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ORIGINAL ARTICLE

Sources of Algeria's economic growth, 1979–2019: Augmented growth accounting framework and growth regression method

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Abstract

This paper examines the sources of economic growth in Algeria, studying the key drivers of their slow and weak economic performance, during the period of 1979–2019 from the perspective of the augmented growth accounting framework and the growth regression method. More specifically, the paper uses the augmented growth accounting framework to decompose the aggregate growth of an individual economy to determine the contribution of various inputs and the total factor productivity. The growth regression method, then, links the growth performance of a given country to a set of economic, social, and institutional variables to identify the deep drivers of its economic growth. Results of the accounting framework show that Algeria's growth performance has been weak and modest for decades. This is due, mainly, to labor growth with weak gain in capital accumulation and to sharp losses in the total factor productivity growth. Furthermore, results of the econometrics study stress the importance of the political, institutional, and economic variables and the macroeconomic stability as potential factors that may affect growth in Algeria. These findings highlight the need for policymakers to identify and to target these determinants to improve the long-run economic growth in Algeria.

KEYWORDS
Algeria, economic growth, growth accounting, test statistics, time-series model

JEL CLASSIFICATION
O11; O47; C12; C32

1 | INTRODUCTION

Algeria is a vast and rich country with large impoverished populations. However, despite its wealth in natural resources, the country's economy had been underperforming for many decades (Akacem et al., 2020; Zoubir, 2020). Algeria's economic and political environment failed in diversifying the rentier economy or in transforming it into a productive one. It maintained Algeria as a one-commodity producer. Revenues from hydrocarbons, indeed, account for about 60% of Algeria's gross domestic product and 97% of its foreign earnings. The economic progress depends, greatly, on oil and gas performances in the global markets. In fact, Algeria's economic growth was below the potential over the past few decades. Clearly, analyzing Algeria's economic growth performance is challenging, particularly due to its complex history. Therefore, examining its proximate sources and deep determinants might help to decode at least some of the intricacies of the 'rich country, poor people' dualism.

To promote Algeria's growth in a more sustainable manner, an analysis of the sources of its economic growth performance is needed. The neoclassical growth accounting framework is used to decompose the aggregate growth of an individual economy into the contribution of various inputs and the total factor productivity (TFP). This growth accounting methodology was pioneered by Solow (1957) and considerably developed by Jorgenson et al. (2003, 2005). The augmented growth accounting framework has been widely accepted as the most accurate way of measuring the contribution of different economic inputs and is therefore the gold standard for the analysis of productivity and sources of growth.

As such, the immediate causes of economic growth remain unclear. Indeed, empirical studies focused on the ultimate reasons for Algeria's growth in terms of changes in institutions, economic policies, and politics conducive to economic growth. The growth regression method links the growth performance of a country to a group of economic, social, and political variables as ultimate sources of economic growth. An extensive literature has empirically found a wide array of multidimensional determinants that are significantly associated with the long-run economic growth. Much as these relationships have been investigated, there is still no consensus on the appropriate theoretical and empirical framework to guide policymakers. So far, many of the country-specific determinants are considered as important to sustain economic growth today (Tag et al., 2008).

The principal aim of this paper is to determine the factors responsible for economic growth in Algeria. To attain this purpose, this paper quantitatively examines the long-run proximate and the deep sources of Algeria's economic growth and its trend between 1990 and 2018. In fact, there are few comprehensive published studies on growth sources assessment for Algeria (Bouznit et al., 2015; Chemingui & El Said, 2006). Therefore, through the lens of the growth accounting framework and the growth regression methods, this paper seeks to fill this gap by contributing to the exploration and the analysis of dynamics growth patterns and its sources.

The paper is organized as follows. Section 2 presents a brief theoretical and empirical framework of the analysis of the source of economic growth. Section 3 states, in short, the current and the past patterns of Algeria's economic growth performance. Section 4 describes the augmented growth framework and presents the results obtained from applying it in identifying the underlying sources of Algeria's gross domestic product (GDP) growth. Section 5 discusses the estimation method and presents the empirical results. Section 6 concludes and provides some policy recommendations.

2 | A PERSPECTIVE ON THE SOURCES OF ECONOMIC GROWTH

The sources of economic growth correspond to factors responsible for economic performance (Błazejowski et al., 2019). They have been investigated in various empirical studies. The role of human capital in economic growth has been extensively studied since Romer (1986) and Lucas and Robert (1988), who emphasized its importance. Lucas and Robert (1988) argue that education is the main channel through which human capital accumulates, which is in turn responsible for sustained growth. Romer (1986, 1990) shows that human capital generates innovations and stimulates growth. He examined three models: one emphasized physical capital accumulation and technological change, another highlighted human capital accumulation through schooling, and one model asserted specialized human capital accumulation through learning-by-doing. In this sense, as stated in Pablo-Romero and Gómez-Calero (2008, 2013), the greatest human capital endowment favors the generation and the absorption of technology making the rate of technological change faster through investing in physical capital. In the same vein, the contribution of Mankiw et al. (1992), which incorporates human capital into the Solow's model as an additional explaining growth factor in the long term, further motivated interests in the way human capital explains growth (Bouznit et al., 2015).

Makdisi et al. (2006) studied the overall growth performance of the Middle East and North Africa (MENA) region over the period 1960–2000. They compared the growth pattern of the MENA region from an international perspective. As a result, they have found that the capital is less efficient, the trade openness is less beneficial to growth, and the impact of adverse external shocks is more pronounced. In addition, the total factor productivity growth (TFPG) in the MENA region was not an important source of growth in comparison with other regions. This is due to its modest stock of human capital and its educational system that focused on preparing students for public sector employment. Moreover, they have found that, within the MENA region, non-oil and diversified economies have fared much better than the oil-exporting countries both in terms of output growth and TFPG. Finally, the degree of exposure to internal and external shocks, the extent of economic diversification, and international competitiveness were found to be important factors explaining the variations in growth performance within the MENA region.

Chemingui and El Said (2006) examined Algeria's economic growth performance, studying its performance over the period 1962–2000. They considered prevailing economic policies and changes introduced in the economic environment over the same time period. In addition, they conducted a Solow's accounting exercise to break down growth in output into growth in capital, labor, and total factor productivity (TFP). During the study's period, Algeria's growth performance has been characterized by high fluctuations and, generally, slow growth as compared with that in the neighboring developing countries. The poor economic growth performance that Algeria experienced is a result of a slow growth in productivity that can be attributed to different factors. Some of them are the following: the inefficient management of the country's natural resources, the country's macroeconomic policies, a weak financial sector, slow and nontransparent privatization process, and some other factors that, too, limited the progress of economic reforms.

Feeny et al. (2013) examined the drivers of economic growth in the case of South Korea using data covering the period 1970–2005. Their paper, first, constructs a genuine progress indicator (GPI). An empirical model is, then, specified and estimated using growth in GDP per capita and in GPI per capita as dependent variables. Results indicate that, while physical capital, research and development, exports, and inflation are all important factors in determining growth in GDP per capita, physical capital is, only, a driver of genuine progress. These findings highlight the need for policymakers to identify and to target other determinants of genuine progress to improve the well-being of South Koreans, rather than focusing attention on traditional sources of economic growth.

Bouznit et al. (2015) analyzed Algeria's slow economic growth by comparing it with South Korea, over the period 1970–2010. Both countries were nearly at the same development level at the beginning of the 1960s. Nevertheless, the South Korean economy was ranked 15th in the world in 2010, while Algeria remained underdeveloped. The results obtained from these authors' studies prove that human and physical capital lies behind the economic growth in the two countries under study. They found that the elasticities of productivity with respect to human and physical

capital are higher in South Korea. Clearly, human capital elasticity is two and a half times higher, whereas the physical capital elasticity is twice as high.

Many other researchers have studied the causality relationship between economic growth and foreign direct investment, trade, and other macroeconomic variables. Some studies support the positive impact of these macroeconomic variables on economic growth. Others, however, stressed their neagative impact (Belloumi, 2014; Choe, 2003; Chowdhury & Mavrotas, 2006; Dritsaki & Stiakakis, 2014; Frankel & Romer, 1999; Manuchehr & Ericsson, 2001).

3 | ALGERIA'S ECONOMIC GROWTH PERFORMANCE

Over the past five decades, Algeria's economic growth performance has been characterized by high fluctuations and, generally, slow growth compared with that in similar developing countries. It begans at much higher relative real income (to US real income per capita) in 1970, but has been actually further behind in both relative and absolute terms. As shown in Figure 1, Algeria reached an average income 37% that of the United States in the 1970s. However, it suffered huge losses in subsequent years, from which it has not recovered yet. As a result, the income gap between Algeria and the United States widened and increasingly lagged behind over time (average of 25% in 2018). To put Algeria's performance in a comparative perspective, Figure 1 illustrates that Algeria had 37% higher level of income per capita than that of South Korea in 1970. However, decades of rapid economic growth in South Korea transformed its income per capita from lower level compared with Algeria in 1970 to more than twice that in Algeria by 2018, while Algeria's income per capita stagnated and remained relatively flat.

The slowdown in the income level in Algeria as a measure of the standard of living has been influenced by the weak economic growth performance over the past five decades. Figure 2 shows that Algeria recorded a very low growth in GDP per capita during the period of 1970–2018 (1.35% on average). The country, also, has been experiencinga negative economic growth in most of the periods and showed a pattern of high volatility in the long term, sometimes less than the poorly performing countries in Sub-Saharan Africa (such as Ethiopia and Rwanda). In fact, this growth pattern is believed to be inextricably linked to several characteristics of the country; notably, its

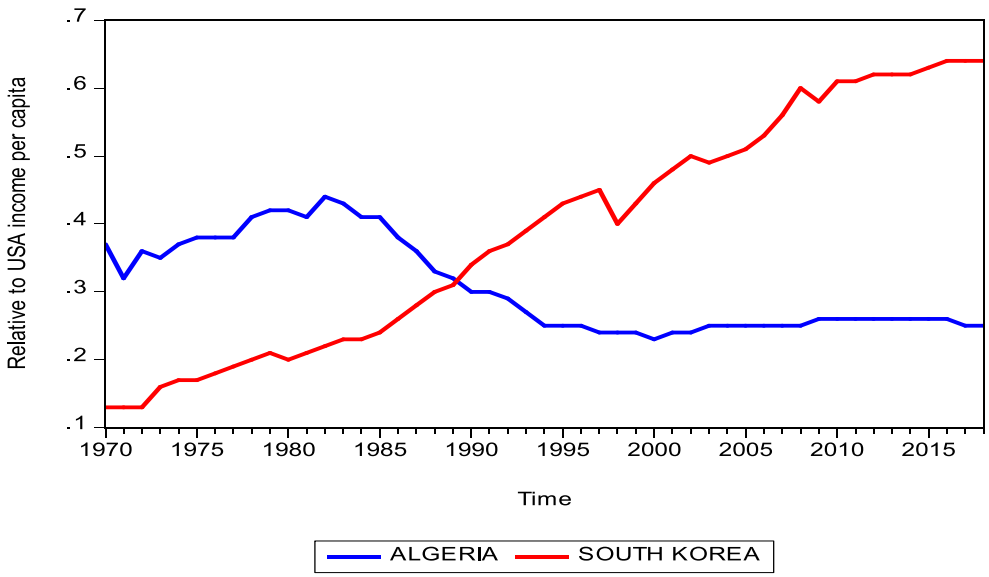

FIGURE 1 Per capita income in Algeria and South Korea relative to the United States. ***Source***: Authors' calculations using data from World Bank dataset

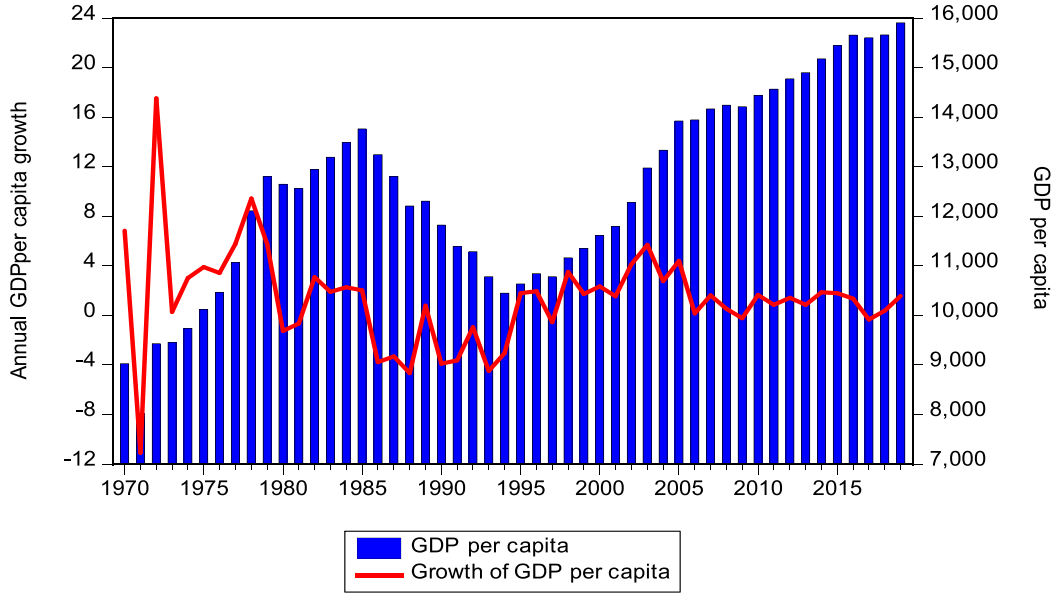

FIGURE 2 Per capita GDP level and growth rates of Algeria. ***Source***: World Bank (2019). *Notes*: Per capita GDP is measured in purchasing power parity (PPP) dollars, 2018 price level

heavy dependence on oil, weak economic base, high population growth, low rates of return on investment, low level of integration into the global economy, underdevelopment of market institutions, and the omnipresence of the state (Bouras, 2008; Chemingui & El Said, 2006; Hill, 2009; Talahite, 2018).

In fact, Algeria achieved a relatively good growth performance in the 1970s until the first half of the 1980s (with average annual growth rate surpassing 3.3% per year during 1970–1985). This is because of the favorable external environment in the form of high energy (oil) prices as well as temporary gains from adopting an industrialization-based development strategy such as improvement in social indicators, falling illiteracy, increasing life expectancy, and high school enrollment. However, the situation was completely reversed in the second half of the 1980s and 1990s, a period that was characterized by declining oil prices accompanied by a sharp decline in domestic investments and savings. This, indeed, affected negatively the economic growth rates (dropped to −1.3% per year during 1986–1999).

Since the early 2000s, Algeria has recovered and has entered a new phase of political and economic system (growth rate rose to more 2.0% during 2000–2013). This is a result of the combination of three factors: firstly, the sharp decline in the different manifestations of armed violence that characterized the 1990s. Most of them had their origins in the actions of various Islamist terrorist groups that had been operating in the country for a long time. Secondly, a significant increase in the state's financial resources (the fiscus) linked to a better valorization of hydrocarbons. These were exported to a world market that had a strong demand for raw materials until the economic downturn in mid-2014. The third factor is the election of Abdelaziz Bouteflika in April 1999, who had launched several economic plans since 2001 to encourage the economic growth (whose modest performances in subsequent years, along with the poor social and political situation, have produced a vicious circle that is pushing standards of living down even further) (Boucetta, 2016; Safir, 2020). Otherwise, since 2014, energy prices have shown severe turbulence leading to a decline in oil revenues, which has strongly affected investments, savings, and development projects in the country (growth rate dropped again to 1.0% per year during 2014–2018).

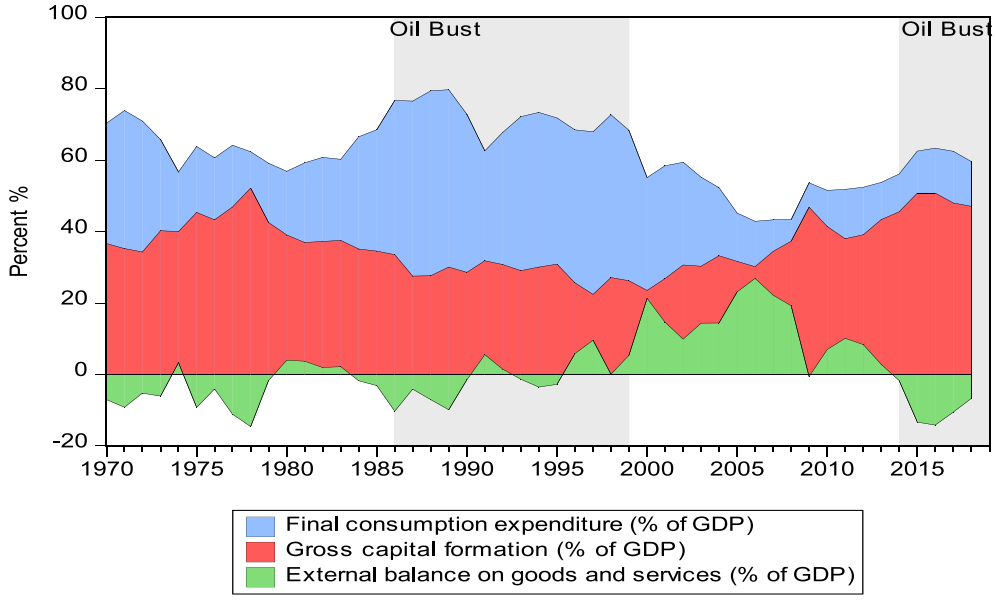

FIGURE 3 Components of GDP in Algeria, 1970–2018. ***Source***: Data from World Bank (2019)

The fundamental reason for the poor performance of the Algerian economy is its heavy reliance on the oil sector and on the low-productivity sectors. This fact may explain why the economy has become more vulnerable to external shocks and is unable to achieve sustainable high growth rates. During 'the oil boom' periods (the 1970s and the first decade of the 2000s), the state induced public spending in public investment programs that represent the main component of the national product (Figure 3), especially in financing excessive social and infrastructure projects rather than productive investment. In this regard, the lack of appropriate investment guidelines may lead to low efficiency and productivity of fiscal policy in oil-producing countries like Algeria (Akacem et al., 2020; Auzer, 2017; Chibi et al., 2019; Selim & Zaki, 2016). In addition, the political pressure exerted by interest groups forced governments to adopt restrictive trade policies, such as import substitution and subsidies that reduce income per capita. These inappropriate fiscal policies may accelerate corrupt behavior, since transfers of oil revenues to protect industries may not be transparent because of low institutional quality. In general, the increase in public spending leads to imbalances in the state budget, and the volatility of resource revenues makes balancing the budget one of the main challenges that Algeria has faced since independence.

During 'oil busts' (mid-1980s and since 2014) periods, the macroeconomic balances declined, resulting in low growth rates, high inflation and unemployment rates, and decrease in the terms of trade (Auzer, 2017; Selim & Zaki, 2016). In fact, governments tend to engage in excessive borrowing and fall into indebtedness in order to cover the deficit and maintain consumption levels. Meanwhile, the state reduces its public expenditures by suspending public projects linked to basic infrastructure or to economic diversification. In terms of the components of GDP on the demand side, we notice a sharp decline in the investment contribution during the post-oil crises and an increase in the volume of final consumption. It is also noticeable that the high volatility of net external trade follows the pattern of fluctuations in oil revenues, which represent a significant share of the total export revenues. This is, in fact, due to the lack of a sustainable fiscal policy to avoid budget deficits at a time of low oil prices and primarily due to poor management of oil revenues (poor institutional quality), plus the low efficiency of capital because of misallocation of resources that may be attributed to the country providing an

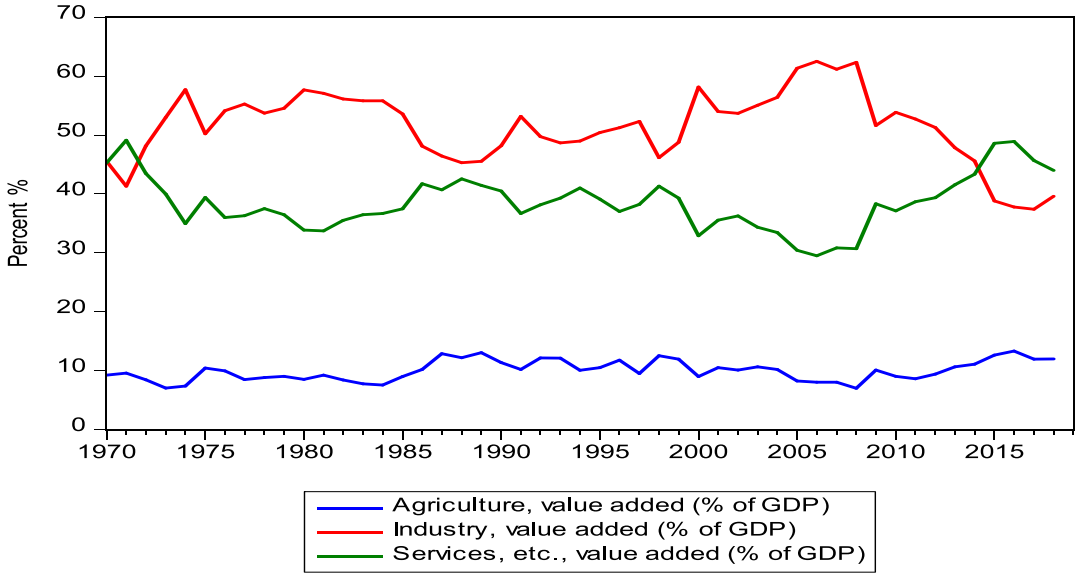

FIGURE 4 Structural transformation of the Algerian economy. ***Source***: Data from World Bank (2019)

inadequate business environment and institutional support for investment and private sector development (Chibi et al., 2019; Zoubir, 2020).[1]

Algeria had become a hostage country to the fortune of oil prices. There has been a failure to diversify the economy and to get any sector other than oil to really take off. Agriculture's share of GDP has plummeted from roughly 13% to 7% during 1970–2018, and manufacturing has stayed at roughly 5% of GDP in the same time period (Figure 4). Apart from the oil sector, the service sector has expanded, and it accounts for 46% of GDP. However, it is primarily made up of low-productivity services such as the public sector, hotels, restaurants, etc. With oil making up 95% of export incomes and the oil sector representing roughly two-third of both GDP and government revenues, the economy is caught in a trap in the sense that it is unable to diversify away from its dependency on a single valuable natural resource.

4 | AUGMENTED GROWTH ACCOUNTING METHOD USED IN STUDY AND DETERMINATION OF THE SOURCES OF ALGERIA ECONOMICGROWTH

This section examines the drivers of the economic performance in Algeria during 1990–2018. Following the economic growth literature, that is, Jorgenson et al. (2003, 2005), Jorgenson and Vu (2018), and Vu (2020), we apply the augmented growth accounting method to decompose economic growth to determine the contribution of capital and labor inputs and total factor productivity growth. In the extended production possibility frontier (PPF) model, gross domestic product Y is produced from an aggregate input function X of capital and labor services. The capital services are rendered by non-ICT capital K_{nict} and ICT capital K_{ict}. The non-ICT capital K_{nict} consists of three non-ICT capital:

[1]As often happens in an oil rentier economy, the drop of prices mostly causes cut budgets, increase the prices of some goods, and reduces imports, similar to what the regime did after the oil slump in 1986 that resulted in the 1988 riots. After the collapse of the oil prices in 2014, the challenges worsened due to other factors, such as the extreme level of corruption and lack of accountability. Indeed, since 2014, the government's ability to keep its end of the social contract has been broken because of the low oil prices, which have strained the country's public finances and reduced Algeria's reserves from US $178 bn in 2014 to approximately US$75 bn in 2019. In 2018, the budget deficit had reached 9.2% of the GDP in 2019 (Zoubir, 2020).

nonresidential buildings and structures, transport equipment, and machinery and equipment. However, the ICT capital K_{ict} comprises computer hardware, computer software, and telecommunication equipment. The labor services come from labor input, which is a product of the total hours worked H and the labor quality index $L_Q L = H.\ L_Q$. The total factor productivity A represents a Hicks neutral augmentation of the aggregate input function.

$$Y = AX\,(K_{ict}, K_{nict}, H, L_Q). \tag{1}$$

Under the neoclassical assumptions of competitive markets and constant returns to scale, Equation (1) can be transformed into a growth accounting decomposition:

$$\Delta \ln Y = \Delta \ln A + \overline{v}_K \Delta \ln K + \overline{v}_L \Delta lnL = \Delta \ln A + \overline{v}_{K_{ict}} \Delta \ln K_{ict} + \overline{v}_{K_{nict}} \Delta \ln K_{nict} + \overline{v}_L \Delta \ln H + \overline{v}_L \Delta \ln Q \tag{2}$$

where $\overline{v}$ is the average share in total factor income of the subscripted input over the two periods of the change. All variables are expressed in logarithmic first differences ($\Delta \ln$) to represent their growth rates. The assumption of constant returns to scale of the aggregate input function implies that

$$\overline{v}_K + \overline{v}_L = 1 (\overline{v}_K = \overline{v}_{K_{ict}} + \overline{v}_{K_{nict}}). \tag{3}$$

Equation (2) implies that GDP output growth can be decomposed into the contribution of:

- Capital input $(\overline{v}_{K_{ict}} \Delta \ln K_{ict} + \overline{v}_{K_{nict}} \Delta \ln K_{nict})$ consisting of the contribution of ICT capital services $(\overline{v}_{K_{ict}} \Delta \ln K_{ict})$ and of the non-ICT capital services $(\overline{v}_{K_{nict}} \Delta \ln K_{nict})$;
- Labor input $(\overline{v}_L \Delta \ln H + \overline{v}_L \Delta \ln Q)$ consisting of the contribution of total hours worked $(\overline{v}_L \Delta \ln H)$ and of the labor quality improvement $(\overline{v}_L \Delta \ln Q)$; and TFPG$\Delta \ln A$.

The dataset used for the growth decomposition exercise is constructed based on two datasets: the Conference Board's Total Economy Database (TED) and the World Bank's World Development Indicators (WDI) database. The TED dataset is used because it provides the complete data needed for the growth decomposition exercise for a large sample of economies for the period 1990–2018, to which all the large economies belong.

Physical capital stock data are constructed using the perpetual inventory method, which is based on aggregate investment data[2] in the PWT 9.1. Specifically, the capital stock at time t is computed as follows:

$$K_{i,T} = K_{i,T-1}(1-\delta_i) + I_{i,T} = \sum\nolimits_{t=0}^{\infty} (1-\delta_i)^t I_{i,T-1}, \tag{4}$$

where I_T denotes the capital investment and δ_i denotes the depreciation rate of existing capital stock.

The income share of capital input $\overline{v}_K$ is assumed one-third if it cannot be estimated from the country's national account. In this case, the income share of labor input is two-thirds.

To measure labor quantity, we use the total worked hours H. Data are collected from the TED dataset. The labor quality L_Q is measured by the sum of the shares of workers across all education categories weighted by their relevant productivity and by their relative wage rates (Barro & Lee, 2015). The relative wage rate of a worker with schooling is calculated by assuming a constant marginal return rate to an additional year of schooling of 10%, which is the world's average.

Following convention, TFP growth is measured as Solow residual:

[2]Data come from Feenstra et al. (2015).

$$\Delta \ln A = \Delta \ln Y - \overline{v}_K \Delta \ln K - \overline{v}_L \Delta lnL. \quad (5)$$

Deriving the growth decomposition results from growth accounting exercise, Table 1 reports the sources of GDP growth in Algeria, during the period of 1990–2018 and its three subperiods of transition (1990–2000, 2000–2010, and 2010–2018), to test the temporal instability of the growth determinants. As the table reports, Algeria's real GDP grows at a modest average rate of 2.7% over the period of 1990–2018, which means that GDP level doubles approximately every 25 years. As expected, the contribution of the labor input dominated the growth performance by about two percentage points. This source accounted for 76% of the overall GDP growth, followed by the contribution of capital input equivalent to 1.88 percentage points with a share of 69% of the GDP growth. In contrast, as the production stock factors grows faster than the output, the total factor productivity growth has been negative, and it contributes to reducing GDP growth by −1.16 percentage points or about 42% of GDP growth. Therefore, weak TFPG is the main reason for Algeria's weak and modest growth performance (see also Barro & Lee, 2015).

During the discussed subperiods, the figures presented in the above stated table reflect the great fluctuations that the Algerian economy has experienced. For example, the increase in growth rates during the post-2000 period was accompanied by an increase of the contribution of capital input to economic growth at an average rate of 2.4 percentage points, up from 0.7 percentage points during the 1990s. Mea while, the contribution of labor growth decreased from 2.8 percentage points to 1.6 percentage points. Thus, the capital input becomes the leading driver of GDP growth since 2000. The increase in the capital input's contribution to economic growth is due, mainly, to the increased levels of savings and investment thanks to the favorable external environment (increased oil revenues) and to the internal environment through the implemention of public investment programs in large infrastructure projects. We also note the increasing importance of ICT capital for growth as it contributes around 23% of the total growth.

TABLE 1 Sources of GDP growth in Algeria, 1990–2018

		1990–2000	2000–2010	2010–2018	1990–2018
GDP growth (%)		1.28	3.89	2.97	2.71
Sources of GDP growth (%)					
Capital input	All	0.78	2.04	2.83	1.88
	ICT	0.37	0.72	0.84	0.64
	NICT	0.45	1.32	1.99	1.24
Labor input	All	1.94	2.8	1.26	2.00
	Quality	0.52	0.58	0.5	0.53
	Hour	1.42	2.22	0.76	1.46
TFP		−1.44	−0.95	−1.12	−1.16
Structure of GDP growth					
Capital input	All	60.93	52.44	95.28	69.37
	ICT	28.9	18.5	28.28	23.61
	NICT	32.03	33.94	67.00	45.76
Labor input	All	151.56	71.97	42.42	73.73
	Quality	40.62	14.91	16.83	19.53
	Hour	110.94	57.06	25.59	53.88
TFP		−112.5	−24.41	−37.7	−42.8

Source: Authors' calculations.

One of the main features of the weak economic growth in Algeria is the slow and the weak effect of the capital contribution as compared with the labor force contribution. It is also certain that the weak growth performance in Algeria since the 1990s is, largely, due to its sharp losses in productivity levels (Table 1). This, in fact, helps the mobilization of labor force to be an important engine boosting economic growth in Algeria. Despite the importance of the labor force as a source of economic growth, increasing the level of output is inversely related to the increase in labor growth and positively to the TFPG and to the growth of capital stock. Note that the GDP growth rate in Algeria accounts for half of the work force growth, which means lowering the country's GDP level (Mankiw et al., 1992). Because of the lack of production possibilities, the full use of labor force cannot be guaranteed, and the inevitable result will be high unemployment rates and high labor immobility. In addition, with the implementation of structural adjustment programs, the share of public investments in the total investment, especially in nonproductive activities, was reduced. Besides, a suboptimal public investment financing was achieved due to declining oil revenues, lack of funding sources of an underdeveloped banking system, inadequate infrastructure, and, most importantly, the increased uncertainty associated with the political and the security instability that the country has been experiencing since what is known as the 'dark decade' in the 1990s.

With the improvement in the business environment at the beginning of the 2000s and the increase in the volume of investments, the performance of economic growth improved slightly. Again, this is due to the achievement of weak efficiency gains (negative TFP growth) as a result of the crises and the market structure recession impacts that leads to misallocation of resources towards less productive sectors. It should also be noted that, despite the relatively good contribution of the labor quality, measured by years of schooling, the further expansion of the education sector did not cause an increase in productivity and an acceleration of economic growth in Algeria. Perhaps this measure does not take into account the low quality of education for graduates of Algerian educational institutions that are poorly equipped with high modern skills and, too, the distortion of the incentive structure associated with public sector employment.

This finding implies the crucial role of the policies and the reforms that foster capital investment, structural change, and job creation in the promotion of economic growth. Thus, it suggests that the creation of an enabling environment that encourages robust capital investment, vibrant job creation, and improvement in education system plays a crucial role in the promotion and in the sustainment of high economic performance in a given country. This insight is consistent with the findings of previous studies on the importance of capital accumulation in driving economic growth (Jorgenson, 1995; Kumar & Russell, 2002; Vu, 2020). Furthermore, other studies suggest that developing countries, likely, have greater potentials to improve their efficiency. One possible reason is the advantage these economies have in achieving growth through reforms that foster structural change, which has been evidenced to be an important source of growth (Caselli & Coleman, 2001; Dietrich, 2012; Lin, 2012, 2017).

5 | MODEL AND EMPIRICAL ANALYSIS

There are many econometric models studying the effect of economic, political, and institutional variables on the economic growth. The choice of our model is based on the existence of different variables. To empirically analyze the effect of of these variables on the economic growth in Algeria, we cover the period 1979–2019 for which data are available. Estimates and tests based on modern analysis of time series (stationary tests, cointegration tests, error correction models). We built a model based on that of Akinlo (2004). As the size of our sample is 41, we estimated two models with four parameters. The structure of our models, which assume a logarithmic form, is the following:

$$\begin{cases} Ln\,GDP_t = \alpha_0 + \alpha_1 Ln\,FDI_t + \alpha_2 Ln\,GCF_t + \alpha_3 Ln\,DI + \alpha_4 TO + \varepsilon_t \\ Ln\,GDP_t = \alpha_0 + \alpha_1 Ln\,FDI_t + \alpha_2 Ln\,FD_t + \alpha_3 Ln\,PR_t + \alpha_4 CI_t + \varepsilon_t \end{cases} \quad (6)$$

with ε being the error term.

5.1 | Data and variables

Our empirical study focuses on studying the impact of economic, political, and institutional variables on the economic growth in Algeria over the period 1979–2019. This method is considered as the most appropriate for estimating the long-term relationships for small samples. In table 2, we present the main economic, institutional, and political variables used in our models and which can influence the economic growth:

The data are balanced time series, spanning the period 1979–2019. Table 3 synthesizes averages and standard deviations, as well as the minimal and the maximal values of dependant and explanatory variables.

Before proceeding to estimate the model, the multicollinearity problem in the data should be verified. Multicollinearity refers to a situation in which two or more explanatory variables in a multiple regression model are highly linearly related. A strong correlation leads to poor estimates of the coefficients. We have perfect multicollinearity if the correlation between two independent variables is equal to 1 or −1. According to the limits pointed out by Kervin (1992), if the correlation coefficient is greater than 0.7 in absolute value, we can confirm the existence of the problem of multicollinearity.

Table 4 presents the various correlation coefficients for the explanatory variables of economic growth. The results show that the different coefficients of correlation are lower than the boundary emitted by Kervin (1992), which indicates the absence of multicollinearity between the explanatory variables. For the estimated model, Table 4 shows that the correlation matrix verifies the degree of correlation between variables, revealing that the levels of correlation between them are very small and are lower than the boundary emitted by Kervin (1992), which justifies the absence of multicollinearity.

TABLE 2 Variables and sources

Variable	Resource
Economic growth (GDP) = GDP per capita (current US$)	World development indicators, World Bank database
✓ Economic variables	
Trade openness (TO) = exports plus imports as percent of GDP	World development indicators, World Bank database
Foreign direct investment (FDI): entries of foreign direct investment relative to GDP	World development indicators, World Bank database
Domestic investment (GCF) is measured by gross capital formation (% of GDP)	World development indicators, World Bank database
Financial development (FD) is measured by market capitalization = total equity market capitalization, in millions of current US$	World development indicators, World Bank database Algiers stock exchange (SGBV)
✓ Institutional variables	
Corruption index (CI) = measure of overall corruption; lower = greater corruption (0 = perceived as highly corrupt, to 100 = perceived as very little corrupt)	Economist intelligence unit. Statistiques mondiales International country risk
Democracy index (DI) = measure of overall democracy; high = greater democracy (0 = weak democracy, to 10 = high democracy)	Economist intelligence unit. Statistiques mondiales International country risk
✓ Political variables	
Political risk (PR) = measure of overall political risk; lower = greater political risk (on a scale of 0–100) (<50: Unstable; >50 stable)	International country risk guide, PRS group

TABLE 3 Summary statistics

Variable	Obs	Mean	Std. dev.	Min	Max
GDP	41	2,910.481	1,291.454	1,452.269	5,591.212
FDI	41	0.6513772	0.6284295	2.00×10^{-6}	2.033265
GCF	41	30.51038	6.163182	20.67724	43.07444
DI	41	3.375366	0.2384963	3	3.9
TO	41	57.27753	10.18045	32.68459	76.68454
FD	41	4,919.122	5,682.966	1	14,967
PR	41	21.65171	6.152295	11.4	38.2
CI	41	2.556341	0.3391516	2	3.2

Source: Author's computation.

TABLE 4 Correlation matrix between the variables

Model 1					
Variable	**GDP**	**GCF**	**FDI**	**DI**	**TO**
GDP	1.0000				
CGF	0.5118	1.0000			
FDI	0.3728	−0.0928	1.0000		
DI	0.0183	0.2761	−0.1649	1.0000	
TO	0.4621	0.0634	0.3296	−0.1174	1.0000
Model 2					
Variable	**GDP**	**FDI**	**FD**	**CI**	**PR**
GDP	1.0000				
FDI	0.3728	1.0000			
FD	0. 0577	0.5684	1.0000		
CI	0.5796	0.5639	0.4057	1.0000	
PR	−0.1436	−0.0206	−0.4562	−0.2623	1.0000

Source: Author's computation.

To study the effect of political, economic, and institutional variables on economic growth, stationary variables should be checked.

5.2 | Results and discussion

A time series is considered stationary if its expectation and its covariance are constant and independent of time on the one hand, and its variance is finite and independent of time on the other. Therefore, one method to verify the existence of unit root (nonstationary) in a time series is to use the Dickey–Fuller (DF) (Dickey & Fuller, 1979) or the augmented Dickey–Fuller (ADF). Alternatively, one can follow with the approach of Phillips and Perron (1988) to test the unit root hypothesis. In this study, we use the ADF test as it is frequently used in recent empirical studies. If we accept the null hypothesis, the series is, then, nonstationary. In such a case, we talk about regression fallacy and

cannot, therefore, interpret the meaning of the economic regression results. We must differentiate the series (first difference).

To test the stationary, we exposed the following series (LGDP,LGCF,LFDI,LDI,LTO,LFD,LCI,and LPR) for unit root tests. The results are listed in the table 5.

Given the results obtained from conducting the ADF test, we find that most variables are nonstationary in levels since the calculated value is greater than the ADF critical values. Therefore, we accept the hypothesis H_0 presence of unit root. To make these series stationary, we have differentiated to order one.

Given the above discussed results, we note that the ADF statistics are below the critical values. Then, we can conclude that the variables are integrated of order one since they are nonstationary in levels and stationary in first difference. What is interesting about the use of the cointegration technique is that it studies the long-run relationship between the nonstationary variables in level. Then, we need to estimate an error correction model to test the possibility of the existence of a short-term relationship.

The theory of cointegration proposed by Engel and Granger (1987) is considered as one of the most important new concepts in the field of econometrics and time series analysis. The cointegration test, clearly, identifies the real long-term relationship between the variables in the model. Most variables are nonstationary, which implies that the statistical estimation may sound good but it is incorrect in reality. Cointegration, therefore, allows for the estimation of the long-term relationship between nonstationary variables integrated of the same order. Furthermore, the Johansen (1988) test is preferred to test the existence and the number of cointegration between variables used in both models. Results are presented in table 6.

We note that the variables in the two estimates are integrated of order one; we can conclude, then, that there is a possibility of existence of a cointegration between the variables. At this level, we must verify the existence of the relationship of cointegration using Johansen method, which calculated two statistics to determine the number of cointegration relationships, and the test of trace and maximum eigenvalue. Results of the test are presented in the stated table.

The results of two estimates presented in the table stated above, reject the null hypothesis of no cointegration relationship between variables estimation because the statistical values are greater than their critical values. We note, then, that the trace test indicates the existence of four cointegration relationships between variables at the 5% and 1% level as compared with the test by the maximum eigenvalue, which implies the existence of just two cointegrating relationships in both models. The cointegration relationship is given in table 7.

TABLE 5 Stationarity test for all variables

Stationarity of all variables in levels			Stationarity of all variables in first difference	
	ADF test in the level 5%		Test ADF in first difference	
Variables	With trend	Without trend	With trend	Without trend
LGDP	−1.054 **	−1.441	−1.626 ***	−1.007 ***
LGCF	−2.003	−1.543	−1.770 ***	−1.503 ***
LFDI	−2.944	−2.416 **	−2.480 ***	−1.692 ***
LDI	−2.884 **	−2.889	−3.220 **	−3.188 **
LTO	−1.793	−1.550	−2.287 ***	−1.911 ***
LFD	−2.785	−0.647	−2.453 ***	−0.346 ***
LCI	−2.220	−1.821	−2.065 **	−1.738 ***
LPR	−1.637	−1.085	−1.596 **	−1.044 **

Notes: *** 1% significance level; ** 5% significance level; * 10% significance level.

TABLE 6 Unrestricted cointegration rank test

Model 1	Eigenvalue	Trace statistic	Critical value at 5%	Probability **
No relationship*	0.43065	59.4578	47.21	0.000
At most 1*	0.40552	37.7531	29.68	0.000
At most 2*	0.29034	25.0341	15.41	0.001
At most 3*	0.18191	6.0028	3.76	0.014
At most 4*	0.502902	5.33424	3.74	0.025
Model 2	**Eigenvalue**	**Trace statistic**	**Critical value at 5%**	**Probability ** **
No relationship*	0.41349	58.1120	47.21	0.000
At most 1*	0.42270	36.1365	29.68	0.000
At most 2*	0.23196	24.5797	15.41	0.001
At most 3*	0.10744	4.0334	3.76	0.014
At most 4*	0.02550	4.4422	3.74	0.025

Trace test indicates five cointegrating eqn(s) at the 0.05 level.
*Denotes rejection of the hypothesis at the 0.05 level.

TABLE 7 Relationship of cointegration

Model 1				
GPD	*FDI*	*GCF*	*DI*	*TO*
1	5.0201 (0.001) ***	1.1175 (0.000) ***	−0.3090 (0.002) ***	3.3983 (0.159)

TABLE 7 Continued

Model 2				
GDP	FDI	FD	CI	PR
1	1.1369 0.05 **	0.6075 0.027 **	−1.7838 0.000 ***	−0.86372 0.000 ***

The error correction model (ECM), proposed by Engel and Granger (1987), is a time series regression model that is based on the behavioral assumption that two or more time series exhibit an equilibrium relationship that determines both short-run and long-run behavior. It describes a process of adjustment by contributing two types of variables: the level variables that measure long-term fluctuations and the first difference variables that measure changes in the short term. The equation that relates the short-run dynamics of economic growth based on the explanatory variables in both models is as follows:

$$\begin{cases} \Delta(\mathrm{GDP_t}) = \underset{(0.00)^{***}}{-5.3814}\,\gamma + \underset{(0.001)^{***}}{0.5034}\,\Delta\mathrm{GCF_{t-1}} + \underset{(0.127)}{0.3708}\,\Delta\mathrm{FDI_{t-1}} - \underset{(0.000)^{***}}{3.5132}\,\Delta\mathrm{DI_{t-1}} + \underset{(0.002)^{***}}{5.7191}\,\Delta\mathrm{TO_{t-1}} \\ \Delta(\mathrm{GDP_t}) = \underset{(0.004)^{***}}{-5{,}0616}\,\gamma + \underset{(0.467)}{0.4618}\,\Delta\mathrm{FDI_{t-1}} + \underset{(0.4199)}{1.7988}\,\Delta\mathrm{FD_{t-1}} - \underset{(0.007)^{***}}{4.6573}\,\Delta\mathrm{CI_{t-1}} - \underset{(0.003)^{***}}{1.6169}\,\Delta\mathrm{PR_{t-1}} \end{cases}. \quad (7)$$

The coefficient γ (force towards the long-run equilibrium) is significantly negative in both models. Given the probability presented above, we could note that all political and institutional variables, that is, political risk (PR), corruption index (CI), and democracy index (DI), are statistically significant at the 0.01 level. However, all coefficients of the economic variables are statistically insignificant, with the exception of the trade openness (TO) and domestic investment GCF.

Because the Algerian financial system in not developed yet, there is no meaningful relationship between financial development (FD) and economic growth in Algeria. Only six companies are listed on the Algiers stock exchange. Algeria's current market capitalization represents only 0.2% of GDP in 2019, a very low ratio compared with the country's economic potential. Findings are in line with the results presented by Lacheheb (2014) and Liu et al. (2021), who found that, on average, a more market-based financial system is associated with a higher level of economic growth and this impact, indeed, varies with different levels of political risks and different stages of economic development. On the other hand, the contribution of financial development to economic growth is weak, and this, undoubtedly, captures its insignificant relationship with growth in the present study. This finding reveals the fragile nature of the financial sector in Algeria. We suggest, therefore, the need for a viable financial system to improve the Algerian economy.

The relationship between foreign direct investment (FDI) and economic growth is generally positive or insignificant because Algeria, like other Mediterranean countries, has attracted little FDI. Foreign direct investissemnts and net inflows in this country represent 0.8% of GDP (World Bank database, 2020). The findings are, indeed, in line with the results presented by Adhikary (2015), Alalaya (2010), and Asiedu (2002). Further, it seems that the Algerian strategy to liberate the foreign trade sector and to attract more FDI is a persistent failure because it has not helped to develop and to change the structure of the Algerian economy by ensuring diversification of national production and non-hydrocarbon exports.

It seems that trade openness (TO) has a positive and a significant effect on economic growth. The Algerian economy is highly dependent on petroleum and on natural gas exports. Hydrocarbons account for over 95% of export earnings in 2019 (Trading Economics, 2020). The findings are in line with the results presented by Mbarki and Mokhtari (2020), Sakyi et al. (2015), Habibi (2015), Belloumi (2014), Yao (2006), and Edwards (1998). Algeria, indeed, should review the measures put in place for the attractiveness of the FDI and trade openness because, if it received more ideas, its industry would be diversified and would create competitiveness with local products. This, in fact, would increase the price–quality ratio and reduce the barriers to trade, and thus exports can be differentiated.

Regarding the variables related to institutional factors, it should be noted that the value taken by the coefficient of democracy index (DI) is negative and has, therefore, a negative impact on economic growth. In the 2019 edition of the economist intelligence unit's annual democracy index, Algeria was ranked in 126th place out of the 167 countries assessed, and it is not considered a democratic country, with a score of 4.01 (on a scale of 0–10). As part of this ranking, Algeria was ranked in the authoritarian regime category. It was ranked ninth in North Africa and MENA region, whilst falling behind Tunisia (63rd) and Morocco (100th). The findings of the study are in line with the results presented by Doucouliagos and Ulubaşoğlu (2008), who conclude that democracy does not have a direct impact on economic growth. However, democracy has robust, significant, and positive indirect effects through higher human capital, lower inflation, lower political instability, and higher levels of economic freedom. Democracies may also be associated with larger governments and less free international trade. The impact of FDI on economic growth is dependent on the level of democracy in the host countries. This implies that countries with strong democratic institutions are able to absorb the positive spillovers from FDI. In policy terms, Algeria should sustain the institutional reform policy agenda already in place in order to benefit more from the significant inflows of FDI.

The corruption index (CI) is significant and is negatively correlated with the economic growth. The 2019 edition of the Transparency International's annual corruption index, published by Berlin-based Transparency International, ranked Algeria in 106th place out of the 180 countries assessed and considered it a democratic country, with a score of 30/100. Subsequently, it is seen as a corrupt country. Macro-level studies, using country-level data to explore cross-country variations in both governance and economic indicators, have consistently found that corruption significantly decreases economic growth and development. For example, cross-country data indicate that corruption is consistently correlated with lower growth rates, GDP per capita, and economic equality, as well as lower levels of human development (Rothstein & Holberg, 2011). Similarly, a 2011 systematic review of available evidence of the

effect of corruption on economic growth confirms that corruption has a direct and a negative effect on growth in low-income countries (Ugur & Dasgupta, 2011).

Among the political variables, it retains the political risk (PR). The value taken by this coefficient is negative and significant. Political instability, therefore, has a negative and significant impact on the economic growth in Algeria. The findings are in line with the results presented by Aisen and Veiga (2011) and Liu et al. (2021), who found that higher degrees of political instability are associated with lower growth rates of GDP per capita.

6 | CONCLUSION AND POLICY RECOMMENDATIONS

The results obtained from the accounting framework show that the growth performance of Algeria has been weak and disappointing for several decades, mainly due to labor growth with weak gain in capital accumulation and sharp losses in total factor productivity (TFP).

The empirical study is performed on a model of time series of annual data covering the period 1980–2018 in Algeria. Results of our model prove the insignificant effect of the two economic variables, foreign direct investments and financial development, on economic growth. On the other hand, all political and institutional variables are statistically significant at the 0.01 level and have a negative effect on economic growth. Our empirical analysis focuses on the following three steps.

The first step is to test the stationarity of the variables studied (real gross domestic product, FDI, trade openness, financial development, democracy index, corruption index, and political risk). It was found that most variables are nonstationary in level. Hence, it was necessary to apply the test in first difference, and the variables were found to be stationary.

The second step is to test existence of such a relationship of cointegration between variables. It was concluded that there are five cointegrating relationships according to the trace test and two cointegrating relationships according to the maximum eigenvalue test. This relationship is described as long-term coefficients between FDI, trade openness, financial development democracy index, corruption index, political risk, and real GDP of the economy of Algeria. We noted that there is a positive relationship between the explanatory economic variables and the dependent variable. The results prove the existence of negative relationship between explanatory political and institutional variables and the dependent variable. The trace test, then, indicates the existence of five cointegration relationship between variables at the 5% and 1% level as compared with the maximum eigenvalue test, which implies the existence of just two cointegrating relationships.

The third step is based on the analysis of the error correction model. This model enables modeling of the adjustments that lead to a situation of long-term equilibrium. We conclude that this error correction specification is acceptable, and the relationship between real GDP and economic, political, and institutional variables may, then, make sense in the short run.

This paper seeks to help policymakers and researchers gain a fresh perspective and deeper reflections on the Algerian growth process. For this purpose, this paper conducts a comprehensive examination of the economic performance and growth patterns of Algeria during the last three decades of 1990–2018. By employing the growth accounting method to decompose the sources of Algeria's economic growth into the contributions of capital and labor inputs and total factor productivity growth, we found that Algeria has made modest progress in terms of economic growth. This is, mainly, due to labor growth that is seen as a main source of growth with weak gain in capital accumulation and sharp losses in TFP as a result of misallocation of resources and inefficiency of (physical and human) capital. This result suggests that policymakers should focus on fostering capital investment, structural change, and job creation to promote the economic growth. Furthermore, the creation of an enabling environment that encourages robust capital investment, vibrant job creation, and improvement in the educational system, etc. is crucial for sustained economic growth in Algeria.

From policymakers' perspective, the results suggest that the Algerian policymakers should focus on financial development and financial sector reforms to sustain steady economic growth in the country regardless of the revenue of the hydrocarbons sector. A well-functioning financial institution can, then, drive the economy to its desired height. Also, there is a need for diversification of the economy to reduce the overdependency on the hydrocarbon sector in order to protect it from the external shocks of falling oil and gas prices. Furthermore, future studies are required to apply better proxies to achieve better results.

Algeria and some other developing countries are held back by overrestrictive regulations, corruption, and high costs of doing business. To attract FDI, it is necessary to remove these costs and create a climate that is conducive to business. Corruption is, often, one of the biggest constraints to economic development; however, tackling it might not be easy.

A possible extension of this survey could be to work on a sample of different countries, such as from North Africa or the MENA region. Incorporating other institutional and other macroeconomic indicators might be another possible extension for this survey.

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