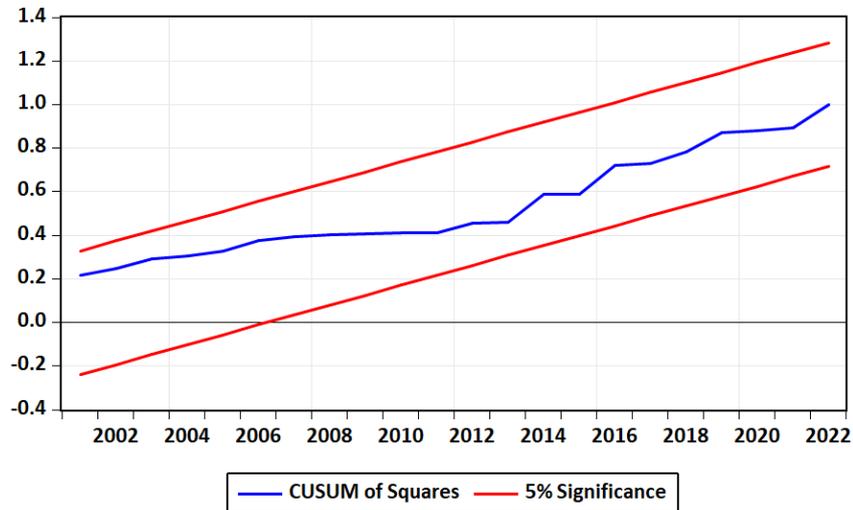


Figure 5. Stability test (CUSUMQ)

F-Bounds Test Null Hypothesis : No levels relationship				
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n = 1000				
F-statistic	9.542893	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

Table 8. Cointegration test result

4.5. Cointegration test: Bound test

After verifying the stationarity of the series, we applied the cointegration test. The F statistic obtained, equal to 9.542893 (Table 8), greatly exceeds the lower critical limits I(0) and upper critical limits I(1) at significance levels of 1%, 2.5%, 5%, and 10%, as proposed by Pesaran et al. [63]. Consequently, the null hypothesis of no cointegration relationship is rejected. There is, therefore, a long-term cointegration relationship between the variables in the model.

4.6. Results of short-run estimations

Table 9 shows the short-term dynamics between the selected variables, as well as the speed of adjustment towards equilibrium. The estimates reveal that gross fixed capital formation has a positive, significant, and notable effect on GDP : a 1% increase in domestic investment leads to an immediate increase of approximately 0.71% in GDP. On the other hand, official development assistance has a negative but insignificant effect, indicating no direct impact in the short term. Although foreign direct investment has no immediate effect, it contributes positively and significantly to growth with a one-year lag, reflecting the time needed for the effective absorption of incoming capital. Migrant remittances (REM) and trade openness (TO) have no statistically significant influence on short-term economic growth. The correction error term (CointEq), which measures the rate of adjustment needed to restore equilibrium after a disturbance, has the expected negative sign and is statistically significant at the 5% level.

ARDL Error Correction Regression				
Dependent Variable: D(LNGDP)				
Selected Model: ARDL(4, 0, 0, 1, 1, 2)				
Case 2: Restricted Constant and No Trend				
Date: 09/11/25 Time: 14:43				
Sample: 19802022				
Included observations: 39				
ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGDP(-1))	-0.152859	0.053944	-2.833650	0.0090
D(LNGDP(-2))	-0.138899	0.065081	-2.134239	0.0428
D(LNGDP(-3))	-0.211602	0.050805	-4.164982	0.0003
D(LNGFCF)	0.713329	0.048875	14.59506	0.0000
D(LNODA)	-0.007740	0.011148	-0.694277	0.4939
D(LNFEDI)	-0.001573	0.004849	-0.324341	0.7484
D(LNFEDI(-1))	0.015238	0.005822	2.617608	0.0148
CointEq(-1)*	-0.512658	0.056328	-9.101226	0.0000
R-squared	0.920309	Mean dependent var		0.053496
Adjusted R-squared	0.902314	S.D. dependent var		0.088467
S.E. of regression	0.027650	Akaike info criterion		-4.157694
Sum squared resid	0.023700	Schwarz criterion		-3.816450
Log likelihood	89.07502	Hannan-Quinn criter.		-4.035258
Durbin-Watson stat	1.803692			

* p -value incompatible with t -Bounds distribution.

Table 9. Short-run estimated coefficients results

This confirms the presence of a long-term relationship between the variables, as previously established by the bounds test. Its estimated value of -0.512658 indicates that any deviation from long-term equilibrium is corrected at an adjustment rate of 51.26%. Consequently, short-term disturbances and shocks are gradually absorbed over time, thereby reinforcing long-term economic equilibrium. In addition, the model explains approximately 92% of the variation in short-term GDP ($R^2 = 0.920309$), indicating very good explanatory power. The Durbin-Watson statistic (1.803692) reveals the absence of autocorrelation in the residuals. These results confirm that the model is robust and well-fitted.

4.7. Results of long-run estimations

Table 10, presents the estimated long-term coefficients. The results show that the positive coefficient for gross fixed capital formation (0.9285) indicates that a 1% increase in domestic investment leads to an increase of approximately 0.93% in GDP. This result confirms the findings of Apergis and Poufinas [8], Ferdaous [28], and Topcu et al. [79], who emphasize the central role of capital accumulation in stimulating economic growth. It also confirms the theoretical hypothesis that investment in infrastructure, machinery, and technology enhances productivity and long-term economic expansion. Furthermore, the coefficient for remittances (0.2699), which is positive and significant at the 5% level, shows that a 1% increase in these flows leads to a 0.27% increase in GDP in the long term. This result confirms that remittances are an essential lever for the Moroccan economy, as they have the potential to stimulate investment, savings, and consumption while strengthening the foreign exchange reserves needed to finance imports. These findings are consistent with those of Eggoh et al. [24], Olayungbo and Quadri [57], and Islam [32], and reflect the central role of migration as a defining feature of the national economy. The value of the coefficient implies that a 1% increase in the degree of openness increases GDP growth by 0.7668%. These results are similar

Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNREM	0.269919	0.088559	3.047904	0.0054
LNTO	0.766815	0.156154	4.910624	0.0000
LNGFCF	0.928515	0.091004	10.20299	0.0000
LNODA	-0.070248	0.032826	-2.139991	0.0423
LNFDI	0.040345	0.019455	2.073765	0.0486
C	-0.986959	1.275461	-0.773806	0.4463
EC = LNGDP – (0.2699* LNREM +0.7668* LNTO +0.9285* LNGFCF -0.0702 *LNODA + 0.0403*LNFDI - 0.9870)				

Table 10. Long-run estimated coefficients results

to the research findings of Islam [32], Alam and Murad [6], for example. Indeed, trade openness stimulates growth by facilitating access to international markets, encouraging specialization, and generating economies of scale. It also promotes innovation and technological progress through the dissemination of international knowledge, while improving the efficiency of resource allocation, strengthening competition, and supporting overall productivity. On the other hand, official development assistance (ODA) has a negative effect (-0.0702), indicating that a 1% increase in ODA flows is associated with a 0.0702% decline in GDP. This result suggests that increased ODA inflows tend to slow economic growth. It corroborates the findings of Moloi [47], Zardoub and Sboui [89], Yahyaoui and Bouchoucha [84], and Adedokun and Folawewo [3]. This negative relationship can be explained by inappropriate public policies and growing dependence on foreign aid. Indeed, despite massive inflows, ODA has contributed to exacerbating the debt trap, aggravated by corruption, poor governance, and inefficient management of funds. In addition, a significant portion of aid is often directed toward non-productive sectors and humanitarian causes, such as natural disaster management or food and security crises. Aid can also crowd out private savings and investment, as the government and economic actors rely more on external flows rather than their own resources. Furthermore, massive aid flows can cause the national currency to appreciate and inflation to rise, reducing the competitiveness of exports, a phenomenon known as "Dutch disease".

Finally, foreign direct investment has a positive (0.0403) and significant effect at the 5% level. A 1% increase in FDI inflows leads to a 0.0403% increase in GDP growth. This positive and significant coefficient is consistent with the findings of Azam and Feng [11], Rashid et al. [65], Dinh et al. [23], and Nguyen [52]. The positive effect of FDI can be explained by its favorable spillover effects, including technology transfer, human capital development, job creation, and increased productivity and competitiveness. They also stimulate business performance and promote the acquisition of new skills and modern management practices. In addition, it is an essential source of savings and capital accumulation, providing access to advanced technologies and supporting sustainable economic growth.

5. Conclusions, Recommendations, and Directions

This article empirically examines the short- and long-term effects of foreign capital, namely foreign direct investment (FDI), official development assistance (ODA), and remittances, on economic growth in Morocco, using World Bank data for the period 1980 – 2022 and applying the ARDL method. The short-term results indicate that only gross fixed capital formation has a positive, significant, and notable effect on GDP. In contrast, official development assistance has a negative but insignificant effect, reflecting the absence of an immediate direct impact. Foreign direct investment has a positive effect, but with a one-year lag, reflecting the time needed for its absorption. As for migrant remittances and trade openness, they do not show a statistically significant effect on economic growth in the short term. Furthermore, our results show that in the long term, remittances, foreign direct investment, gross fixed capital formation, and trade openness have a positive effect on economic growth in Morocco, while official development assistance has a negative impact. In light of the results obtained, several avenues for

reflection can be proposed to policymakers. To maximize the impact of migrant remittances, it is essential to strengthen financial inclusion, develop attractive savings and investment instruments, and reduce transfer costs through increased competition between providers. Improving access to financial services and disseminating reliable information would encourage the use of formal channels. Finally, targeting and channeling part of these funds toward productive projects could support sustainable growth, particularly by creating loans for small businesses backed by remittances from Moroccans living abroad (MRE). This approach would channel a measurable portion of the 11.7\$ billion in annual remittances toward productive investments, strengthening the capital of small businesses and supporting long-term economic growth. With regard to foreign direct investment (FDI), authorities should improve the business environment by reducing investment barriers, simplifying administrative procedures, and ensuring legal certainty and transparency. Directing flows toward strategic sectors, promoting partnerships between local and foreign companies, and adapting taxation to encourage reinvestment and investment in infrastructure, human capital, and innovation would further strengthen their impact on growth. To improve the effectiveness of official development assistance (ODA), it is recommended to strengthen governance and transparency, combat corruption and mismanagement, align funding with national priorities, coordinate ODA with other sources of financing, and prioritize productive projects. The establishment of rigorous monitoring mechanisms would ensure optimal use of aid and sustainable results. This includes establishing a results-based allocation framework, in partnership with multilateral donors, whereby disbursements would be conditional on the achievement of transparent and measurable results in strategic sectors such as infrastructure or education, rather than simply providing general budget support. The adoption of such mechanisms, accompanied by rigorous monitoring systems, would optimize the use of aid and ensure sustainable results.

With regard to gross fixed capital formation (GFCF) on growth, it would be advisable to encourage the development of strategic infrastructure, stimulate advanced manufacturing and innovative technologies, and promote private investment by directing capital to high-productivity sectors. Finally, trade liberalization, diversification of exports towards high value-added sectors, strengthening competitiveness through innovation and infrastructure modernization, and support for exporting SMEs should be priorities. Support for industries and workers affected by changes in global trade, combined with strategic trade agreements and balanced openness, would enable more effective integration into global value chains while protecting vulnerable sectors. However, this study has several limitations. First, it focuses solely on Morocco, which limits the scope of its conclusions. Reliance on time series data sourced mainly from the World Bank, although reliable and widely used, can pose measurement problems and does not allow for regional variations to be captured. Methodologically, the use of the ARDL model, which focuses on linear relationships, excludes the exploration of other econometric approaches that could highlight nonlinear effects or more complex interactions. However, although the study period covers recent episodes of major global disruption, the model does not explicitly incorporate the specific impact of shocks such as the COVID-19 pandemic or geopolitical tensions, which have affected the dynamics of international financial flows. These exceptional events may influence the estimated relationships temporarily or permanently. Similarly, certain exogenous factors, such as financial crises or institutional changes, are not taken into account, even though they can significantly alter economic dynamics.

Furthermore, certain exogenous factors, such as financial crises, the pandemic, geopolitical shocks, and institutional changes, have not been included in the analysis, even though they can significantly influence economic dynamics. Similarly, political and institutional dimensions, such as governance, corruption, and macroeconomic policies, are absent from the framework studied. Finally, the analysis takes a global approach by assessing the aggregate impact of FDI, ODA, and remittances without taking into account their sectoral disparities, which limits the accuracy of the results. In this context, establishing definitive causal relationships remains difficult.

Future research could use more advanced methods to further analyze the impact of financial flows on growth. In particular, the use of alternative cointegration methods such as FMOLS (Fully Modified OLS) or DOLS (Dynamic OLS) would make it possible to verify the robustness of the long-term coefficients obtained by the ARDL approach. The use of interactive regressions would make it possible to assess the complementary role of political, institutional, and governance variables. Furthermore, the adoption of nonlinear models, such as quantile regression or threshold models, would provide a better understanding of the complex relationships between these flows and growth. The application of threshold techniques, such as quadratic estimates, would make it possible to identify the levels at

which these flows have a significant and positive effect. Finally, a disaggregated sectoral analysis could highlight the areas that benefit most from FDI, ODA, and remittances, and those that contribute most to economic development.

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