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Income Inequality and Economic Growth in Algeria: Empirical Study during the Period 1980-2015

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Abstract: In recent years, Algeria achieves significant progress in the economic and social condition of its population due to the improvement in most economic and social indicators, and the increase in the human development index from 0.577 in 1990 to 0.754 in 2018. However, this improvement is not equally shared between groups and different regions. Therefore, poverty and inequality persist and remain a major challenge of the Algerian government. In this paper, we attempt to study income inequality and its impact on economic growth in Algeria. To attend the aim of this study we explore the relationship between income inequality and economic growth over the period 1980-2015 based on the available data. Based on the recent theoretical and empirical studies, we use Autoregressive Distributive Lags (ARDL) model to explore the long-run relationship, and Error Correction Model (ECM) for the short-run dynamics, the results indicate that economic growth as measured by the annual per capita GDP growth rate is associated negatively and significantly with inequality as measured by Gini coefficient, implying that in the long run, a 1% increase in income inequality will hurt economic growth in Algeria by nearly 0.52% in the long-run. The result obtained from the ECM model shows that the coefficient is equal to -1.23 and highly significant; this implies that the deviation for the short-run in economic growth is corrected by 123% percent over each year in a long time. These findings confirm the hypothesis that high inequality hurts the economic growth in low- and middle-income countries. Therefore, the Algerian government must adopt policies that favor economic growth and achieve greater equity in income distribution to ensure sustainable and inclusive growth.

Keywords: income inequality; Gini index; economic growth; empirical study; Algeria.

Introduction

The gaps between rich and poor are growing all over the world, even there is a positive trend globally in economic growth and the slowdown of poverty rates, inequality persists and reaches a new peak in recent years. Oxfam estimates show that just eight men own the same wealth as the poorest half of the world. The growth benefits the richest, and the rest of society, especially the poorest suffers. (Hardoon, 2017, p. 5)

According to WEF's annual global risks report (2017) "rising income and wealth disparity were ranked the first trend that will decide the shape of the world in the next decade". Indeed, increasing inequality poses a risk to the global economy, and could result in the rolling back of globalization unless urgent action is taken. In his new report "Taking on inequality" World Bank considers that "tackling inequality is seen as a vital way of meeting the global goal of ending extreme poverty by 2030". (UNESCO, 2016, p. 11)

Over the last decades, several theoretical and empirical pieces of research attempted to explain whether inequality is good or bad for growth. Theoretical work has provided mechanisms supporting both possibilities, and the results obtained by earlier empirical literature were mixed and largely inconclusive. Authors such as Person and Tabellini (1991), Alesina and Rodrik (1994) find evidence of a negative relationship between inequality and economic growth, on the contrary, Li and Zou (1998); Forbes (2000) find that greater inequality is correlated with faster economic growth. Barro (2000) argues

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that inequality encourages economic growth in advanced economies, but retards it in developing ones.

In recent years, Algeria has achieved remarkable economic and social progress due to the improvement in most economic and social indicators, and the progress in the human development index. This index rose from 0.577 in 1990 to 0.754 in 2018, with an increase of 30.6% and thus, ranked within the category of high human development, placing 85 countries out of 189 countries and territories according to the latest update of global human development data. (UNDP, 2017) However, the improvement was not equally shared between groups of different regions or levels of income. Therefore, poverty and inequality have persisted or even worsened, which makes tackling inequality in Algeria a significant challenge. (Yacine, 2012, p. 191)

Algeria, like other middle-income countries, faces great challenges, including the risk of growing inequality in income and wealth, and inequality in access to basic services, and economic and social weakness, especially in light of the decline of oil prices and thus the financial resources. The disparity between living standards shows that the benefits of growth are not divided equitably between coastal and urban areas in the north, which include most of the country's economic activities and are less affected by poverty and arid southern regions, which contains the majority of the population who live below the poverty line. (Boutayeb, 2011, p. 23)

In colonial times, Algeria experienced high levels of inequality due to the French colonial policy that deepened social differences between the French and the Algerians. This policy adopts discriminatory social measures that favor Europeans in the area of employment, social protection, and wages at the expense of the indigenous population. Thus, the Gini coefficient reached 30.51 in 1966.

Since 1980, inequality increased dramatically mostly due to economic reforms, leading to the share of the top 10 percent of the population accounting for nearly 60 percent of the national income. (Belkacem, 2001, p. 25). The Gini coefficient increased from 34.37 in 1980 to 35.3 in 1990, and then it increased again in 1998, reaching 39.5.

In 2000 the government adopted a number of economic and political reforms to improve the standard of living of citizens, create permanent jobs, economic security, and provide all conditions. These efforts resulted in a reduction in poverty rates and income inequality and an improvement in human development indicators in general, Gini coefficient fall to 27.46 in 2012 and 28 in 2015. (Miliani, 2012, p. 193)

This article aims to explore the link between income inequality and economic growth in Algeria over the period 1980-2015. By using ARDL bounds-testing for long-run relationship and ECM model for the short-run dynamics. The findings show that there is a significant and negative impact of income inequality on economic growth in the long run.

This paper is organized as follows. Section 2 provides brief literature on the link between inequality and economic growth. Section 3 reports the empirical studies. Section 4 presents the data and the model. Section 5 explains the results of ARDL estimation, and Section 6 deals with conclusions.

Literature review

The link between inequality and growth

Inequalities are the unfair distribution of valuable resources among members of society. This is not limited to financial resources only, but rather includes social, cultural, and political resources, which generates a feeling of injustice among the members of this society and establishes a social hierarchy. (World Bank, 2019, p. 22)

Inequality is divided into two main categories: economic inequality and social inequality. Economic inequality refers to differences between income levels, assets, wealth, living standards, and differences in job opportunities. Social inequality is the differences between the social status of different population groups such as classes or age groups, inequality in access to public services such as education and health, and other services.

The theory developed by Kuznets (1955) indicates that the relationship between GDP per capita and inequality is in the form of an inverted (U). In the first phase of development in a country inequality increases due to a sectoral shift of the economy from agriculture to industrialization and urbanization. After having reached a peak, a country would face a decline in income inequality for three reasons. First, redistribution measures by the state would lead to lower income-inequality levels. Second, the dynamics of a capitalist economy would dampen income inequality, because new entrepreneurs would create new industries. Third, there is the structural shift of the labor force towards high service incomes. (Allison, 2014, p. 9)

Alternative theories argue that inequality can influence growth in either a positive or negative direction. According to the classical theory higher inequality stimulates growth by increasing aggregate saving accumulation and thus, increase investment and growth, by providing the incentives to work harder, invest and undertake risks to take advantage of high rates of return. (Gallo, 2002)

By contrast, the modern theories argued the higher inequality impedes economic growth via various channels. According to Keynes (1936) income inequality leads to slower economic growth via the demand channel. Since marginal consumption rates are fairly equal among all income brackets and the demand is the basis of the investment, aggregate consumption depends on changes in aggregate income. Thus, more inequality will diminish economic growth because it lowers aggregate consumption. (Malinen, 2007, p. 5)

Higher inequality results in underinvestment in human capital in the presence of financial market imperfections because the ability to invest of different individuals depends on their income or wealth level, which implies that aggregate output, would be lower than in the case of perfect financial markets. (Galor, 1993) Greater inequality might hinder growth via fertility rates, families with less human capital tend to have more children and invest less in education. Thus, large fertility-differentials lower the growth rate of average human capital, since poor families who invest little in education make up a large fraction of the population in the next generation. (Croix, 2004)

Inequality causes sociopolitical unrest by motivating the poor to engage in crime, riots, and other disruptive activities. Through this mechanism, more inequality threatens property rights and deters investment; therefore, it tends to reduce the productivity of an economy (Barro, 2000).

Greater inequality leads to the financial crisis and the current economic downturn (Rajan, 2010) and seems to lead to general social dysfunction, homicide rates are lower and children experience less violence in more to health, education and general well-being Inequality may impede growth via the fiscal system; more unequal societies tend to redistribute more via taxes and transfers, these efforts have direct negative effects on growth and seem to be the wrong remedy. Lower net inequality seems to drive higher and more sustainable growth. (Ostry, Berg, & Tsangarides, 2014, p. 11)

Empirical studies

The empirical studies on the link between inequality and growth offer contradictory results. Estimators based on time series variation suggest a strong positive link, while estimators based on cross-sectional variation predict a negative relationship.

Alesina and Rodrik (1994) find that inequality in land and income ownership is associated negatively with subsequent economic growth. Greater inequality of wealth and income leads to a higher rate of taxation and, therefore, lowers economic growth. (Alesina, 1994) Deininger and Squire (1998) find a negative relationship between initial inequality in asset distribution and long-term growth. They argue that inequality reduces income growth for the poor but not for the rich. (Deininger & Squire, 1998) Li and Zou (1988) find that income inequality is associated significantly and positively with economic growth. They argue that inequality leads theoretically to higher economic growth if public consumption enters the utility function. These findings stand in sharp contrast to the negative association between inequality and growth obtained by earlier studies. (Li & Zou, 1998) Barro (2000) finds a slight overall relationship between income inequality and rates of growth and investment from a broad panel of countries. He suggests that higher inequality tends to retard growth in poor countries and encourage growth in richer places. (Barro, 2000)

Forbes (2002) uses an improved data on income inequality which reduces measurement error and allows estimation via a panel technique. He suggests that in the short and medium-term, an increase in the level of income inequality in a given country has a significant positive relationship with subsequent economic growth. This relationship is highly robust across samples, variable definitions, and model specifications. He also argues that data quality, period length, and estimation technique all influence the sign and significance of the coefficient on inequality. (Forbes, 2000)

Voitchovsky (2005) argues that inequality coming from the top-end of the distribution promotes growth while bottom-end inequality tends to be harmful. She thus suggests controlling separately for inequality coming from different parts of the distribution, and she finds supportive evidence in a panel of rich countries. (Voitchovsky, 2009) Amparo and Castelló-Climent (2007) argue that inequality has a different effect on growth depending on the level of development of the region. Especially, they find a negative effect of income and human capital inequality on economic growth in the whole sample for as well as in the low and middle- income economies, an effect that vanishes or becomes positive when it comes to higher-income countries. (Castelló, 2002)

Halter (2010) argues that the differences-based methods are prone to reflect the positive short or medium-run implications of inequality while the level-based estimators also incorporate the negative consequences which require more time to materialize. (Halter, 2014) Ncube (2013) finds a negative and significant coefficient of the Gini index for economic growth; this indicates that greater inequality is associated with lower economic growth in the MENA region. Thus, income inequality is very bad for the goal of attaining higher and sustained economic growth in the MENA region. (Ncube, 2014) Fawaz, Rahnama, and Valcarcel (2014) explored the link between income inequality and economic growth in a sample of 55 low-income developing countries and 56 high-income developing countries by using a different generalized method of moments (GMM). Their findings confirmed a negative impact of income inequality on economic growth in the two samples. (Fawaz, Rahnama, & Valcarcel, 2014)

Naguib (2015) analyzed the data of 33 countries in the period 1971-2010 in the complete sample of (OCSE) based on (UNU-WIDER) database, and 27 countries in the restricted sample in the period 1981-2010 based on LIS data. The results showed that regardless of the method used, income inequality affects positively per capita income in the coming period. These results support the results of Barro (2000, 2008), which argues that inequalities hinder growth in developing economies and encourage it in rich countries.

(Naguib, 2015) Nathalie Scholl (2016) studied the link between inequality and growth in a sample of 122 countries during the period 1961-2012 based on the Forbes (2002) model. The result showed that there is no systematic empirical relationship between inequality and growth worldwide except for countries in transition. (Scholl, 2016)

Alvaredo et al. (2018) analyzed the evolution of income inequality over the last 40 years in China, Russia, and India. The authors found in 2015 the top 10 percent of the population in China accounted for nearly 42 percent of the national income. During the same period, the urban-rural income gap has widened. (Alvaredo et al., 2018, p. 2) Amri (2018) studied the causality relationship between economic growth and income inequality in 26 provinces from Indonesia over the period 2005-2015. Based on Pedroni's co-integration test, Panel Vector Error Correction Model, and Granger Causality Test. The research indicates that there is a negative and significant relationship between economic growth and income inequality in the long-run, and a positive relationship in the short-run. (Amri, 2018, p. 8)

Juuti (2020) re-examines the inequality-growth relationship based on an empirical analysis that covers over a hundred countries by using the system GMM estimator. The author finds no clear evidence for inequality to boost or dampen the growth of per capita GDP. (Juuti, 2020, p. 2)

Methods and materials

Data

This study aims to explore the long-run relationship between social inequality and economic growth in Algeria over the period 1980-2017 based on the theoretical literature on the link between inequality and economic growth and the following variables:

Y: Annual per capita GDP growth as a measure of economic growth,

Gini: index to measure the level of income inequality in society.

School: Gross secondary school enrollment ratio as a proxy of human capital, FDI to measure the net influx of Foreign Direct Investments in a country in a given year, it is expressed as a percentage of the country's GDP,

Open: to measure the economic openness it has been computed by dividing the sum of import and export of goods and services of a country by its GDP.

All data are collected from World development indicators WDI (2018), and the data of the Gini index are obtained from standard income inequality databases (SWIID).

Model

The paper uses the Auto Regressive Distributed Lag (ARDL) approach advanced by Pesaran et al (2001) to examine the existence of long-run relationships, and the Error Correction Model (ECM) for the short-run dynamics. This approach is suitable because, first, it allows us to explore both the short and long-run relationship between growth and its determinants. Second, it does not impose the restrictive assumption that all variables under study should be integrated of the same order, it applies to variables that are integrated of order of zero, one, or a mixture of both. Third, it is robust in finite samples. (Njindan Iyke, 2017)

This paper uses the following model:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^n \alpha_{1i} \Delta Y_{t-1} + \sum_{i=1}^n \alpha_{2i} \Delta \text{Gini}_{t-1} + \sum_{i=1}^n \alpha_{3i} \Delta \text{School}_{t-1} + \sum_{i=1}^n \alpha_{4i} \Delta \text{FDI}_{t-1} + \sum_{i=1}^n \alpha_{5i} \Delta \text{Open}_{t-1} + \beta_1 Y + \beta_2 \text{Gini} + \beta_3 \text{School} + \beta_4 \text{FDI} + \beta_5 \text{Open} + \varepsilon_i \dots (1)$$

Where:

Δ : Denotes the first difference operator

α : is the drift component

ε_i : is the white noise residuals

Table (1) shows the descriptive statistics of the variables

Table1. The Descriptive statistics of the variables

	Y	Gini	School	FDI	Open
Mean	0.74	36.84	61.94	0.66	57.32
Median	1.51	36.65	59.13	0.58	59.31
Maximum	5.86	40.19	99.86	2.03	76.68
Minimum	-4.23	31.16	30.08	-0.24	32.68
Std.Dev	2.48	2.22	17.38	0.65	10.78
Skewness	-0.37	-0.13	0.25	0.53	-0.35
Kurtosis	2.55	2.65	2.83	2.19	2.47
Jarque-Bera	1.15	0.27	0.39	2.68	1.16
Probability	0.56	0.87	0.82	0.26	0.55
Sum	26.79	1252.56	1982.18	23.79	2036.81
Sum Sq.Dev	215.54	162.82	9371.25	15.19	4069.96
Observations	37	34	34	37	37

Note: Std.Dev and Sum Sq.Dev. Denote, respectively, the standard deviation and the sum of squared deviation

Results and discussion

The first step in the ARDL approach involves testing the stationary of the variables. The results presented in Table (4) based on the Augmented Dickey-Fuller unit test root indicate that all series are stationary at the first differences.

Table2. Unit Test Root Estimation

At level						
		Y	Gini	School	FDI	Open
with constant	t-statistic	-3.03	-2.66	-0.02	-1.89	-1.45
	Prob	0.02**	0.09*	0.94 no	0.33 no	0.54 no
With constant and trend	t-statistic	-3.45	-4.53	-1.69	0.01	-2.41
	Prob	0.05*	0.00***	0.72 no	0.99 no	0.36 no
Without constant and trend	t-statistic	-3.06	-0.05	3.09	-1.58	-0.40
	Prob	0.00***	0.65 no	0.99 no	0.10 no	0.53 no
At First Difference						
		d(Y)	d(Gini)	d(School)	d(FDI)	d(Open)
with constant	t-statistic	-5.99	-7.66	-4.49	-6.36	-4.60
	Prob	0.00***	0.00***	0.00***	0.00***	0.00***
With constant and trend	t-statistic	-5.87	-7.38	-4.70	-6.48	-4.58
	Prob	0.00***	0.00***	0.00***	0.00***	0.00***

Without constant and trend	t-statistic	-6.09	-7.74	-3.62	-6.09	-4.67
	Prob	0.00***	0.00***	0.00***	0.00***	0.00***
Order of integration		I(1)	I(1)	I(1)	I(1)	I(1)

Notes: (*) significant at the 10%; (**) significant at the 5%; (***) significant at the 1% and (no) not significant

Once we ensure that all variables are not integrated of order two $I(2)$, we can run the ARDL approach for testing the long-run relationship between these variables. We move towards determining the optimal lag length based on Akaike Criterion. Figure.1 shows the optimal model ARDL (1, 2, 3, 3, 2), one lag for growth, two lags for Gini, three lags for both School and FDI, and two lags for Open.

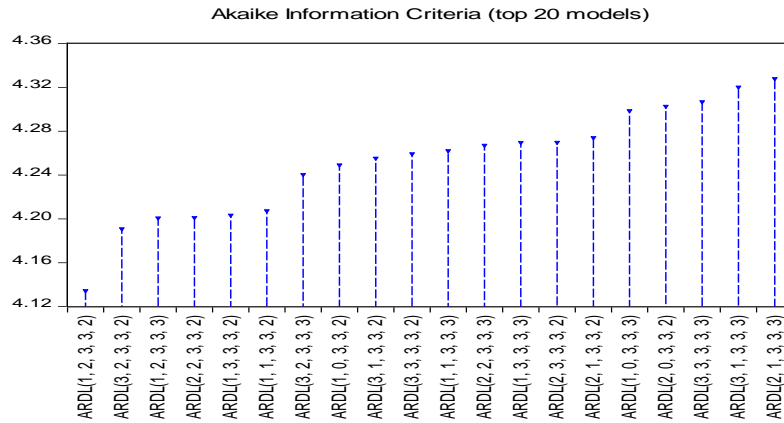


Figure 1. The optimal model using the Akaike criterion

Table (3) provides the results of the Bound-test for testing the existence of a long-run relationship among the variables. The findings indicate that the calculated F-statistic for the model is higher than the lower and upper Bound critical value at 1%, 2.5%, 5%, and 10%. Therefore, we can reject the null hypothesis of no cointegration, implying the existence of long-run cointegration relationships amongst the variables.

Table 3. The Bounds test

F-Bounds Test	Null Hypothesis: No levels relationship			
	Value	Signif.	I(0)	I(1)
F-statistic	6.46	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

The long-run results reported in table (4) indicate that economic growth as measured by the annual per capita GDP growth rate is associated negatively and significantly with income inequality, which means that in the long run, a 1% increase in income inequality will hurt economic growth in Algeria by nearly 0.52%.

The results of ECM imply that income inequality and human capital investment have a positive impact on economic growth in the short span of time in Algeria, while foreign direct investment and economic openness are associated negatively with economic growth in the short run.

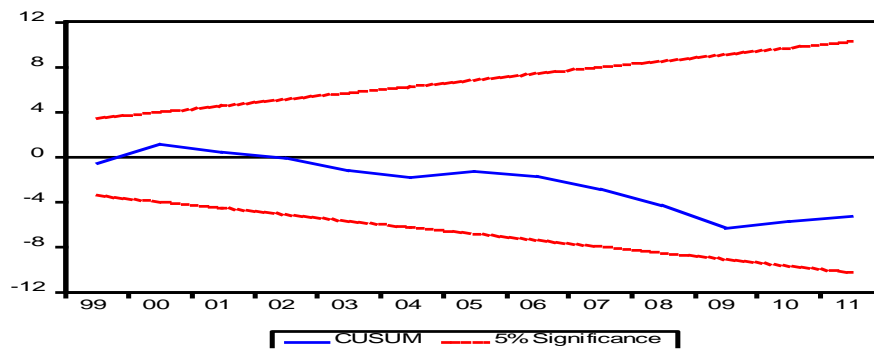
The error correction coefficient, which measures the speed of adjustment to restore equilibrium in the dynamic model should be negative and significant, it is further proof of the existence of a stable long-run relationship. The ECM_{t-1} is equal to -1.23 and highly significant. This implies that the deviation from the short-run in economic growth is corrected by 123% percent over each year in a long span of time.

Table 4. Short-run and Long-run Estimation

Dependent variable: D(Y)				
ECM Short-run coefficients				
Variables	Coefficient	Std.Error	t-statistic	Prob
D(GINI)	0.188	0.231	0.181	0.43
D(GINI(-1))	0.453	0.220	2.054	0.06
D(School)	0.32	0.072	0.447	0.66
D(School(-1))	0.122	0.084	1.449	0.17
D(School(-2))	0.325	0.096	3.386	0.00
D(FDI)	-1.742	1.121	-1.553	0.14
D(FDI(-1))	-2.676	1.024	-2.611	0.02
D(FDI(-2))	-3.162	0.963	-3.281	0.00
D(OPEN)	0.028	0.056	0.503	0.62
D(OPEN(-1))	0.285	0.069	4.091	0.00
CointEq (-1)*	-1.23	0.16	-7.431	0.00
Long run coefficients				
Variables	Coefficient	Std.Error	t-Statistic	Prob
Gini	-0.522399	0.263147	-1.985197	0.0686
School	-0.226183	0.052594	-4.300522	0.0009
FDI	5.951504	1.486247	4.004385	0.0015
Open	-0.020318	0.053429	-0.380273	0.7099
C	30.90968	10.62892	2.908074	0.0122
R-squared	0.80			
Adjusted R Squared	0.69			
F-statistic	4.00			
Prob (F-statistic)	0.008			
Durbin -Watsan	2.46			

Various diagnostic tests and stability tests were conducted to ascertain the efficiency of the model. Table (5) results reveal that the residuals are free from serial correlation, heteroscedasticity, and normally distributed (All P. values are greater than critical values of 0.05). Figures 2.A and 2.B show the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMQ) plots. They reveal that the estimates reported above are structurally stable.

Serial correlation	Heteroskedasticity (Chi-sq)	Normality (Jarque-bera)
0.31	0.91	3.04
(0.04)	(0.45)	(0.21)

**Figure 2.A. The plot of the cumulative sum of recursive residuals**

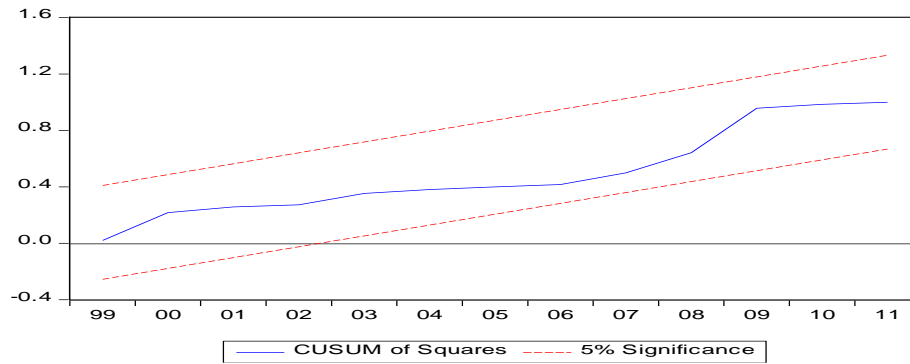


Figure 2.B. The plot of the cumulative sum of squares recursive residuals

Note: The straight lines represent critical bounds at a 5% significance level

Conclusion

The current study provides additional empirical evidence on the link between growth and income inequality. This study contributed to this line of research by studying the relationship between income inequality and economic growth in Algeria based on the available data. This paper is interesting because studies on this topic are very few in Algeria due to the lack of long and sufficient data on the distribution of income and wealth and the difficulty of defining the concept of income and social inequalities in Algeria.

We investigate the long-run relationship between economic growth as measured by the annual growth rate of GDP per capita, and income inequality as measured by the Gini index over the period 1980-2015 in Algeria by using the ARDL approach of Perasan et al. (2001). Furthermore, by applying the diagnostic tests and the stability tests CUSUM and CUSUMQ of the model, we ensure the stability and the reliability of the estimated model.

The results indicate that inequality has a significant negative impact on economic growth in this period. Whereas, increasing inequality by 1% will reduce growth by 0.52%. This result is consistent with the results of previous studies and this supports the idea that high inequality hurts growth in developing countries.

We can explain the negative impact of income inequality on economic growth in Algeria through the rent-seeking channel. High inequality in Algeria leads to the concentration of income and wealth in few hands which creates monopoly powers and other forms of seeking to achieve rent and contributes to a real waste of resources and weakening the process of allocating them, thus reducing productivity and negatively affecting the economy. On the other hand, High inequality affects Algeria's economy via the channel of social and political unrest. The increase in income inequality and inequality in access to basic services between geographical regions (north and south) and between groups of society, lead to an increase in anger, social issues, protests, and the rate of involvement in crime for the poor, which contribute to weakening the accumulation of material and human capital, which in turn hinders the development process.

The empirical evidence presented above has important implications for the conduct of economic policies in Algeria. In other words, the government must adopt policies that do not only aim to raise growth rates, but rather seek to achieve greater equity in income distribution to ensure continuous and sustainable growth that serves all segments of society.

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