African Review of Economics and Finance (2022), **2**, 1–12
ISSN (Print) 2042-1478
ISSN (Online) 2410-4906

ARTICLE

Foreign direct investment, human capital and economic growth in the Arab Maghreb countries

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Abstract

In a global sphere characterized by the interdependence between capital flows, capital markets of the developing countries open up more foreign direct investment flows through host country development such as human capital development and financial system development. One of the sources of economic growth in the developing countries is the implementation of macroeconomic policies, such as the attractiveness of foreign direct investment, the development human capital, the development institutions and the improvement of the education system. Following the estimation of panel data from the Arab Maghreb countries from 1995 to 2019 through the generalized method of moments, this paper shows the positive and significant effect of foreign direct investment and human capital, and the importance of the interaction in strengthening economic growth.

Keywords: FDI, Humain Capital, Economic Growth, GMM

JEL classification: F23, J24, A1

Article history: Received: 19 November 2021|| Accepted: 8 May, 2022

1. Introduction

From an endogenous growth perspective, the liberalization of the capital account is a source of development of nations (Yun & Jing, 2020, Yoshihiko, & al. 2021 and World Bank, 2019). For its part, the inflow of FDI flows contributes to economic growth through different transmission channels. In this vein, economists have distinguished between direct and indirect channels. In fact, the idea of transferring new technologies and knowledge to domestic companies and encouraging exports is ranked among the direct effects (Yaqin & Zhiqiang, 2015). While, the others are classified as indirect links, such as the intensification of competitive advantage due to the establishment of foreign companies on the national territory (Sjoholm, 1978) and the reorganization of the organization chart of new companies in the national territory and the reorganization of the organization chart of new companies in the event of mergers and acquisitions. Apart from the contribution of FDI to economic growth, other economists ignored this contribution. This may explain the under allocation of external resources, the repression of the development of the financial system, the misadaption of adequate sequencing of reforms and the under development of human capital.

On the other hand, the impact of FDI flows on economic growth is a condition among the important skills of the workforce, the technological gap between the issuing and host countries and financial development. Human capital is a source of growth and development of nations through accumulation and qualification (Anetor, 2020).

Thus, the quality of the workforce leads to an increase of labour productivity, which is a proxy for economic growth. Moreover, the most skilled labour force requires a higher wage level than the market one. However, the accumulation of human capital generates economic growth through easy adaptation and improved capacity for transformation and innovation of new technologies. Theoretically, the linear relationship between human capital and economic growth is not always obvious while Yaqin & Zhiqiang, (2015) affirmed the linearity between the two. On the other hand, Messailiand & Kaid, (2020) have challenged the contribution of human capital to economic growth.

Moreover, the inflow of FDI flows encourages economic growth by increasing the productivity of inputs through technology transfer and labour skills (Yaqin & Zhiqiang, 2015). In fact, the triple relationship requires certain conditions, such as the quality of human capital and the technological gap to reinforce the effect of FDI on economic growth.

Furthermore, several motivations have highlighted the interest of working in this theme, such as the important role of FDI in the contribution to the development of nations, the important role of human capital in the attractiveness of FDI, and the massive inflow of FDI into the Arab Maghreb countries compared to other African regions and the low rate of economic growth.

On the other hand, the study of the relationship between private capital flows and economic growth raises the following problem: Human capital in the Arab Maghreb countries reinforces the effect of FDI on economic growth. Therefore, in light of this problem, we make the hypotheses of this research :

H1: FDI inflows contribute to economic growth.

H2: Human capital encourages economic growth.

H3: The interaction between FDI and Economic growth strengthens economic growth.

This paper is organized as follows: the second section presents a brief overview of the theoretical and empirical literature on the link between FDI, human capital and economic growth. The third section deals with research design.

2. Literature review

Historically, FDI affects economic growth through different transmission channels. Such as the "spillover effect" which includes; First, the export incentive effect. The latter comes from the establishment of the multinational firms in the national territory, which strengthens the exports of goods and services by the adaptation of eating strategies and by the control of manufacturing costs thanks to the abundance of labour and the application of high quality production techniques. In this case, we are talking about the establishment of foreign firms in the developing countries, which makes it possible for then to increase the volume of then exports, which improves the state of the trade balance and therefore the balance of payments in certain cases. In this vein, Alaya, (2004) showed that FDI inflows have a positive impact on economic growth only through the two links of spillover effects of increased exports and improved human capital (knowledge transfer) countries of the southern Mediterranean over the period 1975-2002.

Secondly, the transfer of knowledge to the workforce plays an important role between FDI and economic growth. Indeed, the quality of the workforce makes it possible to transfer knowledge, production techniques, from a foreign company to a local one.

However, foreign investors still depend on the quality of the institutions and the level of economic development of the host countries. In this context, Wasseem, (2010) examined the effect of FDI on the Gulf countries from 1984 to 2002. In fact, the results obtained by the generalized method of moments showed that the institutions of the Gulf countries guarantee the private property rights

of foreign investors. In theory, the attention of foreign investors is determined by the economic stability of the host countries. In this regard, Annette, & al. (2021) discussed the FDI explanatory factors for 6 of the most attractive African FDI countries from 1990 to 2017. Cointegration tests have shown that the interest rate attracts FDI. The authors also showed that the mix between the interest rate and the exchange rate reduce the attention of foreign investors. However, the difference between the real interest rate and the unemployment rate reinforces the inflow of FDI.

In fact, the role of financial development in strengthening the effect of capital flows on economic growth depends on the type of capital flows. Indeed, Bruno Ongo, (2018) assessed the role of finance in strengthening the effect of FDI on economic growth for 50 African countries from 1980 to 2016. Using the generalized method of moments, they showed that in financial markets FDI has in effect on the African economic growth. This relationship is explained by the capitalization of multinational firms on stock exchanges in Africa. However, the banking system does not promote the contribution of FDI to economic growth. The absence of the relationship between the banking system, FDI and economic growth may explain the repression of the African banking sector. The researchers recommended that the African countries deepen and integrate financial markets to mobilize and diversify their savings through the easing of portfolio investment measures. Again, these researchers they insist on the liberalization of the banking sector of the African countries. In general, the effect of capital flows depends on the domestic development of the acceding countries. Indeed, Bouzayani & Abida, (2021) studied the effect of complementarity between capital flows and financial development on the economic growth of the North African countries from 1995 to 2017. The results obtained by the generalized method of moments showed that the effect of financial development on economic growth improves with the inflow of private capital.

Again, the effect of capital flows on the GDP depends on the degree of regional and international financial integration. Célestin Balla & Jacques Landry, (2020) examined the effect of regional and international financial integration on economic growth for 29 African countries from 1970 to 2017. The result obtained using the generalized method of moments showed that countries with financial development are able to attract more FDI while, regional integration is associated with a low probability of monitoring a banking crisis. As for, Célestin Balla & Jacques Landry, (2020), they found that it is imploring for countries to develop the financial system before regional and international financial integration to prevent the risks associated with the entry of capital flows.

For this part, Orhan, (2021) looked at the link between FDI and the Turkish economic growth from 1970 to 2019. The result obtained by the use of the econometric technique Vector Error Correction Model and Granger Causality showed thatthere is a short-run unidirectional relationship between GDP and FDI, while in the long-run, there is no effect of GDP on the attractiveness of FDI. In this regard, the author recommended that Turkey attracts more FDI to trigger its economic growth.

Finally, the third link between FDI and economic growth is the transfer of new technologies. On this subject, Arrow, (1971) and Findlay, (1978) focused on the contagious effect of the technology generated by the multinational firms since the objective of each firm undertaking foreign investment is to benefit from the competitive advantages resulting from the use of non-existent technologies. In the event of a merger acquisition between foreign and domestic companies, the technology must automatically be transferred. Honoré, (2010) tried to identify the most important channels of transmission between FDI flows and the Burundian economic growth. On the other hand, the economist take into account the linear relationship between economic growth and domestic investment, human capital, exports, FDI flows, imports of capital goods and employment. The estimation of a structural model from 1974 to 2006 showed that only the employment factor is the most dynamic in creating positive effect of FDI on Brunswick's economic growth. From this perspective, we are talking about technology transfer through the implementation of multinational firms, represented by the level of education, innovation, training. Since they are sub-indices of

employment. On the other hand, Yuandi, & al. (2013) justify that the entry of FDI flows has a positive impact on innovation through technology diffusion in industrial sectors while the specialisation of the industrial sector reduces the positive effects of the entry of FDI flows and vice versa, structural diversification of activities reinforces the benefits of FDI flows from abroad. On the other hand, the inflow of FDI has other indirect effects on economic growth, such as the absorption of unemployment, the creation of new units of production, effective control over companies management and a strong intra-sectoral competition.

According to Anne, (2016), investing in human capital is an additional efficiency by sustaining the acquisition of new skills and generating positive externalities that are sources of increasing returns favorable to innovation.

Therefore, in light of the result of Rezin, (2015) on 31 African countries from 1965 to 2010, by the use of econometric panel data techniques applied to 3 models of endogenous growth, such as the model of Solow, (1956), the second account holds the complements of human capital (primary, secondary and higher education) and the third account holds the quality of the education system (number of years in higher education). We can see from the estimate of these 3 models which emphasize the explanation of technical progress by the quality factors of the workforce the following results; the Ordinary Least Squares Estimator of the first model shows that the demographic variable is not significant, the second model justifies the significance at 5% threshold of human capital. In this case, the secondary and higher education have a significant effect on productivity growth, but the primary education cycle is negative. For the third model, which counts the quality of the education system, we noted that the number of years of higher education has a positive and significant impact on the level of the gross domestic product whereas the other two are not significant. Therefore, the relationship between human capital and economic growth is explained not only by education but also by training and development of the health sector.

In fact, in a comparative study between two groups of countries BRICs and UEMOA, Dedewanou, (2015) tried to identify the link between human capital and economic growth through access to training of the active population which, constitutes a fundamental link in increasing the productivity of workers over the period 1980-2011. This researcher justified the positive and significant relationship between investment (education, health and infrastructure) and the long-term economic growth for both groups at the threshold of 1%. For both long- term groups, an additional point in gross fixed capital formation led to a 0.18% increase per capita income. Moreover, the population aged between 15 and 64 affects the improvement of the income per capita. As for the BRICs countries which are classified as emerging countries, an additional point of investment in education, training and infrastructure, generates an additional 0.012 per capita. The accumulation of population and the increase in the labor force by one percentage point contributes to a 2.18% increase of the income for UEMOA. While the accumulation of the labor force triggers economic growth against a low value of 0.06 for the other group. According to this study, we can see that the basis of a economic growth of the BRICs countries is work.

For her part, Anne, (2016) confirmed existence of a positive relationship between access to training and the French added value. In fact, she shaved that a 1% increase of the rate of access to training leads to an increase of the value added per employee by 0.27% and 20% of the skill rate against 10% of unemployment rate, the improvement onthe skill levels of the French labor force generates 1.5 point of economic growth. As for, Borensztein, & al. (1998) they found that FDI inflows have a positive effect on economic growth through the technology transfer from the home country to the host countries. These writers consider human capital as an essential element of the transfer of technical progress as it determines the absorptive capacity of the receiving countries. In this case, it is said that the absorption capacity of the technological transfer depends on the degree of qualification of the labor force, which generally depends on the development of the education and health sector and the realization of training, etc. For this hard part, Cristina, (2015) reported that

the labor factor contributes to economic growth by increasing the levels of total productivity of the production factors through the FDI inflows through and knowledge transfer. On the basis of the academic research, it can be seen that complementarily between FDI and human capital is a source of increased economic growth; this reinforcement brought together under certain conditions of complementarily between the two. In other words, it is true that technology transfer is accompanied by FDI inflows, but the effect of contagion of new technology and knowledge, to host countries requires qualification of the workforce

3. Research Design

The objective of this section is to show the effect of the interaction between FDI and human capital on economic growth in the Maghreb countries. We present the model and the variables, the econometric method and the results of the various estimates which overall corroborate the theoretical hypotheses.

3.1 General specification of the model and definition of the variables

Our study analyzes a sample of 3 Maghreb countries (Tunisia, Morocco and Algeria) from 1995 to 2019. The specificity of our model is inspired by the work of Yaqin & Zhiqiang, (2015), which is specified in the following equation.

$$TGDP_{it} = \alpha_0 + \alpha_1 TGDP_{it(-1)} + \alpha_2 FDI_{it} + \alpha_3 HK_{it} + \alpha_4 PE_{it} + \alpha_5 INF_{it} + \alpha_6 TR_{it} \quad (1)$$

With: $i : 1, , 3$ and $t : 1995, , , 2019$. Therefore, to identify the role of human capital in the effect of FDI on economic growth, we estimated the following model.

$$TGDP_{it} = \alpha_0 + \alpha_1 TGDP_{it(-1)} + \alpha_2 FDI_{it} + \alpha_3 HK_{it} + \alpha_4 PE_{it} + \alpha_5 INF_{it} + \alpha_6 TR_{it} + \alpha_7 (FDI_{it} \cdot HK_{it}) \quad (2)$$

With : $TGDP, FDI, HK, INF, TR, PE$, and $FDI * KH$, respectively representing the rate of economic growth, foreign direct investment, human capital, inflation rate, the rate of openness of the economy and the variable of the interaction between the indicator of FDI and he human capital.

In fact, the rate of economic growth is measured by the real GDP growth rate noted GDP. FDI is measured by the ratio between the value of FDI inflows and the GDP rated FDI. On the other hand, human capital is measured by the level of primary education, which is noted HK. As for inflation, it is defined as the general price increase. On the other hand, public expenses are measured by the volume of public investments. Therefore, the rate of openness of the economy is calculated as follows as a ratio of GDP. The rate of economic growth and human capital are expressed in logarithms. The rate of openness of the economy, public expenditure, inflation and FDI flows are expressed as a percentage. The data are extracted from the World Bank database (WDI 2020).

3.2 Econometric Methodology

Our econometric analysis is divised into two stages: the first consists in presenting the stationary test of the different variables, the serial autocorrelation test and the second step estimates the variables by a multi-varied analysis, which allows us to conclude the nature of the link between the interaction between FDI, human capital and economic growth.

3.2.1 Stationarity test

Therefore, several econometric are used the unit root test to analyze the stationarity of dynamic panel data. Compared with time series, unit root tests and coi-integration of dynamic panel data are stronger. Indeed, the most use tests are the Im, Pesaran and Shin (1997). In this study, we are interested only in the tests of Im, Pesaran and Shin. In fact, table 1 summarizes the unit root test.

Table 1. Unit Root Test

Test	*PE*	*FDI*	*INF*	*HK*	*TR*	*GDP*
		Level				
Im, Pesaran and Shin	0.67	0.71	0.86	−0.91	1.18	−1.02
	(0.95)	(0.23)	(0.19)	(0.99)*	(0.11)	(0.08)
		1st difference				
Im, Pesaran and Shin	−1.77	−3.85	−0.58	−0.70	−3.75	−1.67
	(0, 07)**	(0.00)***	(0.00)**	(0.047)**	(0.00)***	(0.057)**

Note: : ***, **, *: Stationarity of variables at significance levels 1%, 5%, and 10%.
Source: Authors estimates

By examining table 1, we noted that the variables are not stationary to the execution of human capital and the rate of economic growth. However, when, in passing, in the first difference, we see that all the variables become stationary. In this case, we accept these variables are co- integrated of order 1.

3.2.2 Serial autocorrelation test

The serial autocorrelation test is used to test an error autocorrelation greater than the unit. In fact, the autocorrelation test which is also known as the Breusch-Godfred, (1980). The serial autocorrelation test is based on the a search for a significant relationship between residues and same shifted residue. Therefore, the null hypothesis of Breusch-Godfred test (1980) assumes the absence of autocorrelation.The decision is taken by classical Fischer test of nullity of coefficients or by the distributed LM statistics according to K_2 law at p degrees of freedom. With:

$$LM = T \times R^2$$

If $LM > K_2$ read, error independence hypothesis is rejected. Table 2 displays the error independence test results.

Table 2. Serial autocorrelation test

Test	Breusch-Godfred test	
Models	Model without interaction	Model with interaction
$\chi 2$	32.754	29.032
P. $\chi 2$	0.000	0.000

Source: Authors estimates

According to the results of Breusch-Pagan LM test, the null hypothesis of the independence of errors is rejected. That is, there is a serial autocorrelation problem for the 2 models.

3.2.3 Individual heteroscedasticity test

In econometric terms, we speak bout heteroscedasticity if that variances of the residuals of variables are different. In fact, homoscedasticity corresponds to the case where the residues of the variables are constant. Moreover, the commonly used test for heteroscedasticity is the Wald test (2000). Therefore, the null hypothesis of Wald test assumes the existance of homoscedasticity. In fact, table 3 presents the results of Wald test. Where the hypothesis of homoscedasticity, which assumes the existance hypothesis of heteroscedasticity in most models. Moreover, the use of the dynamic panel generalized method of moments began with the work of Arrelando & Bonde, (1991) and Arrelando & Bover,

Table 3. Wald test

Test	Wald test	
Models	Model without interaction	Model with interaction
$\chi 2$	36.095	28.893
P. $\chi 2$	0.001	0.000

Source: Authors estimates

(1995). According to the latter, we resort to this technique if there are problems of simultaneity bias, inverse causality, omitted variables.

3.2.4 Durbin-Watson test

The objective of Durbin-Watson test (1950) is to identify the significance of the p-coefficient in the estimated it residue.

$$\varepsilon_{it} = p\varepsilon_{it-1} + \mu_{it}$$

with ε_{it}: estimated residue and μ_{it}: a white noise. In fact, the null hypothesis of Durbin-Watson assumes the absence of autocorrelation between residues. Table 4 displays the results of Durbin-Watson test. According to table 4, the null hypothesis of autocorrelation between residues of all the

Table 4. Durbin-Watson testt

Test	Durbin-Watson test	
Models	Model without interaction	Model with interaction
$\chi 2$	2.32	2.47
P. $\chi 2$	0.93	0.95

Source: Authors estimates

models is rejected, which implies that there is a problem of autocorrelation between the residues. To identify the stationarity of the variables and an integration of order 1, the existence of a problem of autocorrelation, heteroscedasticit and the problem of autocorrelation between errors, we can estimate the model by the generalized method of moments.

3.3 Empirical results

Tables 5 and 6 show the result of the T-st coefficients and the probability of the variables according to the generalized method of moments estimated before and after the interaction between FDI and human capital. According to table 5, the two independent variables are statistically positive and significant. It is the same for the control variables, exceptines inflation and public expenditure.

Table 5. Estimation Without Interaction

Variable	Coefficient	T-St	Probability
Constant	0.342	3.2702	0.0019***
TGDP(–1)	–0.0477	–3.0924	0.0032***
FDI	0.0034	1.7825	0.0807*
HK	0.0011	2.6188	0.0116**
PE	–0.0032	–2.4991	0.0158**
INF	–0.0196	–1.0786	0.2859$^{n.s}$
TR	0.0001	0.7767	0.4410$^{n.s}$
R^2 = 0.28			
R^2 adjusted = 0.19			
F =0.74			
P. Sargan test =0.094			

Note: *: significance at the 10% threshold; ** significance at the 5% level; *** significance at 1% and n.s: not significant.

We found that the overall quality of the model is acceptable (F= 0,74). In terms of the explanatory power of the model, we found that the R^2 has a coefficient of determination of 28% and an explanatory variance R^2 adjusted by 19 % of the total variance. When the coefficient of interaction between FDI and human capital is added, the following results are obtained. According to the Sargan test, we do not reject the null hypothesis. Which means that the error term is not correlated with the exogenous variables.

Table 6. Estimation With Interaction

Variable	Coefficient	T-St	Probability
Constant	0.3160	3.0960	0.0032***
TGDP (–1)	–0.0519	–3.4512	0.0012***
FDI	0.0681	2.2194	0.0311**
HK	0.0016	3.4041	0.0013***
PE	–0.0027	–2.2003	0.0325**
INF	–0.0014	–0.8208	0.4157$^{n.s}$
TR	0.0001	0.5832	0.5624$^{n.s}$
IDE × *KH*	0.0006	2.1123	0.0398**
R^2 = 0.34			
R adjusted =0.25			
F = 0.79			
P. Sargan test =0.089			

Note: *: significance at the 10% threshold; ** significance at the 5% level; *** significance at 1% and ns: not significant.

According to Sargan test result, the estimation instruments are valid by 0.089>5%. Then, table 6 showes that the two independent variables as well as the interaction variable are positive and signifiant. Tt, is also the same for the control variables except inflation and public spending.

3.4 Discussion of results

The effect of FDI on economic growth is positive and significant at 10% threshold. Therefore, the first hypothesis is justified. This finding is consistent with that of previous studies by Tamar & Luca, (2020) and counter-reported results by Mahembe & Odhiambo, (2016). This contribution may be explained by the effect of the new technologies incorporated by FDI on economic growth. In the case of an interaction with the human capital, the effect of FDI on economic growth becomes more important. This increase is explained by the development of human capital in the Arab Maghreb countries. This implies that, the labour force in these countries absorbs and disseminates the new technologies incorporated by FDI. Based on this result, we found that the effect of FDI on economic growth depends on the development of human capital, which has a positive and significant impact at 5% threshold of economic growth in the Arab Maghreb countries. Therefore, the second hypothesis is verified. This result invalidates the results of Anetor, (2020). The contribution of human capital to economic growth can be explained by the quality of the labour force in the Arab Maghreb countries. In other words, a skilled workforce improves labour productivity and demands a higher level of income. As a consequence, the latter two can encourage economic growth. As a result of the interaction with FDI, the impact of human capital has increased. This improvement may be explained by FDI leading new knowledge to the workforce, which affects labour productivity.

The coefficient of interaction has a positive and significant impact at 5% threshold. Therefore, the third hypothesis is justified, which confirms the results of the Yaqin & Zhiqiang, (2015) studies. From this perspective, we see that the interaction between FDI and human capital strengthens economic growth by increasing the impact of each but by the positive effect of the interaction between the two. After the interaction, we noticed that the quality of the model is improving (F=0,79). This improvement can be explained by the important role of the interaction effect between FDI and human capital in strengthening economic growth.

Moreover, we have noticed a negative effect of inflation on the economic growth of the Arab Maghreb countries. The adverse effect of inflation is explained by the continued and rapid rise prices in the Arab Maghreb countries, that is to say, the rise of raw material prices can increase the costs of investment and manufacturing, which creates a problem for companies. On the other hand, public spending in the Arab Maghreb countries has a negative and significant impact on economic growth at 5% threshold. Withe the inverse relationship between public spending and economic growth can be explained by the misallocation of public spending, that is to say that most public expenditure is intended for the officials of the State but not intended for investment projects.

Trade opening affects economic growth in a positive and significant way. In fact, the linear relationship between trade openness and economic growth is explained by the commitment of the Arab Maghreb countries to free trade with the outside world and the adoption of international standards. The latter two can facilitate export and import operations. The economic growth rate of the previous year has had a negative effect on the level of economic growth of the current year. The inverse relationship between the current and the previous growth rates is based on the assumption that the Arab Maghreb countries are converging towards a stable state of economic growth.

4. Conclusion and recommendations

This paper tests an endogenous growth model that describes the relationship between FDI, human capital and other factors, such as public spending, inflation, and economic openness. To do so, we used the stationary tests, the Breusch-Godfred serial autocorrelation test, the Wald test of individual heteroscedasticity, the Durbin-Watson test and the generalized method of moments.

The results show that FDI, human capital and trade openness are sources of economic growth in the Arab Maghreb countries. Moreover, the interaction between FDI and human capital plays a key role in strengthening economic growth and the development of the Arab Maghreb countries. This implies that study is different from previous work as it identifies and explainis the problems of

integration, autocorrelation and heteroscedasticity for 3 neighbouring countries.

Moreover, this paper distinguishes an understanding of the complementary between FDI and human capital and their role in strengthening the economic growth of the Arab Maghreb countries. This complementarity is explained by the skills of the workforce, which absorbs and disseminates the new technologies incorporated by FDI in the economy of the Arab Maghreb countries. This operation can improve overall productivity, which is a source of economic growth.

In the light of our results and explanations we recommend the Arab Maghreb countries to reprogram the strategies of distribution of public expenditure, for example, a decrease of the proportion allocated is the officials and an increase of the proportion allocated to public investment to affect the long-term efficiency of the economy. Therefore, it is important for the Arab Maghreb countries to control inflation so as not to hinder economic growth.

According to this paper, to wait for the complementarity between FDI and human capital, we note that it is important for poor and developing countries to achieve a minimum level of human capital so that FDI can play its full role as a creative driver of economic growth. Mreover, this study may be complemented by addressing the complementarity between FDI and financial development.

Biographical Notes

Bouzayani Rajab is a PhD student in the Faculty of Economics and Management at the University of Sfax. His research interests are particularly anchored on capital flow, financial developpment and economic growth.

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Acknowledgements

We are thankful to the Handling Editor, Associate Prof. Dr. Hebatallah Ghoneim and two anonymous reviewers whose insightful comments made this article better.

Conflicts of interest

The authors declare no conflict of interest.

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