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RESEARCH ARTICLE

The Impact of Sectoral Investment on Economic Growth: Evidence from Algeria using Static Panel Data Models

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ABSTRACT
This study aims to measure the impact of sectoral investment on economic growth in Algeria through an econometric model including a panel of eight key sectors over a 25-year period from 1996 to 2020. The study uses static panel data models based on several economic variables, where the dependent variable is Gross Domestic Product (GDP) and the independent variables are Gross Fixed Capital Formation (GFCF) and Compensation of Employees (COE). The results indicate that the fixed effects model is the appropriate model; i.e., the investment in the different sectors does not have the same impact on economic growth in Algeria. After examining the validity of the fixed effects model, it was found that it suffers from cross-sectional dependence, autocorrelation, and heteroscedasticity of errors. This complication was eliminated by using fixed effects regression models with robust Driscoll and Kraay standard errors.

Keywords: Sectoral investment, economic growth, fixed effects model, random effects model, pooled data, Algeria

Introduction

All countries seek to achieve economic growth and stimulate it by supporting the factors that influence it. Investment is one such factor that positively influences growth and contributes significantly to the wheel of development and economic progress.

Perhaps the most striking feature of developing countries' economies is the lack of economic diversification and the dependence on a single sector, which leads to volatility, instability, and fluctuations on the one hand and dependence on the other. Algeria is an example, as its economy depends on the hydrocarbon sector, while neglecting the role other investment sectors can play. Sectors such as agriculture, tourism, construction, industry, and services all have potential and, if invested in and promoted, can lead to economic diversification for Algeria.

However, when discussing positive economic investments, the nature and type of such investments differ. Some authors call for the support of foreign investment by preparing an adequate climate, while others call for supporting and developing domestic investment because of the negative effects that foreign direct investment can leave by crowding out domestic investment and limiting its effectiveness, alongside the high level of hegemony and its effects on host countries. Algeria is not an exception to the double effect (positive and negative) of foreign investment. Moreover, it has reoriented its policy toward domestic investment, through numerous reforms and regulatory and economic adjustments, in the face of the profound transformations that its economy has undergone.

Theoretically, investment is a crucial component of aggregate demand and significantly affects economic growth by stimulating capital accumulation and optimizing the use of available resources. Additionally, the effective deployment of resources for investment across various sectors is a fundamental driver of economic growth. In a sectoral context, the significance of investment becomes apparent in its role in efficiently allocating resources, thereby fostering productive capacities across diverse domains, ultimately heightening rates of economic growth.

Given the pivotal role of the sectoral investment, this paper discusses the issue of investment in the economic sectors that have a proportional advantage and those that contribute most to economic growth, and examines the impact of sectoral investment on economic growth in Algeria. The questions addressed are: "Does sectoral investment affect economic growth in Algeria?" and "In terms of their impact on growth, which sectors of investment should the state differentiate and prioritize?" Under these questions

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the study assumes that the relationship between investment and economic growth is nonlinear and causal in both directions; and that the investment in Algeria's different economic sectors positively impact economic growth with varying proportions.

The article is divided into five sections and several subsections. Section 2 reviews the literature; Section 3 describes the methodology and data; Section 4 presents the estimations and discussion; and Section 5 is the conclusion.

Literature review

Upon reviewing the existing literature concerning the impact of sectoral investment on economic growth, studies focused on the Algerian context are lacking. Conversely, few studies have explored this aspect in other countries such as South Africa, Indonesia, India, and Saudi Arabia, and these studies adopted a sectoral approach to investigate the influence of investment on economic growth.

In spite of the scarcity of research, some key perspectives emerge regarding the nature of the impact of sectoral investment. One viewpoint asserts that sectoral investment acts as a catalyst for economic growth. This notion finds support in Abdul Khaliq and Ilan Noy (2007), under the title "Foreign Direct Investment and Economic Growth: Empirical Evidence from Sectoral Data in Indonesia." Their study, which employed a panel data model, revealed evidence of a positive influence of foreign direct investment on economic growth across various sectors.

Likewise, Daniel Francois Meyer et al. (2017) lent support to the notion of sectoral investment positively affecting economic growth. Their study, analyzing quarterly time series data from 1995 to 2016 in South Africa under a VECM model, indicated that investment in the financial sector yielded a positive short-term impact, while investment in the industrial sector had a favorable long-term impact on economic growth. In another study, Jitendra Kumar Sinha (2017) gauged the contribution of investment in major sectors to the economic growth of the Indian state of Bihar, covering 1980–2015. The estimations based on the Ordinary Least Squares (OLS) method revealed a notably positive effect of investments in the agriculture and allied sectors on economic growth compared to other sectors (industry and service).

Another perspective suggests a long-run relationship between sectoral investment and other economic variables (output and the real interest rate). This is revealed by Muhammad Javid et al. (2022). Their study investigated the determinants of short- and long-run private investment behavior in Saudi Arabia for eight non-oil sectors from 1989 to 2017 using a cointegration and equilibrium correction approach.

The consensus and common finding among these studies suggest that custom-tailored investment policies designed for specific sectors are more favorable and advantageous than adopting a uniform investment policy.

Aim, Methodology, and Data

The issue of the impact of sectoral investment on economic growth is of great importance insofar as it contributes mainly to directing the state's efforts to encourage investment and fill gaps in the sectors that have a proportional advantage and those that contribute most to economic growth. To discuss this issue, the study will apply some econometric models based on panel data obtained from the National Statistics Office during 1996–2020, while in the estimation part, the Stata program is used. This article aims to estimate the impact of sectoral investment on economic growth; it is an econometric analysis of the sectoral effect.

The basic idea of the approach used in this research relies on using static models applied to panel data (estimating the three models and their variants, selecting the best one, studying the validity of the best model, and trying to improve it). Estimating the relationship between sectoral investment and economic growth from 1996 to 2020 is the principal focus of the econometric study. For this purpose, the relationship was estimated through a linear model linking the GDP, as a variable reflecting the economic growth, with the Sectoral Investment and Compensation of Employees (COE) as explanatory variables.

The static analysis methodology for panel models

To measure the impact of sectoral investment on economic growth, the models applied to panel data are used. Overall, the panel data models fall into three categories, according to the number of cross-sectional units (N) and the time (T): "small N and large T," "small T and large N," and "large T and large N." The first case (small N, large T) follows the procedure of Zellner (1962) (the SURE procedure); the second case (small T, large N) assumes that the independent variables are strictly exogenous; and the last case (large T, large N) relaxes the exogeneity assumption and allows the regressors to be weakly exogenous (Pesaran, 2015).

In this study, the data consist of a large number of individuals or cross-sectional units (the investment sectors) observed over a relatively short period (25 years); the explained variable has no lags, and the independent variables are strictly exogenous. Thus, the models used are of a static nature, and they are set out in three main models:

- The pooled data model, which is the simplest panel data model where all coefficients are constant for all periods, any time effect is neglected, and the OLS method is used to estimate the model parameters; under the homogeneity assumption that characterizes the pooled model, it can be written and estimated as:

$$y_{it} = x_{it}^{'}\beta + \mu_{it}; \qquad \hat{\beta} = \frac{S_{xy}^{Total}}{S_{xx}^{Total}} \tag{1}$$

- The fixed effects model, where the aim is to know the behavior of each individual from the cross-sectional data separately by varying the constant parameter from one individual to another; "fixed effects" means that the constant term is variable for each individual in the panel and is constant over time. To estimate the parameters of the model and allow the constant term parameter to change between individuals, dummy variables are generally used up to N-1 to avoid multi-collinearity, then the OLS method is used, and the model is then called the least squares model for the dummy variables. For the rest of the variants, the within model is found in which the deviations of the observations from the arithmetic means of the panels are used, and the between model, in which the arithmetic means of the panels are used as observations of the dependent variable. As for formulating the various fixed effects models and estimating the coefficients, it is:

$$Within\,model : (y_{it} - \bar{y}_i) = \beta^{'}(x_{it} - \bar{x}_i) + (\varepsilon_{it} - \bar{\varepsilon}_i); \hat{\beta} = \frac{S_{xy}^{Within}}{S_{xx}^{Within}} \tag{2}$$

$$Between\,model : (y_i - \bar{y}_{..}) = \beta^{'}(x_i - \bar{x}_{..}) + (\varepsilon_{it} - \bar{\varepsilon}_{..}); \hat{\beta} = \frac{S_{xy}^{Between}}{S_{xx}^{Between}} \tag{3}$$

$$LSDV\,model : y_{it} = \beta_0 + \beta_{01}D_1 + \ldots + \beta_{0N}D_N + \beta^{'}(x_{it}) + \varepsilon_{it}; \hat{\beta} = \frac{S_{xy}^{Within}}{S_{xx}^{Within}} \tag{4}$$

- The random effects model, also called the components error model, considers that the constant changes randomly, where the random effect is in both the individual and the time factor, and the appropriate estimation method is the generalized least squares method. This model assumes that the variation of the unobserved effects across units is random and uncorrelated with the exogenous variables X and that a composite error term is included, so the model formulation is:

$$y_{it} = x_{it}^{'}\beta + \mu_i + \varepsilon_{it}; \tag{5}$$

The *GLS* estimators of β as a function of weightsθ, $\hat{\beta}_{Between}$ and $\hat{\beta}_{LSDV}$ are

$$\hat{\beta}_{random\,effects} = \theta \times \hat{\beta}_{Between} + (1 - \theta) \times \hat{\beta}_{LSDV} \tag{6}$$

In panel models, there are several tests to differentiate or choose among models such as Fisher's test, LM test, and the Hausman test. Fisher's test allows comparing the fixed effects model with the pooled model, where the alternative hypotheses for this test indicate that the appropriate model is the fixed effects model; LM test enables comparing the random effects model and the pooled model, in which the alternative hypotheses for this test indicate that the appropriate model is the random effects model; and the Hausman test allows choosing between fixed effects and random effects models. As for formulating the tests:

Fisher's test (testing the Fixed Effects):

$$F = \frac{(\hat{u}^{'}\hat{u} - \Sigma_{i=1}^{N}\hat{u}_1{'}\hat{u}_i)}{\Sigma_{i=1}^{N}\hat{u}_1{'}\hat{u}_i} \times \frac{(NT - N - K)}{(N - 1)} \sim F_{N-1;NT-N-K} \tag{7}$$

LM test (testing the Random Effects):

$$LM = \frac{NT}{2(T-1)}\left[1 - \frac{(\hat{u}'(I_N \otimes J_T)\hat{u}}{\hat{u}'\hat{u}}\right]^2 \sim \chi^2\ (1) \quad (8)$$

Hausman test (Fixed or Random Effects):

$$(\hat{\beta}_{LSDV} - \hat{\beta}_{GLS})'[VAR(\hat{\beta}_{LSDV}) - VAR(\hat{\beta}_{GLS})]^{-1}(\hat{\beta}_{LSDV} - \hat{\beta}_{GLS}) \sim \chi^2\ (K) \quad (9)$$

Specification of the econometric model

This study first constructs a model assuming that investment is a direct nonlinear function of the evolution of GDP (assumption based on the Cobb–Douglas production function model). In the end, depending on the variables available, the model chosen is: $GDP = F\ (GFCF, COE, \mu)$

*With Gross Domestic Product **(GDP)**, Gross Fixed Capital Formation or Gross Fixed Capital Accumulation **(GFCF)**, and Compensation of Employees **(COE)**.*

Model Variables and Data Source

In this application, panel or longitudinal data is used where the cross-sectional units represent eight sectors of economic activity observed over 1996–2020; the number of observations is (8×25). For the estimation of the different models, there is the Stata program.

Regarding the variables, Table 1 provides brief definitions.

Table 1. *Model Variables*

Variable	Abb.	Nature	Brief Def.
Gross Domestic Product	GDP	Dependent	*The value of all goods and services produced in a country during a certain period (a year). Besides, it is a good indicator to measure the wealth of a country.*
Gross Fixed Capital Formation	GFCF	Independent	*Is an accounting aggregate that measures investment, measured by the value of tangible or intangible fixed assets intended for production. Here, it is the sum by sector of activity.*
Compensation of Employees	COE	Independent	*Consists in what employers pay their employees in cash and in kind for work and tasks performed. This is also the sum per sector of activity.*

The data used come from the Input–Output Tables across 1996–2020. The National Accounts Directorate of the National Statistics Office designs these tables and the Statistics Office provides them annually [ONS, 2019 & 2015].

Estimation and Discussion

Pre-estimation: Preliminary Analysis

The preliminary and descriptive analysis of the variables allows us to identify trends and to describe the total dispersion, the dispersion between groups, and the dispersion within groups. Below, the preliminary analysis is carried out in two stages: the first stage concerns the chronological evolution by sector of activity; the second stage begins with some basic measures of the total dispersion, between groups and within groups (standard deviation and coefficient of variation (CV)).

Regarding the chronological evolution by sector of activity, Figure 1 shows that the GDP of the sectors of Construction, Agriculture, Forestry and Fishing does not cease increasing across 2000–2020; several reasons can justify this increase, among which the government programs of expenditure and support to growth adopted are the main ones. As for the GFCF, the graph shows an upward trend in the construction sector during 2000–2020; and fluctuations in the steel and mechanical engineering sector and in the services sector provided to institutions. The graph also shows an upward trend in the variable COE in all sectors of activity. This increase coincided with the increase in the volume of investments, which stimulated the demand for labor.

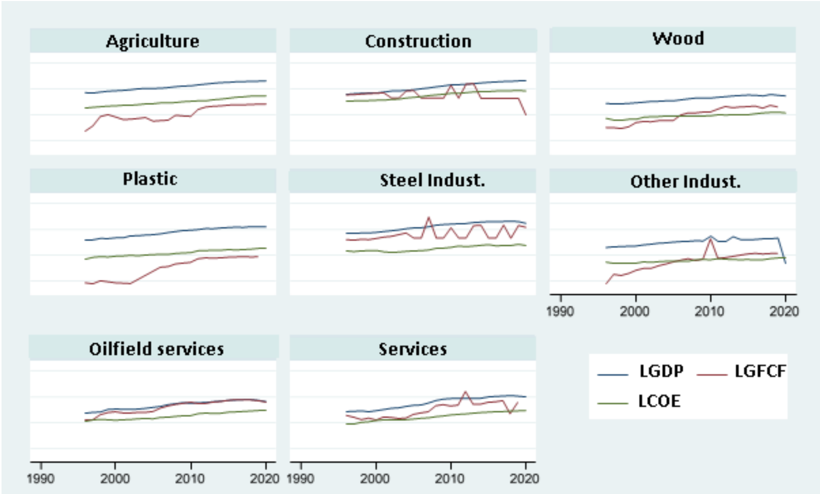

Figure 1. Representation of the different variables by sector.

On the other hand, for dispersion statistics, Table 2 shows a strong heterogeneity across sectors for the different variables. In the same sense, by partitioning the total dispersion into within-sector and between-sector dispersion, the variance estimated from the within-sector dispersion (the dispersion around the sector means) is significantly different from the variance estimated from the between-sector dispersion (the dispersion between sector means). For the values of the coefficients of variation of each variable, which is equal to the ratio of the standard deviation to the mean, heterogeneity is higher for GFCF (investment) than for COE.

Table 2. *Dispersion statistics*

Variable		**Standard deviation**	**N = n*T**	**Variable**		**Standard deviation**	**N = n*T**
LGDP	*Total*	0.5862	200				
	Between sector	0.4956					
	Within sector	0.3574					
	CV	**10.32%**					
LGFCF	*Total*	1.4674	200	**LCOE**	*Total*	0.6191	200
	Between sector	1.1802			*Between sector*	0.6345	
	Within sector	0.9635			*Within sector*	0.2511	
	CV	**33.86%**			**CV**	**13.83%**	

For correlation between variables, Figure 2 shows a relatively strong correlation between GDP on the one hand and COE and GFCF on the other; the figure also shows a significant association between these two independent variables. As a reminder, correlations on logarithmic variables values have been calculated.

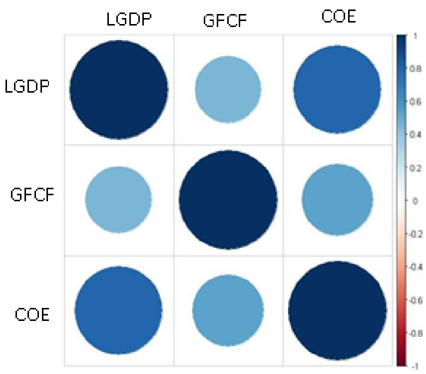

Figure 2. Correlogram of the correlation matrix.

Estimation Results

Initial estimation

In the following, the *Pooled* model, *FD* (First-Differenced) estimator, *Within* and *Between* estimators, LSDV (Least Squares Dummy Variable) estimator, and random effects model are used to estimate the impact of sectoral investment on economic growth.

- The "Pooled" model simply groups/stacks individuals without considering individual or temporal differences, thus imposing a homogeneity constraint on the groups. Alongside homogeneity, this model relies on the same assumptions as the multiple linear regression model: linearity, exogeneity, homoscedasticity, non-autocorrelation, and so on. Under these assumptions, OLS is the most appropriate estimation method. Estimating the parameters of the model by stacking all the data (dependent variable; independent variables) gives weak results for model quality, explanatory power and statistical significance (Table 3).

- The *"FD"* estimator deals with fixed effects, differentiates the sector-specific error, and solves the problem of omitted variables. The appropriate estimation method is the OLS. Looking at the explanatory power and statistical significance of the parameters, the estimation of the difference model (without constant) gives less efficient results (Table 3)

- The *"Within"* estimator is an intra-individual estimator that uses the variation within each sector, while the *"Between"* estimator is an inter-individual estimator that uses the individual means of the explanatory and explained variables. Looking at the estimation results using OLS (Table 3), the parameters of the *"Between"* model are not significantly different from zero and the model is not globally significant, unlike to the *"Within"* model that shows good results for significance (individual and global).

- The "LSDV" estimator consists of applying OLS to the model with sector-specific indicator variables. This fixed effects model treats the unobserved fixed effects as coefficients of the indicator variables representing the sectors. The estimation yields significant coefficients and sector-specific coefficients that are all significant. Initially, it appears that this model has better explanatory power, significance, and validity (Table 3).

- The random effects model is a component error model, where the error term is decomposed into three effects: random individual effects, time effects (identical for all individuals), and an error term independent of the effects (individual and time). In this model, the randomness of the relationship between the dependent variable and the independent variables is assumed. The estimation of this model using the GLS method gives good results for explanatory power and statistical significance (only the coefficient of the constant is significantly different from zero) (Table 3).

Table 3. *Summary of estimation results for different static panel data models (initial estimation)*

Variable	pooled	FD	FE_within	BE	LSDV	RE
LGFCF	0.038		0.107***	−0.053	0.107***	0.109***
LCOE	0.709***		1.106***	0.695	1.106***	1.095***
dLGFCF		0.057***				
dLCOE		0.467***				
isector						
2					−0.691***	
3					0.293***	
4					0.643***	
5					0.434***	
6					0.459***	
7					−0.431***	
8					−0.103**	
_cons	2.337***	-	0.233	2.808*	0.181	0.306
R^2	0.658	0.228	0.904	0.495	0.967	0.660
F	182.19	27.18	892.21	4.42	608.56	
Prob F	0.0000	0.0000	0.0000	0.0784	0.0000	
Chi^2						1735.7
Prob chi^2						0.0000

* p < 0.10; ** p < 0.05; *** p < 0.01

Comparison of models and selection of the best one

After estimating the different models comes performing statistical tests to select the best and most appropriate model for the study data. Diagnosis was performed in several steps, first comparing the "pooled" model with the fixed effects model using Fisher's test, then comparing the "pooled" model with the random effects model applying the Breusch–Pagan LM test, and finally comparing the fixed effects model with the random effects model using the Hausman test. Table 4 presents the results.

Table 4. *Summary of Comparison Test Results*

Test		Test value	Prob.
Pooled* vs. *fixed effects	*Fisher test*	247.49	0.000
Pooled* vs. *Random effects	*Breusch–Pagan LM test*	1204.63	0.000
“Fixed effects*” vs. “*Random effects”	*Hausman test*	7.38	0.025

- **Fixed effects test:** to select the appropriate model for the data, first comes checking for unobserved effects, i.e., whether there is a difference between sectors or between periods, to see if there is a need for specific cross-sectional effects. The model is tested so that the null hypothesis indicates that there is no individual effect (the coefficients of all sectors jointly equal to zero). Here, the appropriate test for comparison between the *“Pooled”* model and the fixed effects model is Fisher’s test. The results in Table 4 lead to the rejection of the null hypothesis, which means that if the relevance of the Pooled model and the fixed effects model are compared, then the appropriate model is the fixed effects model, which indicates that the impact on economic growth vary across investment sectors.

- **Random effects test:** this test reveals the existence of random effects and is similar to the LM test for least squares errors. Under the null hypothesis that there is no random effect in the model, the LM statistic follows a chi-square distribution with one degree of freedom. Given the results of the tests presented above, the null hypothesis is rejected, which means that if the fit of the *“Pooled”* model with that of the random effects model are compared then the appropriate model for the data is the random effects model.

- **Hausman test:** after confirming the inadequacy of the *“Pooled”* model, next is finding the most appropriate model: the fixed effects model or the random effects model. The basis of the Hausman test is the significance of the difference between fixed and random effects, the null hypothesis assumes the absence of correlation between fixed and random effects, then the estimators of fixed and random effects are consistent, but the ability of random effects is the most effective. However, under the alternative hypothesis that there is a correlation, the ability of fixed effects is only consistent and the most effective. This test shows that there is a correlation between the sector effects and the explanatory variables, indicating the acceptance of the fixed effects model as an appropriate model with a probability of 0.025 (see Table 4).

Validity of the appropriate model

After determining the appropriate model comes examining whether it exhibits the three common econometric issues of cross-sectional dependence, autocorrelation, and error heteroskedasticity. The results in Table 5 summarize the findings from three key tests: the Pesaran CD test for cross-sectional dependence, the Wooldridge test for autocorrelation, and the likelihood ratio test for error heteroskedasticity.

Table 5. *Summary of the Cross-sectional dependence, autocorrelation and error heteroskedasticity tests*

Problem	Test	Test value	Prob.
Cross-sectional dependence	*Pesaran CD test*	2.863	0.0042
Autocorrelation	*Wooldridge test*	6.378	0.0395
Heteroskedasticity	*Modified Wald test*	51.07	0.0000

Cross-sectional dependence arises when the sectors in the dataset are not independently drawn observations but instead influence each other. This is due to the interconnected nature of investment sectors. DeHoyos and Sarafidis (2006) note that the impact of cross-sectional dependence on estimation depends on the strength and nature of correlations among different units. Generally, standard fixed effects estimators are consistent but not particularly efficient, and their estimated standard errors tend to exhibit bias. To test cross-sectional dependence, the study employs the Pesaran CD test, which is based on a scaled average of pairwise correlation coefficients. The null hypothesis assumes cross-sectional independence, implying no association among the cross-sectional units, while the alternative hypothesis suggests the presence of cross-sectional dependence. Table 5 indicates that the CD test rejects the null hypothesis of no cross-sectional dependence.

Autocorrelation leads to standard deviation bias and results in less efficient outcomes. The Wooldridge test detects error autocorrelation in the fixed effects model, under the assumption that error term values within each sector are independent, meaning there is no cross-sectional autocorrelation in the error term. The test results in the table 5 reveal that the fixed effects model indeed suffers from error autocorrelation.

Regarding the assumption of homoscedasticity, the modified Wald test is employed for group heteroskedasticity within the fixed effects regression model. The null hypothesis indicates that the residuals exhibit homoskedasticity by group. An advantage of this test is its compatibility with unbalanced panels and its ability to work even when the normality assumption is violated. The previous table (table 5) shows that the likelihood ratio test's probability value is less than 5%, indicating that the hypothesis of homoskedasticity can be rejected.

Given these issues of serial correlation, cross-sectional dependence, and heteroskedasticity, we use fixed effects regression models with robust Driscoll and Kraay standard errors, as recommended by Hoechle (2007).

Analysis of the results of the robust fixed effects model

This approach, as outlined by Hoechle (2007), produces Driscoll–Kraay standard errors, offering robustness against heteroskedasticity, autocorrelation, and cross-sectional dependence. Through the re-estimation of the fixed effects model using Hoechle's (2007) procedure provides updated results (Table 6).

Table 6. *Summary of estimation results for the fixed effects model using Hoechle's (2007) procedure (FE Regression with Driscoll–Kraay standard errors)*

			N	=	189
			isector	=	8
			maximum lag	=	4
			F(2,7)	=	1024.77
			Prob F	=	0.0000
			within R-squared	=	0.9088
LGDP	Coef.	Drisc/Kraay Std. Err.	t		Prob.
LGFCF	0.10657	0.02546	4.19		0.004
LCOE	1.10595	0.02590	42.70		0.000
cons	0.23245	0.15524	1.50		0.178

Table 6 unequivocally reveal significant statistical findings. When considering student's values and their associated probabilities, it becomes evident that the model's parameters are substantially different from zero. Moreover, the model demonstrates statistical significance based on Fisher's value and its associated probability. Notably, the independent variables exhibit a remarkable ability to explain the variations in the dependent variable, exceeding 90% (with a within R-squared value of 90.88

Economically, the estimated model uncovers a positive relationship between the GPD of various sectors, representing sectoral economic growth, and the GFCF within those sectors (indicating sectoral investment). The results also confirm positive elasticities for both capital and labor, underscoring the underutilization of the labor factor (COE) and emphasizing the government's interest in stimulating labor demand. Concerning investment, the estimate suggests that it contributes to approximately 11% of GDP growth, recognizing this contribution as a collective measure across sectors. However, when comparing the impact, significance, and weight among sectors, differences emerge. These disparities are attributable to the government's reliance on specific investment sectors at the expense of others. Furthermore, the absence of improvements in the business climate and the lack of economic diversification have contributed to limited investment in certain sectors with a competitive advantage. Additionally, the low competitiveness of some investment sectors has amplified opportunities for foreign investment compared to domestic investment.

Conclusion

The econometric modeling carried out here consists of applying static models to panel data from eight economic sectors, with GDP as the dependent variable and GFCF and COE as the independent variables. At the end of this modeling work, we came up with the following results:

The GFCF positively and significantly affects GDP, with an effect that varies across sectors; this result is almost correct in all models. The model choice tests also indicated that the best static model appropriate for this study is the fixed effects model, meaning that the investment sectors do not have the same impact on economic growth. The results of the study also confirmed that the best model is not free from cross-sectional dependence and serial correlation and that there is a heteroscedasticity problem, and to deal with this complication, the fixed effects models using Hoechle's (2007) procedure was re-estimated. Finally, the final fixed effects model (the optimal model) is quite significant, and the independent variables (GFCF and COE) explain GDP well, so there is a positive impact.

Applying these findings to Algeria reveals several important implications for the country's economic landscape. First, the positive sign of the elasticities for both capital and labor, with a notable emphasis on labor (an elasticity of 0.11 compared to 1.11 for capital), underscores the underutilization of the labor factor. This presents a clear opportunity for the Algerian government to stimulate labor demand, potentially by reinvigorating employment agencies and implementing policies that encourage job creation.

Regarding investment, the recognition of an overall sectoral participation of 11% in GDP growth is significant, but it is important to delve deeper and analyze the variations among sectors. These differences are influenced by the government's reliance on specific investment sectors, often at the expense of others. To foster economic development and address disparities, policymakers need to diversify investment strategies and promote a more balanced approach to sectoral development.

The identified disparities among investment sectors also stem from broader economic challenges. The need to improve the business climate and diversify the Algerian economy is evident. Enhancing the ease of doing business, promoting entrepreneurship, and removing barriers to investment can facilitate the growth of sectors with competitive advantages. These measures can further harness the potential of domestic investment, thereby reducing the prominence of foreign investment.

Addressing these challenges represents an opportunity for Algerian policymakers to create a more conducive investment climate that stimulates sustainable growth and unlocks the full potential of underutilized sectors. This underscores the importance in Algeria of strategic economic planning and comprehensive policy measures aimed at enhancing competitiveness and achieving balanced economic development.

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