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DEVELOPMENT PROGRAMS AND ECONOMIC GROWTH IN DEVELOPING COUNTRIES – ANALYTICAL AND ECONOMETRIC STUDY USING PANEL DATA

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Abstract. *Economic growth is one of the primary objectives pursued by governments and aspired to by societies, as it is considered one of the main indicators reflecting the progress of nations. The optimal preparation and implementation of development programs are among the significant factors that contribute to achieving economic development, raising the rate of economic growth, improving living conditions, and reducing unemployment levels. Economic growth is linked to a set of fundamental factors in society that serve as a conducive environment for its advancement, such as the availability of highly efficient institutions, good governance, scientific research, health, education, and so on. Through this study, we have attempted to explore various aspects that embody the essence of determining the extent and effectiveness of economic development programs on economic growth in developing countries.*

Keywords: *economic growth, economic development, development programs, infrastructure, gross domestic product (GDP), equipment expenditures.*

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Introduction

Since the end of World War II, economic growth has been one of the fundamental political and social challenges globally, primarily due to the independence of most colonized regions during this period. Upon gaining independence, these regions sought to improve their living standards by implementing various reforms aimed at revitalizing their economic growth. During the 1960s and 1970s, most developing countries adopted an economic policy based on central planning and a public sector to achieve two primary goals: meeting essential social needs and attaining economic independence. Algeria was among these countries, pursuing this policy by increasing public expenditures in both operational and capital spending. It outlined several development programs aimed at boosting the economic growth rate, improving living conditions, and reducing unemployment levels.

Through this study, we aim to examine development programs through the lens of capital and investment expenditures, which serve as the basis for funding and implementing these programs. Additionally, we will explore economic growth in a sample of developing countries. The sample comprises (3) developing nations: Algeria, Morocco, Tunisia.

Literature Review

Several studies have directly or indirectly addressed the reality of economic development in Arab countries through the outlined development programs, where we find:

- A study by Ouail Miloud (2013-2014) titled Modern Determinants of Economic Growth in Arab Countries examined the various policies adopted by these countries to support economic growth. The study concluded that there should be a strong focus on increasing and developing human capital accumulation, as it serves as a key driver of economic growth, especially in the long term.

- A study by Boufelih Nabil (2004-2005) titled The Impact of the Economic Recovery Support Program in Algeria (2001-2004) on Public Budgets concluded that the implementation of this program contributed to an indirect increase in tax revenues. However, this increase did not match the level of growth in government investment expenditures, which affected the overall balance of the public budget.

- A study by Mohamed Ratoul (2001) titled Transformations of the Algerian Economy and Its Implications on External Transactions concluded that the development programs implemented had a significant impact on various external transactions. Additionally, efforts were made to achieve higher levels of contribution to foster better growth rates.

An additional focus of this study was to clarify the relationship between economic development programs and economic growth in a sample of countries. The aim was to draw comparisons in this field regarding the extent of impact and contribution in the countries under study.

Methods

This research paper will focus on a descriptive analytical study by outlining the development programs specific to the selected sample of countries. Additionally, an empirical econometric study will be conducted after obtaining results using the statistical software EViews, which assists in extracting econometric modelling outcomes.

Results

Descriptive Study of the Economies of the Sample Countries

This study focuses on three (3) African countries Algeria, Morocco, and Tunisia.

The *Algeria's economy* has gone through various phases since its independence. Following independence, Algeria adopted a socialist economic policy, where the state dominated all economic sectors using public institutions as tools for implementing its policies. Algerian authorities worked to improve the living standards of their citizens and secure a significant position for Algeria among the nations of the world.

Currently, Algeria's economic growth strategy on the domestic level is evident in the state's support for this process through ambitious development programs. Key initiatives include the Economic Recovery Support Program, the Supplementary Growth Support Program, and the Economic Growth Consolidation Program, among others. These programs aim to boost growth by implementing government-led economic projects that support wealth-creating and value-added activities, generate job opportunities, and enhance public services in areas such as water resources, transportation, and infrastructure, while fostering local development (Karbali, 2005).

These developmental programs address the delays recorded in previous years, contribute to revitalizing the economy, and sustain the achievements made in overall macroeconomic stability.

The overarching goal is to revive aggregate demand, which had declined due to successive years of deteriorating economic and social conditions (Hakemi, 2009).

The *Moroccan economy*, characterized by the significant presence of public authorities in investment and the steering of economic policies, has experienced macroeconomic stability since the late 1990s. This stability is reflected in low inflation rates and moderate growth rates. The Moroccan economy is predominantly service-oriented, with strengths including the country's wealth of natural and agricultural resources, as well as its attractiveness as a tourist destination.

Over the past two decades, Morocco has undertaken deep political and institutional reforms, enabling its economic fabric to integrate high-productivity sectors such as electronics, chemicals, and automobile manufacturing. However, the Moroccan economy continues to face structural challenges, including the burden of energy costs and public debt. Additional issues include persistent structural inequalities, such as social and regional disparities, alongside the widespread prevalence of poverty, vulnerability, and unemployment.

To address these deficits and accelerate growth, Moroccan governments have launched numerous infrastructure projects and sectoral programs over the last two decades, such as the "Green Morocco Plan" for agriculture and the "Blue Plan" for tourism. Concurrently, Morocco has signed several free trade agreements with the United States, the European Union, Turkey, Egypt, Jordan and Tunisia.

The *Tunisian economy*, prior to the reforms, experienced external instability, such as a decline in global demand, and internal instability, primarily due to climatic conditions. These factors led to a drop in the prices of export-oriented products. Additionally, the economy faced temporary challenges across various levels, exposing structural difficulties that negatively impacted economic performance.

With the onset of reforms in 1986, Tunisia achieved control over its macroeconomic balances, resulting in improved per capita income, reduced unemployment, and population growth management. Tunisia's reform experience is considered one of the most successful, as it created an outward-oriented economy, leading to positive outcomes such as poverty reduction and the expansion of the middle class.

During the Eleventh Development Plan (2007-2016), Tunisia worked toward economic integration within the global environment to accelerate growth rates and address employment challenges. The adopted policies yielded positive results, especially during the last decade, relying on economic openness and developmental strategies implemented in stages. One of these was the Tenth Development Plan, covering the period 2000-2006, which enabled the economy to sustain high growth rates.

During this time, Tunisia renewed its focus on agriculture, improved competitiveness, and strengthened the role of the services sector, particularly in information technology, tourism, and transportation. The country also offered numerous incentives to position itself as a strategic hub for investment. This allows us to conclude that growth rates achieved over the past 25 years have shown a consistent upward trend.

Economic Measurement Using Panel Data

The use of panel data econometrics has significantly evolved, both in terms of applications and model construction. The first use of panel models dates back to the 19th century, initially in the fields of astronomy and agriculture, where they were used to understand agricultural yields based on types of fertilizers (Sualiili, 2006).

Panel data refers to a set of observations that are repeated for a group of individuals over several periods of time, combining the characteristics of both cross-sectional data and time series data simultaneously. Cross-sectional data describe the behaviour of several units or individuals (such as companies or countries) at a single point in time, while time series data describe the behaviour of a single unit over a given period (Peracchi, 2001).

The importance of panel data lies in its ability to incorporate necessary information that deals with both time dynamics and multiple entities. Panel data has a dual dimension: temporal and

individual. This duality makes panel data studies more effective and active in econometrics, making them highly significant for econometric analysis.

Additionally, panel data models allow for the study of common problems that arise when using cross-sectional or time series data, such as addressing the problem of heteroscedasticity (the inconsistency of variance across observations) and reducing multicollinearity issues (the presence of high correlation between independent variables) (Dielman, 1989).

Study Variables Definition

In this study, a set of variables and indicators have been used to explain economic growth for the period from 1980 to 2023, including the expenditures covering developmental programs in the form of capital and investment expenditure. The purpose is to determine and assess the relationship between developmental programs and economic growth in the studied countries. Below is a detailed explanation of the various variables used:

- *Real GDP Per Capita Growth Rate*: This is the dependent variable and is commonly used as an indicator of economic growth in both neoclassical growth theory and endogenous growth theory. It measures the change in individual welfare, calculated by dividing real GDP by the total population. This variable is denoted by the symbol (GDPPC);

- *Capital and Investment Expenditures as a Percentage of GDP*: This is an important indicator for explaining changes in economic growth, calculated by dividing total expenditures allocated for capital and investment by the total GDP. This variable is denoted by the symbol (EAI);

- F*inal Operating Expenditures*: This is another key indicator for explaining economic growth changes, calculated by dividing the total government consumption related to operating expenditures by total GDP. This variable is denoted by the symbol (FCT);

- *Trade Openness Index*: This index is used in several studies as one of the determinants of growth, calculated by dividing the sum of exports and imports by total GDP. Some studies show that trade openness has a positive effect on the economic growth of developing countries, especially those led by export sectors. However, others argue that openness could negatively impact economic growth. This variable is denoted by the symbol (OPN);

- *Population Growth Index*: This is an essential indicator that significantly relates to economic growth, especially in countries with substantial population growth. This variable is denoted by the symbol (POP);

- *Human Capital Index*: Human capital is a key determinant of growth in both classical and endogenous growth theories. This variable is measured by the growth rate of secondary school enrolment, irrespective of the age group corresponding to this level of education. This variable is denoted by the symbol (HDV).

Homogeneity Tests of Hsiao

Homogeneity tests are used, based on Fisher's statistic, to determine the optimal approach for selecting a panel model. The following stages are involved in the test:

Stage 1: Test for complete homogeneity (the constants and coefficients are identical). If this hypothesis is accepted, we are dealing with a fully homogeneous panel model. If rejected, other hypotheses regarding the fixed effects model are tested.

Stage 2: In this stage, we test the hypothesis for individual fixed effects based on the existence of identical coefficients for all individuals, while allowing for differences in constants.

Stage 3: Test the hypothesis for fixed individual effects, assuming that individual effects are fixed parameters, with the regression coefficients for independent variables remaining constant, but with differing constant terms for each country.

Stage 4: Test for random effects by assuming that the individual effects are not fixed parameters, but rather random variables.

Stage 5: This stage involves using the Hausman test to determine whether fixed or random effects should be used (Hurlin, 2001).

Using the study's data and based on the previous steps related to homogeneity tests, we reached the results presented in the following Table 1.

Table 1. Results of the Homogeneity Tests (Hsiao)

Test	Calculated Fisher Statistic	Tabulated Fisher Statistic (α = 5%)	The Decision
F_1	605.1	48.1	**Reject** (the hypothesis of complete homogeneity)
F_2	30.1	52.1	**Accept** (the hypothesis of homogeneity for coefficients)
F_3	3.007	14.2	**Reject** (the hypothesis of homogeneity for constants)

Source: Prepared by the researchers, using the study data of the sample countries

Based on the results obtained, we find the rejection of both the hypotheses of perfect homogeneity and homogeneity of constants, while the hypothesis of homogeneity of coefficients is accepted. Therefore, it can be concluded that the model takes the form of an individual effects model (fixed or random).

Preference between Fixed Effects Model and Random Effects Model

Through the previous stages and homogeneity tests according to the Hsiao framework, we concluded that the model takes the form of an individual effects model (fixed or random). In this step, the test for the suitability of either the fixed effects model or the random effects model is conducted using the Hausman test. This test is used to evaluate the null hypothesis, which assumes the suitability of the random effects model, against the alternative hypothesis, which assumes the suitability of the fixed effects model. The test is formulated as follows:

H0: The suitability of the random effects model.
H1: The suitability of the fixed effects model.

In order to determine the appropriate model for this study, we conducted the Hausman test using the EViews software. The results were as follows:

Table 2. Results of the Hausman Test

Prob	Value of the test. GHi-Sq.statistic
0.5471	4.016147

Source: Prepared by the researchers, based on the outputs of EViews software

From the Table 2, we observe that the calculated value of the Hausman test (Hcal = 4.016) is less than the critical value (Htab = 11.07) at a chi-square distribution with degrees of freedom (K = 5) and a significance level of (α = 5%). Additionally, the p-value (Prob = 0.54) is greater than the significance level (α = 0.05). Therefore, we fail to reject the null hypothesis, indicating that the random effects model is appropriate.

Panel Data Stationarity and Cointegration Analysis

For the analysis of stationarity and cointegration of panel data, we first examined the stationarity of the time series and cross-sectional data for the different model variables using unit root tests:

- LLC (Levin, Lin, and Chu);
- IPS (Im, Pesaran, and Shin);
- ADF test.

The results of these tests are presented as follows:

Table 3. Results of the Stationarity Test

Variables Stationary at First Difference I(1)	Variables Stationary at Level I(0)
EAI, FCT, OPN, HDV	GDPPC, POP

Source: Prepared by the researchers, based on the outputs of EViews software

In the next stage, we tested the cointegration relationships among variables that are stationary and integrated of the same order. Among the most commonly used tests in this field is the Pedroni test. After applying this test, we obtained the following results:

Table 4. Results of the Pedroni Test for Cointegration Relationships

Probability	Weighted Statistic	Probability	Statistic	(Com.AR)
0.3082	0.5	0.3	0.51	Statistic V:
0.8129	0.89	0.88	1.17	Statistic RHO:
0.5404	0.1	0.71	0.54	Statistic PP:
0.1307	-1.12	0.3	-0.54	Statistic ADF:
Probability		**Statistic**		**(Indiv.AR) :**
0.9858		2.19		Statistic RHO:
0.8140		0.89		Statistic PP:
0.1716		-0.95		Statistic ADF:

Source: Prepared by the researchers, based on the outputs of EViews software

From the Table 4 above, we observe that based on the statistics V, RHO, PP, ADF, or by comparing the p-values to the significance level α=5% in the case of within individual effects (Com.AR), the result shows Prob>0.05. Thus, we fail to reject the null hypothesis (the hypothesis of no cointegration relationships) and reject the alternative hypothesis. This indicates the absence of cointegration relationships among the studied variables differentiated to the first degree (EAI, FCT, OPN, HDV).

Similarly, for the case of between individual effects (Indiv.AR), the same observation holds. The null hypothesis is accepted, and the alternative hypothesis is rejected, confirming no cointegration relationships among the variables differentiated to the same degree.

Estimating the Model Using the Random Effects Model

Given the results obtained earlier, which supported the suitability of the random effects model, we proceed to estimate the parameters of this model in two stages.

Estimation of the Random Effects Model for Individuals (Countries)

The results of this estimation are presented in the following Table 5.

Table 5. Results of the Estimation of the Random Effects Model for Individuals (Cross-section random)

The dependent variable in this analysis is the **growth rate of real GDP per capita**			
Prob	**t.stat**	**Coefficients**	**independent variables**
0.2097	1.257786	2.887566	C
0.0008	3.414463	0.157475	EAI
0.1986	-1.289259	-0.109015	FCT
0.4504	-0.756038	-0.016386	HDV
0.6381	0.470942	0.004469	OPN
0.0009	-3.367382	-1.116470	POP
	RHO = 0.0939		Effects Specification (Cross-section random)

Source: Prepared by the researchers, based on the outputs of EViews software

From the estimation results summarized above, we observe the statistical significance of the explanatory variables. After comparing these values with the critical values at the 5% significance level (α=5%). The significance of the following variables becomes evident: capital Expenditure and Investment as a percentage of GDP (EAI), population Growth Index (POP).

This can also be observed by comparing their p-values to the 5% significance threshold, where the p-values are smaller than 0.05. Therefore, we reject the null hypothesis (no significance of estimated parameters) and accept the alternative hypothesis (significance of these parameters).

Regarding other variables, as well as the constant term, they were found to be insignificant when using this random effects model for individuals.

Key Findings:

- ***Capital Expenditure and Investment (EAI)***. There is a positive and significant effect, where a 1% increase in the ratio of capital expenditure and investment to GDP leads to a 0.15% increase in the growth rate of GDP per capital. This confirms a positive relationship between developmental expenditure and the growth of GDP per capita, which is economically and theoretically acceptable. The higher investment and capital expenditure contribute to improving the standard of living by increasing GDP per capita.

- ***Population Growth Index (POP)***. A significant negative effect was observed, meaning that a 1% increase in the population growth index results in a 1.11% decrease in GDP per capital growth. This reflects the negative impact of rapid population growth on economic development, particularly in developing countries like Egypt, where an effective economic strategy to handle population growth is often lacking.

- **Other Variables (FCT, HDV, OPN)**:

- *Final Consumption Expenditure (FCT)*. A negative relationship was found between FCT and GDPPC, indicating that an increase in consumption expenditure without productive output results in a decline in GDP per capita growth. A 1% increase in FCT leads to a 0.1% decrease in GDPPC.

- *Human Capital (HDV)*. A negative relationship was observed, where an increase in human capital decreases GDPPC growth. This can be explained by high unemployment rates among graduates in many developing countries, which detracts from the expected positive impact of human capital on economic growth.

- *Openness to Global Trade (OPN)*. A positive relationship with GDPPC was found, indicating that a 1% increase in trade openness leads to a 0.004% increase in GDPPC. This supports the idea that trade openness boosts economic growth by encouraging production and investment.

- *Random Effects.* The random effect statistic for individuals (countries) was found to be significant at the 10% level. Therefore, based on this result, as well as the Hausman test (1978), we conclude that the random effects model is the most appropriate model for explaining the relationship between the explanatory variables and GDPPC. The random effects model highlights the importance of individual country characteristics in determining GDP per capita growth, though the effect is random and varies across countries.

Estimation of the Random Effects Model for Time (Years)

The results of this estimation are presented in the following Table 6.

Table 6. Results of the Estimation of the Random Effects Model for Time (Period Random Effects)

The dependent variable in this analysis is the growth rate of real GDP per capita (GDPPC)			
Prob	**t.stat**	**Coefficients**	**Independent variables**
0.2212	1.226617	2.826253	C
0.0007	3.427864	0.158083	EAI
0.2079	-1.262738	-0.106862	FCT
0.4762	-0.713605	-0.015640	HDV
0.6688	0.428366	0.004068	OPN
0.0009	-3.362931	-1.114511	POP
	RHO = 0.0073		Effects Specification (Period random)

Source: Prepared by the researchers, based on the outputs of EViews software

Discussion

Based on the results from the table above and regarding the effects of time (random effects for years), the random effect for time was found to be significant at the 1%, 5%, and 10% levels. This suggests that the random effects model is the best model for explaining the relationship between the explanatory variables and the dependent variable, GDP per capital. Furthermore, the random effect of time (the years) also plays a role in determining the growth rate of GDP per capita. However, this effect is random and varies according to the specific characteristics of each year in the study period.

Conclusion

The findings highlight that expenditures directed toward investment and capital formation, which support the implementation and management of development programs, positively influence the growth rate of real GDP per capita in developing countries. Additionally, the random effects of individual countries and years play an important role in determining GDP per capita growth, but these effects are random, reflecting the unique characteristics of each country and year.

From the two models estimated, it is evident that the better implementation of development programs contributes significantly to economic growth. In Algeria, for example, recent efforts have led to a recovery in economic activity, although the economy remains heavily reliant on the oil sector, with agriculture, industry, and tourism still underdeveloped.

The empirical study across the sample countries (Algeria, Morocco, Tunisia) confirmed a significant positive relationship between capital expenditure and investment (which forms the basis of development programs) and economic growth. This provides a clear indication of the importance and effectiveness of such programs in driving economic growth, while also emphasizing the unique context of each country.

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References

Dielman, T.E. (1989). Pooled Cross-Sectional and time series data analysis. USA: University USA.

Hakemi, B. (2009). Reforms and Economic Growth in North Africa: A Comparative Study Between Algeria, Morocco, and Tunisia. Journal of North African Economics , 12.

Hurlin, C. (2001). L'Econométrie des données de panel, modèle linéaires simples. Document de travail, Ecole Doctorale Edocif, UniversitÈ Paris IX Dauphine.

Karbali, B. (2005). Overview of Economic Transformations in Algeria. - Journal of Humanities, Mohamed Khider University of Biskra.

Miloud, O. (2014). Modern Determinants of Economic Growth in Arab Countries and Ways to Activate Them, PhD dissertation in Economic Sciences, University of Algiers 3, 2013-2014.

Nabil, B. (2005). The Effects of Economic Development Programs on Public Budgets in Developing Countries, Hassiba Ben Bouali University of Chlef, 2004/2005.

Peracchi, F. (2001). Econometrics . England, John Wiley et Sons LTD.

Ratoul, M. (2001). Transformations of the Algerian Economy: The Economic Recovery Program and Its Implications on External Transactions. Arab Economic Research Journal, Center for Arab Unity Studies (Lebanon), Issue 23, 2001.

Sualiili, S. (2006). Growth and International Trade in Developing Countries. Algiers: University of Algiers.