

# Complementarity between private capital flows and the development of regulatory institutions: Empirical evidence for North African countries

Bouzayani RAJAB<sup>1</sup>, and Abida ZOUHEIR<sup>2</sup>

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**Abstract:** *Private capital flows are seen as factors for growth, development and the emergence of economies, which is why host country officials are putting in place incentive policies to attract the maximum foreign resources. This study analyzes the complementary relationship between private capital flows and the development of regulatory institutions and their effect in strengthening the level of economic growth in North African countries over the period from 1995 to 2020. The results of the regression of dynamic panel data by the econometric technique GMM clearly show the significant contribution of private capital flows and regulatory institutions to the improvement of the level of economic growth. The important relationship of complementarity between regulatory institutions and private capital in strengthening economic growth can be observed. This observation is due to the increased effect of private capital flows on economic growth.*

**Keywords:** *Private capital flows, institutional development, economic growth, GMM*

**JEL classification:** *E2, O47, C23*

## 1. Introduction

Following the implementation of the programs of reform, liberalization and economic and financial integration in the late 1980s, a massive movement of capital between the rich countries themselves and the poor was observed. This phenomenon is explained by the implementation of development strategies in poor countries in particular, the development of regulatory institutions and the attractiveness of external resources.

Based on previous academic research by Acharya and Prakash (2013), Nyang'oro (2017), Baum et al. (2017), Adams et al. (2017), Ikpesu (2019), Combes et al. (2022), Oeking and Gabriella (2022) and Akalpler and Hove (2022), foreign capital flows generate gains and costs. These can affect growth and economic development. Indeed, foreign capital improves economic growth through several means. In this perspective, we can mention the improvement of investment by increasing savings and

<sup>1</sup> University of Sfax, Faculty of Economics and Management of Sfax, Tunisia, bouzayanilazher@gmail.com; \* Corresponding author.

<sup>2</sup> University of Sfax, Faculty of Economics and Management of Sfax, Tunisia, zouheirabida@gmail.com

investment capacity (Dupont, 2018), encouraging innovation through the establishment of foreign companies that facilitates innovation through the presence of the transfer of new technologies (Wang et al., 2012), improve the banking system and stabilize the financial system thanks to the establishment of foreign banks in hot countries (Oeking and Gabriella, 2022), stimulating macroeconomic discipline following economic, financial stability (Igan et al., 2020; Akalpler and Hove, 2022) and creation of new job positions (Pavelescu, 2006). The combination of these factors can create economic growth.

In addition, international investors seek a well-developed and stable business climate to exploit the opportunities provided and increase the return on capital. That is, the orientation of capital flows depends on financial development (Sghaier, 2018), human capital development (Anetor et al., 2020) and Rajab and Zouheir, 2024), infrastructure development (Liu et al., 2023), macroeconomic stability (Cambazoğlu and Güneş, 2016; Gümüšoğlu and Alçın., 2019), trade opening and development of host country institutions.

Again, many studies suggest that institutional development is vital to economic growth and development (North, 1990; Peres et al., 2018). Indeed, the development of economic institutions ensures the rules of economic games and organizes the markets (Sari and Prastyani, 2021). Still, legal institutions guarantee private property rights and stabilize the political state (Recuero and González, 2019; Adegboye et al., 2020; Uddin et al., 2021; and Tiwari & Bharadwaj, 2021).

Apart from the important role of institutional development in contributing to economic growth, it can attract foreign capital. That is, economic and political institutions play a very important role, including the attractiveness of private capital through political stability (Midjiyawa, 2015), the absence of corruption and respect for the private property rights of foreign investors (Anyanwu, 2012).

This study examines the complementarity between private capital flows and the development of regulatory institutions and their effect on the economic growth of North African countries from 1995 to 2020. Based on these objectives, we propose the hypotheses below:

Hypothesis 1: Private capital flows improve economic growth.

Hypothesis 2: Institutional development encourages economic growth.

Hypothesis 3: complementarity between capital flows and institutional development enhances economic growth.

The remainder of this study is organized as follows: The first section presents a review of the theoretical and empirical literature relating to the effects of private capital flows on economic growth. The second section presents the econometric specification. The third summarizes the results obtained. The fourth section concludes the main findings and recommendations.

## 2. Literature reviews

On the basis of previous studies, the significant positive contribution of private capital flows on growth and economic development is explained by the optimal allocation of foreign resources, good risk forecasting, control of transaction costs, encouraging innovation and the transfer of new technologies, improving portfolio efficiency, diversifying investment and financing opportunities, reducing the costs of financial intermediaries and exploiting foreign savings for domestic needs, creating new job positions, etc. On this subject, Wang et al. (2012) addressed the link between private capital flows and economic growth through innovation and the transfer of new technologies. They showed that FDI has a positive impact on innovation through technological diffusion in China's regional industrial sectors from 1999 to 2008. Thus, they showed that the specialization of the industrial sector reduces the positive effects of foreign direct investment while the structural diversification of activities reinforces the benefits due to FDI. On this subject, the authors recommend that emerging countries diversify the nature of the economic fabric to benefit more from foreign resources.

In addition, Nyang'oro (2017) focuses on the relationship between foreign capital flows and economic growth in 26 sub-Saharan African countries from 1980 to 2011. The results of the regression by the generalized moment method show that the effect of the net inflow of foreign capital on gross domestic product is positive, the volatility of portfolio investments has no effect on gross domestic product. Nyang'oro (2017) explained the lack of allocation by the low degree of integration of sub-Saharan countries in the stock market.

Based on academic research, economic integration of poor developing countries facilitates the circulation of private capital on a global scale. Thus, this operation can increase the return on capital and accelerate economic growth processes by increasing the saving capacity. For his part, Dupont (2018) emphasized the role of internal and external resources in financing poor and developing countries, as well as the effectiveness of capital flows in contributing to Haitian economic growth. The results of the Granger causality test show that the main obstacle to the mobility of capital flows in developing and poor countries is the low level of savings. In light of these results, it is important for poor countries to open the capital account to increase the saving capacity and therefore the financing capacity.

Also, the study by Oeking and Gabriella (2022) justified the importance of portfolio investments in ASEAN countries. They processed data from Malaysia, Hong Kong, Korea, Indonesia, Thailand, Japan, Singapore and China from 1990 to 2020 by quantile regression and vector autoregression. It showed that capital flows in the form of investment have a significant positive effect on the economic growth of the ASEAN countries. Again, this contribution is explained by the role of the development of the financial system in the attractiveness and best allocation of foreign resources.

In addition, the subject of capital flows - economic growth is covered by Akalpler and Hove (2022). They tested the Granger causal link between private capital and the gross domestic product of the BRICS countries from 2001 to 2015. The results suggest a one-way causative of foreign direct investment to real GDP per capita. However, they indicated that foreign direct investment influences the targeted monetary policy. This idea is explained by obtaining an autonomous monetary policy that requires a closed capital account.

According to previous reviews, external resources directly or indirectly affect economic growth and development. In this regard, Combes et al. (2022) examine the effect of capital flows and their composition on the real exchange rate and economic growth of 77 low- and middle-income countries from 1980 to 2012. The results of the generalized GMM moment method show that private capital inflows directly affect the level of gross domestic product. They showed that private capital improves economic growth indirectly through the appreciation of the real exchange rate. In light of these findings, Combes et al. (2023) found that it is important for officials in low-income countries to develop strategies to attract external sources.

Again, Olaniyi and Adedokun (2022) emphasized the moderating role of institutional development between finance and economic growth in South Africa. They estimated the time series from 1986 to 2015 by ARDL. The results indicated that the financial system and institutional quality are complementary to long-term economic growth, while institutional quality reduces the prospects for short-term financial development.

To finish the subject of private capital flows and economic growth, according to studies by Wang et al. (2012), Nyang'oro (2017), Dupont (2018), Oeking and Gabriella (2022) and Akalpler and Hove (2022), we note that there are several gains related to the inflow of foreign capital such as increased saving capacity and accumulation of investment stock, contribution to innovation and transfer of new technologies, improving the efficiency of the banking sector and macroeconomic discipline. Therefore, the latter increased the economic growth of hot countries. But this idea does not

exclude the potential costs of the entry of foreign capital (Kouzez and Séjourné, 2019; Wachlel, 2017; Ehigiamusoe and Lean, 2019; Kurtović et al., 2022).

The subject development of institutions- economic growth has been explained and developed by several studies. These studies distinguished between legal and economic institutions and justified the strong relationship between the good quality of institutions and economic development. In this regard, Recuero and González (2019) studied the link between economic growth, the institutional framework and financial development in a sample of middle-income countries. The results of the Vector Autoregressive (VAR) regression justify a positive unidirectional relationship between economic growth and financial development, the positive effect of institutional quality on economic growth. Moreover, they show the quality of legal institutions has an impact on economic growth. Moreover, this contribution of legal institutions is explained by the good quality of institutions that guarantees private property rights.

Moreover, the development of institutions is an explanatory factor for the growth of emerging countries. On the one hand, economic institutions ensure the rules of economic games and organize markets. On the other hand, legal institutions guarantee private property rights and stabilize the political state. In this regard, Tiwari & Bharadwaj (2021) examined the contribution of institutions to the economic performance of BRICS countries from 2002 to 2019. Indeed, the OLS regression results show that the size of government affects the level of gross domestic product in the BRICS countries. In light of these results, it is important for poor countries to improve the size of their governments in order to improve economic performance.

According to previous theories, legal institutions define the rules of the economic game. They have an incentive role for economic agents and also help to organize the use of resources. In this regard, Uddin et al. (2021) examined the moderating effect of institutions in the relationship between human capital and economic growth for 120 developing countries from 1996 to 2004. In fact, the results of the GMM show that the development of human capital, the development of economic and political institutions are explanatory factors of growth. They showed the absence of the significant effect of human capital complementarity - institution development in strengthening growth.

Moreover, theoretical and empirical reviews agree that the development of institutions is an important factor for growth and economic development. Sari and Prastyani (2021) discussed the contribution of institutional development to economic growth by estimating panel data from 10 ASEAN countries from 2002 to 2018. The results of the regression of the fixed-effect model show that voice and responsibility, the quality of regulation and the rule of law are explanatory factors for ASEAN's gross domestic product per capita. They noted that political stability, effective government and control of corruption do not affect economic growth. The authors recommended the political institutions for the 10 ASEAN countries to share the synergies of all stakeholders of the institutions.

On the other hand, the positive allocation of the development of regulatory institutions to growth and economic development has not always been certain. On this subject, Chomen (2022) analyzed the causality between regulatory institutions and economic growth for 43 sub-Saharan African countries over a 13-year period. In fact, the results of the generalized moment method (GMM) show the absence of causality between institutions and GDP. Again, the absence of a causal link is explained by the poor quality of institutions. In this regard, Chomen (2022) recommended these countries to improve the quality of regulatory institutions to encourage economic growth.

Furthermore, Hassan and Meyer (2022) emphasize the moderating role of institutions in the relationship between finance and industrial development in South Africa over the period from 1984 to 2021. In fact, the results of the cointegration test of Bayer and Hanck (2013) justify the significant positive contribution of financial development to the industrial sector. Again, this finding is explained by the crucial role of the financial system in the development process of the industrial sector in South Africa. In addition, Bayer and Hanck (2013) show the non-significant negative effect of the interaction

variable of industrial development. In addition, the effect of financial development becomes negative. This decline is explained by the underdevelopment of institutions in South Africa.

Finally, we note that economic institutions include economic rules of the game, market transparency, etc. Political and legal institutions include political stability, democracy, property rights, etc. In addition, the link between the two types is explained by the political and legal institutions that guarantee the rules of law that they themselves ensure the proper functioning of economic activity.

As regards complementarity between institutional development- capital flows and economic growth, we can say that some studies have shown that foreign direct investment leads to stronger economic growth in countries with good institutional quality. In this regard, Hayat (2017) examined the role of regulatory institutions in contributing to economic growth and more particularly the role they play via the foreign direct investment channel for a group of 104 countries from 1996 to 2015. The GMM results show that institutional development directly contributes to improving the level of economic growth. In addition, institutional development reinforces the significant positive effect of foreign direct investment on economic growth. Again, this relationship is explained by the important role in the development of economic institutions in creating a desirable business climate for foreign investors.

According to previous studies, the development of institutions attracts the attention of foreign investors thanks to a business climate characterized by a low level of corruption. In this regard, Ravi (2015) dealt with the relationship between corruption and FDI in India and China from 2004 to 2014. He showed that the negative effect of corruption on foreign direct investment in India is less significant than in China. In addition, he found that the lower level of corruption is a key to attracting the attention of foreign investors. He recommended for countries with open capital and low economic growth to develop the institutional framework to allocate foreign resources effectively.

Moreover, the development of host country institutions is a determining factor in the inflow of private capital. In this regard, Adegboye et al. (2020) examined the link between political stability and FDI in the sub-Saharan region from 2000 to 2018. They showed that political stability reinforces the positive effect of FDI on growth. They noted that human capital and the financial system do not affect the contribution of FDI. Therefore, in light of these results, the financial system and human capital are two important factors for benefit from the advantages of FDI.

In addition, the development of economic institutions can encourage economic growth by improving financial services. In this regard, Olaniyi and Oladeji (2020) emphasized the relationship between institutional development and short-term and long-term financial development in Kenya. The results of FMOLS and ARDL show the significant positive effect of the institutions on the long-term financial system. But, in the short term, the effect becomes insignificant. This relationship is explained by the role played by economic institutions in the liberalization of financial services.

Moreover, foreign capital does not only affect economic growth, but in some cases, it can improve the quality of institutions. In this regard, Fon et al. (2021) examine the effect of foreign direct investment on the quality of regulatory institutions in 56 African countries from 2003 to 2015. Indeed, they showed that aggregate foreign direct investment flows from developed and developing economy development have a significant positive contribution to the institutional quality of host countries. According to these results, it is therefore important for poor countries to attract foreign resources in order to improve economic growth and improve the institutional framework.

### 3. Methodology -Econometric specification

#### Data

This paper deals with data from Tunisia, Algeria, Morocco and Egypt over the period 1995 to 2020. The four countries of North Africa are characterized by an intermediate level of gross domestic product. Moreover, they recorded a low level of economic growth compared to other regions despite the massive inflow of capital.

Equation 1 is part of a theoretical perspective of endogenous growth. Indeed, the complete formulation of the model is inspired by previous academic research, notably the studies of Alfaro et al. (2004, 2010) and Chiang and Birtch (2012):

$$\Delta \text{GDP}_{it} = \alpha_0 + \alpha_1 \Delta \text{GDP}_{it-1} + \alpha_2 \text{KAOPEN}_{it} + \alpha_3 \text{FD}_{it} + \alpha_4 \text{INF}_{it} + \alpha_5 \text{ID}_{it} + \alpha_6 \text{GFCF}_{it} + \alpha_7 \text{HC}_{it} + \alpha_8 \text{PE}_{it} + \varepsilon_{it} \quad (1)$$

With:  $t = 1995 \dots 2020$  and  $i = 1, 2, 3, 4$

Furthermore, to analyze the moderating role of institutional development in the capital flow-economic growth relationship, we added the interaction variable between private capital flows and institutions. In this case, the formulation of model 1 becomes like:

$$\Delta \text{GDP}_{it} = \alpha_0 + \alpha_1 \Delta \text{GDP}_{it-1} + \alpha_2 \text{KAOPEN}_{it} + \alpha_3 \text{FD}_{it} + \alpha_4 \text{INF}_{it} + \alpha_5 \text{ID}_{it} + \alpha_6 \text{GFCF}_{it} + \alpha_7 \text{HC}_{it} + \alpha_8 \text{PE}_{it} + \alpha_9 (\text{KAOPEN} \cdot \text{ID}_{it}) + \varepsilon_{it} \quad (2)$$

**Table 1. Description, measurement and sources of variables**

| Variables | Description                        | Measurement  | Expectation           | Sources  |
|-----------|------------------------------------|--|-----------------------|--|
| GDP       | Economic growth                    | GDP per capita growth  | -                     | WDI (2022)   |
| CF        | Capital flow                       | Chinn and Ito Index (KAOPEN)                                 | Positive/<br>Negative | <a href="http://web.pdx.edu/~ito/ChinnIto_website.htm">http://web.pdx.edu/~ito/ChinnIto_website.htm</a> (2022) |
| FD        | Financial development              | Credits granted to the private sector as a percentage of GDP | Positive              | WDI (2022)   |
| INF       | Inflation                          | The general increase in consumer prices                      | Negative              | WDI (2022)   |
| ID        | Institutional development          | Economic Freedom   | Positive/<br>Negative | Fraser Institute (2022)  |
| GFCF      | Gross fixed capital formation      | The ratio of GCF divided by GDP                              | Positive              | WDI (2022)   |
| HC        | Human capital                      | Secondary education rate                                     | Negative/<br>Positive | WDI (2022)   |
| PE        | Government consumption expenditure | Value of public investment as a percentage of GDP.           | Positive              | WDI (2022)   |

Source: authors.

#### Data processing

##### Descriptive analysis of variables

The importance of descriptive statistics of macroeconomic series is the identification of minimum and maximum value, mean, standard deviation, skewness and kurtosis. Indeed, the table below displays the results of the descriptive statistics of the variables.

**Table 2. Descriptive analysis of variables**

| Variables       | GDP    | CF    | HC     | GFCF  | INF   | FD    | PE    | ID     |
|-----------------|--------|-------|--------|-------|-------|-------|-------|--------|
| <i>Skewness</i> | -0.130 | 1.772 | -1.695 | 0.678 | 1.054 | 0.137 | 1.172 | -1.752 |
| <i>Kurtosis</i> | 1.889  | 4.454 | 6.791  | 3.704 | 4.747 | 2.078 | 4.186 | 6.487  |

|                   |       |        |         |        |         |        |        |       |
|-------------------|-------|--------|---------|--------|---------|--------|--------|-------|
| <b>Average</b>    | 3.474 | -0.634 | 107.908 | 24.695 | 5.760   | 44.992 | 26.326 | 5.781 |
| <b>StandardD</b>  | 0.131 | 1.174  | 8.208   | 6.277  | 6.560   | 25.348 | 4.507  | 0.792 |
| <b>maximum</b>    | 3.684 | 2.359  | 119.751 | 43.048 | 28.577  | 95.506 | 1.172  | 6.977 |
| <b>Minimum</b>    | 3.219 | -1.202 | 75.973  | 12.445 | -11.189 | 3.907  | 19.871 | 3.111 |
| <b>JB</b>         | 16.1  | 26.1   | 31.0    | 8.15   | 16.5    | 8.22   | 16.6   | 31.1  |
| <b>P-value JB</b> | 0.000 | 0.000  | 0.000   | 0.017  | 0.000   | 0.016  | 0.000  | 0.000 |

Source: Calculated by authors.

Overall, the gross domestic product ratio recorded an average of 3.474 with a standard deviation of 0.131. In fact, the values are between 3.220 and 3.684. On the other hand, the GDP takes an asymmetrical distribution form spread to the left since the Skewness is negative. In addition, it is leptokurtic because the Kurtosis is equal to 1.889.

Indeed, from 1995 to 2020, inflation recorded an overall average value of 5.760 with a very large standard deviation of 6.560. In addition, all the minimum and maximum values are between -11.189 and 28.577. Based on these figures, it can be said that from 1995 to 2017, the North African region was characterized by a low annual average inflation rate compared to other regions of Africa. On the other hand, the distribution of the variable «inflation rate» is asymmetrical and slightly spread to the right where the Skewness equals  $1.054 > 0$  and again, it is leptokurtic where the Kurtosis  $> 0$ .

Again, from 1995 to 2020, the variable “gross fixed capital formation” has an average of 24,695 with a standard deviation of 6,277. The maximum and minimum values were 43.048 and 12.445. Again, it takes an asymmetric distribution spread to the right because the Skewness is positive 0 and it is leptokurtic where the Kurtosis is equal to 3.704.

Moreover, from 1995 to 2020, the North African region recorded an average value of public expenditure of 26.326 with a standard deviation of 4.507. Overall, the minimum and maximum values are between 4,507 and 19.871. In addition, the sample distribution of public spending is strongly asymmetrical spread to the right with a Skewness equal to 1.172 and strongly leptokurtic where the Kurtosis =  $4.1861 > 0$ .

Human capital captured a mean value of 107,908, with a standard deviation of 8,208. Observations are limited to between 75.973 and 119.751. According to the average secondary school enrollment rate, 107 students were enrolled in secondary education between 1995 and 2020. Overall, the distribution is asymmetric and spreads towards the left where the asymmetry is negative.

Indeed, the institutional development index averaged 5,781, with a low standard deviation of 0.792 from 1995 to 2020. Indeed, the minimum and maximum values are between 6.977 and 3.111. Indeed, compared to the interval of the “economic freedom” index of the Fraser Institute (2018), we see that the institutions of North African countries are developed. Overall, the sample distribution is skewed to the left as the skewness is -1.752 and strongly leptokurtic where the kurtosis statistic = 6.487.

Indeed, domestic credits granted to the private sector recorded an average of 44.992 with a standard deviation of 25.348. Additionally, the maximum and minimum values are between 95.506 and 3.907. Overall, the “financial development” variable takes a slightly asymmetrical distribution spread towards the right because the Skewness is equal to 0.137 and it is leptokurtic because the Kurtosis is equal to 2.078.

In fact, the “KAOPEN” index captured an average value of -0.634 with a low standard deviation of 1.174. Overall, the observations are bounded between 2.359 and -1.202. In total, the distribution of the «KAOPEN» index takes an asymmetrical shape weakly spread to the right where the Skewness equals 1.772. Again, it is leptokurtic where the Kurtosis =  $4.454 > 0$ .

**Stationarity test**

To justify the stationarity of the series, we used the Hadri LM test (2000). Indeed, the null hypothesis of Hadri LM (2000) proposes that all series are stationary. However, the alternative hypothesis is that some series are not stationary. In fact, the null hypothesis is written:  $H_0$ : T-statistic  $> 0$  vs the alternative hypothesis:  $H_1$ : T-statistic  $< 0$ . The table below displays the results of the stationarity test.

**Table 3. LM Hadri Test**

|                            | GDP               | CF                | FD                | INF               | ID                | GFCF              | HC                | DP                |
|----------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Level                      |                   |                   |                   |                   |                   |                   |                   |                   |
| Hadri LM                   | 26.855<br>(0.174) | 8.407<br>(0.000)  | 21.735<br>(0.351) | 4.019<br>(0.000)  | 12.904<br>(0.000) | 18.363<br>(0.000) | 17.309<br>(0.000) | 6.595<br>(0.000)  |
| 1 <sup>st</sup> Différence |                   |                   |                   |                   |                   |                   |                   |                   |
| Hadri LM                   | -3.024<br>(0.01)  | -4.780<br>(0.000) | -1.759<br>(0.039) | -1.413<br>(0.021) | -0.656<br>(0.074) | -0.394<br>(0.000) | -0.411<br>(0.059) | -0.933<br>(0.029) |

Source: STATA 15.

According to Table 3, not all variables are stationary in the level. In this case, we reject  $H_0$ . In the first difference, all series become stationary. So, we assert that all variables are integrated in order 1. For this, we will study the correlation matrix and test the cointegration relationship.

**Correlation test**

The positive sign of the correlation coefficient means the increase or decrease together of two variables. In addition, multicollinearity means that the coefficient of correlation between variables is greater than 0.9. Table 4 presents the correlation coefficients between the model 1 variables.

**Table 4. Correlation matrix**

|             | GDP               | CF                | FD                | INF               | ID               | GFCF              | HC               | PE    |
|-------------|-------------------|-------------------|-------------------|-------------------|------------------|-------------------|------------------|-------|
| <b>GDP</b>  | 1.000             |                   |                   |                   |                  |                   |                  |       |
| <b>CF</b>   | 0.514<br>(0.000)  | 1.000             |                   |                   |                  |                   |                  |       |
| <b>FD</b>   | 0.114<br>(0.078)  | 0.014<br>(0.090)  | 1.000             |                   |                  |                   |                  |       |
| <b>INF</b>  | -0.034<br>(0.742) | -0.160<br>(0.127) | 0.399<br>(0.000)  | 1.000             |                  |                   |                  |       |
| <b>ID</b>   | 0.232<br>(0.026)  | 0.230<br>(0.027)  | 0.733<br>(0.000)  | -0.262<br>(0.011) | 1.000            |                   |                  |       |
| <b>GFCF</b> | 0.388<br>(0.000)  | 0.410<br>(0.000)  | -0.046<br>(0.059) | -0.350<br>(0.000) | 0.245<br>(0.018) | 1.000             |                  |       |
| <b>HC</b>   | 0.385<br>(0.000)  | 0.020<br>(0.046)  | -0.300<br>(0.003) | 0.072<br>(0.495)  | 0.124<br>(0.237) | -0.150<br>(0.151) | 1.000            |       |
| <b>PE</b>   | -0.050<br>(0.630) | -0.041<br>(0.696) | 0.026<br>(0.804)  | -0.119<br>(0.255) | 0.015<br>(0.880) | 0.406<br>(0.000)  | 0.220<br>(0.034) | 1.000 |

Note: Values in parentheses are probabilities.

Source: STATA 15

Table 4 shows that the correlation coefficient between all variables is less than 0.9. Therefore, there is no problem of multicollinearity between the series.

Table 4 shows the existence of positive and negative correlation coefficients between the different variables. In this context, the variable "private capital flow" is the variable most correlated with economic growth. Whereas, the variable least correlated with economic growth is public spending. In this case, we find that the economic growth of North African countries is mainly based

on foreign capital. In addition, private capital is positively correlated with the development of institutions.

### *Cointegration test*

The cointegration tests in the panel allow to take into account the possible interdependencies between the units of the panel in different forms. We tested cointegration with the Kao test (1999). The null hypothesis (Kao, 1999) assumes no cointegration between panels. The table below presents the cointegration test (Kao, 1999).

*Table 5. Kao cointegration tests*

| Test                              | T-Statistics | P-value |
|-----------------------------------|--------------|---------|
| ModifiedDickey-Fuller t           | -1.70        | 0.044   |
| Dickey-Fuller t                   | -1.865       | 0.031   |
| AugmentedDickey-Fuller t          | -2.187       | 0.014   |
| UnadjustedmodifiedDickey-Fuller t | -1.824       | 0.034   |
| UnadjustedDickey-Fuller t         | -1.909       | 0.028   |

Source: STATA 15

Table 5 shows the presence of at least one long-term cointegration relationship so the null hypothesis is rejected. In other words, economic growth, private capital flows, gross fixed capital formation, financial development, human capital, public spending, inflation and institutional development are co-integrated.

### *Estimation*

Table 6 shows the results of estimation using the generalized moment's method.

*Table 6. Estimation results*

| Variable                               | Estimation Model 1 |              |             | Estimation model 2 |              |             |
|--|--------------------|--------------|-------------|--------------------|--------------|-------------|
|  | Coefficient        | T-Statistics | Probability | Coefficient        | T-Statistics | Probability |
| <b>Constant</b>                        | 0.234              | 1.21         | 0.000***    | 0.007              | 2.38         | 0.000***    |
| <b>CF</b>                              | 0.069              | 1.22         | 0.007***    | 2.83               | 3.46         | 0.019**     |
| <b>FD</b>                              | 0.055              | 3.39         | 0.000**     | 0.022              | 2.66         | 0.000**     |
| <b>INF</b>                             | -0.267             | -3.45        | 0.002***    | -0.092             | -1.21        | 0.004***    |
| <b>ID</b>                              | 0.128              | 1.81         | 0.031**     | 0.173              | 3.06         | 0.004***    |
| <b>GFCF</b>                            | 0.029              | 2.57         | 0.006***    | 0.231              | 8.21         | 0.009***    |
| <b>HC</b>                              | 0.092              | 3.38         | 0.004***    | 0.353              | 3.07         | 0.002**     |
| <b>PE</b>                              | -0.008             | -1.05        | 0.000***    | -0.063             | -4.08        | 0.039**     |
| <b>GDP (-1)</b>                        | -0.019             | -4.93        | 0.094*      | -0.047             | -9.09        | 0.069*      |
| <b>CF.ID</b>                           | -                  | -            | -           | 0.038              | 3.47         | 0.032**     |
| <b>R<sup>2</sup></b>                   | 0.762              | -            | -           | 0.897              | -            | -           |
| <b>R<sup>2</sup> adjusted</b>          | 0.639              | -            | -           | 0.692              | -            | -           |
| <b>F</b>                               | 2.009              | -            | 0.0019      | 2.827              | -            | 0.0021      |
| <b>Durbin-W.Test</b>                   | 2.078              | -            | 0.81        | 2.324              | -            | 0.41        |
| <b>Dif-in-Hansen (excluding group)</b> | 0.273              |              |             | 0.341              |              |             |
| <b>Dif-in-Hansen (H0 = exogenous)</b>  | 0.876              |              |             | 0.891              |              |             |
| <b>Number of observations</b>          | 100                |              |             |                    |              |             |
| <b>Number of countries</b>             | 4                  |              |             |                    |              |             |
| <b>Number of instruments</b>           | 25                 |              |             |                    |              |             |

Note: Significant at the level 10, 5, 1 means that \*, \*\*, \*\*\*.

Source: STATA 15

The Fisher F statistic, which is equal to 2.009, confirms the good quality of the model at a significance level of less than 1%. Indeed, according to the probability of F, we reject the null hypothesis and we can say that the regression is declared significant as a whole.

Regarding the explanatory power of the "R<sup>2</sup>" model, we can say that 76.2% of the variation in the level of economic growth is explained by private capital flows, public spending, institutional development, inflation, human capital, gross fixed capital formation and financial development.

Still, according to the results of the Durbin-Watson test, the Durbin-Watson statistic is close to 2. In this case, the null hypothesis of the Durbin-Watson test is accepted. This is the absence of autocorrelation between residues.

After the interaction between the variable "capital flow" and the variable "institution development", the value of F increased from 2.009 to 2.827. It is the improvement of the overall quality of the model. In addition, the adjusted R<sup>2</sup> value that measures the effect of adding the interaction variable to the initial model increased from 0.762 to 0.897. This increase is explained by the important contribution of the interaction variable to the initial model. This means that the effect of the interaction between the variable "capital flow" and that of "institutional development" reinforces the contribution of each to improving economic growth.

#### 4. Discussion of results

The table above shows that the sign associated with the flow of private capital is positive and significant. This means that private capital contributes to economic growth in the North African regions. This result confirms the results of the studies of Adams et al. (2017) and Ikpesu (2019). However, it contradicts the studies of Ehigiamusoe and Lean (2019) and Rahman et al. (2023). This relationship can be explained by the transfer of new technologies and technological catch-up. Indeed, the use of new technologies makes companies in North African countries more productive. Moreover, the large technological gap between the countries that generate private capital flows, generally the countries of the European Union, and the countries of North Africa facilitates the technological catching-up processes of the region.

Moreover, the estimation results showed that financial development has a positive and significant effect at the level of 5% on economic growth. This effect can be explained by the improvement of services related to the financial system and the mobilization of savings following the liberalization of the interest rate and North African countries. This operation mobilizes savings towards agents who are in need of financing, which facilitates investment processes and consequently economic growth.

Again, the significant contribution of human capital to the economic growth of North African countries has been justified. Indeed, this result corroborates the traditional literature on the human capital – economic growth relationship with Han and Lee (2020). But, the justifications of Anetor (2020) are contradicted. This relationship is explained by the good quality of the workforce in North African countries thanks to the improvement of the education system. In addition, the quality of the workforce improves work productivity, which is a source of economic growth. In addition, the quality of the workforce and the accumulation of knowledge facilitate the innovation and research processes. So, these factors are sources of growth and economic development of countries.

Also, the effect of institutional development on economic growth is positive and statistically significant. Therefore, this finding corroborates the studies of Peres et al. (2018). This relationship is explained by the freedom of international trade and respect for private property rights that improve investor confidence. Good regulation also contributes to macroeconomic stability, reducing uncertainty for local investors. In this case, investor confidence and the absence of uncertainty can encourage investment and consequently the encouragement of growth.

In addition, the contribution of gross fixed capital formation to economic growth can be explained by the effect of public works and the accumulation of physical capital. So, the combination of these factors stimulates the economy of North African countries in infrastructure and basic equipment.

On the other hand, the result shows the negative impact of public spending on the economic growth of North African countries. The result corroborates Gupta's (2018) study. For its part, the inverse relationship between public spending and economic growth can be explained by the idea that the largest share of public spending is for non-productive projects. This makes long-term strategies inefficient and hampers growth.

Furthermore, according to the results obtained, we can say that the general rise in prices is an obstacle to the economic growth of North African countries. This is consistent with the results of previous studies by Hou et al. (2011). In this regard, this effect is explained by the increase in prices of energy products in the North African region. In addition, the continued rise in raw material prices in North African countries is leading to an increase in production costs, which creates difficulties within companies and consequently reduces production.

The significant negative effect of the previous year's economic growth on the current year's growth is explained by the convergence hypothesis. This means that North African countries are converging towards a steady state of growth rate of real gross domestic product per capita.

After the interaction, the results show that the coefficient of the interaction variable is positive and significant. In addition, this effect is explained by the moderating role in the development of institutions. This means that North African countries have prepared an appropriate institutional framework to make private capital attractive. This is the important role of political and economic institutions in the settlement of the business climate through the liberalization of short-term operations such as the abolition of customs duties, the encouragement of exports and the abolition of the quota, and respect for the private property rights of foreign investors.

## **5. Conclusion and involvement**

This study analyzes the complementary relationship between private capital flows and the development of regulatory institutions and their effect in strengthening the level of economic growth in North African countries (Tunisia, Morocco, Algeria and Egypt) over the period from 1995 to 2020

The results of the generalized moment method (GMM) show that human capital, fixed capital formation and financial development are explanatory factors for economic growth. In addition, the inflow of foreign capital and regulatory institutions contributes to the economic growth of this region. However, public spending and the rate of inflation affect growth. This requires a change in public expenditure allocation strategies and control of the general price increase within the region.

After the interactions, the positive allocation of private capital flows to economic growth has improved remarkably. This is due to the improvement in the contribution of capital flows following the complementarity between capital flows and the development of institutions. This means that the development of the regulatory institutions of North African countries ensures the preferences of foreign investors, which can attract international capital flows and thus increase economic growth.

This study is only interested in explaining the effect of complementarity between capital flows and the development of institutions on economic growth. Additionally, it processes data from a small sample. On the other hand, this can be determined by improving the sample size, for example by studying the most developed African countries. Again, it can analyze the complementary relationship between private capital flows and human capital development or the development of the financial system and their effect on economic growth. Furthermore, this can be determined by analyzing the role

of regulatory institutions, especially economic institutions, in controlling the adverse effects of inflation on economic growth.

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